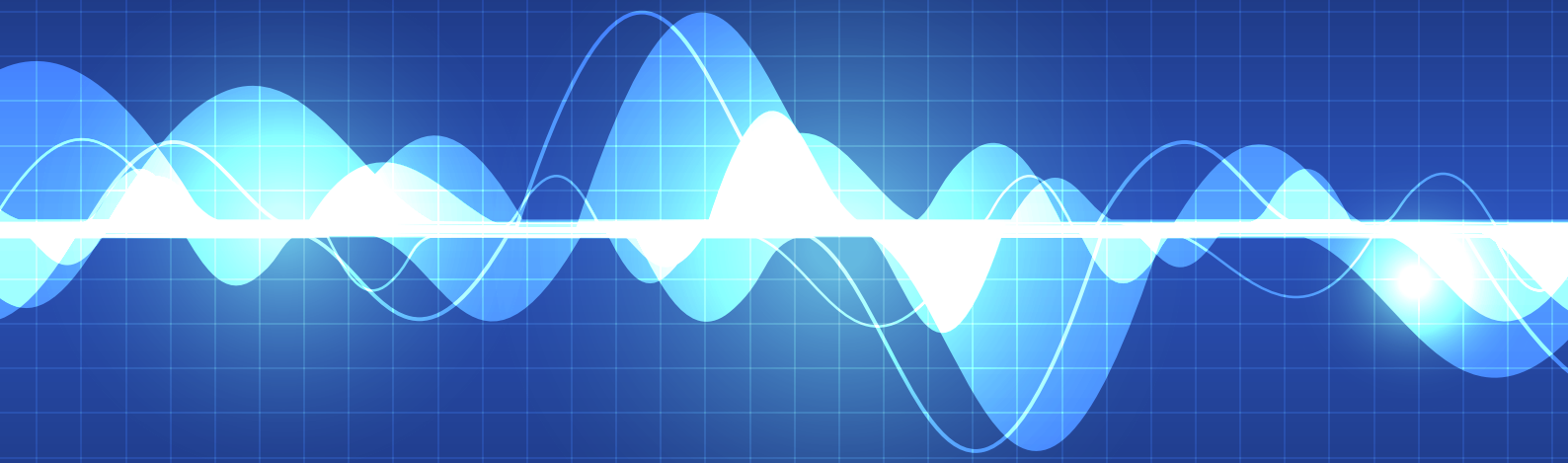
Appendix B

Noise and vibration impact assessment

APA East Coast Grid Expansion, Moomba to Wilton Pipeline - Modification Report 1

Noise Impact Assessment

Prepared for APA Group
July 2021



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APA East Coast Grid Expansion, Moomba to Wilton Pipeline - Modification Report 1

Noise Impact Assessment

Report Number

J200919 RP#7

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APA Group

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5 July 2021

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5 July 2021

Executive Summary

This Noise Impact Assessment (NIA) has been commissioned by APA Group (APA) to address potential noise impacts associated with the construction and operation of two gas compressor stations proposed along the existing Moomba to Wilton Pipeline (MWP).

This assessment has been prepared in support of Modification Report 1. The new gas compressor stations included under Modification 1 are:

- MW433 – Round Hill approximately 103 km north of Wilcannia; and
- MW880 – Milne approximately 35 km south-west of Condobolin.

The scope of this NIA is to undertake a review of likely noise generated by the 24-hour operation of gas compression equipment at each pad and determine whether the operation of each site is capable of achieving compliance with Environmental Protection Authority (EPA) guidelines.

The proposed compressor station site at Round Hill is located in a remote rural location, with no noise sensitive assessment locations within 10 km of the site. The proposed compressor station at Milne (MW880) includes assessment locations within 2 km of the site. Noise from the operation of each compressor station has been assessed against the EPA 2017, Noise Policy for Industry (NPfI).

Potential construction noise impacts have been addressed in accordance with the NSW Department of Environment and Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG).

The outcomes from the construction and operation noise assessment for each compressor station indicates the following:

- Noise associated with the construction and operation of compressor stations has been modelled using the SoundPlan™ noise modelling software incorporating the CONCAWE noise propagation algorithm. The CONCAWE algorithm has been utilised. The CONCAWE propagation algorithm provides the more representative prediction over relatively larger distances where noise enhancing weather conditions are present.
- Noise from the operation of the Round Hill compressor stations has been addressed using a screening noise model for a receiver at 10 km. The model considers noise propagation under noise-enhancing conditions. It has been determined that due to the distance between the proposed sites and assessment locations, the minimum distance being 10 km, a detailed acoustic model is not required. The predicted noise level from the Round Hill site will be at least 30 dB below the night-time noise criteria, and as such, noise impacts are highly unlikely.
- Based on the source noise levels submitted to EMM, predicted noise levels from the operation of the Milne compressor station will comply with the requirements of the NPfI for the proposed 24-hour operation.
- Given the distance between the compressor station and assessment locations at Round Hill, noise impact from project construction is expected to be negligible and below ICNG NMLs for all periods of the day, evening and night.

- Construction noise impacts from the Milne compressor station site have been modelled using the SoundPlan™ noise model. Predicted noise levels indicate that construction noise from the site will meet the ICNG standard construction hours noise management level (NML). Construction outside of standard construction hours has also been addressed. Recommended noise management and mitigation strategies have been provided such that construction noise from the sites during these periods can achieve the out of hours NMLs.

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1 Introduction

1.1 Background

East Australian Pipeline Pty Ltd, part of the APA Group (APA) currently operates an underground high pressure natural gas transmission pipeline, extending from Moomba (South Australia) to Wilton (New South Wales), a distance of approximately 1,299 kilometres (km). The Moomba to Wilton Pipeline (MWP) is the mainline part of the Moomba Sydney Pipeline (MSP) and was constructed in 1976.

Initially, the pipeline was owned and operated by the Pipeline Authority, a Commonwealth agency, and generally regulated under the *Pipeline Authority Act 1973*. The MWP is now owned and operated by APA; it was gazetted as State Significant Infrastructure (SSI) on 11 December 2020 and is authorised by Pipeline Licence No. 16 (PL16).

The MWP currently operates at a forward haul capacity of approximately 489 terajoules (TJ/day) (AEMC 2021).

1.2 Project overview and context

NSW imports the majority of its natural gas from other states, and a gas shortfall on Australia's east coast is predicted by Winter 2023, with demand for gas forecast to outstrip supply.

APA is proposing an expansion of gas transportation capacity on its East Coast Grid that links Queensland to southern markets ahead of projected potential 2023 supply risks. Expansion would be through the construction of additional compression stations and associated works on both the South West Queensland Pipeline (SWQP) and MWP in NSW.

The expansion will be delivered in a number of stages. The first stage of expansion works includes the construction of a single site of compression on each of the SWQP and MWP and will increase Wallumbilla to Wilton capacity by 12%. The first stage is targeted for commissioning in the first quarter of 2023 ahead of forecast southern state winter supply risks identified in the 2021 Australian Energy Market Operator (AEMO) Gas Statement of Opportunities (AEMO 2021).

The second stage of expansion works (an additional site on the SWQP and on the MWP) will add a further 13% capacity and will be staged to meet customer demand.

APA is undertaking engineering and design works on a potential third stage (three additional compressor locations on the MWP) of the East Coast Grid to add a further 25% transportation capacity. All up, these proposed capacity expansions would mean that the entirety of NSW peak demand could be met by gas flowing from northern sources.

The proposed East Coast Grid Expansion (the project) presents an optimal opportunity to maximise gas supply via existing infrastructure with minimal impact.

The five compressor stations for the East Coast Grid Expansion will be constructed at the following locations on the MWP:

- Modification 1:
  - Stage 1:
    - MW880 – Milne approximately 35 km south-west of Condobolin.
  - Stage 2:
    - MW433 – Round Hill approximately 103 km north of Wilcannia.

