MOREE SPECIAL ACTIVATION PRECINCT

MASTER PLAN REPORT

PLANNING CONSIDERATIONS FOR AIR, NOISE AND ODOUR

Department of Planning, Industry & Environment

9 April 2021

Job Number 20041104

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DOCUMENT CONTROL

Report Version	Date	Prepared by	Reviewed by
DRAFT - 001	09/12/2020	E McDougall & D Kjellberg	
DRAFT - 002	15/12/2020	E McDougall	
DRAFT - 003	04/02/2021	E McDougall & D Kjellberg	A Todoroski
FINAL – 001	05/02/2021	D Kjellberg	
FINAL – 002	19/02/2021	E McDougall & D Kjellberg	
FINAL – 003	25/03/2021	D Kjellberg	
FINAL – 004	09/04/2021	D Kjellberg	A Todoroski

EXECUTIVE SUMMARY

The Moree Special Activation Precinct (SAP) investigation area encompasses an area of approximately 5,800 hectares (ha) immediately south of the Moree township. The SAP investigation area spans both sides of the Newell Highway and the Inland Rail corridor (Narrabri to North Star section).

A preferred Structure Plan for the Moree SAP has been developed through an enquiry by design process identifying the possible location of certain types of industries within precincts.

Air Quality (including odour), and Noise are regulated in NSW under the *Protection of the Environment Operations Act 1997* and subordinate regulations made under the Act. The Regulations empower the appropriate regulatory authority (the NSW EPA) to develop guidelines and policies for managing air quality and noise. The EPA guidelines set out suitable criteria for air pollutants, odour and noise to prevent adverse impacts on amenity and health for sensitive receptors such as residential areas.

The prevailing terrain, meteorology, and available air quality and noise monitoring data were considered to better understand the baseline air quality and noise environment in the SAP investigation area. A key consideration in the assessment is that there are no sensitive receptors within the precinct boundary with the exception of the proposed Airport Hotel development which would be within the SAP boundary.

Noise and air dispersion modelling was used to define the maximum noise, air and odour emissions that could be emitted from all sources within the industrial area without causing any adverse impacts at sensitive receptor locations. The study recommends noise, air and odour emission allocations per lot area, that would minimise any potential noise, air and odour impacts outside of the SAP boundary.

This study has considered the noise, air and odour constraints and opportunities within and surrounding the SAP boundary. Potential effects upon aircraft operations due to the presence of large buildings within the SAP are also considered. Industrial facilities in close proximity to the airport may be required to undertake windshear and turbulence assessments to ensure the wind induced wake downwind of large buildings does to not affect the operation of the airstrip, and plume rise assessments to ensure stacks can operate within the airport Obstacle Limitation Surface (OLS) without affecting flying aircraft.

Emission allowance contours for noise (sound power), air (oxides of nitrogren (NO_x) stack concentration) and odour (odour emission rate) per hectare have been made in this study. These three emissions considered together can reasonably represent the total extent of likley impacts. The contours presented in this rpeort can be applied in potential new planning instruments for the locality and may be used in the approvals process for any new and expanded industries. The information provided can also help potential new industries to identify the more suitable lots where, depending on their emissions, the facility can reasonably expect to be able to operate without causing impacts (outside of the SAP boundary) or to require any extra controls.

Per the allowance of emissions per lot area, brief attended measurements can be made at a site to evaluate compliance, rather than making often inconclusinve, lengthy cumulative measurments or modelling. With implementation of appropiate controls and mitigation measures, the industial air, noise and odour impacts can be controlled at the source at the planning/ design/ construction and operations phase.

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1 INTRODUCTION

1.1 Background

The New South Wales (NSW) Government has identified dedicated areas throughout regional NSW to bring together planning and investment to stimulate economic growth across a range of industries such as freight and logistics, advanced manufacturing, renewable energy, agribusiness and tourism. These dedicated areas are recognised as Special Activation Precincts (SAPs).

The NSW Government announced the investigation of a SAP at Moree on 3 December 2019. The purpose of the SAP is to investigate opportunities to unlock the economic potential of the region by leveraging Moree's location in the middle of one of the most productive agricultural regions in Australia, its proximity to the Inland Rail, and its strategic connections to inter- and intra-state, national and global markets. The SAP will guide development to support and enable future business growth and diversification in Moree.

1.2 SAP investigation area

Moree is located on the lands of the Gamilaroi (also known as Kamilaroi) people, the second largest Aboriginal nation on the eastern coast of Australia. The descendants of the Gamilaroi Nation continue to live on their land in Moree, with 21.6 percent of the Moree Plains local government area (LGA) population identifying as Aboriginal and/or Torres Strait Islander.

The natural assets of Moree and its surrounds make it one of the most productive agricultural regions in Australia. Natural benefits brought by fertile soils, a temperate climate, and location above significant artesian basin water have long enabled the success of large-scale broadacre cropping and pastoral production in the region. The region relies on a reliable water supply of both artesian and surface water to support community and agribusiness. Fertile plains are drained by the Namoi and Gwydir Rivers and their tributaries, including the Mehi and Peel Rivers.

The Moree SAP investigation area encompasses an area of approximately 5,800 hectares (ha) and lies just south of the Moree township and Gwydir Highway. The SAP investigation area spans both sides of the Newell Highway and the Inland Rail corridor (Narrabri to North Star section). There are a number of creek tributaries which traverse the investigation area. The primary waterway is Halls Creek, which crosses the SAP investigation area midway in an east-west direction, south of the Moree Regional Airport.

The Moree SAP investigation area and key features are shown on **Figure 1-1.**

1.3 Preferred Structure Plan

A preferred Structure Plan for the Moree SAP is shown on **Figure 1-2**. The proposed SAP boundary for the preferred Structure Plan has been developed through an enquiry by design process identifying the possible location of certain types of industries within precincts.

