

# **Narrabri Special Activation Precinct**

## **Noise report**

---

Prepared for NSW Department of Planning and Environment

June 2023

# Narrabri Special Activation Precinct

## Noise report

NSW Department of Planning and Environment

E210753 RP7

June 2023

Version	Date	Prepared by	Reviewed by	Comments
V1	11 November 2022	Katie Teyhan	Tony Welbourne	
V2	16 February 2023	Katie Teyhan	Najah Ishac	
V3	20 March 2023	Katie Teyhan	Najah Ishac	
V4	13 June 2023	Katie Teyhan	Najah Ishac	

Authorised by



**Najah Ishac**

Director

13 June 2023

Level 3 175 Scott Street

Newcastle NSW 2300

This report has been prepared in accordance with the brief provided by NSW Department of Planning and Environment and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of NSW Department of Planning and Environment and no responsibility will be taken for its use by other parties. NSW Department of Planning and Environment may, at its discretion, use the report to inform regulators and the public.

© Reproduction of this report for educational or other non-commercial purposes is authorised without prior written permission from EMM provided the source is fully acknowledged. Reproduction of this report for resale or other commercial purposes is prohibited without EMM's prior written permission.

## Acknowledgement of Country

We acknowledge country and pay respects to the Gomeroi/Gamilaroi/Gamilaraay/Kamilaroi people as the Traditional Owners and Custodians of the land and waters on which the Narrabri Special Activation Precinct is located.

We recognise their continued connection to Country and that this connection can be seen through stories of place and cultural practices such as art, songs, dances, storytelling, and caring for the natural and cultural landscape of the area.

We also recognise the continuing living culture of Aboriginal people, and the significance of Narrabri in that living culture. We recognise the contemporary stories of displacement and the cultural significance of Narrabri in the continued journey of self-determination in Australia.

# TABLE OF CONTENTS

---

<b>Acknowledgement of Country</b>	<b>ES.1</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Background	1
1.2 Narrabri SAP	1
1.3 Master planning process	1
1.4 Previous noise reports	2
1.5 Purpose of this report	2
<b>2 Structure plan</b>	<b>3</b>
<b>3 Existing environment</b>	<b>5</b>
3.1 Sensitive receptors	5
3.2 Land use and terrain	5
3.3 Existing acoustic environment	8
3.4 Meteorology	8
<b>4 Existing and future development</b>	<b>10</b>
4.1 Existing developments	10
4.2 Proposed future developments	11
<b>5 Noise goals</b>	<b>15</b>
5.1 Overview	15
5.2 Industrial (operational) noise	15
<b>6 Recommended key principles for noise</b>	<b>20</b>
6.1 Overview	20
6.2 BMP and BATEA	20
6.3 Streamlined planning	21
<b>7 Noise modelling</b>	<b>22</b>
7.1 Methodology	22
7.2 Noise risk map	23
7.3 Operational noise modelling	25
7.4 Evaluation of noise risk mapping and predictions	29
<b>8 Outcomes and recommendations</b>	<b>31</b>
<b>Glossary</b>	<b>32</b>
<b>References</b>	<b>35</b>



## Tables

Table 5.1	Amenity noise levels - Recommended $L_{Aeq}$ noise levels from industrial noise sources	16
Table 5.2	Project (SAP) intrusive noise levels	17
Table 7.1	Industry types considered in noise risk mapping	22
Table 7.2	Noise risk categories	23
Table 7.3	Industry categories assumed for noise modelling	25
Table G.1	Perceived change in noise	34

## Figures

Figure 2.1	Narrabri SAP preferred land use Structure Plan	4
Figure 3.1	Sensitive receptors outside the SAP area	6
Figure 3.2	Sensitive receptors inside the SAP area	7
Figure 4.1	Proposed future development of Council landfill site	10
Figure 4.2	Residential properties qualifying for consideration of noise mitigation	13
Figure 4.3	Narrabri Gas Project – key project components	14
Figure 7.1	Noise risk map for preferred land use Structure Plan	24
Figure 7.2	Indicative noise emission contours from preferred land use Structure Plan - Day	27
Figure 7.3	Indicative noise emission contours from preferred land use Structure Plan – Evening/Night	28
Figure G 8.1	Common noise levels	34

# 1 Introduction

## 1.1 Background

EMM Consulting Pty Ltd (EMM) has been commissioned by New South Wales (NSW) Government Department of Planning and Environment (DPE) to support the development of a Master Plan for the Narrabri Special Activation Precinct (Narrabri SAP). EMM's role is to provide technical input with respect to potential noise impacts<sup>1</sup>.

## 1.2 Narrabri SAP

The New South Wales (NSW) Government, through its introduction of the Special Activation Precincts (SAPs), has identified six distinct areas for development throughout regional NSW. The SAP program brings together planning and investment to stimulate economic growth across a range of industries, including freight and logistics, manufacturing, waste management and recycling, energy generation, agriculture, and food processing. The planning and creation of these areas is partially facilitated and funded through the \$4.2 billion Snowy Hydro Legacy Fund.

The establishment of SAPs is a joint NSW Government Agency initiative by the Department of Regional Growth NSW, Department of Planning and Environment (DPE) and the Regional Growth NSW Development Corporation (RGDC). It forms part of the 20-Year Economic Vision for regional NSW. DPE is responsible for preparing the planning framework, with the Department of Regional NSW managing each SAP.

In November 2020, Narrabri was declared the sixth and final SAP investigation area, enabled by its strong reputation and location within Australia's highest productive grain region as well as its strong transportation linkages including existing road and rail connections and the future Inland Rail.

Narrabri township is located within the Narrabri Shire local government area (LGA), 420 km north-northwest of Sydney. In the 2021 census, the population of Narrabri township was 6,898 persons, with 16% identifying as Aboriginal and/or Torres Strait Island Peoples. The township lies at the junction of the Newell and Kamilaroi highways and has direct rail connection to the Port of Newcastle via the Walgett branch of the Main North line. Once completed, Narrabri will also have a direct connection to the new Inland Rail route which will connect Melbourne to Brisbane via new and upgraded track.

## 1.3 Master planning process

The master planning process for the Narrabri SAP involves the following main stages:

- Stage 1 – Analysis. This included a characterisation of baseline conditions for the SAP and Investigation Area.
- Stage 2 – Identification of Options. This involved an options analysis of three possible scenarios for the SAP.
- Stage 3 – Evaluation of the Draft Structure Plan. This involves the assessment of the draft land use Structure Plan for the SAP which is the subject of this report.

As part of the master planning process, and to inform this technical study, two Enquiry by Design (EbD) workshops were organised. A preliminary EbD was held on 29 and 30 March 2022 to develop three initial land use scenarios. Following an interdisciplinary assessment of the three scenarios, a final EbD workshop was held between 5 and 8 September 2022 to study the interdisciplinary constraints of the three scenarios and to identify and develop a preferred land use Structure Plan.

<sup>1</sup> EMM is also addressing air quality and odour impacts, although these are reported separately.

## 1.4 Previous noise reports

The Stage 1 baseline report for noise (EMM 2021) provided an overview of regulations and guidance that are relevant to the management of these aspects in NSW. The locations of noise sensitive receptors were identified, as well as noise criteria that would apply at them. Key existing and known future developments (noise sources) were also identified for the Narrabri SAP Investigation Area.

The Stage 2 options report for noise (EMM 2022) presented an options analysis of three possible scenarios for the Narrabri SAP. The approach was largely qualitative, based on key considerations such as prevailing meteorology, the cumulative effects of industry interactions, and impacts on sensitive receptors outside the SAP. The first step was to map the risk of noise impacts for each of the three scenarios, based on the location of nearest noise-sensitive receptors and typical industrial noise levels. In the second step, each scenario was assessed at a high level using a SWOT analysis. The scenarios were compared using a star rating system, and opportunities were presented to help mitigate and manage potential noise impacts.

## 1.5 Purpose of this report

This report has been prepared for Stage 3 and completes step F.3.3 of the Narrabri SAP scope of work (Noise Report). It also summarises the findings of the previous noise studies for the earlier stages of the SAP program.

This report assesses the land use Structure Plan from the final EbD workshop from a noise perspective. The main purpose of it is to build on the baseline noise study and scenarios report, taking all applicable noise guidelines and policies into consideration. Using noise modelling results, the report shows likely compliance (or otherwise) with relevant noise amenity levels at identified sensitive locations surrounding the SAP, and thus identifies areas of potential concern to further inform the Narrabri SAP layout.

The report focuses on potential **operational** noise from likely activities within the SAP. General recommendations have also been provided in relation to mitigation and management of noise from construction activities and from road and rail systems.