- Modification 2:
  - Stage 3:
    - MW162 – Binerah Downs approximately 68 km north-west of Tibooburra.
    - MW300 – Mecoola Creek approximately 70 km south-east of Tibooburra.
    - MW733 – Gilgunnia approximately 63 km south-west of Nymagee.

This report has been prepared to address the noise impacts for Stage 1 and 2 of the expansion works and to support Modification Report 1. As such, only the noise impacts at MW433 and MW880 have been assessed in this report. A separate report will be prepared to support Stage 3 in Modification Report 2.

The proposed locations of compressor stations on the MWP are shown in Figure 1.1.

1.3 Report purpose and method

EMM Consulting Pty Limited (EMM) has been commissioned to prepare a noise impact assessment for the construction and operation of the project.

1.3.1 Referenced guidelines

This NIA has been undertaken with consideration to the following documents, standards and guidelines:

- NSW Environment Protection Authority (EPA) 2017, Noise Policy for Industry (NPfI);
- NSW Department of Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG); and
- NSW Department of Environment and Conservation (DEC) 2006, Assessing Vibration: a technical guideline (AVTG).

1.3.2 Assessment method

The assessment of noise impacts from each site has been conducted by identifying:

- suitable noise emission criteria to govern the construction and operation of each site;
- the predominant sources of noise associated with each compressor station;
- modelling of noise associated with the operation of this equipment;
- modelling of noise associated with the construction of each site; and
- noise mitigation measures which may be employed to achieve noise emission criteria applicable to each site.

Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); LPI (2021); Metromap (2021)

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Proposed location of compressor stations on the MWP

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Figure 1.1

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2 Project description

2.1 Compressor station details

The East Coast Grid Expansion in NSW will be facilitated by the construction of five compressor stations along the length of the MWP. This modification report addresses the construction and operation of two compressor stations: Stage 1 (MW880) and Stage 2 (MW433).

Each compressor station will include:

- an enclosed gas turbine driven compressor unit;
- microturbine;
- compressor inlet/scrubber;
- a control equipment building;
- two fuel gas skids;
- air compressors and receivers;
- associated piping, electrical equipment, instrumentation, and controls;
- a station vent; and
- small accommodation and maintenance buildings for operations.

All facilities will be installed on driven piles or supported on structural steel skids over gravel sheeting, with the exception of the accommodation and maintenance buildings which will be constructed on concrete slab.

Both of the proposed sites for the compressor stations are on land owned by APA, with MW433 being approximately 380 m x 400 m with an area of 15.5 hectares (ha), and MW880 being approximately 400 m x 400 m with an area of 16 ha. The compressor station will have a final footprint of approximately 1.5 ha.

2.1.1 Construction

Each compressor station will require a construction footprint of approximately 3.5 ha, which will be reduced to approximately 1.5 ha for operations.

At MW433, the temporary construction workforce required to build the compressor station will be accommodated in a temporary accommodation camp, with mobilisation and demobilisation of the workforce to and from Broken Hill airport for each roster. The temporary accommodation camp will measure approximately 100 m x 100 m, with an additional 100 m x 100 m for waste water treatment. A smaller accommodation unit for operations will be included within the operational footprint on the compressor station.

At MW880, there are two options for the accommodation of the construction workforce. The preferred option is to house the workforce in short-term accommodation in Condobolin (42 km by road from the site), with potential overflow accommodation in West Wyalong (85 km by road from the site), if required. Workers will be driven to and from site each day, with between one and four buses and between five and eight cars required per day, depending on workforce numbers. The alternative option is to use a temporary accommodation camp on site (as per MW433), where mobilisation and demobilisation of the workforce will be to and from Dubbo airport for each roster.

Waste water from the construction camp (if used) will be treated and disposed of via spray irrigation on site.

Construction materials and supplies (including food and services for the temporary accommodation camps) will be sourced from relevant suppliers and transported to site. APA will use local suppliers where practicable.

At MW880, water will likely be purchased under a commercial arrangement from Lachlan Shire Council, or another local provider and transported to site by 25 kilolitre (kL) water truck. At MW433, there are two options for water supply – accessing groundwater on site, and/or purchasing water under a commercial arrangement from a local water provider and transporting it to site by 25 kL water truck. APA is investigating options to access groundwater under the relevant water sharing plans and regulations. If accessing groundwater at MW433 is feasible, then all regulatory requirements for water licences will be met, and any further assessments and approvals will be undertaken and applied for prior to water abstraction. If accessing groundwater is not feasible for all or part of the project, then the commercial purchase and transport will become the default water supply option.

The majority of construction activities will take place between 7:00 am and 6:00 pm, seven days per week. During the commissioning phase, activities will also take place between 7:00 am and 6:00 pm, seven days per week, however for the final two weeks, commissioning activities will be 24-hours per day.

i Construction activities

Construction of the compressor stations will include the following activities:

- mobilisation of construction equipment;
- establishment of access (where required);
- establishment of construction camp accommodation and associated facilities;
- establishment of access to water supply;
- site bulk earthworks including build up to match existing levels;
- installation of steel piles;
- installation of all equipment items, skids and buildings;
- installation of associated steel structures, prefabricated piping, electrical equipment, instrumentation and controls;
- supply and install communication and controls infrastructure;
- demobilisation of construction equipment;
- rehabilitation of temporary disturbance areas; and
- pre-commissioning and commissioning of compressor station.

ii Workforce

The construction of the compressor stations will require an average workforce of 40 with a peak of 80 personnel over the 12-month period. All roles are likely to be drive-in-drive-out (DIDO) or fly-in-fly-out (FIFO) and based at the construction camp when on site. The anticipated roster is three weeks on followed by one week off on a rotational basis.

There are expected to be five contracts put out to tender for the construction and commissioning of the compressor stations:

- earthworks and civil works;
- establishment of the construction camp and associated waste water treatment system;
- piling;
- structural, mechanical, piping, electrical and instrumentation construction (SMPEI); and
- compressor station pre-commissioning and commissioning.

In addition to the contractor workforce, APA will have a project team on site to manage the works.

The anticipated workforce associated with each contract is outlined in Table 2.1 below.

Table 2.1 Construction and commissioning workforce

Entity	Average workforce	Peak workforce
APA Project Team	4	10
Earthworks	10	15
Piling	6	6
SMPEI Construction	30	50
Construction Camp	8	16
Pre-commissioning and Commissioning	10	14

The anticipated workforce distribution over the 12-month construction and commissioning program is presented in Table 2.2.

Table 2.2 Monthly construction and commissioning workforce distribution

1	2	3	4	5	6	7	8	9	10	11	12
20	28	28	37	47	65	68	59	49	39	18	18

2.1.2 Operation

i Activities

The compressor stations are designed to operate remotely without onsite staff for most of their working life. They will be operated remotely from APA's control centre in Brisbane, and can operate up to 24 hours per day, seven days per week.

Typical operations activities will involve minor maintenance, calibrations, inspections, equipment performance checks, or equipment repair if needed. Operation activities will be typically carried out during daylight hours, unless an emergency requires urgent works at night. Site personnel will carry out inspections ranging from daily inspections to more rigorous inspections that may vary from one month to 4 years apart, dependent on the works. Detailed maintenance plans will be prepared for all sites.

Regulatory compliance checks will be carried out on different equipment as prescribed in applicable standards but will typically vary from one to four-year intervals subject to the equipment types. Compliance checks may include emissions testing, hazardous area compliance assessments, pressure vessel inspections, and electrical safety checks.

Major services and engine overhauls will be carried out at five-to-ten-year intervals subject to equipment condition, manufacturer's recommendations and run hours.