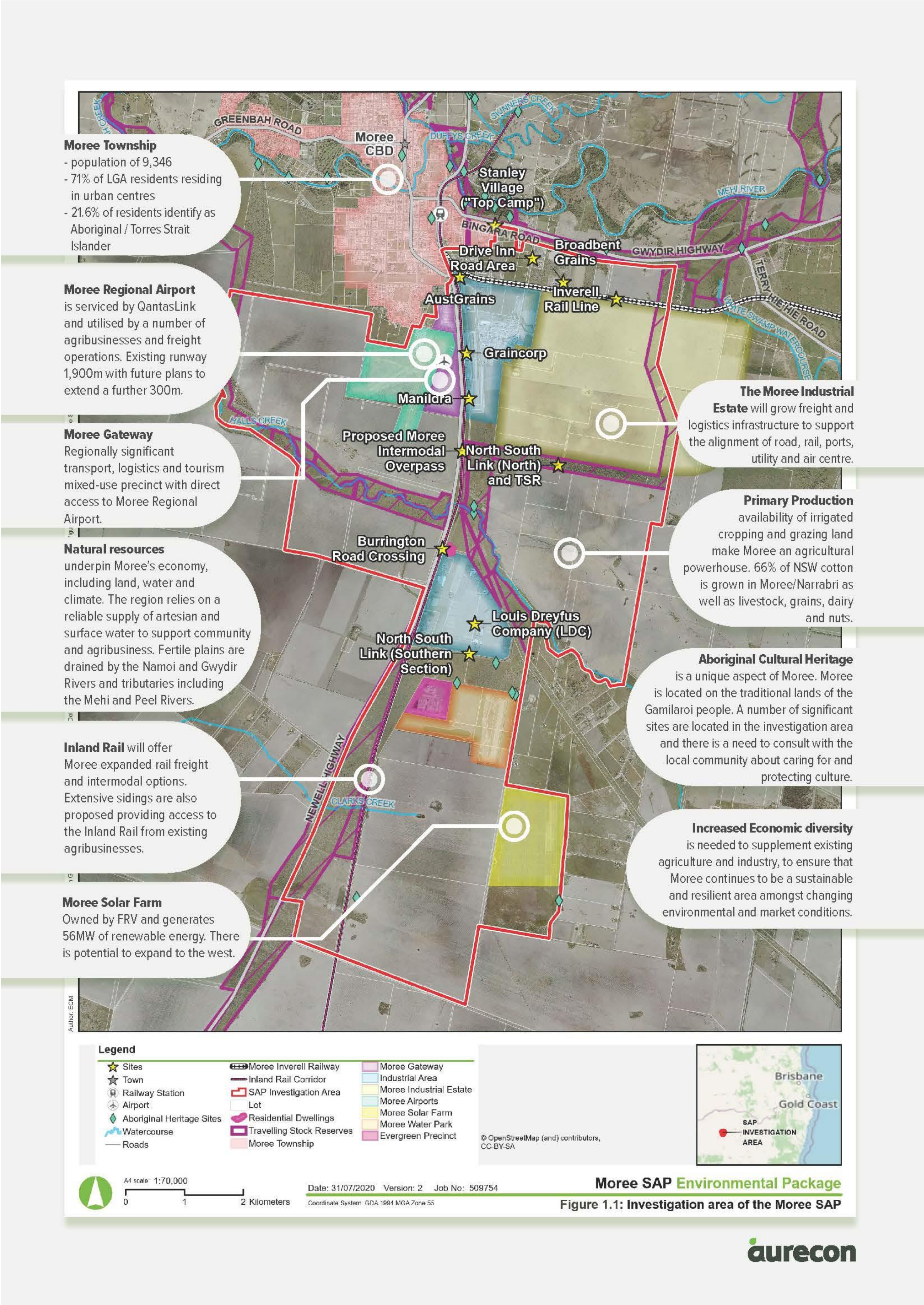

Figure 1-1: Map of the investigation area of the Moree SAP

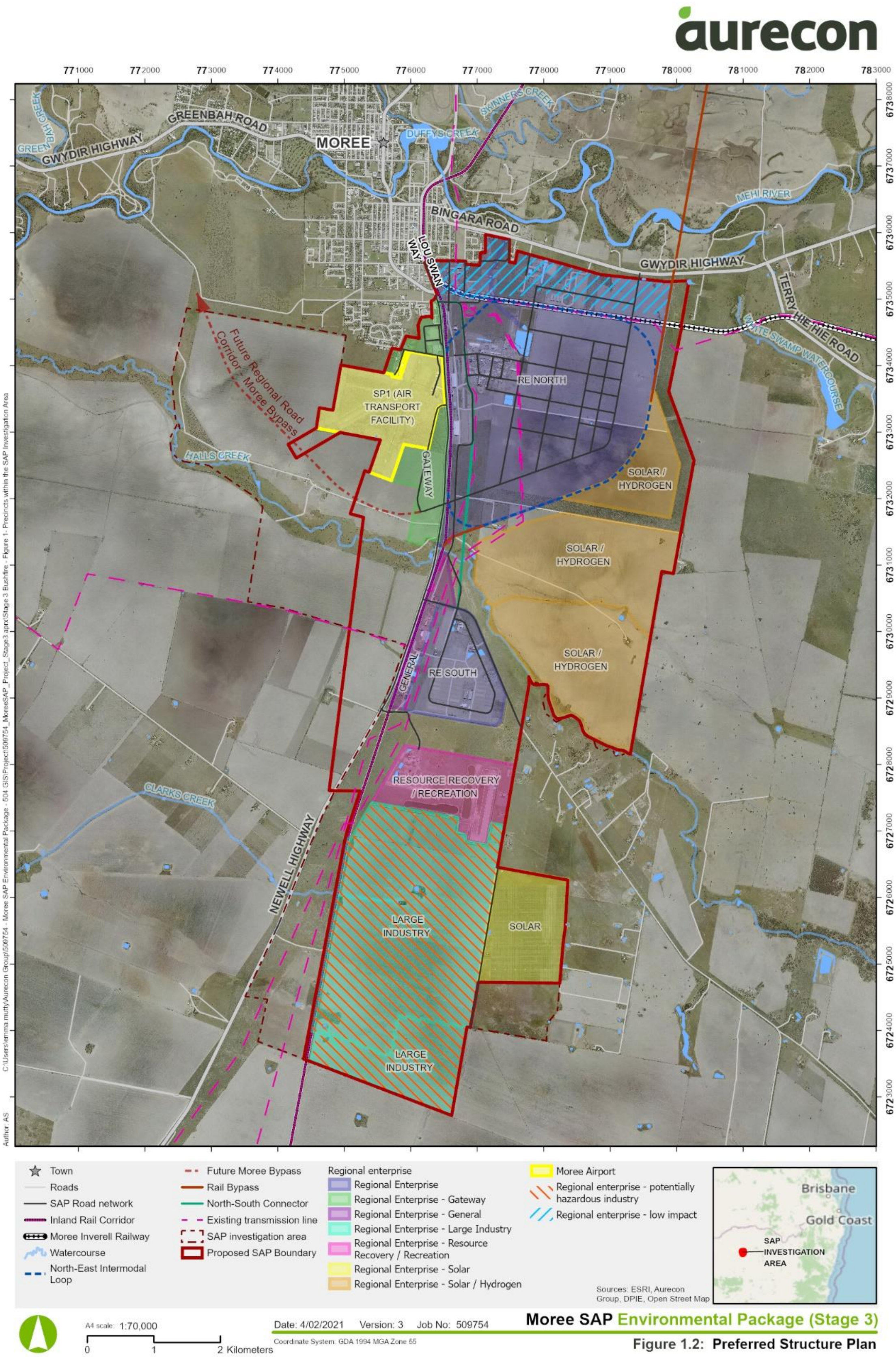

Figure 1-2: Map showing the proposed Structure Plan for the Moree SAP

1.4 Purpose of this report

Future development within the Moree SAP will require careful consideration ensuring the right balance can be achieved between community need, environmental values, cultural heritage, economic development and technical considerations.

Aurecon has been commissioned by the NSW Department of Planning, Industry and Environment (DPIE) to prepare a suite of environmental technical studies to support the Moree SAP Master Plan, including:

- Biodiversity
- Bush fire
- Aboriginal and non-Aboriginal cultural heritage
- Soils, geology and contamination
- Hydrogeology
- Air, odour and noise

Our environmental technical studies ensure a comprehensive appreciation of environmental constraints and opportunities within and surrounding the SAP investigation area. The preferred Structure Plan, land yields and notional allocation to land uses have been used to inform an assessment of the potential impacts of the Moree SAP and preparation of the environmental technical studies to support the Moree SAP Master Plan.

The purpose of this report is to define the maximum extent of emissions from within the industrial area of the preferred scenario that do not cause impacts at sensitive receptor locations. The corresponding noise, air and odour emissions from any part of the industrial area are also identified.

2 OVERVIEW OF REGULATORY FRAMEWORK AND RELEVANT GUIDELINES

2.1 Overview

SAPs are a joint Government Agency initiative announced by the NSW Government as part of its 20-Year Economic Vision for Regional NSW and will be delivered as part of the Snowy Hydro Legacy Fund by the Department of Regional NSW, DPIE and the Regional Growth NSW Development Corporation (RDGC).

Through place-based strategic planning, SAPs will help to create jobs, attract businesses and investors, and fuel economic development in areas of regional or State significance in regional NSW, in line with the competitive advantages and economic strengths of each area. At present, there are five SAPs announced by the NSW Government: Parkes, Wagga Wagga, Snowy Mountains, Moree and Williamtown.

2.2 Overarching regulatory framework – Special Activation Precincts

The key approvals for development assessment are governed by the State planning framework. The *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and *Environmental Planning and Assessment Regulation 2000* (NSW) (EP&A Reg) provide the statutory planning context to govern land use planning, environmental assessment and approval in NSW.

Under the EP&A Act, if an environmental planning instrument, such as a State Environmental Planning Policy (SEPP), provides that specified development may be carried out without the need for development consent, the development may be carried out in accordance with that instrument.

The *State Environmental Planning Policy (Activation Precincts) 2020* (NSW) (AP SEPP) came into force on 12 June 2020 and provides the statutory planning framework for development within SAPs, providing for simplified planning processes to streamline development where it is consistent with the approved Master Plan.

The AP SEPP outlines the Master Plan and Delivery Plan requirements to be met for each SAP as well as the process for obtaining an Activation Precinct Certificate. Each schedule of the AP SEPP will outline a Land Use Table and the Development Standards for each SAP, outlining the approval pathways for land uses, including permitted without consent, permitted with consent and prohibited development. For development proposals to access the simplified planning and environmental approvals of the proposed AP SEPP, they must meet the relevant Development Standards. Proposed developments will need to obtain an Activation Precinct Certificate from the RGDC to provide assurance that the proposal is consistent with the relevant Land Use Table, Development Standards, Master Plan, and building design and performance requirements set out in a Delivery Plan.