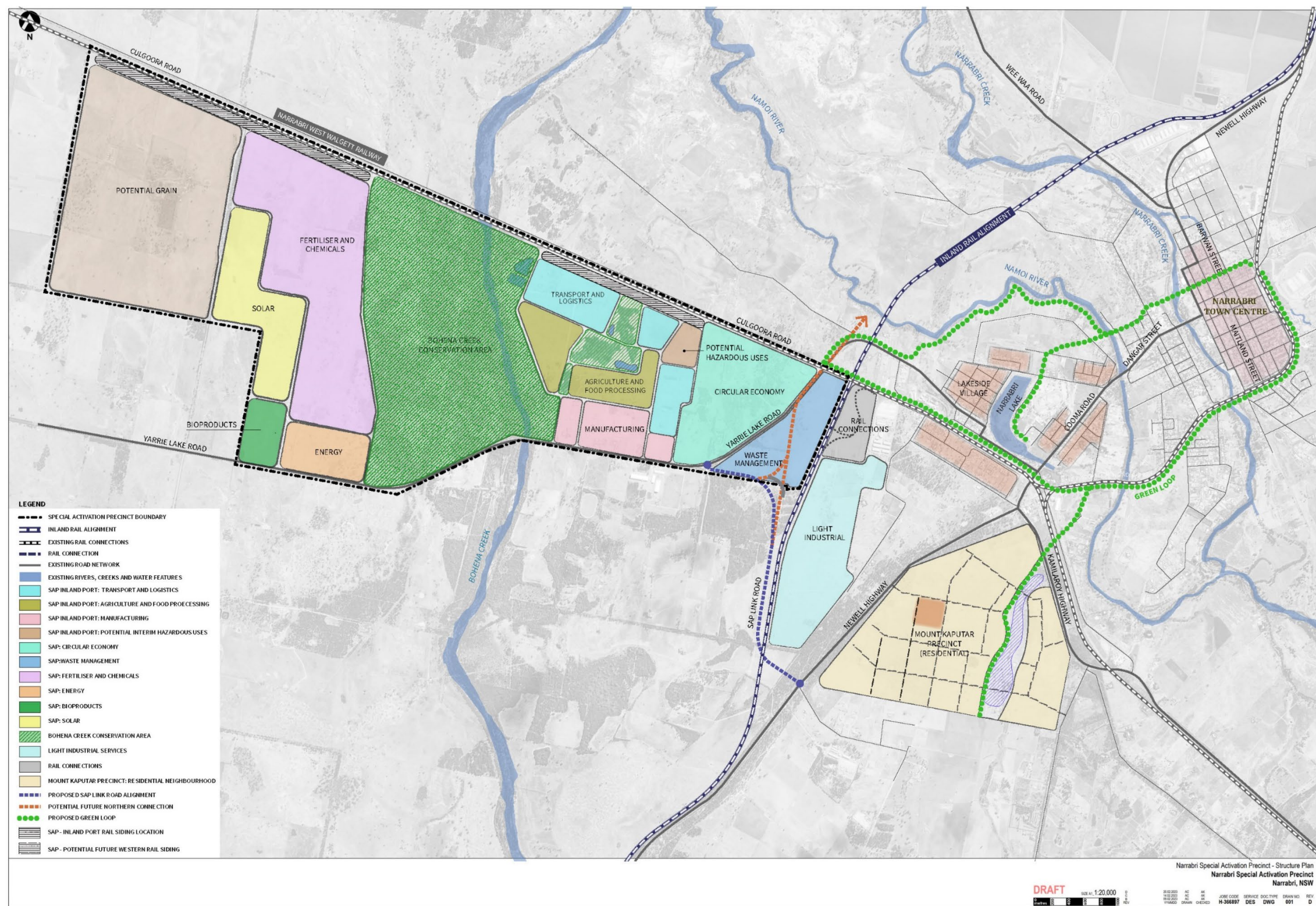
Recommendations are provided regarding noise mitigation and management measures that should be considered and/or incorporated into the final Structure Plan that reflect industry best-practice methods including a proposed noise monitoring program and the potential use of a noise model to assist in the ongoing management of noise emissions.

## 2 Structure plan

The investigation area for the Narrabri SAP covers an area of approximately 2670 ha. It is located to the west of the existing township and incorporates two areas separated by an environmental buffer zone. This investigation area is shown in Figure 2.1 (as provided by Hatch Roberts Day).



**Figure 2.1**      **Narrabri SAP preferred land use Structure Plan**





## 3 Existing environment

### 3.1 Sensitive receptors

The area surrounding the Narrabri SAP is generally rural land with scattered residential dwellings. The suburban area of Narrabri West is situated north-east of the Narrabri SAP.

To assess noise from the Narrabri SAP, sensitive receptors including residential dwellings, schools, and playgrounds within 2 km of it have been identified as shown in Figure 3.1. There are also a number of existing residential dwellings inside the Narrabri SAP which are shown in Figure 3.2.

Sensitive receptors have been identified using desktop assessment only. We recommend that a ground-truthing exercise be undertaken at a suitable time in the future to validate the locations and types of noise sensitive receptors to enable relevant updates to the noise risk mapping (refer Section 7.2).

### 3.2 Land use and terrain

Narrabri is a traditional agricultural community focused on cotton and wheat farming. Land use change over the past 50 years has seen intensification of the cotton industry and an expansion of coal mining and coal seam gas exploration in the Shire. Land use is characterised by large and small agricultural producers, research facilities, extractive industry projects, parks of national and state significance, and a rich Aboriginal heritage.

The Narrabri SAP is located within previously cleared agricultural areas. Large areas of native vegetation exist to the south (Pilliga National Park, Jacks Creek State Forest and the Bibblewindi State Forest). To the east/northeast is the Mount Kaputar National Park. Bohena Creek is located in the centre of the SAP area coursing south to north.

The elevation of Narrabri SAP varies very little, from approximately 215 m Australian Height Datum (AHD) in the northern area to around 230 m AHD in the southern area. Regional topography is also very flat.

\\vemmsvr1\EMM\3\2021\1210753 - Narrabri Special Activation Precinct\GIS\02\_Maps\FM001\_ReceptorsOutsideSAP\_20230529\_02.mxd 29/05/2023



- KEY**
- Special Activation Precinct
  - Receptor type**
    - Commercial/industrial
    - Education
    - Health
    - Neighbourhood centre
    - Playground
    - Rural residential
    - Suburban residential
  - Existing environment**
    - Rail line
    - Major road
    - Minor road
    - Vehicular track
    - Named watercourse

Sensitive receptors  
outside the SAP area

Narrabri Special Activation Precinct  
Final Noise Report  
Figure 3.1



Source: EMM (2023); DPIE (2021); DFSI (2020); ESRI (2023)







- KEY**
- Special Activation Precinct
  - Receptor type**
  - Commercial/industrial
  - Rural residential
  - Existing environment**
  - Rail line
  - Major road
  - Minor road
  - Vehicular track
  - Named watercourse

Sensitive receptors  
inside the SAP area

Narrabri Special Activation Precinct  
Final Noise Report  
Figure 3.2



Source: EMM (2023); DPIE (2021); DFSI (2020); ESRI (2023)



### 3.3 Existing acoustic environment

EMM participated in an initial site visit with the SAP team during December 2021. This provided an opportunity to observe locations of the nearest noise-sensitive locations as well as the nature of existing industry near to and within the SAP.

The ambient noise environment in the vicinity of the Narrabri SAP area was described and quantified as part of noise assessments prepared for the Narromine to Narrabri Inland Rail project. The methodology used and results of ambient noise monitoring for this purpose were reported in the *ARTC Inland Rail Narromine to Narrabri Project – Noise and Vibration Assessment - Construction and Other Operations* (JacobsGHD IR Joint Venture).

Results of ambient noise monitoring indicate a typically rural noise environment in the Narrabri SAP vicinity with measured background noise levels typically below  $L_{A90}$  30 dB. Ambient noise levels recorded adjacent to the industrial area just outside (west of) the Narrabri West suburban area also indicate relatively low background during all periods (day, evening, and night).

Results of day period operator-attended noise measurements indicated that natural sounds (birds and insects) and road traffic noise dominate the acoustic environment with industrial noise not observed at any of the monitoring locations.

It is noted, however, that some of the nearest receptors already experience industrial-type noise from seasonal agricultural activity or existing industrial/commercial operations in Narrabri West. This is likely to be the case at residences east of the SAP, in Narrabri West, and south of the SAP (east of Bohena Creek).

### 3.4 Meteorology

Historical meteorological data was obtained from the Bureau of Meteorology automatic weather station located at Narrabri Airport, approximately 7 km north-east of the Narrabri SAP. Five calendar years (2017–2021) of hourly data was analysed to determine the frequency of occurrence of certain weather conditions in accordance with Noise Policy for Industry (NPfI) methodology. As per Fact Sheet D of the NPfI, the significance of noise-enhancing conditions is based on a threshold occurrence of 30%. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for noise modelling and assessment.

Results of the wind data analysis indicate that noise-enhancing winds (up to 3 m/s) are not a feature of the area since the frequency of occurrence does not meet the 30% threshold in any season or period (day, evening, or night). The analysis of winds above 3 m/s indicates that very noise-enhancing conditions, particularly from the south-south-east, occur for up to approximately 20% of time during some periods of some seasons.

Atmospheric stability data from the BoM AWS at Narrabri Airport was analysed to determine the frequency of occurrence of Pasquill-Gifford stability categories (and associated vertical temperature gradients). Results of this analysis showed that temperature inversions are a feature of the area given their frequency of occurrence exceeds the 30% threshold during most seasons.

During noise-enhancing weather conditions, noise levels at receptors may increase or decrease compared with those received during standard (sometimes referred to as calm or still isothermal) conditions. This is due to refraction caused by the varying speed of sound (relative and/or absolute) with increasing height above the ground associated with wind speed and/or air temperature changes with height.

Based on the findings of the meteorological data analysis and with reference to Fact Sheet D of the NPfI, noise emissions from the SAP area are required to be assessed under noise-enhancing weather conditions during the night-time period only.

Notwithstanding the preceding, a conservative approach has been adopted for the purpose of assessing potential noise impacts, consistent with the methodology outlined in the NPfI, by adopting noise-enhancing meteorological conditions in the noise model. This is becoming a standard approach to noise assessment in NSW and consistent with standard conditions provided by the EPA in environment protection licences. Noise emissions under these conditions are expected to represent the upper range of noise emissions from the Narrabri SAP.