Once complete, the compressor stations will have an average design life of approximately 25 years. APA will continue to monitor the condition of equipment up to and beyond the end of life to ensure equipment is sound and fit for further service. Continued operation beyond the nominal design life will be subject to specific equipment condition and plant fitness assessments. The compressor station will be decommissioned when there is no further economic potential to continued use.

ii Workforce

The compressor stations are designed to operate as unmanned facilities. The typical site workforce for operation activities is expected to be one to two people.

Larger groups of up to five people associated with major services or overhauls will be required to minimise the time the compressor station is offline.

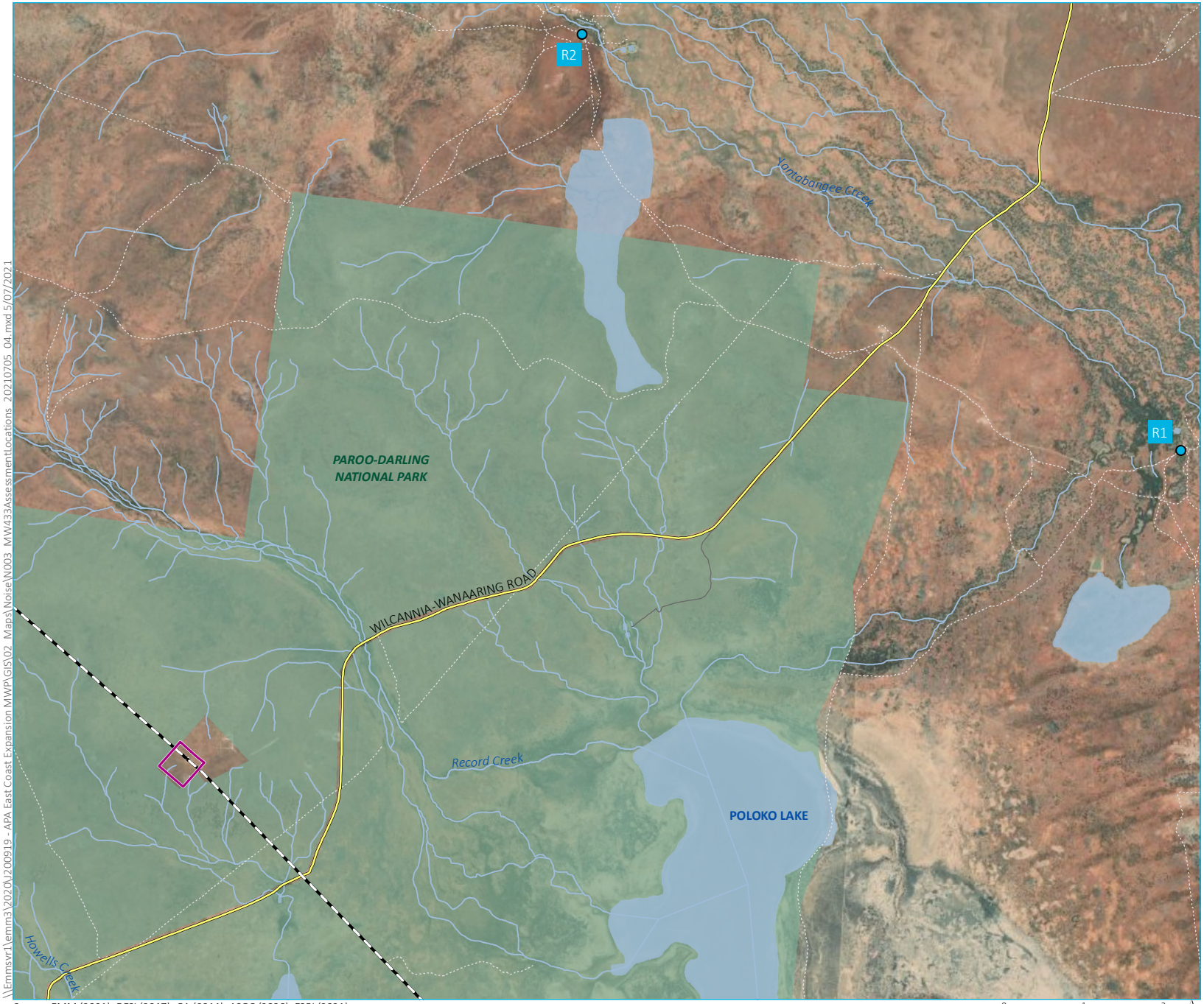
The operations workforce will comprise existing APA employees, who are unlikely to be resident locally. Additional specialist servicing will be carried out by a mix of local contractors and interstate/international based depending on the complexity of the task.

2.2 Assessment locations

Assessment locations have been established based on a desktop review of satellite imagery. It is noted that given the vast and remote nature of the surrounds that other locations not easily identifiable using aerial imagery may exist. However, this is considered highly unlikely. The assessment locations identified in the vicinity of each compression station are summarised in Table 2.3. Site layouts are presented in Figure 2.1 and Figure 2.2.

Table 2.3 Assessment locations

Station	Assessment ID	Lot/address	Classification	Coordinates		
				MGA	Easting	Northing
MW433	MW433-R1	Lot 3693, DP766075	Residential	54	759403	6610210
	MW433-R2	Lot 2, DP1058420	Residential	54	751881	6615446
MW880	MW880-R1	3208 Crown Camp Road	Residential	55	504346	6303586
	MW880-R2	2557 Crown Camp Road	Residential	55	500259	6303227
	MW880-R3	1276 West Milby Lane	Residential	55	499585	6306422
	MW880-R4	1515 Clarries Lane	Residential	55	500470	6306804
	MW880-R5	3341 Crown Camp Road	Residential	55	504341	6306539
	MW880-R6	3368 Crown Camp Road	Residential	55	505859	6306714
	MW880-R7	7241 The Gipps Way	Residential	55	506825	6306464



KEY

- Compressor site
- Sensitive receiver location
- Moomba to Wilton pipeline
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- NPWS reserve

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Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); ESRI (2021)

0 1 2 km

GDA 1994 MGA Zone 54

N

MW433 - Round Hill
assessment locations

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Figure 2.1

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KEY

- Compressor site
- Sensitive receiver location
- Moomba to Wilton pipeline
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody

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Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); LPI (2021)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

MW880 - Milne
Assessment locations

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Figure 2.2

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3 Assessment criteria

3.1 Operational noise

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

The objectives of noise trigger levels for industry are to protect the community from excessive intrusive noise and preserve amenity for specific land uses. It should be noted that the audibility of a noise source does not necessarily equate to disturbance at an assessment location.

To ensure these objectives are met, the EPA provides two separate criteria: intrusiveness criteria and amenity criteria. The fundamental difference being intrusiveness criteria apply over 15 minutes in any period (day, evening or night), whereas the amenity criteria apply to the entire assessment period (day, evening or night).

3.1.1 Intrusiveness criteria

The intrusiveness criteria apply to residential receivers, which requires that $L_{Aeq\,(15\,min)}$ noise levels from the proposed development do not exceed the rating background noise level (RBL) by more than 5 dB.

The acoustic environment in some locations can have RBLs which would result in noise criteria that are impractical for the reasonable assessment of noise from a site. Section 2.3 of the NPfI provides guidance where the recorded RBL is below the minimum assumed background noise level and is reproduced in Table 3.1.

Table 3.1 Minimum assumed RBLs

Time of day	Minimum assumed rating background noise level, dBA
Day	35
Evening	30
Night	30

Given the remote and rural locations of the proposed compression stations, minimum assumed background level has been adopted as per Table 3.1. It is noted that intrusiveness noise levels are only applicable at residential assessment locations.

Table 3.2 presents the intrusive noise criteria determined for the proposal based on the adopted RBLs.