In the case of proposed development that involves a permitted land use which does not meet the Development Standards to be exempt or complying development under the AP SEPP, development consent may be required to be obtained with the relevant planning authority in accordance with existing legislation.

2.2.1 Relationships with other environmental planning instruments

The AP SEPP prevails over other SEPPs and LEPs to the extent of any inconsistency, with upfront strategic environmental planning and design of the Master Plan satisfying and mitigating many of those requirements.

The exception to the above are Clauses 12 and 13 of *State Environmental Planning Policy No 33 – Hazardous and Offensive Development* and Clause 7 of *State Environmental Planning Policy No 55 – Remediation of Land* which will continue to apply to an application for an Activation Precinct certificate which relates to complying development in the same way as they apply to an application for development consent.

Where development is not complying development in accordance with the AP SEPP, *SEPP No. 33 – Hazardous and Offensive Development* and *SEPP No 55 – Remediation of Land* continue to apply.

2.3 Air, odour and noise NSW legislative framework

Air Quality (including odour), and Noise are regulated in NSW under the *Protection of the Environment Operations Act 1997* and subordinate regulations made under the Act. These are the Protection of the Environment Operations (Clean Air) Regulation 2010, and the Protection of the Environment (Noise Control) Regulation 2017.

The Regulations enable the appropriate regulatory authority (the NSW EPA) to develop guidelines and policies for managing air quality and noise. The key guidelines applicable for the SAP investigation area include the following:

- Approved Methods for the Modelling and Assessment of Air Quality in New South Wales (2017) (Approved Methods);
- NSW Odour Policy, comprised of:
  - Technical Framework – Assessment and Management of odour from stationary sources in NSW, 2006; and,
  - Technical Notes – Assessment and Management of odour from stationary sources in NSW, 2006; and,
- Noise Policy for Industry (2017) (NPI)

These guidelines set out suitable criteria for air pollutants, odour and noise to prevent adverse impacts on amenity and health for sensitive receptors such as residential areas. The approved Methods contain both Air and Noise Criteria. In addition to the above, other NSW noise policies include:

- NSW Road Noise Policy (DECCW, 2011)
- Rail Infrastructure Guideline (EPA, 2013)
- Assessment Vibration A Technical Guideline (DEC, 2006)

3 BASELINE ANALYSIS

3.1 Desktop characterisation of Existing Environment

This section describes the existing environment including the climate, existing industries and ambient air quality in the SAP investigation area and surroundings. The data allows consideration of the long-term conditions in any decision making, rather than potentially anomalous conditions in any short period.

3.1.1 Topography

Figure 3-1 presents a representative three dimensional visualisation of the terrain features surrounding the SAP investigation area. The local topography is generally flat and gently sloping towards the river which flows to the west.

The relatively flat topography indicates that temperature inversions may be a significant feature within the SAP investigation area, and gentle katabatic drift is likely to be towards the northwest. This would not generally be favourable for preventing noise and odour reaching residents south of the Mehi River, however the effects are not known with certainty at this time, and detailed modelling in the next phases of the project is likely to reveal more specific details in this regard.

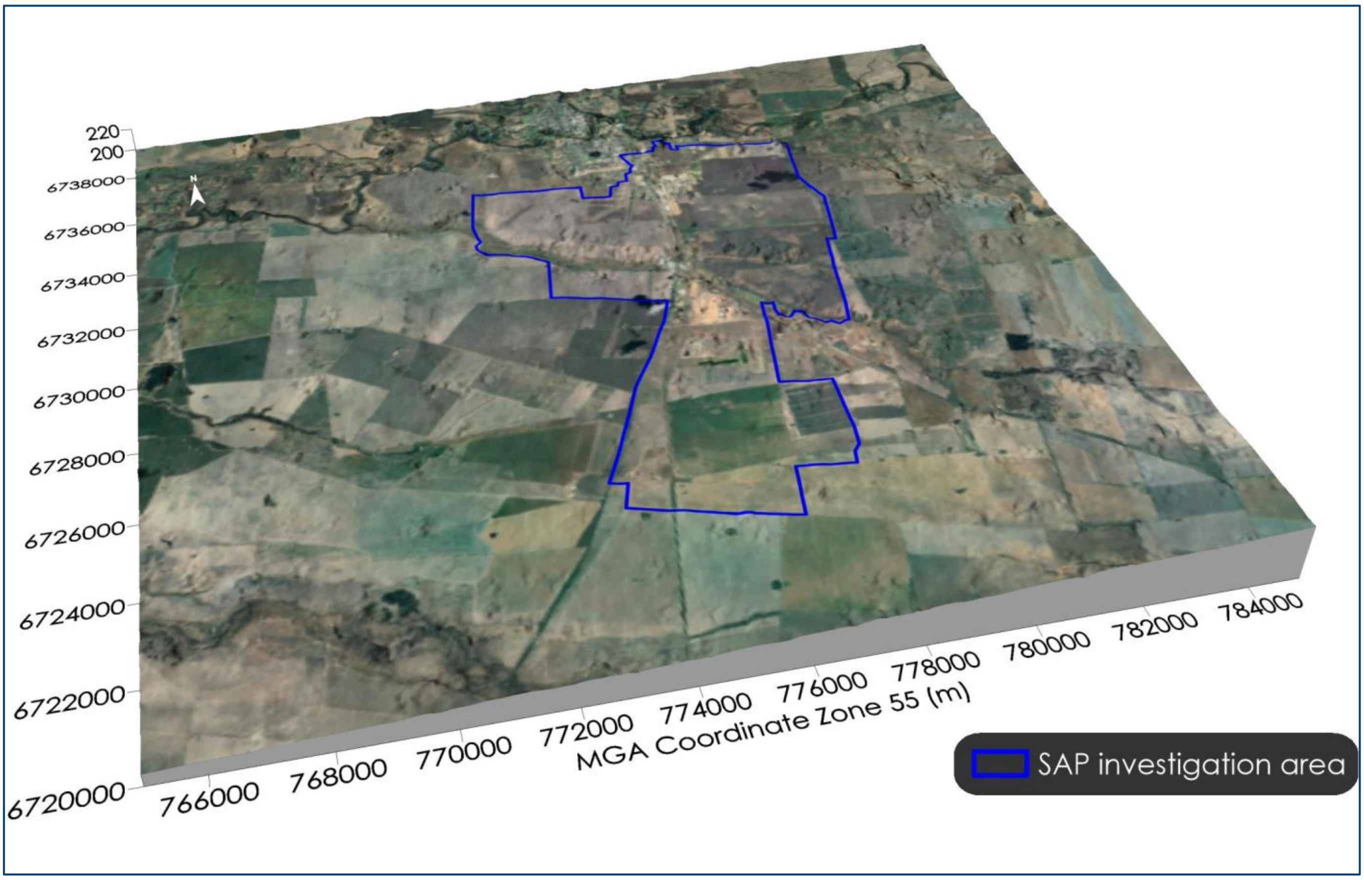

Figure 3-1: Representative visualisation of the local topography surrounding the SAP investigation area

3.1.2 Climatic conditions

Long-term climatic data from the Bureau of Meteorology (BoM) weather station at Moree Aero (Site No. 053115) were used to characterise the local climate in the proximity of the SAP investigation area. The Moree Aero is located within the SAP investigation area to the north-northwest.

Table 3-1 and **Figure 3-2** present a summary of data from the Moree Aero collected over an approximate 15 to 25 year period for the various meteorological parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 34.3 degrees Celsius (ºC) and July is the coldest month with a mean minimum temperature of 4.5ºC.

Rainfall exhibits variability across the year. The data indicate that January is the wettest month with an average rainfall of 79.4 millimetres (mm) over 5.7 days and April is the driest month with an average rainfall of 22.8mm over 2.4 days.

Humidity levels exhibit variability and seasonal flux across the year. Mean 9am humidity levels range from 50 per cent (%) in October to 75% in June. Mean 3pm humidity levels range from 30% in October to 46% in June.

There is little spread in the wind speeds between the 9am and 3pm conditions. Mean 9am wind speeds range from 12.9 kilometres per hour (km/h) in June to 21.0km/h in December. Mean 3pm wind speeds range from 15.3km/h in March to 18.0km/h November.