## 4 Existing and future development

### 4.1 Existing developments

Land use surrounding the Narrabri SAP is generally characterised by agricultural land uses, predominantly comprising grazing and grain storage/transport facilities. It also includes scattered rural dwellings as well as the suburban area of Narrabri West adjacent to the north-west side of the SAP area.

Land use within the Narrabri SAP is generally characterised by agricultural land uses, predominantly comprising grazing. It also includes scattered dwellings, industries, and a waste management facility. Additional details about the most acoustically significant existing developments within the Narrabri SAP are summarised in the following sections.

#### 4.1.1 NSC waste management facility

Narrabri Shire Council (NSC) currently operates a waste management facility, including a landfill, in the northern section of the site. The facility operates 8:00 am to 5:00 pm, seven days per week.

Recommendations provided in the *Narrabri Shire Council Narrabri WMF Landfill Cell Design & Ancillary Services Landfilling Strategy* (GHD 2020) indicate the future development of the waste management facility will likely involve the following (refer Figure 4.1):

- construction of Piggyback Cell 1 (south of the existing active cell) for extra capacity in the short term
- development of Piggyback Cells 2, 3, and 4 (west of both the active cell and Cell 1) for the longer term.



Source: *Narrabri Shire Council Narrabri WMF Landfill Cell Design & Ancillary Services Landfilling Strategy* (GHD, 2020)

**Figure 4.1** Proposed future development of Council landfill site

Machinery, plant, and equipment required for operation of this facility includes, but is not limited to:

- spreading, compaction and covering of deposited waste
- compacting, trimming, shaping, grading, and levelling of cover layers
- any other operation required for the proper and efficient operation of the site, including the resource recovery.

The Narrabri Waste Management Facility Landfill Environmental Management Plan (GHD, 2021) states the following regarding noise from the landfill site:

Noise from the premises must not exceed:

- An LA10 (15 minute) noise emission criterion of 45 dB(A) (7 am to 6 pm) Monday to Friday and 7 am to 1 pm Saturday
- An LA10 (15 minute) noise emission criterion of 45 dB(A) during the evening (6 pm to 10 pm) Monday to Friday
- At all other times, an LA10 (15 minute) noise emission criterion of 35 dB(A), except as expressly provided by the site EPL.

It is noted that the landfill's environment protection licence (EPL 12193) dated 11 May 2021 does not contain any requirements regarding noise emissions from the site.

#### 4.1.2 Australian Recycled Plastics

Australian Recycled Plastics is a manufacturing plant, the first of its kind in Australia, that can process kerbside collected recyclable 442 plastic materials (442) to produce polyethylene terephthalate (PET) Flake and high density poly ethylene (HDPE) Flake simultaneously.

The processing facility is housed in a single large shed. The process generally consists of raw material delivery via road truck, processing and washing of the raw material and, finally, packing and delivery of the final product via road truck.

### 4.2 Proposed future developments

Proposed future developments within the Narrabri SAP that were known at the time of preparing this report include the following.

#### 4.2.1 Northern NSW Inland Port (N2IP)

The Northern NSW Inland Port (N2IP) project involves construction of an 1,800 metre rail siding with slip road infrastructure to facilitate rail loading and storage capability of the NSW Inland Port logistics and Freight Hub. The Port will feature a freight and logistics terminal with access to Inland Rail, as well as an industrial park with all the enabling infrastructure required to support business operations.

#### 4.2.2 Ammonia Plant

Perdaman have a Memorandum of Understanding (MoU) with Council to develop part of the land within the Council's Northern NSW Inland Port (N2IP) development. The Perdaman proposal is to develop a \$1.2–1.4 billion ammonia based derivative manufacturing plant. The manufacturing plant will use low emissions technology and be capable of supplying product to domestic and international markets. No other information was publicly available at the time of writing this report.

### 4.2.3 Inland Rail

The Narromine to Narrabri project in mid-north-western New South Wales is Inland Rail's longest section of track. This 306 km of new track is a crucial part of delivering the fast and reliable freight rail service between Melbourne and Brisbane.

The *Preferred Infrastructure Amendment Report – Response to Submissions* (ARTC) has been prepared for the Narromine to Narrabri Project. This report describes the Project, considers potential environmental, social and economic impacts of the Project, and identifies measures to avoid, minimise and mitigate these impacts. This report was accompanied by the *Updated noise and vibration assessment – operational rail* (SLR).

The reference design may change as a result of further investigations, government approvals, or during the detailed design phase. The Narromine to Narrabri Inland Rail project is currently under assessment with DPE. Construction is expected to commence shortly after project approval.

Receivers in the vicinity of the Narrabri SAP identified as qualifying for consideration of feasible and reasonable noise mitigation measures as a result of Inland Rail operational noise are identified in Figure 4.2 (as provided in Section 11 of the *Updated noise and vibration assessment – operational rail* (SLR)).





- KEY**
- Special Activation Precinct
  - ✱ Inland rail noise mitigation location
  - Indicative inland rail alignment
  - Existing environment
  - Rail line
  - Major road
  - Minor road
  - Vehicular track
  - Named watercourse

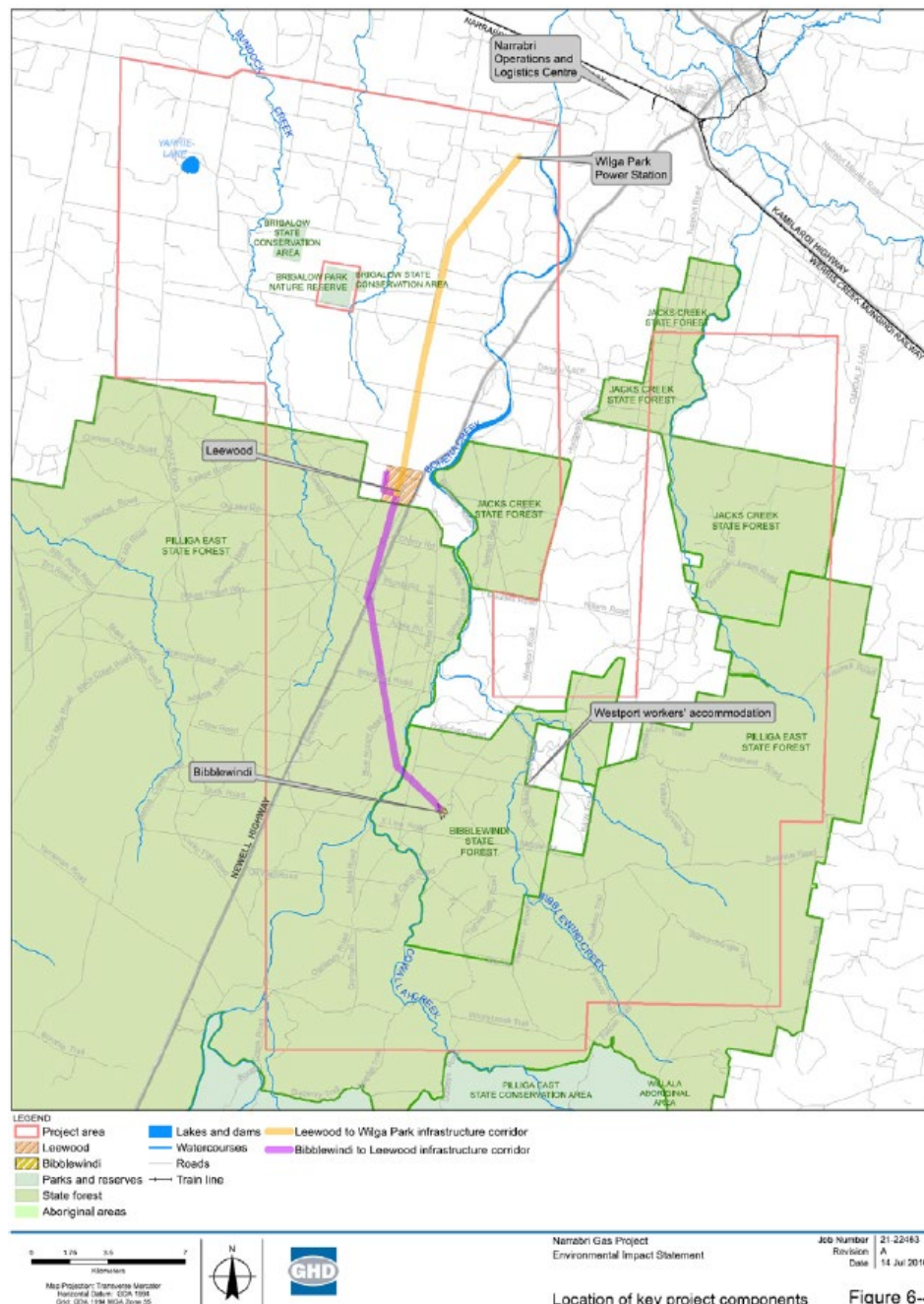
Residential properties qualifying for  
consideration of noise mitigation

Narrabri Special Activation Precinct  
Final Noise Report  
Figure 4.2



#### 4.2.4 Narrabri Gas Project

Santos NSW (Eastern) Pty Ltd was granted Development Consent (SSD 6456) by the Independent Planning Commission of NSW on 30 September 2020 for the Narrabri Gas Project. There is a small overlap of the Narrabri Gas Project area with the south-western portion of the Narrabri SAP area. Infrastructure for the project is proposed to extend south of the Wilga Park Power Station. There is very little potential for cumulative noise impacts from the Narrabri Gas Project and the Narrabri SAP at residences south-west of the SAP area, given the separation distance of relevant infrastructure. Conditions B7 through to B14 of SSD 6456 relate to noise emissions and the management of noise from the Narrabri Gas Project. Condition B7 limits noise from operation of the Narrabri Gas Project to  $L_{Aeq,15\text{minute}}$  dB at all privately owned residences.