Table 3.2 Intrusive noise criteria

Assessment location	Time of day[1]	Intrusive noise criteria $L_{Aeq,15min}$, dB[3,4]
All residential assessment locations	Day	40
	Evening	35
	Night	35

Notes. 1.The daytime is 7.00 am to 6.00 pm; evening 6.00 pm to 10.00 pm; night-time 10.00 pm to 7.00 am. On Sundays and Public Holidays, the daytime is 8.00 am to 6.00 pm; evening 6.00 pm to 10.00 pm; night-time 10.00 pm to 8.00 am.

3.1.2 Amenity criteria

The assessment of amenity is based on noise criteria specific to the land use. The amenity criteria are used to assess the cumulative impacts of industrial noise. Where the measured existing industrial noise approaches recommended amenity criteria, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that criteria are exceeded.

The corresponding recommended amenity criteria for the proposed development are given in Table 3.3.

Table 3.3 Amenity criteria

Receiver type	Indicative area	Period[1]	Recommended noise level dB, $L_{Aeq\ (period)}$
Residential	Rural	Day	50
		Evening	45
		Night	40
Commercial premises	All	When in use	65

Notes. 1. The daytime is 7.00 am to 6.00 pm; evening 6.00 pm to 10.00 pm; night-time 10.00 pm to 7.00 am. On Sundays and Public Holidays, the daytime is 8.00 am to 6.00 pm; evening 6.00 pm to 10.00 pm; night-time 10.00 pm to 8.00 am.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location. To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise. The project amenity noise level for industrial developments equals the recommended amenity noise level (Table 3.3) minus 5 dB(A).

The following exceptions to the above method in deriving the project amenity noise level apply:

- in areas with high traffic noise levels;
- in proposed developments in major industrial clusters;
- where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time; and
- where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development.

There are currently no significant industrial noise sources in the vicinity of each site. As such, no additional correction to the amenity noise level is applied.

3.1.3 Project noise trigger level

The project-specific noise level (PNTL) is the lower of the calculated intrusive or amenity criteria. As per Section 2.6 of the NPfI, the PNTL and maximum noise level is to be assessed at the reasonably most-affected point on or within the residential property boundary or, if that is more than 30 m from the residence, at the reasonably most affected point within 30 metres of the residence.

A summary of the PNTL for assessment of operational noise from the Project is presented in Table 3.4, showing in all cases that the intrusive noise criteria are the limiting and hence define PNTLs.

Table 3.4 Project noise trigger levels – residential receivers

Assessment location	Assessment period[1]	Intrusiveness noise level, $L_{Aeq,15min}$, dB	Amenity noise level[2], $L_{Aeq,15min}$, dB	PNTL[3], $L_{Aeq,15min}$, dB
All residential premises	Day	40	53	40
	Evening	35	48	35
	Night	35	43	35

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Morning shoulder: 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.

2. Project amenity $L_{Aeq,15min}$ noise level is the recommended amenity noise level $L_{Aeq,period}$ +3 dB as per the NPfI. In the absence of existing or future industrial noise sources, the amenity level has not been adjusted 5dB.

3. PNTL is the lower of the calculated intrusiveness or amenity noise levels.

3.1.4 Sleep disturbance criteria

The development will operate during the night-time period (10 pm to 7 am) and therefore, in accordance with the NPfI, the potential for sleep disturbance has been assessed.

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

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

Some guidance regarding potential for sleep disturbance is also provided in the DECCW's Road Noise Policy (RNP) (2011). The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides the following conclusions from the research on sleep disturbance:

- maximum internal noise levels (L_{Amax}) below 50 to 55 dB are unlikely to awaken people from sleep; and
- one or two noise events per night, with maximum internal noise levels (L_{Amax}) of 65 to 70 dB, are not likely to affect health and wellbeing significantly.

It is commonly accepted by acoustic practitioners and regulatory bodies that a facade including a partially open window will reduce external-to-internal noise levels by 10 dB. Therefore, external noise levels in the order of 60 to 65 dB calculated at the facade of a residence is unlikely to cause awakening affects.

The sleep disturbance criteria for all residential assessment locations are provided in Table 3.5.

Table 3.5 Sleep disturbance screening criteria

Assessment location	Assessment period	Adopted RBL, dB	Sleep disturbance screening criteria, dB	
			$L_{Aeq,15min}$	L_{Amax}
All residential assessment locations	Night	30	40	52

3.2 Construction noise

The Interim Construction Noise Guideline (ICNG) (DECC 2009) has been jointly developed by NSW Government agencies including the EPA and Department of Planning, Industry and Environment (DPIE). The objectives of the guideline relevant to the planning process are to promote a clear understanding of ways to identify and minimise noise from construction and to identify 'feasible' and 'reasonable' work practices.

The guideline recommends standard construction hours where noise from construction activities is audible at residential premises (ie assessment locations):

- Monday to Friday 7.00 am to 6.00 pm;
- Saturday 8.00 am to 1.00 pm; and
- no construction work is to take place on Sundays or public holidays.

Construction works may be undertaken all day Saturday, Sundays and public holidays during daytime hours. Commissioning works are expected over a three month period. Noise generated during commissioning works may occur over a 24-hour period during the final two weeks of commissioning. This will typically be associated with the running of equipment consistent with the general operation of each site. As such an assessment of noise against the out of hours construction noise management levels will be undertaken. Noise associated with blowdowns may occur, however these would be scheduled during normal construction hours. An assessment of blowdown events is provided in Section 4.6.

The ICNG acknowledges that works outside standard hours may be necessary, however, justification should be provided to the relevant authorities.

While construction activities outside of standard hours could be limited, this would result in the construction timeframe being significantly extended, which would have further implications for the environmental impact of the project. The construction and commissioning timeframe of 12 months is based on construction activities being undertaken for 10 hours per day, seven days a week. If construction activities are limited to standard hours, then 1.5 of every 7 days will be unproductive. This reduction in hours would extend the nominal construction timeframe by approximately three months, which would have consequential impacts on air quality, soil and water. The advantages of limiting construction activities to standard hours do not outweigh the disadvantages of an extended construction timeframe. With the project proposing to work outside of standard hours, the impacts on sensitive receptors are limited in both number and duration. Therefore, limiting general construction to standard hours is not proposed.

It should also be noted that the ICNG include provisions for construction works outside of standard hours on public infrastructure and nominates the following:

> In general, only works undertaken on public infrastructure need to be undertaken outside the recommended standard hours. This need is typically based on a requirement to sustain the operational integrity of public infrastructure, as works to restore operation of the infrastructure provide benefit to the greater community (that is more than just local residents). Examples of public infrastructure are:
>
> - transport – railways, roads, ferries, airports
> - utilities – water, electricity or gas, sewerage or drainage.

Whilst the pipeline and associated gas compression stations are not necessarily public infrastructure, they do provide for increased service of gas resources to the greater community and should be considered accordingly. In any event, construction noise outside of standard construction hours should comply with the NMLs relevant to the out of hours periods.

The ICNG provides two methodologies to assess construction noise emissions. The first is a quantitative approach, which is suited to major construction projects with typical durations of more than three weeks. This method requires noise emission predictions from construction activities at the nearest assessment locations and assessment against ICNG recommended noise levels.

The second is a qualitative approach, which is a simplified assessment process that relies more on noise management strategies. This method is suited to short-term infrastructure and maintenance projects of less than three weeks.

Given that the construction of each compressor station is expected to take up to nine months, the quantitative assessment approach has been undertaken.

3.2.1 Noise management levels

Table 2 of the ICNG provides guidance on establishing noise management levels (NML) for residential receivers during standard hours and has been reproduced in Table 3.6.

Table 3.6 ICNG residential NMLs

Time of day	NML $L_{Aeq,15min}$	How to apply
Recommended standard hours: Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Recommended standard hours: Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; and 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 of the ICNG

Source: ICNG (DECC 2009).

3.2.2 Project construction NMLs

The construction NMLs for residential assessment locations have been based on the RBLs provided in Table 3.1. The NMLs for standard construction hours adopted for this NIA were derived in accordance with the ICNG for all assessment locations. Construction NMLs for standard and out of hours periods are provided in Table 3.7.