Table 3-1: Monthly climate statistics summary – Moree Aero

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temp. (ºC)	34.3	33.2	31.2	27.3	22.6	19.0	18.4	20.5	24.7	28.2	30.9	33.0	26.9
Mean min. temp. (ºC)	20.5	19.7	17.4	12.9	8.3	5.9	4.5	5.2	8.9	12.9	16.4	18.7	12.6
Rainfall													
Rainfall (mm)	79.4	67.6	54.8	22.8	27.7	37.4	34.3	24.7	32.6	45.7	73.2	64.3	557.5
No. of rain days (≥1mm)	5.7	5.3	4.5	2.4	3.0	4.0	3.8	2.8	3.9	5.1	5.9	6.1	52.5
9am conditions													
Mean temp. (ºC)	24.7	24.0	21.8	20.1	15.1	11.5	10.3	12.8	17.4	20.7	22.1	24.1	18.7
Mean R.H. (%)	58	62	62	55	64	75	73	62	56	50	54	55	60
Mean W.S. (km/h)	20.8	19.3	17.7	16.3	13.7	12.9	13.3	15.8	17.7	19.7	20.6	21.0	17.4
3pm conditions													
Mean temp. (ºC)	31.9	31.1	29.5	26.1	21.5	18.0	17.2	19.5	23.4	26.6	28.5	30.7	25.3
Mean R.H. (%)	35	37	34	32	38	46	43	35	32	30	32	32	35
Mean W.S. (km/h)	15.5	15.7	15.3	15.6	15.6	16.2	16.8	17.8	17.0	17.3	18.0	17.3	16.5

Source: **Bureau of Meteorology, 2020 (accessed July 2020)**

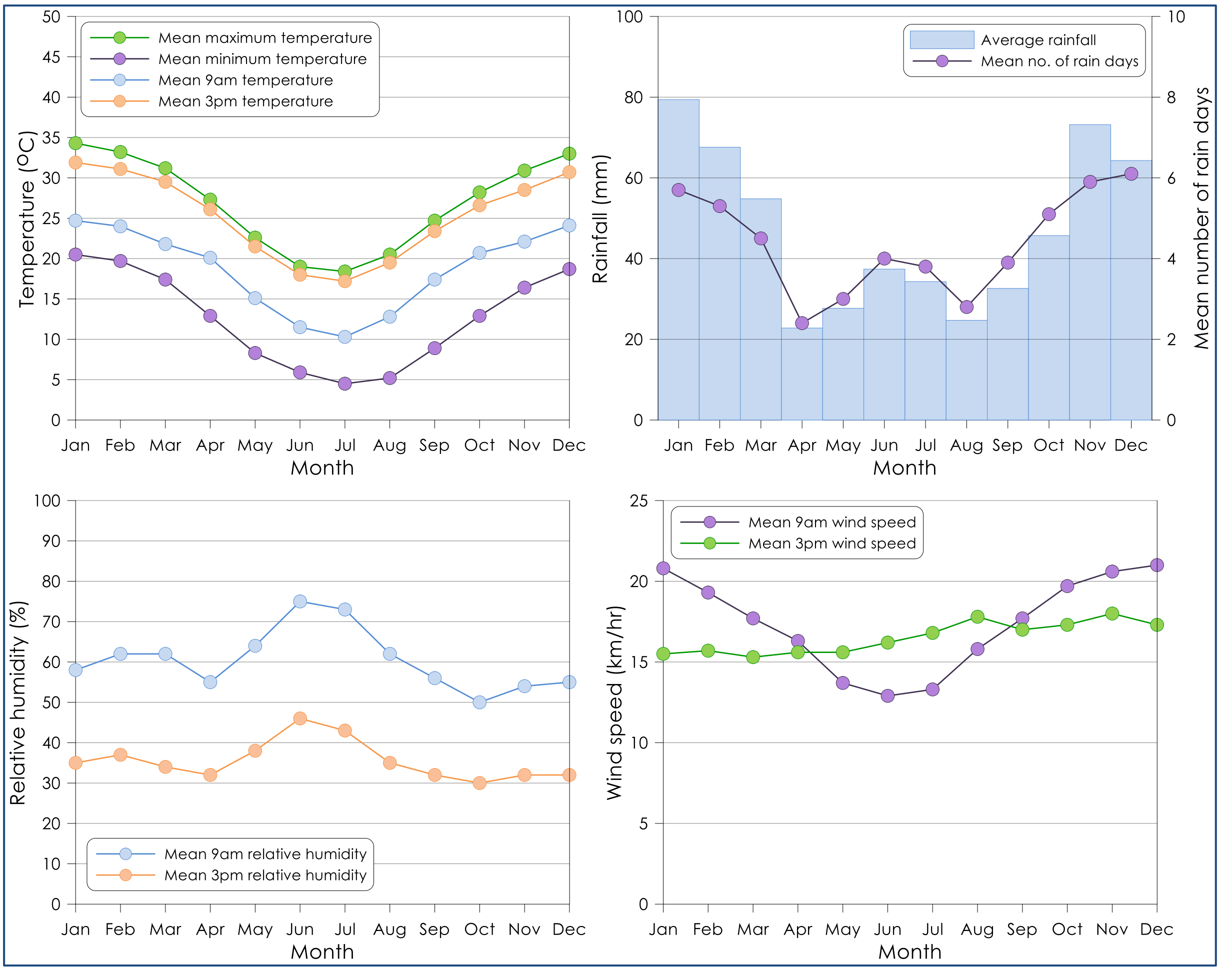

Figure 3-2: Graphs showing monthly climate statistics summary – Moree Aero

3.1.3 Meteorological conditions

The Moree Aero has been used to represent local meteorological conditions that would be experienced within the SAP investigation area. The Moree Aero is located in the north-northwest of the SAP investigation area. Annual and seasonal windroses prepared from data collected for the 2017-2019 calendar years are presented in **Figure 3-3**.

The windroses indicate that on an annual basis winds are predominately from the northeast quadrant with some winds from the southwest. In summer, winds are predominantly from the northeast quadrant with less frequent winds from the southwest. The wind distributions during autumn and spring are generally similar to the annual wind distribution. In winter, the winds are predominantly from the southwest.

Diurnal wind roses are presented for the same data in **Figure 3-4** and show a distinct pattern of night time and morning winds predominantly from the northeast, and more winds from the southwest in the afternoon and evening.