Source: SSD 6456 Development Consent

**Figure 4.3** Narrabri Gas Project – key project components



## 5 Noise goals

### 5.1 Overview

Noise goals for the Narrabri SAP have been established based on current NSW Environment Protection Authority (EPA) and DPE guidelines. This study focuses on the potential operational impacts of activities within the SAP with reference to the NSW EPA 2017, Noise Policy for Industry (NPfI).

Construction noise emissions from development within the SAP would be relatively short-term and could be effectively managed via the implementation of a Construction Noise Management Plan for the SAP prepared in accordance with the NSW Department of Environment and Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG).

Assessment and ongoing management of noise from transport on public roads or railways will be undertaken in accordance with methodology and guidance outlined in the Road Noise Policy (RNP) (DECCW 2011) and Rail Infrastructure Noise Guideline (RING) (EPA 2013).

The following sections summarise the principles and methodology that have been used to establish operational noise goals for the SAP. This assessment has adopted an outcomes-based approach to ensure appropriate noise amenity for sensitive receptors in accordance with expectations outlined in the NPfI. This is consistent with initial advice provided by EPA noise specialists as part of this study.

### 5.2 Industrial (operational) noise

#### 5.2.1 Operational noise goals

Noise from industrial sites or processes in NSW is regulated by local council, DPE, and/or the EPA and usually involve a licence and/or development consent stipulating noise limits. They are based on EPA guidelines (i.e. NPfI) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation measures.

Reaction to noise is highly subjective. Hence, it is not possible to derive limits that guarantee no one will experience an impact. Adherence with project noise trigger levels (PNTLs) should not be interpreted to mean that industrial noise will be inaudible, or that all members of the community will find it acceptable.

The increase in noise above background levels (i.e. the intrusiveness of a source) and the absolute level of it are important factors in how a community will respond to industrial noise. The EPA requires evaluation of both noise trigger level types: intrusiveness and amenity.

Industrial noise goals for individual developments are normally the lowest of derived intrusiveness and amenity levels together with specific requirements in relation to noise characteristics (e.g. low frequency noise, tonal noise and maximum noise events in the night-time period). Given the nature of the proposed development as a cluster of yet unknown industries, the assessment will adopt relevant amenity noise levels as goals for the Narrabri SAP as a whole.

Determining appropriate amenity levels is based on noise targets specific to land use and associated activities. These targets relate only to industrial-type noise and do not include road, rail and/or community noise. Where industrial noise exists in the area, it needs to be demonstrated that noise from new industry combined with that from existing will stay below the recommended amenity noise levels.

The NPfI recommends that the project amenity noise level for a development in an area where industrial noise is already contributing to the ambient noise environment should be the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB. Given the area has relatively low existing industrial noise levels (based on the results of ambient noise monitoring in the area – refer to Section 3.3) it is appropriate to adopt the recommended amenity noise level (from Table 2.2 of the NPfI and shown in Table 5.1) without adjustment for the relatively isolated residences north, west, and south-west of the SAP area. It is noted that some of the nearest noise-sensitive receptors may already experience noise from seasonal agricultural activity or existing industrial/commercial operations in Narrabri West. This would be applicable to residences east of the SAP in Narrabri West and south of the SAP (east of Bohena Creek). Hence, the recommended amenity level has been adjusted by minus 5 dB to ensure that total levels of industrial noise remain below the recommended amenity noise level (from Table 2.2 of the NPfI) at these residences.

Residences surrounding and within the Narrabri SAP will be categorised primarily in the NPfI rural amenity category, with some more appropriately categorised as suburban or urban as per the definitions provided in the NPfI, particularly once the SAP is fully developed.

An extract from the NPfI that relates to the amenity noise levels relevant to the project is given in Table 5.1.

**Table 5.1**      **Amenity noise levels - Recommended  $L_{Aeq}$  noise levels from industrial noise sources**

Type of receptor	Noise amenity area	Time of day <sup>1</sup>	Recommended $L_{Aeq(Period)}$ noise level, dB
Residence	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See final column	See final column	5 dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35
Hospital ward	All	Noisiest 1-hour	35
Internal	All	Noisiest 1-hour	50
External	All	Noisiest 1-hour	50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65

**Table 5.1**      **Amenity noise levels - Recommended  $L_{Aeq}$  noise levels from industrial noise sources**

Type of receptor	Noise amenity area	Time of day <sup>1</sup>	Recommended $L_{Aeq(Period)}$ noise level, dB
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB to recommended noise amenity

Notes:

1. Daytime 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, daytime 8:00 am - 6:00 pm; evening 6:00 pm - 10:00 pm; night-time 10:00 pm - 8:00 am. The  $L_{Aeq}$  index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

The intrusiveness assessment methodology would be appropriate to assist in determining likely affectation at residences within the Narrabri SAP that will have existing use rights. Avoiding intrusive noise impact requires  $L_{Aeq,15min}$  noise levels from the subject development do not exceed the relevant period RBL by more than 5 dB. Intrusive noise levels apply to residential receptors only. Those relevant to the SAP are summarised in Table 5.2 based on recommended minimum background levels, as per the NPfI.

**Table 5.2**      **Project (SAP) intrusive noise levels**

Assessment locations	Period <sup>1</sup>	Adopted RBL, dB	Project intrusive noise level, $L_{Aeq,15min}$ dB
All residences within the SAP	Day	35	40
	Evening	30	35
	Night	30	35

Notes:

1. Day: 7:00 am to 6:00 pm Monday to Saturday; 8:00 am to 6:00 pm Sundays and public holidays; evening: 6:00 pm to 10:00 pm; night: 10:00 pm to 7:00 am Monday to Saturday; 10:00 pm to 8:00 am Sundays and public holidays.
2. The RBL is an NPfI term and is used to represent the background noise level.

### 5.2.2 Sleep disturbance

The difficulty in establishing an absolute noise level criterion that would correlate to an acceptable level of sleep disturbance is acknowledged by relevant governing authorities.

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where night period noise levels at a residential location exceed:

- $L_{Aeq,15minute}$  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).

The NPfI also references guidance regarding potential for sleep disturbance provided in the RNP. The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP provides the following conclusions from that research on sleep disturbance:

- maximum internal noise levels ( $L_{Amax}$ ) below 50 to 55 dB are unlikely to awaken people from sleep
- 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 noise levels by 10 dB. Therefore, according to the RNP, external noise level in the order of 60 to 65 dB at the facade of a residence is unlikely to awaken people.

If noise levels over NPfI screening levels are identified, then additional analysis is required to consider factors such as the maximum noise level, the extent to which it exceeds the rating background noise level, and the number of occurrences during the night-time period.

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

- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development
- whether there are times when there is a clear change in the noise environment (such as during early-morning shoulder periods)
- current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

### 5.2.3 Annoying noise characteristics

Where a noise contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for these characteristics.

### 5.2.4 Noise Management Precinct

Consideration has also been given to the concept of a noise management precinct as described in Section 2.8 of the NPfI with the following objectives:

- to ensure that noise impacts are not exacerbated in residential areas close to a nominated industrial precinct
- to provide a mechanism that will allow noise impacts to be managed over time
- to allow a nominated industrial precinct to be fully utilised in a cost-effective and efficient manner.

Within a noise management precinct, emissions from the whole area would be managed as a single site. For example, when a new development is proposed, the responsible landowner or entity must show the precinct would continue to meet the recommended amenity noise level if their project was operating.

This may involve relocating a planned new activity to a different location than originally proposed, or to reduce noise emissions from other sources to accommodate it. The principle that all feasible and reasonable means of mitigating noise impacts will be implemented would be consistently applied across all developments within the precinct.

The form of implementation of a noise management precinct will depend on site-specific circumstances but could be implemented through the Structure Plan, Special Activation Precincts SEPP, or a Delivery Plan relevant to the Narrabri SAP. Other components of the noise management precinct approach could include:

- noise abatement programs for existing residential properties (inside and outside the SAP) exposed to noise from development within the SAP
- development of an over-arching noise management plan which describes the general approach to monitoring and managing noise emissions from the SAP, or
- planning controls for new residential or other noise-sensitive developments near the SAP.



## 6 Recommended key principles for noise

### 6.1 Overview

To support streamlined planning within the Narrabri SAP that is consistent with NSW regulatory requirements, the following key principles are proposed for noise:

- use of best management practice (BMP) and best available technology economically available (BATEA) for development in the Narrabri SAP
- implementation of a risk-based assessment and management framework that supports streamlined planning for the SAP.

In applying these principles, the assessment framework would ensure that EPA's statutory roles and obligations under the Protection of the Environment Operations Act 1997 (POEO Act 1997) can be fulfilled as efficiently as possible.

### 6.2 BMP and BATEA

Section 3.4 of the NPfI provides a broad overview of ways to mitigate noise from industrial activities. A summary of the NPfI regarding BMP and BATEA is provided as follows and should be utilised as a guiding principle in assessment and management of noise from the Narrabri SAP.

BMP is the adoption of operational procedures that minimise noise while retaining productive efficiency. When an appropriate mitigation strategy that incorporates expensive engineering solutions is being considered, the extent to which cheaper, non-engineering-oriented BMP can contribute to the required reduction of noise should be considered.

Where BMP fails to achieve the required noise reduction by itself, the BATEA approach should be considered. The BATEA approach means that equipment, plant, and machinery incorporate the most advanced and affordable technology to minimise noise output. Affordability is not necessarily determined by the price of the technology alone. Increased productivity may also result from using more advanced equipment, offsetting the initial outlay.