Table 3.7 Construction NMLs for standard hours

Assessment location	Period	RBL, dB(A)[1]	NML, $L_{Aeq,15min}$, dB	HNL[2]
All assessment locations	Day (standard ICNG hours)	35	45	75
	Day (Outside standard ICNG hours – Sundays, public holidays and Saturday between 1.00 pm and 6.00 pm)	35	40	-
	Evening and night (Outside standard ICNG hours)	30	35	-

Notes: 1. Based on the day period RBL established in Table 3.1

2. HNL – highly noise affected level

4 Operational noise modelling

4.1 Equipment noise levels

The Solar Turbines Mars 100 gas turbine will be installed at each compressor station. Noise data for the gas turbine equipment package has been supplied by APA for the assessment of operational noise from each site and is provided in Table 4.1.

Table 4.1 Solar Turbines Mars 100 noise data

Description	Octave band centre frequency, dB									dBA
	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Turbine sound power level-full load										
Enclosed package	116	109	106	103	101	100	98	94	90	105
Ventilation sound power levels										
Vent duct inlet/outlet unsilenced	97	100	100	97	98	96	108	105	101	112
Ventilation fan	-	91	95	99	100	98	93	89	86	102
Turbine inlet/exhaust[1] sound power levels										
Inlet unsilenced[2]	122	125	125	125	125	127	131	161	152	162
Exhaust unsilenced	123	124	123	122	123	120	114	106	90	124
Insertion losses										
Turbine inlet silencer	0	1	4	7	26	43	52	60	55	-
Turbine exhaust silencer	3	5	10	21	32	37	39	38	34	-
Ventilation inlet silencer	0	1	5	11	22	29	33	31	22	-
Ventilation outlet silencer	0	2	7	11	16	19	21	20	16	-
Combustion air cleaner insertion losses										
Pulse cleaning	0	1	8	10	14	15	18	20	25	-
Medium velocity 3-stage	0	0	0	3	5	10	21	24	24	-
Barrier	0	2	3	4	4	5	8	13	18	-
Marine	0	1	2	1	2	5	6	9	8	-
Cooler sound power level										
Standard	105	112	109	102	97	94	90	86	81	100

Note: 1. Turbine inlet and exhaust noise data has been adopted from the Solar Turbines, 1998 *Noise Prediction – Guidelines for Industrial Gas Turbines*.

The diagram layout for each compression station is provided in Figure 4.1.

Figure 4.1 Gas compression station layout

The noise model has been prepared assuming the following:

- Round Hill:
  - the turbine exhaust incorporates a silencer as per Table 4.1; and
  - there is no additional attenuation on the turbine exhaust, ventilation inlet and outlet.

  No attenuation measures have been incorporated into the Round Hill screening assessment. The combined sound power level (SWL) for the equipment operating under normal conditions is 124dB $L_{Aeq\ 15min}$.
- Milne:
  - the turbine exhaust incorporates a silencer as per Table 4.1;
  - the turbine intake incorporates a silencer as per Table 4.1; and
  - there is no attenuation on the ventilation inlet and outlet.

  The combined sound power level (SWL) for the equipment operating under normal conditions is 116dB $L_{Aeq\ 15min}$. The predominant source of noise will be due to the untreated ventilation openings.

4.2 Noise modelling parameters

Noise modelling was conducted using the SoundPlan™ noise modelling software. Noise propagation models typically adopted in NSW for modelling industrial noise include international standard ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors' and the CONCAWE propagation model.

The acoustic model prepared the Milne compressor station site utilises the CONCAWE noise model to determine noise at surrounding assessment locations. Empirical evidence has shown that for long range predictions the CONCAWE model is most suitable.

As such, CONCAWE as the more conservative model, has been utilised. The same CONCAWE model has been used in a screening assessment to determine if detailed noise modelling is required for assessment locations outside of 4.5 km. The modelling parameters adopted for the assessment are provided in Table 4.2.

Table 4.2 Modelling standard parameters

Modelling Parameter	Input
Model	CONCAWE
Environmental conditions	Humidity 70% Temperature 10°C Air pressure [mbar] 1013.3
Elevation contours	Contours adopted from 1 Second Digital Surface Model Version 3
Receiver height and position	1.5 m above ground within 30 m of residence
Ground absorption factor	50% over open remote rural areas (generally dirt and shrubs) 70% over open rural areas (generally grass)

The noise-enhancing meteorological conditions provided in Table D1 of the NPfI have been adopted for assessing noise to surrounding noise sensitive receivers. These conditions are provided in Table 4.3.

Table 4.3 Standard and noise enhancing meteorological conditions

Meteorological conditions	Meteorological parameters
Standard meteorological conditions	Day/evening/night: stability categories A–D with wind speed up to 0.5 m/s at 10 m AGL.
Noise-enhancing meteorological conditions	Daytime/evening: stability categories A–D with light winds (up to 3 m/s at 10 m AGL). Night-time: stability categories A–D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

Notes: m/s = metres per second; m = metres; AGL = above ground level; where a range of conditions is nominated, the meteorological condition delivering the highest-predicted noise level should be adopted for assessment purposes. However, feasible and reasonable noise limits in consents and licences derived from this process would apply under the full range of meteorological conditions nominated under standard or noise enhancing conditions as relevant. All wind speeds are referenced to 10 m AGL. Stability categories are based on the Pasquill–Gifford stability classification scheme.

4.3 Screening assessment for Round Hill

A rudimentary noise model was created to substantiate the level of noise at 10 km utilising the CONCAWE noise propagation model under noise enhancing conditions. The model conservatively did not consider potential screening effects provided by the natural topography.

The screening noise model indicates that noise from the operation of the compression station is expected to be less than 9dB L_{Aeq} at a distance of 10 km from the site which is 26dB below the night-time noise criterion. As such, no further assessment has been undertaken for the Round Hill compression station.

Assessment locations around the Milne compression station are within 2 km and as such a detailed SoundPlan™ noise model has been prepared for this site.

4.4 Predicted noise levels for the Milne compressor station

Predicted noise levels from the operation of the Milne compressor station are provided in Table 4.4. Predictions been compared against the PNTL for the night-time period which presents the most stringent noise criteria applicable for each site. The night-time noise enhancing conditions (ie category F with 2 m/s winds) have been adopted for the predictions.

Table 4.4 Predicted noise levels – Milne

Gas compressor station	Assessment location	Predicted noise levels, dB $L_{Aeq\ 15min}$	PNTL, dB[1] $L_{Aeq\ 15min}$
Milne	MW880-R1	26	35
	MW880-R2	20	35
	MW880-R3	20	35
	MW880-R4	19	35
	MW880-R5	31	35
	MW880-R6	21	35
	MW880-R7	17	35

Note: 1. Predicted noise levels have been compared against the PNTL for the night-time period which will be the most onerous noise criteria applicable to the site.

Predicted noise levels indicate that noise from the Milne compressor station will be 4 dB less than the night-time PNTL at potentially the worst affected assessment locations based on a conservative noise model. The recommended silencers on the turbine intake and discharge are to be incorporated into the compression station design.

A review of the A weighted and C weighted noise levels for the potentially worst-case receiver at MW880-R5 indicates that the C weighted noise level will be greater than the A weighted noise level by 16 dB, exceeding the 15 dB threshold for assessment of low frequency noise (LFN).

Where the difference between the A-weighted and C-weighted noise levels exceeds 15 dB, the predicted one-third octave noise levels are to be compared against the low-frequency thresholds in Table C2 of the NPfI. One-third octave noise data is not available for the proposed gas turbine. As such, corrections provided in Table C2 of the NPfI have been compared against the single-octave predictions.