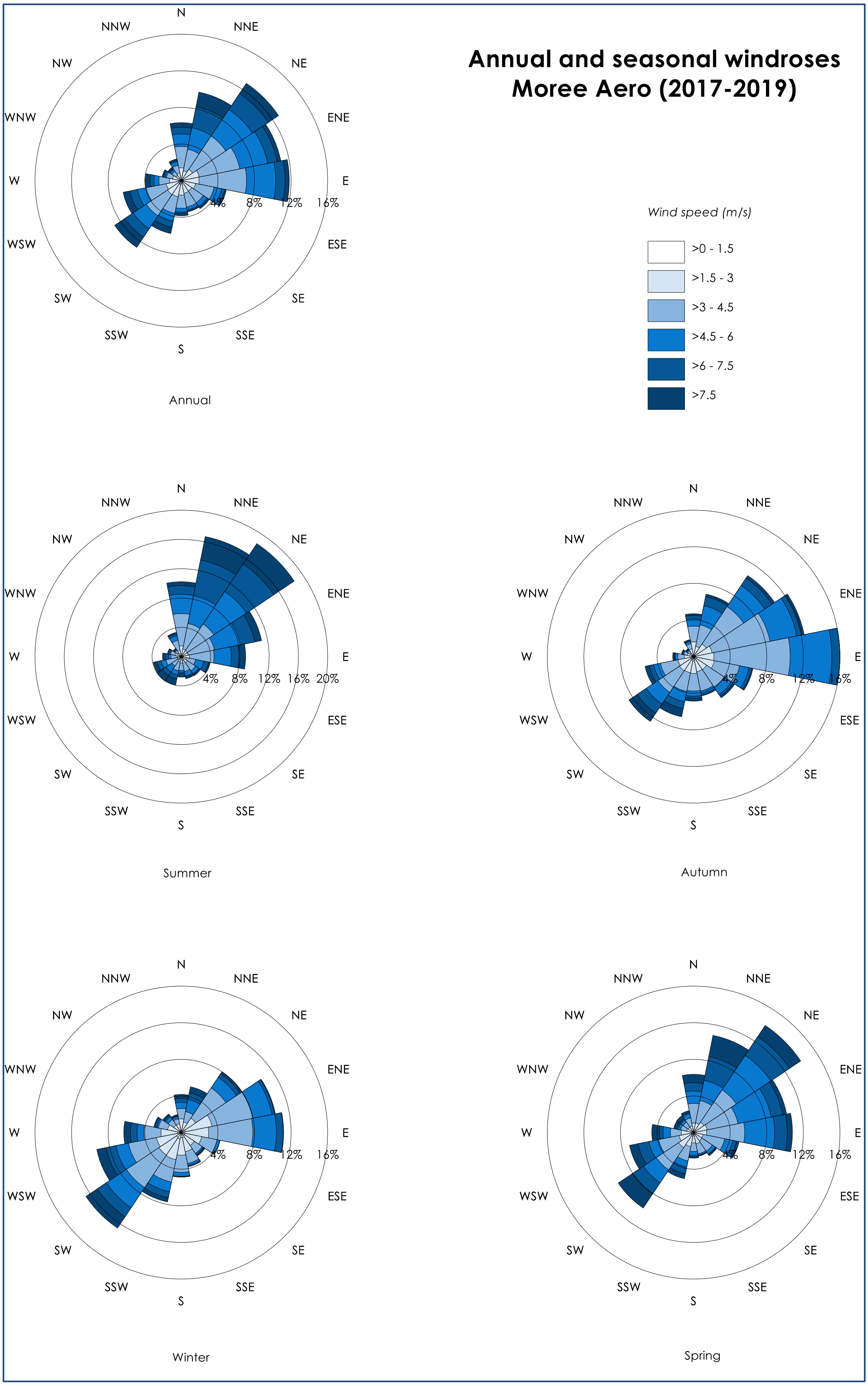

Figure 3-3: Annual and seasonal windroses showing meteorological conditions for Moree Aero, 2017 to 2019.

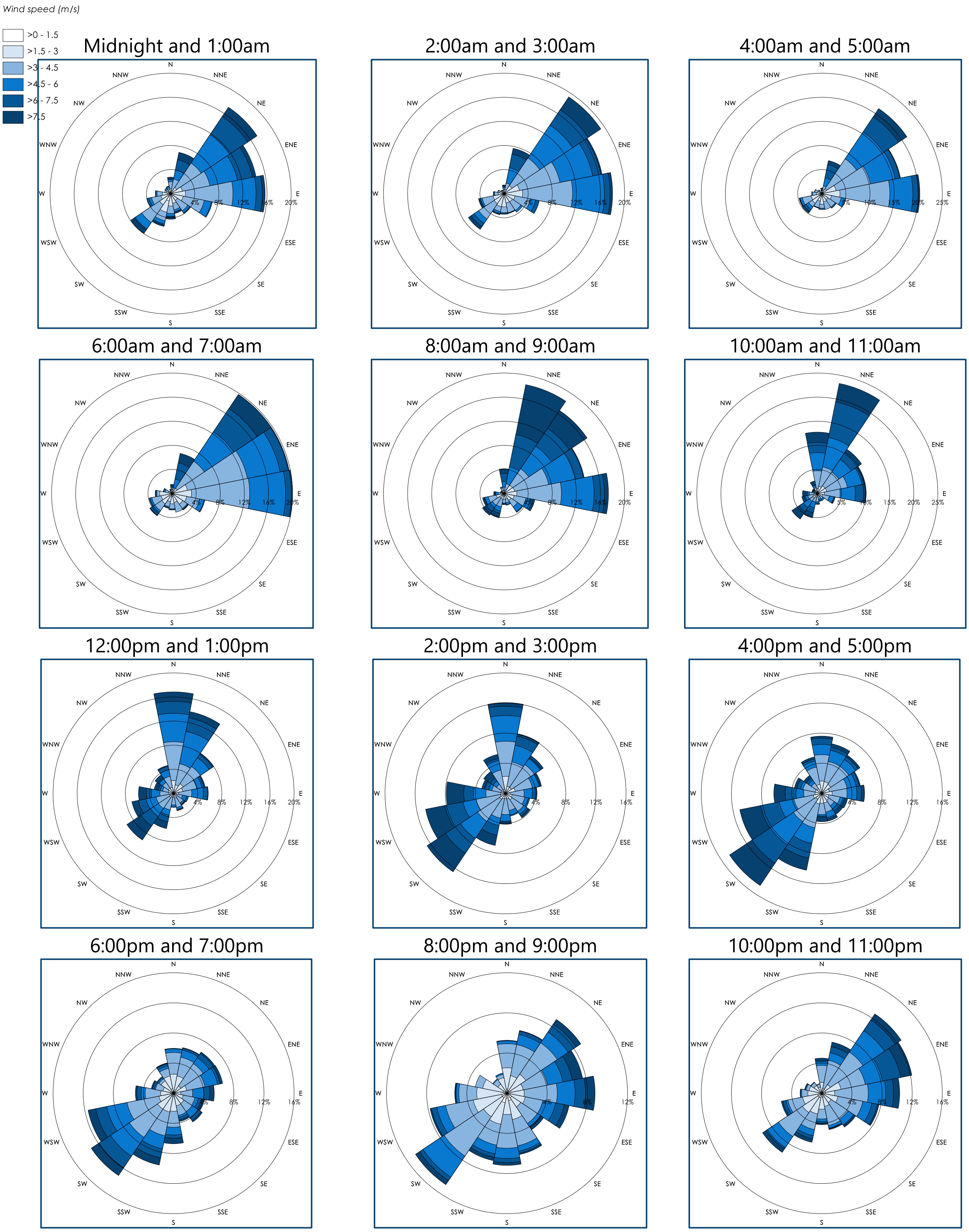

Figure 3-4: Diurnal annual windroses showing the meteorological conditions for Moree Aero, 2017 to 2019.

3.1.4 Existing industries

The operations identified within the SAP investigation area are detailed in **Table 3-2** and shown **Figure 3-5.** In summary, the SAP investigation area contains a mix of industries such as waste management and storage, grain handling, agricultural, concrete, fuel and scrap metal operations.

For this analysis, the existing impacts of these industries on surrounding residential receptors is considered. An area larger than the SAP investigation area is considered, as there would be existing and potential future residential receptors outside of the investigation area that warrant consideration.

Figure 3-6 below presents the location of existing residential areas and residential dwellings within close proximity to the SAP, identified by satellite imagery.

The key pollutants with most scope to exceed criteria are also shown, and the industries estimated to have potential to cause unacceptable amenity or health impacts outside of the SAP boundary are highlighted in light blue shading.

Table 3-2: Detailed identification of operations within the SAP investigation area

Company	Industry	Likely key pollutant	Potential impact	Map id number
Moree Waste Management Facility	Waste Management	Odour	Y	1
Moree Regional Airport	Transport	Noise, Odour, VOC	Y	2
Incitec Pivot Fertiliser	Chemical storage	Odour	Y	3
Moree Water Ski Lakes	Water park	Noise	Y	4
Moree Livestock Selling Centre	Livestock intensive activities	Odour	Y	5
Frome Street Investments No 11 Pty Ltd	Waste storage	Odour	Y	6
Australian Oilseeds Processors Pty Ltd	Agricultural products	Odour	Y	7
LDC Australia Cotton	Agricultural products	Dust	Y	8
GrainCorp	Agricultural products	Dust	Y	9
Gwydir Asphalt	Asphalt	Dust	Y	10
Johnstone Concrete and Quarries	Concrete works	Dust	N	11
Lawson Grain - Kealandi	Agricultural products	Dust	N	12
Austgrains	Agricultural products	Dust	N	13
Broadbent Grain Moree	Agricultural products	Dust	N	14
McDonald Ready Mix Concrete & Earthmoving	Concrete works	Dust	N	15
Moree Solar Farm	Power distribution	-	N	16
Caltex Depot	Fuel	VOCs	N	17
T and FS Woods Pty Ltd	Trucking company	-	N	18
Nufarm Australian Ltd	Agricultural products	-	N	19
Major Metals Pty	Steel distributor	Welding fume	N	20
Muggleton Cranes	Crane Hire Company	-	N	21
RBI Recycling Pty Ltd	Scrap metal dealer	-	N	22
Toptyres	Wheel store	-	N	23
Berger Ice Supplies	Ice supplier	-	N	24
Mayco Foods	Distribution service	-	N	25