It is acknowledged that there are a wide range of factors that can restrict the feasibility and reasonableness of implementing BMP or BATEA measures on a particular site. Work health and safety considerations must also be considered as well as any other regulatory and process requirements.

In accordance with methodology outlined in the NPfI, mitigation strategies should be considered in the following hierarchical approach:

1. control of noise at the source (this includes reducing the overall noise level as much as is practicable, as well as minimising the potential for annoying characteristics as per Fact Sheet C of the NPfI)
2. once feasible and reasonable source/s controls are exhausted, controlling the transmission of noise
3. once feasible and reasonable source and transmission controls are exhausted, considering mitigation measures at affected noise-sensitive receivers.

To ensure that BMP and BATEA principles are effectively incorporated into the design of individual developments it will be important that proponents are aware of this expectation as early as possible in their application process. This expectation should be made clear in the Delivery Plan and associated documentation.

Examples of specific noise mitigation measures that could be incorporated into the design of individual developments proposed for the SAP could include:

- Selection of low-noise equipment including consideration of silencing exhausts.
- Although the SAP is intended to operate 24 hours per day, seven days per week, proponents may be able to restrict allowable hours of operation (e.g. day period only) for particularly noisy developments or specific activities.
- Effective site design to maximise the distance from major noise sources to receptors including intervening buildings/structures to act as barriers.
- Enclosures for specific items of noisy plant and equipment or activities.
- Orientation of certain plant and equipment to ensure that noise emissions are directed away from noise-sensitive receptors.
- Keeping plant, equipment and sites (including roadways) well-maintained.
- Noise barriers on (or near) site boundaries to reduce off-site noise emissions.
- Specific operational practices that would minimise the likelihood of maximum noise events and, hence, likelihood of sleep disturbance.

### 6.3 Streamlined planning

As part of a streamlined planning process, the concept of screening for significance of noise impact is proposed. This could be achieved by using noise risk mapping (refer Chapter 7) to identify a development's level of risk of generating noise impacts. For example, a noise impact assessment may not be required for developments identified as low risk, however, some level of noise assessment may be required for those identified as medium or high risk.

This process could be outlined in the Delivery Plan to accompany the Narrabri SAP Structure Plan with additional detail regarding the noise assessment process provided in the *SAP Technical Assessment Framework (Noise)* or similar. These documents (or their equivalent, depending on exactly how this would be implemented) would also outline consultation process with the NSW EPA as the government's relevant technical body regarding noise.

This risk management assessment framework would help guide the suitability for specific development within each land use category, with potential noise impacts evaluated for sensitive receptors outside the SAP and differing land use categories within the SAP. In this regard, noise-sensitive developments, for example places of worship, educational facilities or child-care centres, would not be permitted, within the SAP. Further, it is recommended that planning controls be utilised to ensure that the development application for any noise-sensitive development in proximity to the SAP be required to consider potential amenity impacts from the SAP.

It is anticipated that noise emissions from future development within the SAP could be managed through the implementation of an over-arching and/or individual noise management plan/s.

## 7 Noise modelling

### 7.1 Methodology

Noise risk mapping was undertaken for the preferred land use Structure Plan. Noise modelling has considered three generalised categories of industry; light, medium and heavy, which are qualitatively described in Table 7.1.

**Table 7.1** Industry types considered in noise risk mapping

Industry type	Description	Typical activities
Light	E.g. warehousing, industrial/commercial retailer, restaurant/takeaway, small-scale agriculture.	E.g. occasional truck deliveries, customer light vehicles, forklift.
Medium	E.g. building supplies manufacturer, automotive repair/manufacturer, metal fabrication, small-scale transport/logistics.	E.g. welding/fabrication, regular truck deliveries, ventilation/exhaust.
Heavy	E.g. concrete batch plant, materials processing, asphalt plant, landscape supplies, large-scale agriculture.	E.g. processing plant and equipment, frequent truck deliveries, materials handling (excavator, front-end loader).

Sound power levels for each industry type were estimated based on the ‘typical activities’ for each industry as  $L_{Aeq,15min}$  120 dB, 115 dB and 105 dB for heavy, medium and light industries, respectively. No adjustment has been made to predicted  $L_{Aeq,15min}$  for comparison to  $L_{Aeq,period}$  noise goals which provides a level of conservatism (up to 3 dB) into the evaluation of noise emissions.

Noise risk modelling involved predictions undertaken ‘in reverse’ i.e. from the nearest existing noise-sensitive receptors to the Narrabri SAP. The nearest receptor in each direction from the Narrabri SAP was identified and used as an industry ‘source’ in the noise model. Proposed new housing areas (known at the time of this assessment) were also considered in the selection of noise-sensitive receptors. These noise modelling outputs then enable the identification of areas within the SAP area where operation of the proposed industry types would be acceptable with or without constraints.

If the location of the nearest noise-sensitive receptors changes in the future, then this would alter the risk map. Therefore, it is recommended that the locations of nearest noise-sensitive receptors are reviewed and, if required, the risk map is updated prior to utilising it for the purpose of assessing applications for development within the SAP.

Based on feedback provided by the EPA, existing land use rights will apply and, as such, existing residences inside and outside the SAP may need to be considered in the rural amenity category, at least in the short-term.

For the purpose of initial risk mapping, acceptability was determined based on noise amenity goals provided in Table 2.1 of the NPfI for a suburban residential area including a reduction of 5 dB to those residences already likely to be affected by industrial-type noise east and south of the SAP (east of Bohena Creek). Although some residences may be currently considered as being in the rural noise amenity category, once the area is developed all nearest residential locations to the SAP would be more appropriately classified in the suburban amenity category since they will be in “an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry.” It is noted that noise amenity levels for rural and suburban areas are the same for evening and night, the only difference being suburban is 5 dB higher than rural during the day period.

This methodology considers any existing and/or known future industrial developments inside the SAP area together with its expansion. It allows for evaluation of potential cumulative noise by considering multiple noise sources based on the assumption that there could be industrial development near any of the nearest noise-sensitive receptors.

Noise predictions were carried out using the ISO9613 algorithms within iNoise software. iNoise calculates total levels at assessment locations from concurrent operation of multiple sources. The model considers factors such as the lateral and vertical location of plant (all sources and receptors were assumed to be at 2 m and 1.5 m above ground level, respectively), source-to-receptor distances, ground effects, atmospheric absorption, topography of the site and surrounding area.

Noise modelling considered the existing landform and did not include any additional mitigation measures such as barriers. Further, the model includes a level of conservatism since it does not include any potential acoustic shielding afforded by future buildings within the SAP area.

Categories of noise risk are described in Table 7.2.

**Table 7.2**      **Noise risk categories**

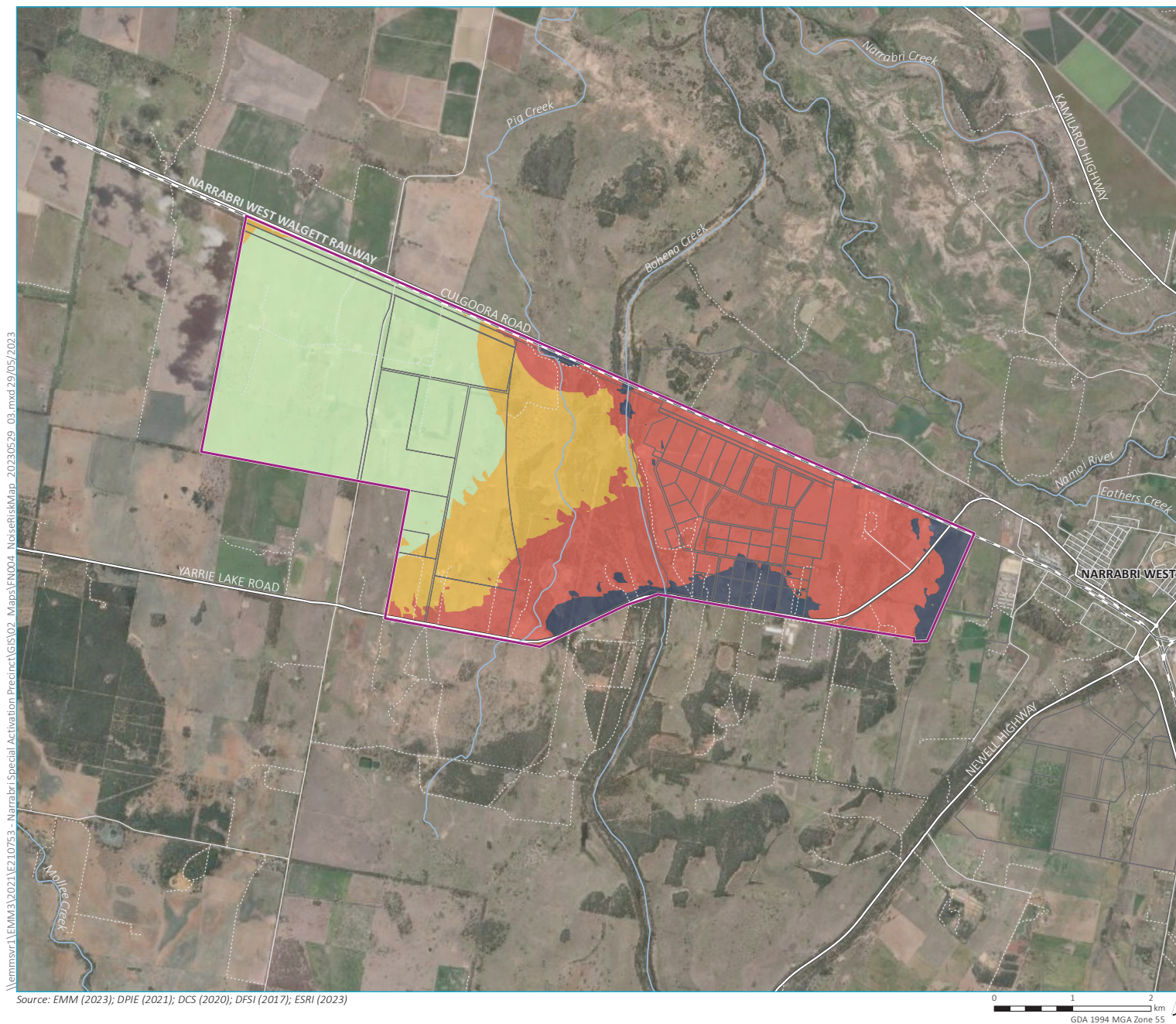
Risk category	Qualitative description
Low	24-hour operation of any (light, medium and heavy) industry unlikely to be constrained in this area.
Medium	Operation of heavy industry is unlikely to be constrained in this area during day and evening periods. 24-hour operation of light and medium industry unlikely to be constrained.
High	Operation of heavy industry is unlikely to be constrained in this area during the day. Operation of medium industry is unlikely to be constrained in this area during day and evening periods. 24-hour operation of light industry unlikely to be constrained.
Extreme	Industrial development not recommended in this area without detailed assessment.