Table 4.5 Low frequency noise thresholds

Noise source	Noise level $L_{Zeq,\ 15min}$ in single octave bands, dB		
	31.5Hz	63Hz	125Hz
Predicted level at MW880-R5	49	47	36
Threshold level NPfI – Table C2	61	50	46

The predicted noise level at the potentially worst-case receiver location will satisfy the LFN assessment. Accordingly low frequency corrections do not need to be applied to the sources.

4.5 Assessment of sleep disturbance

There is no specific L_{Amax} noise data for the Mars 100 turbine unit, however like most pumps, the operation of the turbine compressor station is expected to be steady-state. In this regard, there will likely be very little variance in noise level between the L_{Aeq} parameter and the L_{Amax} parameter.

The worst-case predicted noise level at any compressor station is at Milne. Predicted noise levels at assessment location MW880-R5, indicates an operational noise level in the order of 31 dB $L_{Aeq\ 15min}$. Compliance with the sleep disturbance criteria at this location will indicate compliance with the sleep disturbance criteria for all assessment locations. In this regard, we note:

- the predicted 31 dB $L_{Aeq,\ 15min}$ noise level complies with the 40 dB $L_{Aeq,\ 15min}$ maximum noise level limit; and
- the sleep disturbance criteria for loud instantaneous noise events, is 52 dB L_{Amax}. Given that only marginal variance between the L_{Aeq} and L_{Amax} level is expected from the operation of the turbine, noise levels of between 30-35 dB L_{Amax} at MW880-R5 would be expected. This is up to 17 dB below the 52 dB L_{Amax} noise criteria.

As such, the operation of the gas compressor stations will comply with the NPfI sleep disturbance criteria.

4.6 Noise from blowdown events

The loudest potential noise source associated with gas compression stations is that associated with compressor blowdowns. Compressor blowdowns of gas compression stations may be required during the life of the pipeline but would be an extremely rare activity.

Blowdowns involve the controlled expulsion of gas from the compression station system and can occur for several minutes to sufficiently purge the system. During these times, other items of plant will cease operation. Blowdowns are utilised to effectively purge compressed gas from the system during an emergency or for rare maintenance purposes. Such scenarios are an extremely rare activity, occurring during 4-yearly inspections and possibly for periodic repairs of compressor units. As such, noise from such events is atypical of the general operation of the compressor station.

Blowdowns are expected to occur during the commissioning stage of the gas compression station. Such high intensity noise events will be managed via community consultation in accordance with the ICNG.

A study of noise during blowdown events was presented in the Boland, J. et al, 2016, *Pipeline Blowdown Noise Levels* paper presented at Acoustics 2016 Brisbane, Australia November 2016. The study included near and far field noise measurements of blowdown events, which were used to establish a representative curve of likely noise levels at specific distances from the vent. The curve provided in Figure 9 of the Boland (2016) paper indicates blowdown noise levels in the order of:

- 75 dB $L_{Aeq\ 15min}$ at 2 km; and
- 50 dB $L_{Aeq\ 15min}$ at 10 km.

It is noted that the noise levels presented above were based on an initial pipeline pressure in the order of 9.2 MPag. The average pressure of the project system is 4.7 MPag. Figure 5 of the Boland (2016) paper indicates that there is a measured difference in the order of 5dB between 9.2 MPag and 4.7 MPag. As such, noise levels during blowdowns would be in the order of:

- 70 dB $L_{Aeq\ 15min}$ at Milne; and
- 45 dB $L_{Aeq\ 15min}$ at Round Hill.

5 Construction noise impact assessment

A preliminary assessment of noise and vibration impacts from the construction of each site has been undertaken. At this stage, a detailed construction methodology has not been developed. As such, noise predictions are based on the likely worst-case construction activities.

Given the distance between each site and surrounding assessment locations, construction vibration impacts are expected to be negligible. As such, construction vibration has not been addressed further.

5.1 Construction stages

5.1.1 Site preparation

The new gas compressor stations will be located on cleared and levelled ground. Each compressor station will require a construction footprint of 200 m x 200 m reduced to 100 m x 100 m for operations. The temporary accommodation camp will measure approximately 100 m x 100 m, with an additional 100 m x 100 m for waste water treatment. A smaller accommodation unit for operations will be included within the operational footprint on the compressor station.

To clear and prepare the site, the main sources of noise are expected to be associated with bulldozers, excavators, graders and vibratory rollers.

5.1.2 General construction

The general construction phase of the project will typically include:

- the erection of structure including piling and pouring of the compressor station foundations; and
- fitting of mechanical, hydraulic and electrical services.

The main source of noise is expected to be associated with impact piling, smaller hand tools and impact wrenches for fixing of equipment supports.

5.2 Construction noise modelling

Equipment sound power levels have been taken from the Department of Environment, Food and Rural Affairs (DEFRA) 2005, Update of Noise Database for Prediction of Noise on Construction and Open Sites, where relevant to the project and the NSW Roads and Maritime Services (RMS) 2017, Construction and maintenance noise estimator. Otherwise, data was sourced from an EMM database of similar equipment which is based on measurements at other construction sites as indicated.

Acoustically significant mobile equipment items considered in the model for each construction area and adopted typical worst-case scenarios and utilisation are presented in Table 5.1.

Table 5.1 Construction stage and equipment sound power levels

Construction phase	Construction appliance	Sound power level, dB $L_{Aeq\ 15min}$
Site preparation	Grader[2]	113
	Excavator 35t (tracked) [2]	110
	Dozer[1]	108
	Vibratory roller[2]	109
	Combined sound power level	**116**
Piling	Impact pile[1]	117 (inc. +5dB impulsive correction)
Construction	Angle griding (steel)[1]	108
	Impact wrench	105
	Forklift	106[1]
	Welder	105[1]
	Combined sound power level	**112**

Notes: 1. Noise level adopted from DEFRA noise database.

2. Noise level adopted from RMS 2017, *Construction noise and maintenance estimator*

Construction noise during the evening and night time periods during the commissioning phase will include the running of plant that will produce noise levels similar to that from the general operation of the facility. The construction NML for the evening and night is the same as the operational PNTL for the evening and night. As such, compliance with the PNTLs for noise associated with the general operation of the compression stations will also indicate compliance with the construction NMLs during the commissioning phase.

5.3 Predicted noise levels

The ICNG recommends the following where NMLs are predicted to be exceeded:

- application of feasible and reasonable work practices to minimise noise; and
- inform potentially impacted residents of the nature of the works to be carried out, expected noise levels and duration and relevant contact details.

A detailed assessment of construction noise impacts for the Milne site has been undertaken given proximity to noise sensitive assessment locations. This has been undertaken using a SoundPlan™ noise model, utilising the day-time noise enhancing meteorological conditions.

Predicted noise levels are provided in Table 5.2 and have been compared to the standard construction hours NML and out of hours NML.

Table 5.2 Predicted construction noise levels

Compressor station	Construction stage	Receiver location	Predicted noise levels, dB $L_{Aeq\ 15min}$	Standard construction hours NML, dB[1] $L_{Aeq\ 15min}$	Out of hours (daytime) NML[2]
Milne	Site preparation	MW880-R1	32	45	40
		MW880-R2	25	45	40
		MW880-R3	25	45	40
		MW880-R4	24	45	40
		MW880-R5	36	45	40
		MW880-R6	27	45	40
		MW880-R7	23	45	40
	Piling	MW880-R1	38	45	40
		MW880-R2	31	45	40
		MW880-R3	31	45	40
		MW880-R4	30	45	40
		MW880-R5	42	45	40
		MW880-R6	33	45	40
		MW880-R7	29	45	40
	Construction	MW880-R1	28	45	40
		MW880-R2	21	45	40
		MW880-R3	21	45	40
		MW880-R4	20	45	40
		MW880-R5	32	45	40
		MW880-R6	23	45	40
		MW880-R7	19	45	40

Note: 1. Noise affected level based on RBL + 10dB in accordance with the ICNG.