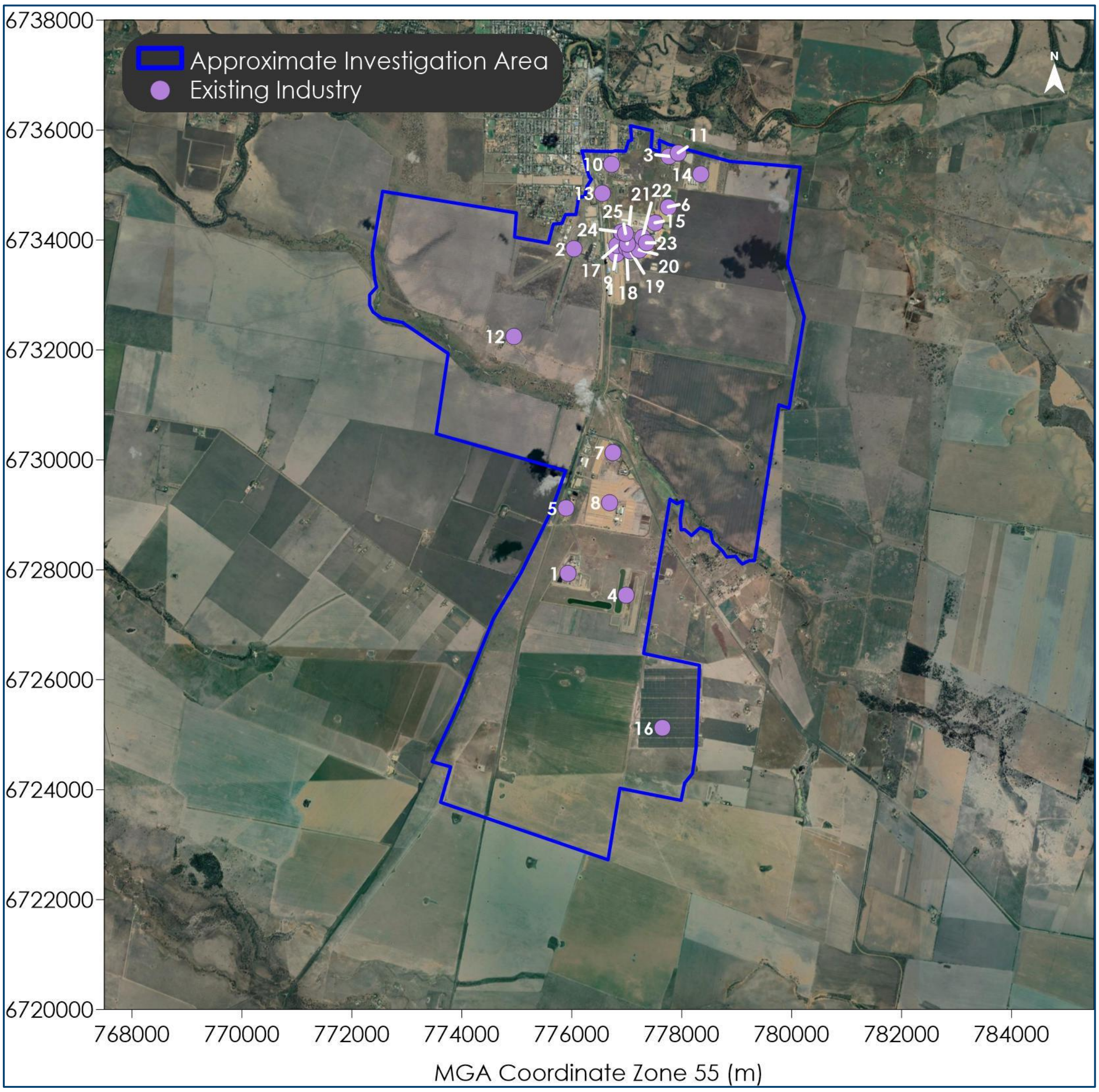

Figure 3-5: Figure showing identification of existing industries within the SAP investigation area

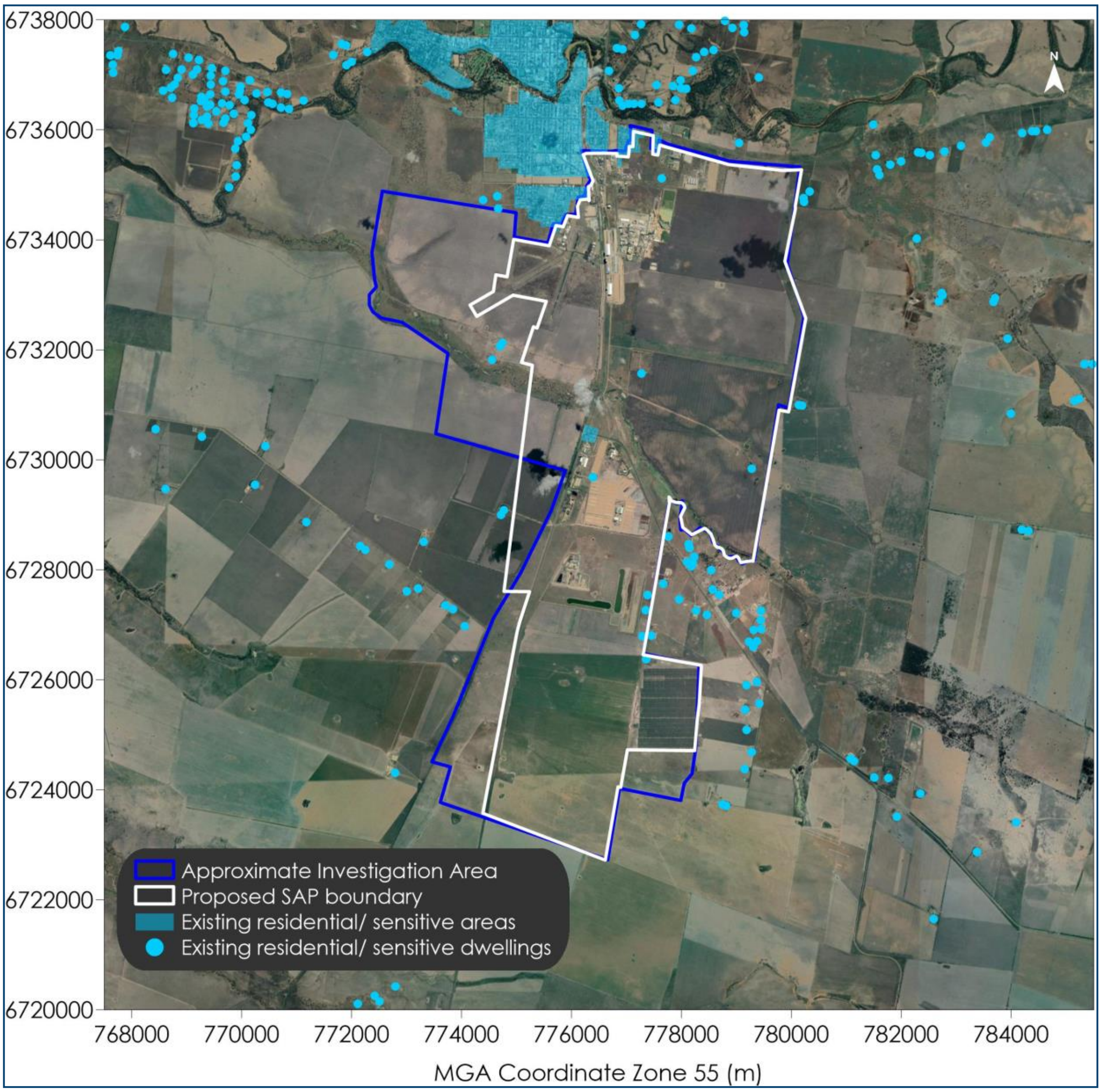

Figure 3-6: Location of existing residential areas and residential dwellings within close proximity to the SAP as identified by satellite imagery

3.1.4.1 Existing industries - noise limits

A number of industries within the SAP investigation area have been issued Environmental Protection Licences (EPL) which include noise limits. The EPLs and relevant noise limits for industries identified within the SAP investigation area are presented in **Table 3-3**.

It is understood that the Australian Oilseeds Processors PTY LTD is not currently operational. However, the noise limits included in their license have been included in **Table 3-3**.