It is important to note that the risk map indicates the best location for certain industry types that will provide the greatest chance of achieving relevant noise amenity goals at the existing nearest residential locations once the site is fully developed.

## 7.2      Noise risk map

The noise risk map for the preferred land use Structure Plan is provided in Figure 7.3. It shows a large area in the western part of the site where unconstrained operation of heavy industry would likely be permissible at all times. Other areas of the site have various limitations as per Table 7.2.





- KEY**
- Special Activation Precinct
  - Noise risk level
    - Low
    - Medium
    - High
    - Extreme
  - Existing environment
    - Rail line
    - Major road
    - Minor road
    - Vehicular track
    - Named watercourse

Noise risk map for preferred land use structure plan

Narrabri Special Activation Precinct  
Final Noise Report  
Figure 7.1



### 7.3 Operational noise modelling

The purpose of modelling hypothetical industrial noise from the SAP was to gain an understanding of the potential impacts to noise amenity at existing noise-sensitive receptors from operation of potential developments within the SAP. The outputs of the operational noise model are indicative only and have been used to provide an indication of the feasibility of the preferred land use Structure Plan in being able to achieve the relevant noise amenity goals. They have also been used to guide recommendations regarding noise mitigation and management relevant to the SAP.

Based on the preferred land use Structure Plan (Figure 2.1), the generalised categories of industry (heavy, medium and light) were allocated to each area as summarised in Table 7.3 for the purpose of predicting likely noise emissions from the SAP area at the noise sensitive receptors outside the SAP area.

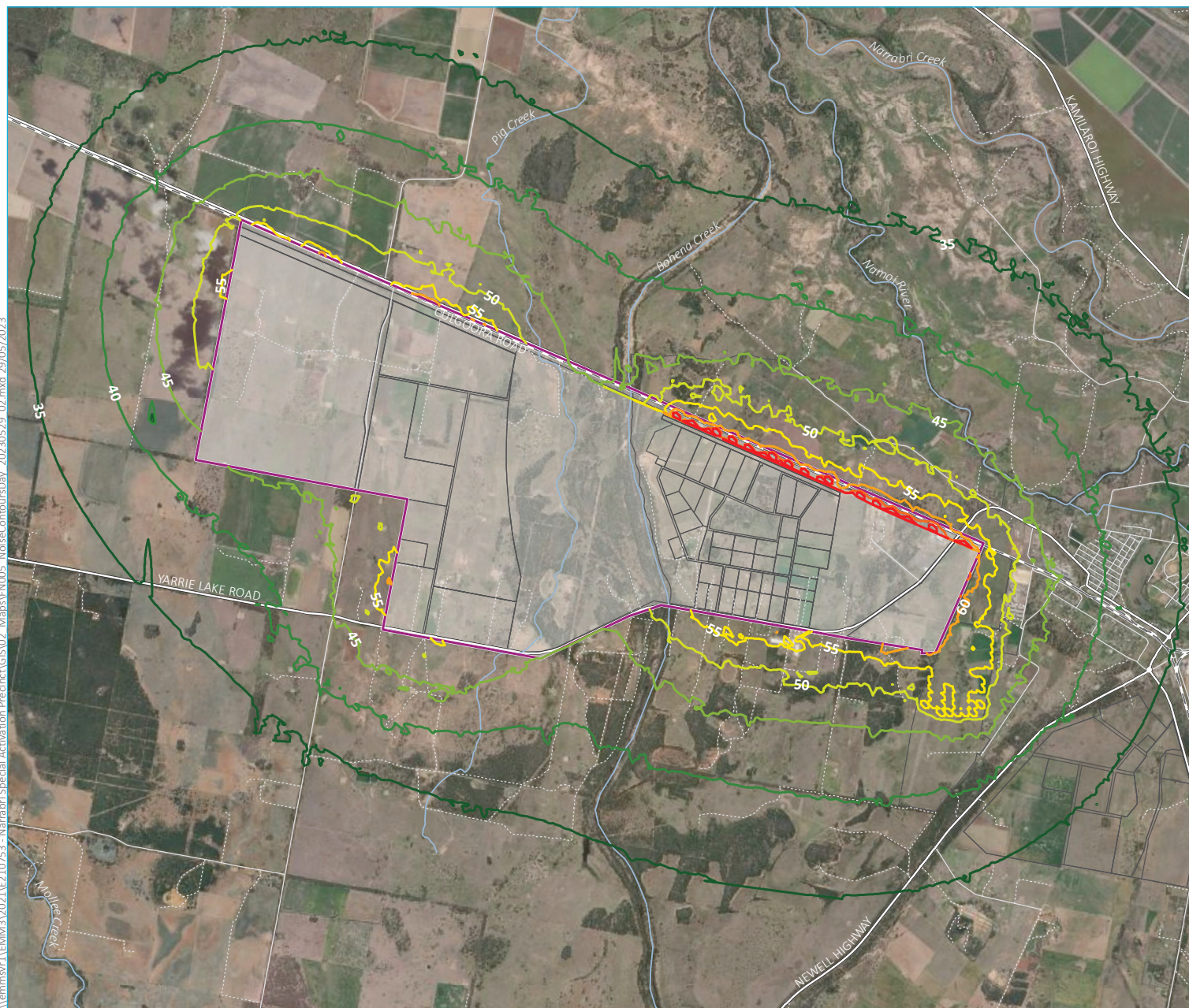
**Table 7.3 Industry categories assumed for noise modelling**

Structure Plan land use area	Number of each generalised industry category assumed in noise model			Comments
	Heavy	Medium	Light	
Potential grain	9	3	0	Industry assumed to operate 24 hours per day and located generally in the northern section of this site in proximity to the rail line.
Fertiliser and chemicals	4	3	0	Industry assumed to operate 24 hours per day and located generally in the northern section of this site in proximity to the rail line.
Solar	1	0	3	Industry assumed to operate 24 hours per day and light industry located generally in the northern section of this site with heavy industry located centrally.
Bioproducts	1	1	0	Industry assumed to operate 24 hours per day
Energy	1	1	0	Industry assumed to operate 24 hours per day
Transport and logistics	1	12	0	Industry assumed to operate 24 hours per day with heavy industry located near the rail line
Agriculture and food processing	0	15	0	Industry assumed to operate 24 hours per day and a medium industry on each proposed lot
Manufacturing	0	14	0	Industry assumed to operate 24 hours per day and a medium industry on each proposed lot
Interim potential hazardous uses	0	0	2	Industry assumed to operate 24 hours per day
Circular economy	3	9	0	Industry assumed to operate 24 hours per day
Waste management and recycling	4	2	0	Industry assumed to operate 24 hours per day
Light industrial*	0	0	6	All these light industrial sites have been assumed to be daytime operation only based on advice provided by DPE.
<b>Totals</b>	<b>24</b>	<b>60</b>	<b>11</b>	

Notes: \*The "Light industrial" area is located outside the SAP boundary however has been included here for the purpose of predicting likely cumulative noise impacts.

Indicative noise contours during the day and evening/night periods are shown in Figure 7.2 and Figure 7.3, respectively. The only difference between the two figures is the light industry area outside the SAP area, to the southeast, does not operate during the evening/night periods. These figures also show the locations of residential properties that qualify for consideration of additional noise mitigation measures as a result of the Inland Rail Project.