2. Noise affected level based on RBL + 5dB for work outside of standard hours during the day (Sundays, public holidays and Saturday between 1.00pm to 6.00pm) in accordance with the ICNG.

Predicted construction noise levels during the site preparation, piling and construction stages comply with the daytime 'noise affected' NMLs at all assessment locations.

With regard to predicted noise levels from construction processes which may be undertaken outside of standard constructions hours we note:

- the cumulative noise level from site preparation plant complies with the daytime out of hours NML at all assessment locations;
- impact driven piles will exceed the daytime out of hours NML at MW880-R5 by 2dB (which is defined as negligible in the EPA's NPfI); and
- the cumulative noise level from the construction phase will comply with the day out of hours NML at all locations.

There are no physical noise mitigation measures available for impact driven piles as the noise is associated with the pile being driven by the rig hammer. As such, impact driven piling should be avoided outside standard construction hours where practical.

With regard to Round Hill, the worst-case construction works (impact piling) would result in noise levels in the order of 12 dB L_{Aeq} at the nearest assessment location 10 km from the Round Hill compression station site. This level is 28 dB L_{Aeq} below the daytime out of hours NML. As such, construction works at the Round Hill site may be undertaken during daytime out of hours periods.

5.4 Blowdown events during commissioning

Blowdown events may be required during commissioning to depressurise the system. A prediction of blowdown events is provided in Section 4.6. The predicted noise levels from such events would likely exceed the standard construction hours NML, but not exceed the 'highly noise affected' NML.

Noise from such events would be suitably managed by community consultation to inform noise sensitive receivers of the blowdown process (ie duration, frequency of occurrence) during this period.

6 Recommendations

The following recommendations have been incorporated into the acoustic model for predicting noise levels from the construction and operation of each compression station and as such should be incorporated into the project design.

6.1 Milne – MW880

6.1.1 Operational noise

The following acoustic treatments are recommended for the Milne compression station:

- the turbine exhaust is to be fitted with a silencer consistent with the insertion losses provided in Table 4.1; and
- the turbine intake is to be fitted with a silencer consistent with the insertion losses provided in Table 4.1.

6.1.2 Construction noise

Standard daytime construction hours of 7:00 am to 6:00 pm daily will be applied, excluding travel to and from site, and extenuating circumstances beyond the control of the project. Any activities which require extension beyond standard construction hours will be discussed with relevant affected landholders.

Impact piling should be avoided during daytime out of hours periods as defined by the ICNG (ie Sundays, public holidays and Saturday between 1.00 pm to 6.00 pm).

6.2 Round Hill – MW433

The following acoustic treatments are recommended for the Round Hill compression station:

- the turbine intake incorporates a silencer consistent with the insertion loss provided in Table 4.1.

6.3 Blowdown events

In the course of compression station maintenance and commissioning, scheduled blowdown events will likely occur. It is recommended that relevant affected landholders are notified of such events, including information regarding:

- when these scheduled blowdown events will occur; and
- the duration of the blowdown events.

6.4 Summary of commitments

The following commitments will minimise noise impacts associated with the project:

Table 6.1 Summary of commitments – noise

Stage	Commitment ID	Commitment
Construction Operation	GE-04	A complaints management system will be put in place that documents: • name of persons receiving complaint; • name of person making the complaint; • date and time of complaint; • nature of the complaint; • actions taken to rectify; • actions to minimise risk of reoccurrence; and • name of person(s) responsible for undertaking the required actions.
Construction Operation	GE-06	Nearby landholders will be provided a dedicated point of contact for the duration of the project.
Construction	NV-01	Standard daytime construction hours of 7:00am to 6:00pm daily will be applied, excluding travel to and from site, and extenuating circumstances beyond the control of the project. Any activities whichrequire extension beyond standard construction hours will be discussed with relevant affected landholders.
Construction	NV-02	Impact piling at MW880 will not be conducted outside of Interim Construction Noise Guideline standard construction hours (Sundays, public holidays and Saturday between 1.00pm and 6.00pm) unless agreed with potentially impacted landholders..
Operation	NV-03	Turbine intakes and exhausts will be fitted with silencers consistent with those assessed in Table 4.1 of the noise impact assessment.
Construction Operation	NV-04	Relevant affected landholders will be notified of any blowdown events scheduled to take place and informed of the potential noise impacts, including timing and duration.
Design Construction Operation	SE-01	The existing stakeholder engagement plan will continue to be implemented to facilitate ongoing consultation with relevant stakeholders, including local businesses, throughout the project so that stakeholders have access to information regarding the nature of the proposed project activities and their likely impacts.

7 Conclusion

EMM has completed a NIA to address potential noise impacts associated with the proposed gas compressor stations to be constructed at two locations along the MWP in support of Modification Report 1. The assessment considered potential noise impacts from the construction and operational phases of the project and has been prepared in accordance with the methods outlined in the ICNG and NPfI.

Project noise trigger levels for the operation of the project have been established based on the methodology provided in the NPfI. Given the remote location of the compressor stations, specific noise targets have been based on the minimum background noise levels provided in the NPfI.

Noise management levels for the construction of the project have been established based on the methodology provided in the ICNG.

An assessment of construction noise generated by both sites indicate compliance with the standard construction hours NML. Construction outside of standard construction hours would be feasible at each location.

Operational noise from the Round Hill compressor station has been addressed using a conservative screening noise model for a receiver at 10 km. The model considers noise propagation under noise-enhancing conditions. Predicted noise levels from the operation of this site will be at least 26 dB below the 35dB $L_{Aeq\ 15min}$ NPfI night-time noise criterion.

Operational activities have been conservatively modelled at the Milne compressor station for noise-enhancing meteorological conditions. Predicted noise from the operation of the Milne compressor station at the nearest affected assessment location is 31 dB $L_{Aeq\ 15min}$ which complies with the 35 dB $L_{Aeq\ 15min}$ night-time noise criterion.

Noise associated with the general operation of each compression station has been addressed for potential sleep disturbance during the night time period. Predicted noise levels indicate compliance with the NPfI sleep disturbance target for both the Milne and Round Hill sites.

Noise associated with blowdown events has been discussed. In this regard we note:

- blowdown events occur rarely during emergency shut down procedures and for routine maintenance on the compression station (eg yearly). These events would occur for short periods of time (eg 15 minutes) and can be scheduled during normal daytime hours. As such, the impact from such events will be acoustically acceptable; and

- blowdown events are likely to occur as part of the construction stage of the compression stations. Such events would occur during standard construction hours. Noise from such events would be managed by consultation with assessment location landholders identified in this report.

Glossary

Several technical terms are required for the discussion of noise. These are explained in Table G.1.

Table G.1 Glossary of acoustic terms

Term	Description
ABL	The assessment background level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{90} statistical noise levels.
dB	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
L_{A1}	The A-weighted noise level exceeded for 1% of the time.
L_{A10}	The noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{A90}	The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{Aeq}	The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The $L_{eq,15\ minute}$ descriptor refers to an L_{eq} noise level measured over a 15-minute period.
L_{Amax}	The maximum root mean squared sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (L_w)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.