Table 3-3: Environmental Protection Licences and relevant noise limits for existing industries identified within the SAP investigation area

Facility	EPL No.	Noise Limits (dBA)			
Moree Water Ski Lakes	20633	NL			
Incitec Pivot Fertiliser	11793	NL			
Moree Livestock Selling Centre	11486	NL			
LDC Australia Cotton	4133	NL			
		Day	**Evening**	**Night**	
		L_{Aeq} (15 min)	L_{Aeq} (15 min)	L_{Aeq} (15 min)	L_{A1} (1 min)
Moree Waste Management Facility	12788	**35**	**35**	**35**	**45**
		Day 7am-6pm Mon-Sat 8am-6pm Sun & Pub. Hol.	**Evening 6pm-10pm**	**Night 10pm-7am Mon-Sat 10pm-8am Sun & Pub. Hol.**	
		L_{Aeq} (15 min)	L_{Aeq} (15 min)	L_{Aeq} (15 min)	L_{A1} (1 min)
Frome Street Investments No 11 Pty Ltd	21015	**35**	**35**	**35**	**45**
		Day 7am-6pm Mon-Sat 9am-6pm Sun & Pub. Hol.	**Evening 6pm-10pm**	**Night 10pm-7am Mon-Sat 10pm-9am Sun & Pub. Hol.**	
		L_A 90	L_A 90	L_A 90	
Johnstone Concrete and Quarries	EPPR00372213 *	**50**	**45**	**40**	
		55	**50**	**45**	
		Day 7am-6pm Mon-Sat	**Evening 6pm-10pm Mon-Fri**	**All Other Times**	
		L_{A10} (15 min)	L_{A10} (15 min)	L_{A10} (15 min)	
Australian Oilseeds Processors PTY LTD	4884	45	35	35	

*Queensland Department of Environment and Science Environmental authority
NL – (Not listed) No noise requirements listed for the facility

The limiting NPI criteria for an individual operation would be 35 dB(A) L_{Aeq} (15-min) at night time, coupled with a L_{A1} (1 min) sleep disturbance criterion.

When considering the fully developed SAP, we need to consider the effect of all existing and potential future industries operating at night (the limiting case), thus the limiting criteria will be the amenity criteria of 45 dB(A) L_A90 at night time which is applicable to the total cumulative noise level.

3.1.5 Ambient air quality

The main sources of air pollutants in the residential areas surrounding the SAP investigation area include emissions from local anthropogenic activities (such as motor vehicle exhaust and domestic wood heaters), industrial activities and agricultural activities.

Only Deposited Dust monitoring within the SAP investigation area is available, as measured by LDC Australian Cotton. Other ambient air quality monitoring data available from the nearest air quality monitors operated by the NSW Department of Planning Industry and Environment (DPIE) and Rural

NSW DPIE DustWatch air quality monitoring network have been used to quantify the existing background levels within the SAP investigation area.

The nearest Rural NSW DPIE DustWatch monitor at Moree and NSW DPIE air quality monitor at Narrabri are approximately 0.5km and 82.1km, respectively, from the SAP investigation area. Note that the Moree monitor was commissioned for PM_{10} and $PM_{2.5}$ in November 2019 and the Narrabri monitor was commissioned in December 2017.

It is noted that the Rural NSW DPIE DustWatch air quality monitoring network uses low cost indicative particulate monitors that are non-compliance monitors (these monitors do not strictly conform with the National Environment Protection Measure (Air Quality) (NEPM) monitoring protocols). As such, data obtained from the Moree monitor are for indicative use only.

3.1.5.1 PM_{10} monitoring

PM_{10} refers to particulate matter (or dust) with an aerodynamic diameter of 10 microns or less. This is approximately 1/5th the thickness of a human hair. PM_{10} is harmful to health, although the fine subfraction ($PM_{2.5}$ and smaller) of the PM_{10} matter is believed to cause the most harm. Dust that is of mineral origin (i.e. dust originating from the soil) generally only has a small subfraction of the finer particulate matter (typically less than 5%), whereas particulate matter from combustion, such as open fires, and diesel soot is almost all comprised of the fine sub fraction (typically 95% to 99%).

The available PM_{10} monitoring data from the nearest air quality monitors operated by the NSW DPIE have been reviewed and are summarised in **Table 3-4**. Recorded 24-hour average PM_{10} concentrations are presented graphically in **Figure 3-7**.

A review of **Table 3-4** indicates that the annual average PM_{10} concentrations at Narrabri were below the criterion of 25µg/m^3. The data indicate a seasonal trend with higher levels occurring in the warmer months when the air contains more pollens and dust from the land, and that lower levels occur in the winter. This is typical of most of NSW (metropolitan and regional areas), but in general we tend to see less fluctuation between the seasons for areas further north.

The maximum 24-hour average PM_{10} concentrations recorded at the monitoring stations exceed the relevant criterion of 50µg/m^3 many times during the review period. It is noted that most parts of NSW experienced the effects of smoke pollution from regional bushfires in late 2019 and early 2020, along with dust storms. The bushfires and dust storms appear to be the cause of the relatively large number of elevated dust days (and this appears to be related to the rainfall/ drought conditions which affect a wide area). Hence the elevated dust days would not be related to any activity in the SAP investigation area and were not examined in detail as part of this study.

We note that harvesting can occur at any time of the year, however the peaks in ambient air quality do not appear to relate to harvest activity.

Table 3-4: Summary of reviewed PM_{10} monitoring data levels from nearest NSW DPIE operated monitors (µg/m³)

Year	Annual average			Year	Maximum 24-hour average			Year	No. days above standard	
	Moree[a]	Narrabri[b]	Criterion		Moree[a]	Narrabri[b]	Criterion		Moree[a]	Narrabri[b]
2017	-	-	25	2017[a]	-	18.7	50	2017[a]	-	0
2018	-	14.3	25	2018	-	**221.7**	50	2018	-	10
2019	-	23.2	25	2019	**250.4**	**232.6**	50	2019	23	31
2020c	-	-	25	2020[b]	**140.3**	**119.6**	50	2020[b]	4	7

[a] Data available from 4 November 2019. [b] Data available from 8 December 2017. [c] Includes data until 16 July 2020.

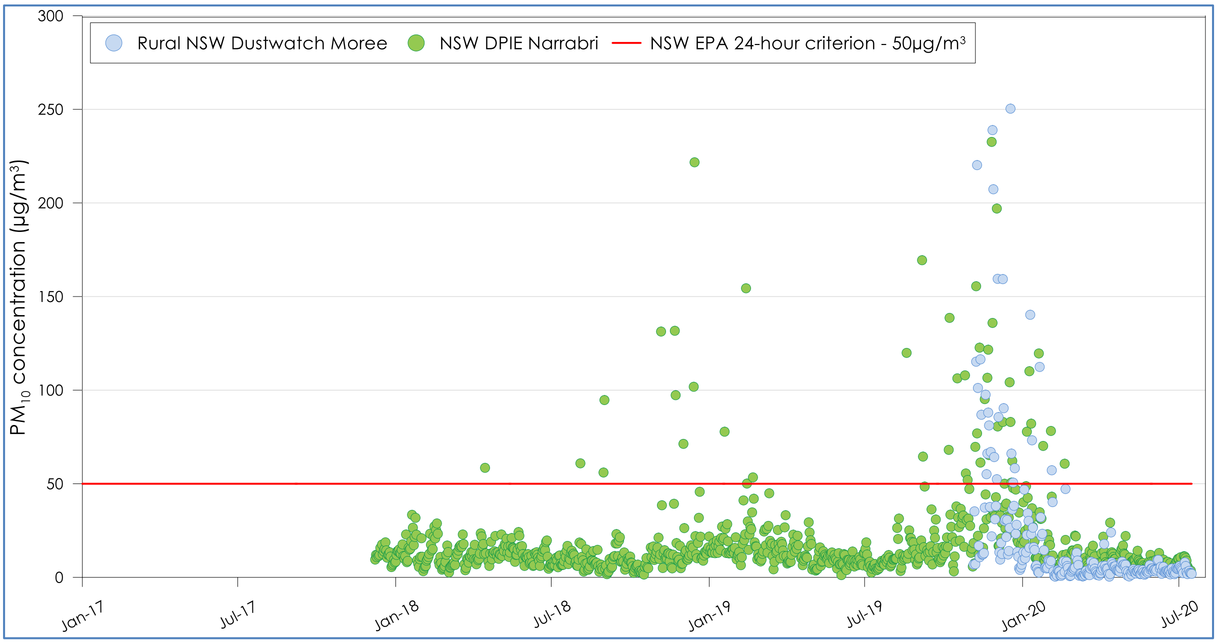

Figure 3-7: Graph presenting recorded 24-hour average PM_{10} concentrations

3.1.5.2 $PM_{2.5}$ monitoring

$PM_{2.5}$ refers to particulate matter (or dust) with an aerodynamic diameter of 2.5 microns or less. This is approximately 1/20th the thickness of a human hair. Any exposure to $PM_{2.5}$ is considered harmful to health. $PM_{2.5}$ can be inhaled deep into the lungs and can enter the blood stream via the lungs, causing a range of health impacts. $PM_{2.5}$ is most closely associated with combustion sources such as fires and diesel engine exhaust, for which the large majority of the particulate emissions may be in the $PM_{2.5}$ size range or smaller. $PM_{2.5}$ generally comprises a small fraction of dust from soil, typically 5%.