\\vemmsvr1\EMM\3\2021\12\10753 - Narrabri Special Activation Precinct\GIS\02 - Maps\FN005 - NoiseContoursDay\_20230529\_02.mxd 29/05/2023



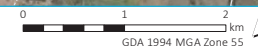
- KEY**
- Special Activation Precinct
  - SAP layout
  - Day noise contour (dB)**
  - 35
  - 40
  - 45
  - 50
  - 55
  - 60
  - 65
  - 70
  - Existing environment**
  - Rail line
  - Major road
  - Minor road
  - Vehicular track
  - Named watercourse

Indicative noise emission contours  
from preferred land use Structure  
Plan - Day

Narrabri Special Activation Precinct  
Final Noise Report  
Figure 7.2

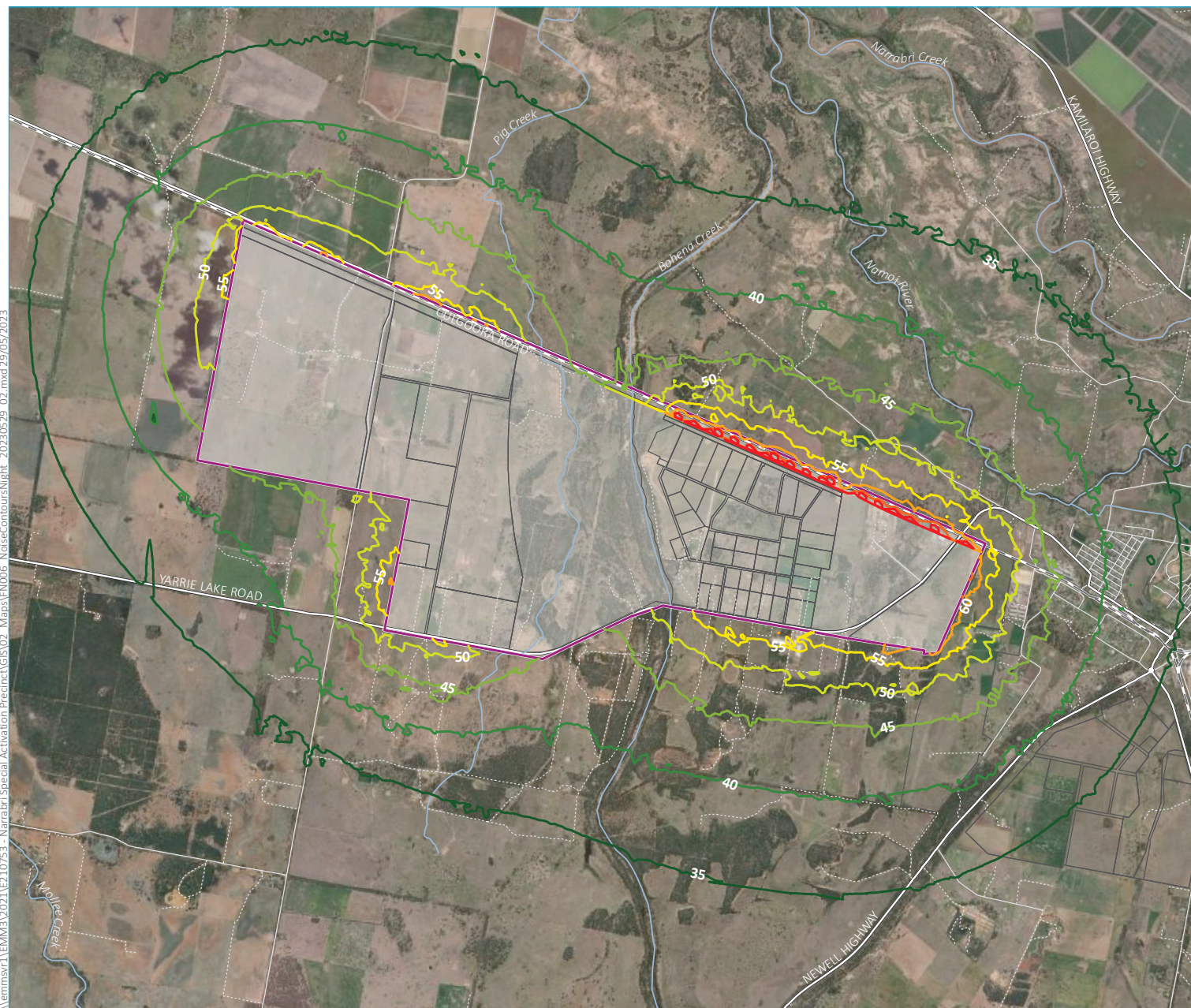


Source: EMM (2023); DFSI (2017, 2020); ESRI (2022)





\\vemmsvr1\EMM\3\2021\1210753 - Narrabri Special Activation Precinct\GIS\02 - Maps\FN006 NoiseContoursNight - 20230529 - 02.mxd/29/05/2023



- KEY**
- Special Activation Precinct
  - SAP layout
  - Evening/night noise contour (dB)**
  - 35
  - 40
  - 45
  - 50
  - 55
  - 60
  - 65
  - 70
  - Existing environment**
  - Rail line
  - Major road
  - Minor road
  - Vehicular track
  - Named watercourse

Indicative noise emission contours  
from preferred land use Structure  
Plan - Evening/night

Narrabri Special Activation Precinct  
Final Noise Report  
Figure 7.3



Source: EMM (2023); DFSI (2017, 2020); ESRI (2022)





## 7.4 Evaluation of noise risk mapping and predictions

It is important to note that noise predictions presented in Figure 7.2 and Figure 7.3 should be considered indicative only. Actual received noise levels at noise-sensitive receptors will depend on many factors including (but not limited to) the type of industry, location and orientation of specific sources and intervening buildings. These predictions provide an indication of the likelihood of the SAP, once fully operational, being able to meet relevant noise amenity levels. Where noise emissions are predicted to be above relevant amenity noise levels, this provides information about where additional noise mitigation or management measures may need to be considered.

Noise predictions indicate that the assumed full operation of the SAP would be relatively unconstrained for the day period (refer Figure 7.2) with the majority of existing residences outside the SAP area predicted to experience noise below even the strictest (rural) residential amenity level  $L_{Aeq,Day}$  50 dB. Only two residences, immediately south of Yarrie Lake Road near the Manufacturing Area, have predicted results above the recommended suburban residential  $L_{Aeq,Day}$  55 dB.

Noise emissions from the SAP are predicted to be greater than the relevant amenity level  $L_{Aeq,Night}$  40 dB or 35 dB at several locations. Where this is the case, it may be considered an unacceptable impact on noise amenity for both rural and suburban residential receptors. Noise emissions from the SAP are predicted to exceed the relevant amenity level by more than 5 dB at several residential properties north of the SAP area due mainly to operation of the proposed rail siding (heavy industry) in this vicinity. Due to the nature of this proposed activity and the physical constraints associated with it (i.e. not possible to relocate the rail line) it may not be feasible to reduce noise emissions to acceptable levels through site design or redistribution of noise sources across the site.

It is recommended that noise-sensitive uses (e.g. residence, places of worship, educational facilities or child-care centres) would not be permitted in the SAP.

The following measures, consistent with the noise mitigation hierarchy described in the NPfl, were considered with the aim of reducing potential noise emissions from the SAP where exceedances of the relevant amenity noise levels are predicted in other areas:

- Redistribution of and/or reducing the intensity of industrial development in certain areas.

Reducing the intensity of industrial development on the southern and eastern boundaries of the SAP area can provide effective reduction of predicted cumulative noise impacts from the SAP. With careful planning (e.g. consideration of the noise risk map and/or use of a noise prediction tool together with effective design of the proposed development site and operations) it is anticipated that total noise emissions from the SAP can achieve the relevant noise amenity levels. The reduction in intensity along the eastern and southern boundaries could also be offset by increasing the intensity of development in the centre of the western portion of the SAP (refer to the low risk areas identified in the risk map in Figure 7.1).

- Noise barrier.

A noise barrier<sup>2</sup> on the southern boundary of the Narrabri SAP in the vicinity of the Manufacturing Area was considered. Results of preliminary noise modelling indicate this would have limited effectiveness (less than 2 dB reduction) at reducing total noise emissions from the developments within the SAP. Further, DPE does not support noise barriers as a noise mitigation measure due to cost and potential visual impacts.

<sup>2</sup> A noise barrier could take many different forms; a noise wall (e.g. concrete or timber construction), an earth bund, or a combination of the two. The effectiveness of a noise barrier reduces as its distance from the source or receptor increases. Thus, to maximise the effectiveness of a barrier on the Narrabri SAP boundary it should be located as near as possible to the boundary (and noise sources) of the individual development site.

- At-receiver-treatments.

Where noise emissions cannot be reduced to acceptable levels after the consideration of noise reduction at the source then noise reduction measures at receptors may need to be considered. As per Section 3.4.3 of the NPfI, it is expected that this would only apply to isolated residences in rural areas. Measures that could be considered here include provision or upgrade of insulation or glazing for windows incorporated with an alternative means of ventilation. Alternatively, consideration could also be given to a structure that provides shielding to the residence (e.g. a shed or courtyard screening) or additional landscaping to provide visual screening and/or masking noise (e.g. tree planting or water features). This could be implemented, if required, via negotiated agreements with affected residences. Acquisition of noise-sensitive properties may also need to be considered in cases where noise impacts are likely to be significant.

As can be seen from the noise contour figures (Figure 7.2 and Figure 7.3), noise emissions from developments in the SAP are predicted to meet the relevant amenity noise levels at nearest receptors in the rural area west and south-west of the SAP. The results of initial risk mapping and operational noise modelling indicate minimal constraints to development in the western part of the SAP based on the existing noise-sensitive receptors in the area. This would change if a noise-sensitive development were permitted to be developed in close proximity to the SAP boundary. Hence, it will be important to implement planning controls that can ensure that the development application for any noise-sensitive development in proximity to the SAP is required to consider potential amenity impacts from the SAP.