It is useful to have an appreciation of decibels, the unit of noise measurement. Table G.2 gives an indication as to what an average person perceives about changes in noise levels:

Table G.2 Perceived change in noise

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

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

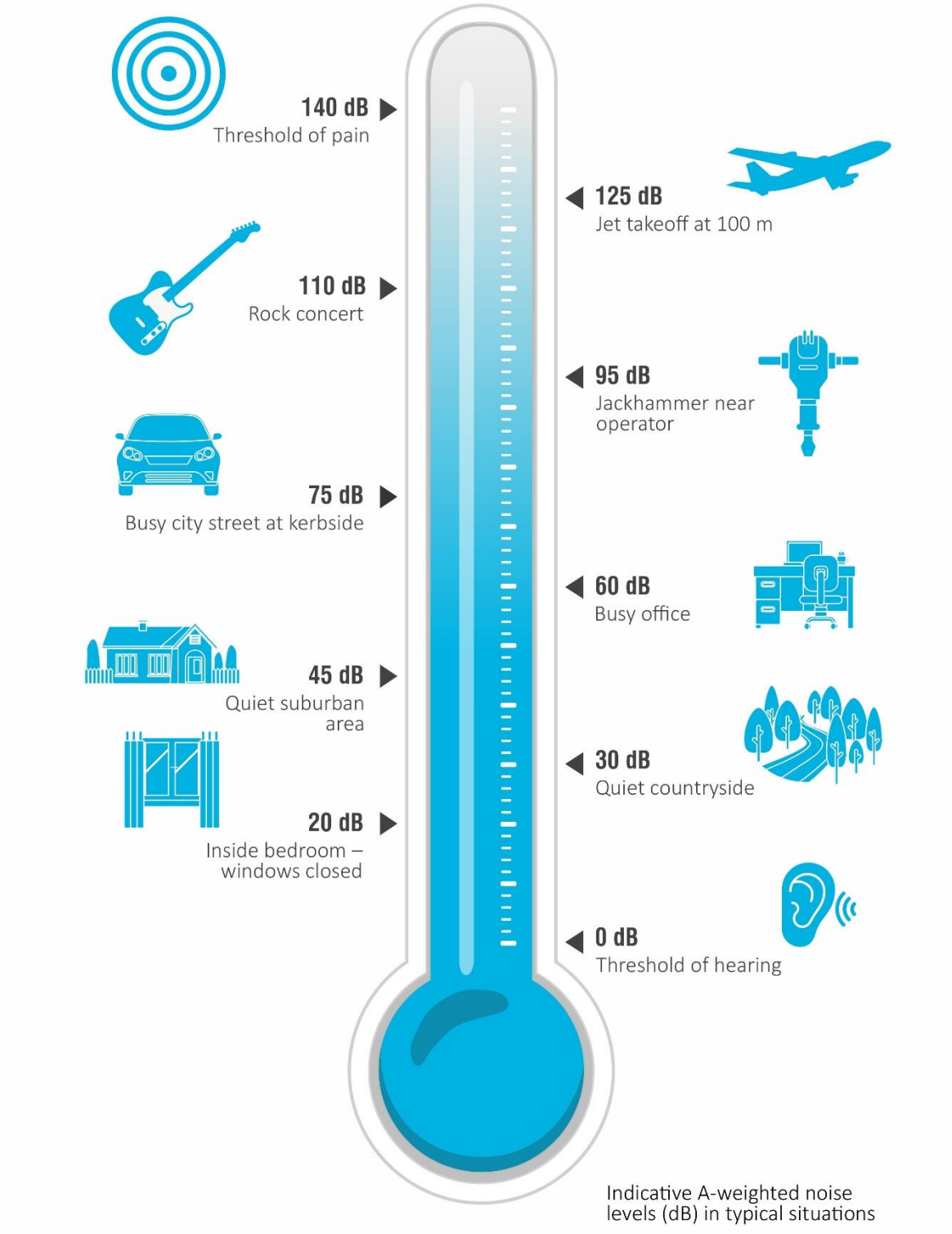
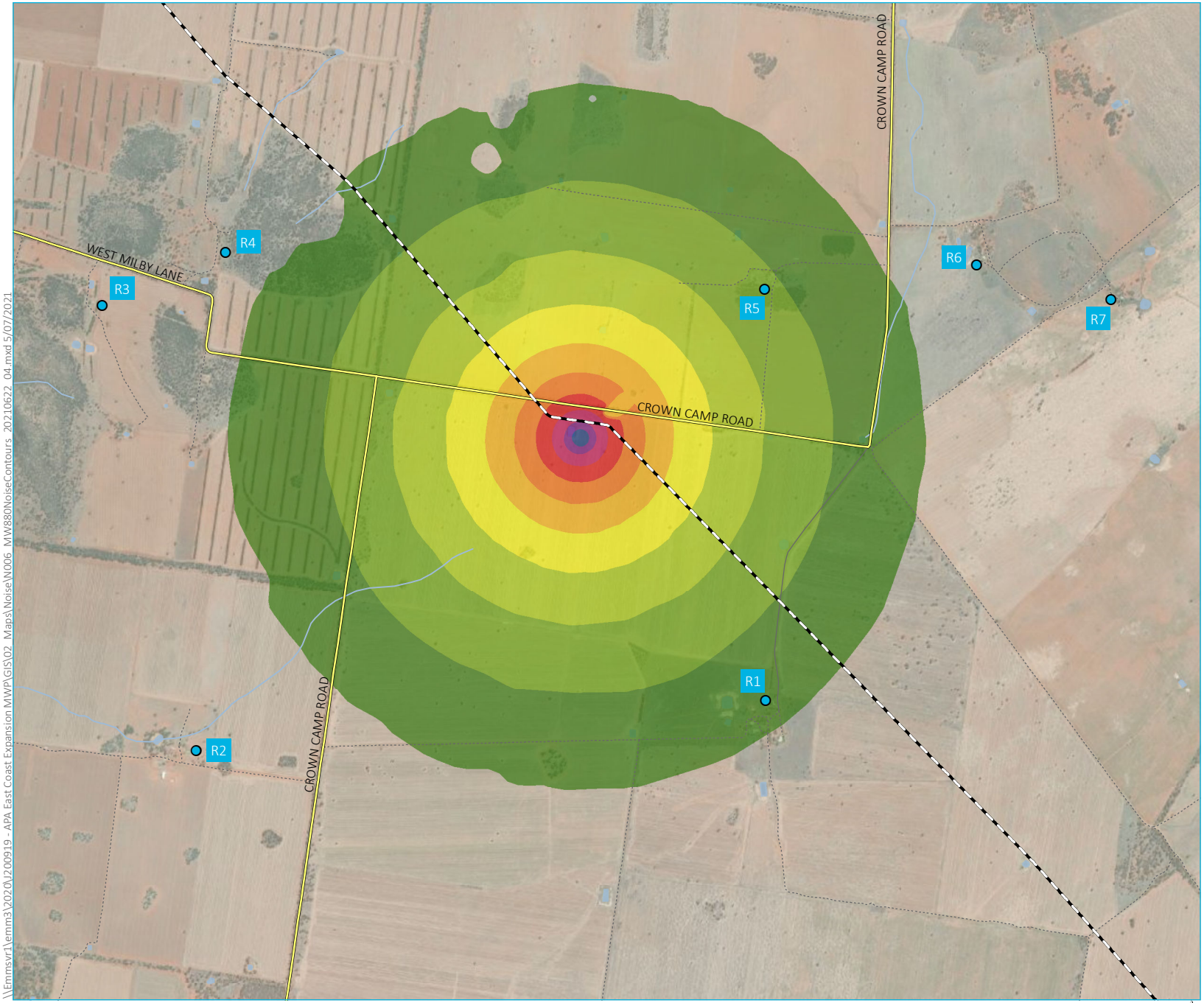


Figure G.1 **Common noise levels**

Appendix A

Grid noise map



KEY

- Sensitive receiver location
- Moomba to Wilton pipeline
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody

Noise contour (dB)

- 25 - 30
- 30 -35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- < 70

INSET KEY

- NPWS reserve
- State forest

\\Emmsvr1\emm3\2020\J200919 - APA East Coast Expansion MWP\GIS\02 Maps\Noise\N006 MW880NoiseContours 20210622 04.mxd 5/07/2021

Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); ESRI (2021)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

MW880 - Milne compressor station operational noise contours

APA - East Coast Grid Expansion
Noise impact assessment
Modification report 1
Figure A.1

EMM
creating opportunities