## 8 Outcomes and recommendations

The following outcomes and recommendations are the culmination of the entire Narrabri SAP project noise study. They are based on results of noise modelling for risk-mapping and the preferred land use Structure Plan, findings and feedback received from DPE as well as consultation undertaken with the EPA and other relevant stakeholders over the course of these studies:

- Noise-sensitive developments, for example residences, places of worship, educational facilities or child-care centres, should not be permissible within the SAP.
- Planning controls be utilised to ensure that the development application for any noise-sensitive development in proximity to the SAP be required to consider potential amenity impacts from the SAP.
- Establishment of operational noise criteria for the SAP (as a whole) consistent with the NPfl as outlined in Section 5.2.
- Preparation of an operational noise management strategy that demonstrates a commitment to and methodology for a precinct-wide approach to noise mitigation and management. It is anticipated this would also describe how noise modelling and/or a detailed noise monitoring program would be used to assist with the minimisation and ongoing management of noise emissions from development within the Narrabri SAP to receptors inside and outside the SAP area as the site develops over time.
- Ensure that proponents are aware of the expectation to incorporate BMP and BATEA principles into the design of individual developments. This could be outlined in the Delivery Plan and associated documentation.
- Preparation of a *SAP Technical Assessment Framework (Noise)* which would contain additional detail regarding the noise assessment process for developments proposed in the SAP. This document (or equivalent) would also outline the consultation process with the EPA as the relevant regulatory body regarding noise. It would also describe how the noise risk map (as updated where required) could be used to assist in appropriately placing high-noise industries.

# Glossary

Acronym, term, or abbreviation	Definition
CEMP	Construction Environmental Management Plan
DA	Development Application
DPE	Department of Planning and Environment
eg	for example
EPA	NSW Environmental Protection Authority
EPL	Environmental Protection License
km	Kilometres
m	Metre
m <sup>2</sup>	square metres
m <sup>3</sup>	cubic meter
NVIA	Noise and Vibration Impact Assessment
NSW	New South Wales
OEMP	Operational Environmental Management Plan
Planning Systems SEPP	State Environmental Planning Policy (Planning Systems) 2021
SSD	State Significant Development
Transport and Infrastructure SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
ABL	The assessment background level (ABL) is defined in the Npfl as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Amenity noise criteria	The amenity noise criteria relate to existing industrial noise. Where industrial noise approaches base amenity noise criteria, then noise levels from new industries need to demonstrate that they will not be an additional contributor to existing industrial noise.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
Day period	Monday-Saturday: 7 am to 6 pm. Sundays and public holidays: 8 am to 6 pm.
BATEA	Best available technology economically available
BMP	Best management practice
dB	Decibels. Relative unit of measurement on a logarithmic scale used extensively in the field of acoustics.
dBA	Decibels adjusted using the “A”-weighting scale to consider human response to sound
dB(C	Decibels adjusted using the “C”-weighting scale used to take into account low-frequency components of noise within the audibility range of humans
Evening period	Monday-Sunday: 6 pm to 10 pm
EbD	Enquiry by Design

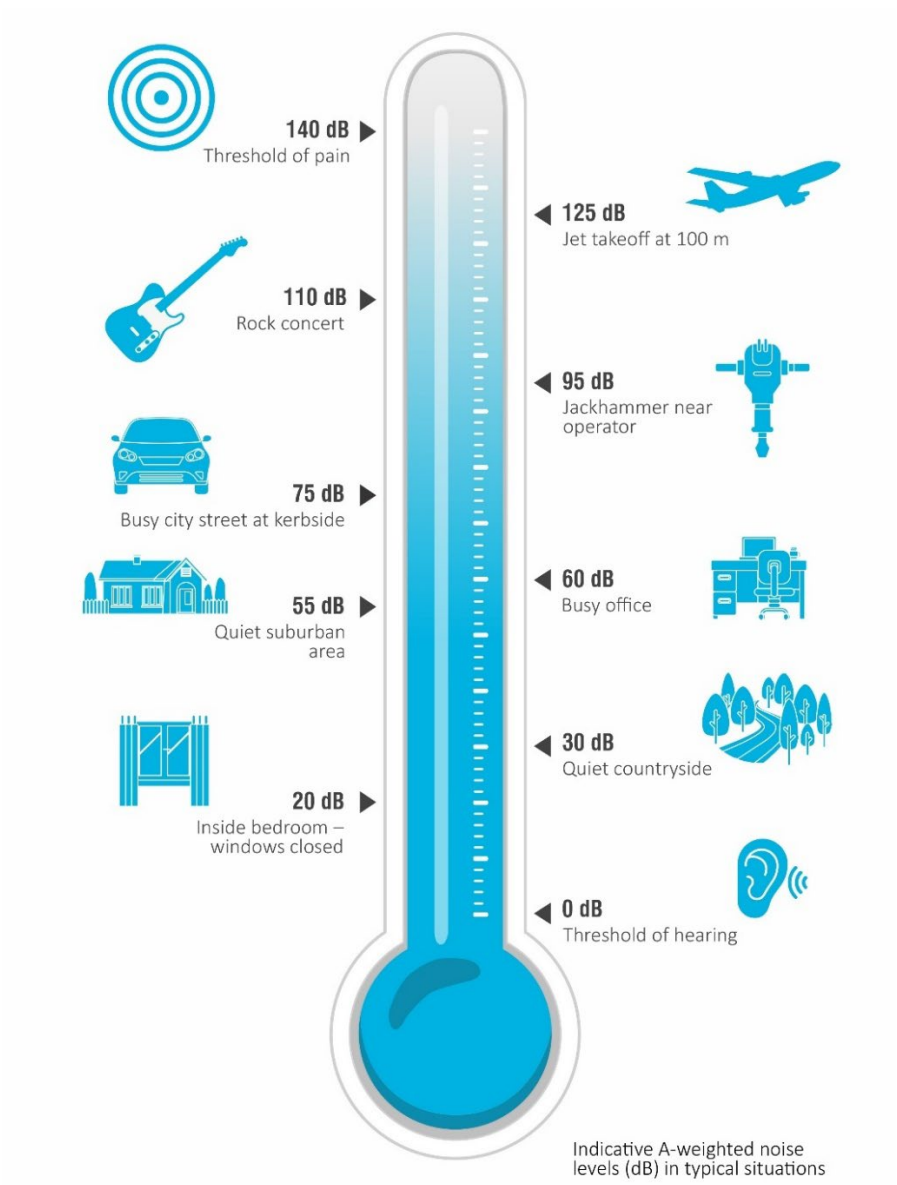


Acronym, term, or abbreviation	Definition
Intrusive noise criteria	The intrusive noise criteria refers to noise that intrudes above the background level by more than 5 dB
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A1,1minute</sub>	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute (or 0.6 seconds)
L <sub>A10</sub>	The noise level which is exceeded for 10 percent of the time
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period
L <sub>A90</sub>	The level exceeded for 90 percent of the time. The LA90 level is often referred to as the “background” noise level and is commonly used to determine noise criteria for assessment purposes.
L <sub>Aeq</sub>	The average noise A-weighted energy during a measurement period
L <sub>Aeq,t</sub>	The average A-weighted sound energy during a measurement period of time (t)
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period
L <sub>Amin</sub>	The minimum A-weighted noise level over a time period
L <sub>Ceq</sub>	The average C-weighted noise energy during a measurement period. The “C” weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
L <sub>W</sub>	Sound power level. Measured as 10 times the logarithmic ratio of power of a source relative to a reference level of one picowatt.
L <sub>WA</sub>	A-weighted sound power level
Night period	Night period Monday-Saturday: 10 pm to 7 am. Sundays and public holidays: 10 pm to 8 am.
N2IP	Northern NSW Inland Port
NML	Noise Management Level (as per the ICNG)
NPfi	Noise Policy for Industry
NSC	Narrabri Shire Council
POEO	Protection of the Environment Operations (Act)
PNTL	The project-noise trigger level (PNTL) is criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive noise criteria or amenity noise criteria.
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 average background levels.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SAP	Special Activation Precinct
SPL	Sound pressure level. Measured as 10 times the logarithmic ratio of pressure fluctuations relative to a reference level of 20 micropascals.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude

It is useful to have an appreciation of decibels (dB), the unit of noise measurement. Table G.1 gives an indication as to what an average person perceives about changes in noise levels. Examples of common noise levels are provided in Figure G 8.1.

**Table G.1      Perceived change in noise**

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



**Figure G 8.1      Common noise levels**

## References

NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry*.

NSW Government 2018, *Voluntary Land Acquisition and Mitigation Policy For State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP).

NSW EPA 2013, *Rail Infrastructure Noise Guideline* (RING).

NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP).

NSW Environmental Protection Authority (EPA) 2009, *The Interim Construction Noise Guideline* (ICNG).

## **Australia**

### **SYDNEY**

Ground floor 20 Chandos Street  
St Leonards NSW 2065  
T 02 9493 9500

### **NEWCASTLE**

Level 3 175 Scott Street  
Newcastle NSW 2300  
T 02 4907 4800

### **BRISBANE**

Level 1 87 Wickham Terrace  
Spring Hill QLD 4000  
T 07 3648 1200

### **CANBERRA**

Level 2 Suite 2.04  
15 London Circuit  
Canberra City ACT 2601

### **ADELAIDE**

Level 4  
74 Pirie Street  
Adelaide SA 5000  
T 08 8232 2253

### **MELBOURNE**

Suite 8.03 Level 8  
454 Collins Street  
Melbourne VIC 3000  
T 03 9993 1900

### **PERTH**

Suite 3.03 Level 3  
111 St Georges Terrace  
Perth WA 6000

## **Canada**

### **TORONTO**

2345 Young Street Suite 300  
Toronto ON M4P 2E5

### **VANCOUVER**

60 W 6th Ave Suite 200  
Vancouver BC V5Y 1K1



[linkedin.com/company/emm-consulting-pty-limited](https://www.linkedin.com/company/emm-consulting-pty-limited)



[emmconsulting.com.au](http://emmconsulting.com.au)