A summary of the available $PM_{2.5}$ monitoring data from the NSW DPIE monitoring stations is presented in **Table 3-5**. Recorded 24-hour average $PM_{2.5}$ concentrations are presented graphically in **Figure 3-8**.

A review of **Table 3-5** indicates that the annual average $PM_{2.5}$ concentrations at Narrabri were below the relevant criterion of 8µg/m³ for all years of the review period.

The maximum 24-hour average $PM_{2.5}$ concentrations recorded at the monitoring stations were found to exceed the relevant criterion of 25µg/m³ at times during the review period.

We note that harvesting can occur at any time of the year, however the peaks in ambient air quality do not appear to relate to harvest activity.

Table 3-5: Summary of available $PM_{2.5}$ monitoring data levels from NSW DPIE monitoring stations (µg/m³)

Year	Annual average			Year	Maximum 24-hour average			Year	No. days above standard	
	Moree[a]	Narrabri[b]	Criterion		Moree[a]	Narrabri[b]	Criterion		Moree[a]	Narrabri[b]
2017	-	5.4	8	2017[a]	-	8.5	25	2017[a]	-	0
2018	-	4.9	8	2018	-	**26.3**	25	2018	-	1
2019	-	7.8	8	2019	**231.1**	**87.7**	25	2019	13	20
2020[b]	-	5.5	8	2020[b]	24.6	42.4	25	2020[b]	0	1

[a]Data available from 4 November 2019.

[b]Data available from 8 December 2017.

[c]Includes data until 16 July 2020.

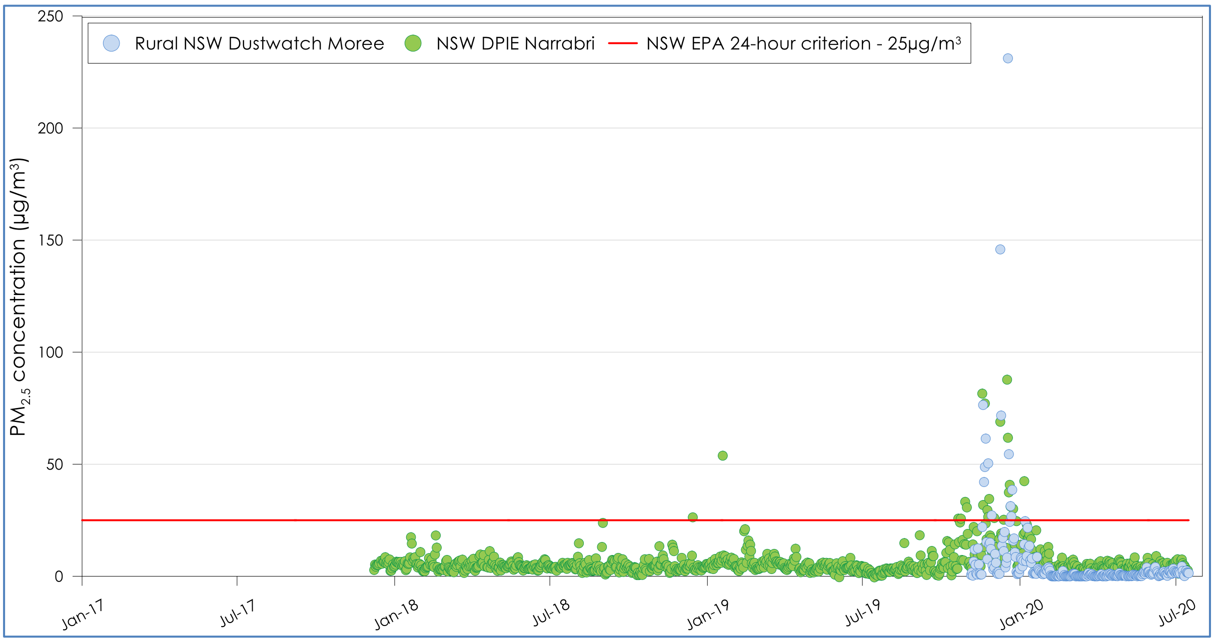

Figure 3-8: Graph showing 24-hour average $PM_{2.5}$ concentrations

3.1.5.3 Total particulates

A summary of the available 24-hour average Total Particulate monitoring data from the Rural NSW DPIE DustWatch monitoring station at Moree are presented graphically in **Figure 3-9**.

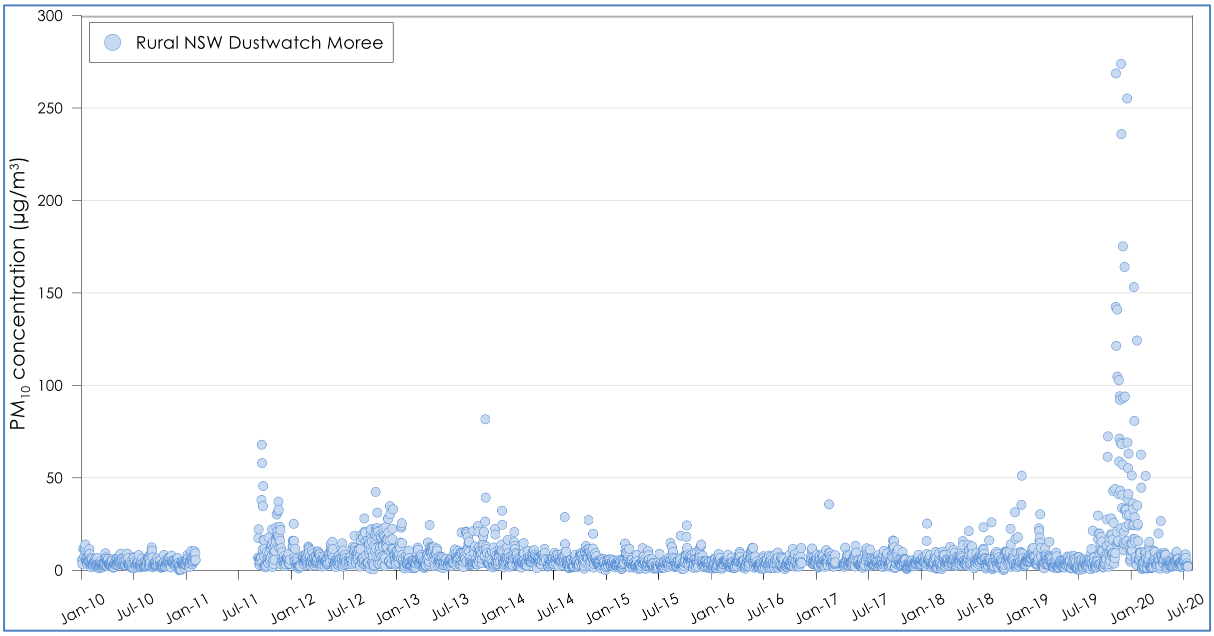

Figure 3-9: Graph showing summary of available 24-hour average Total Particulate concentrations from Rural NSW DPIE DustWatch monitoring station at Moree

3.1.5.4 LDC Australian Cotton Deposited Dust monitoring

A summary of the available deposited dust monitoring data from the LDC Australian Cotton is presented in **Table 3-6**. Recorded monthly deposited dust concentrations are presented graphically in **Figure 3-10**.

The LDC annual reports note that elevated dust samples showed evidence of tampering with excessive dirt. These were removed from the annual average result to provide a more realistic measurement and representation of dust samples.

Table 3-6: Summary of deposited dust monitoring data levels from LDC Australian Cotton (g/m²/month)

Year	Annual average			
	DDG1	DDG2	DDG3	Criterion
2012	3.1	3.2	3.2	4
2013	1.6	1.5	2.7	4
2014	1.7	3.1	1.7	4
2015	1.2	1.2	2.7	4

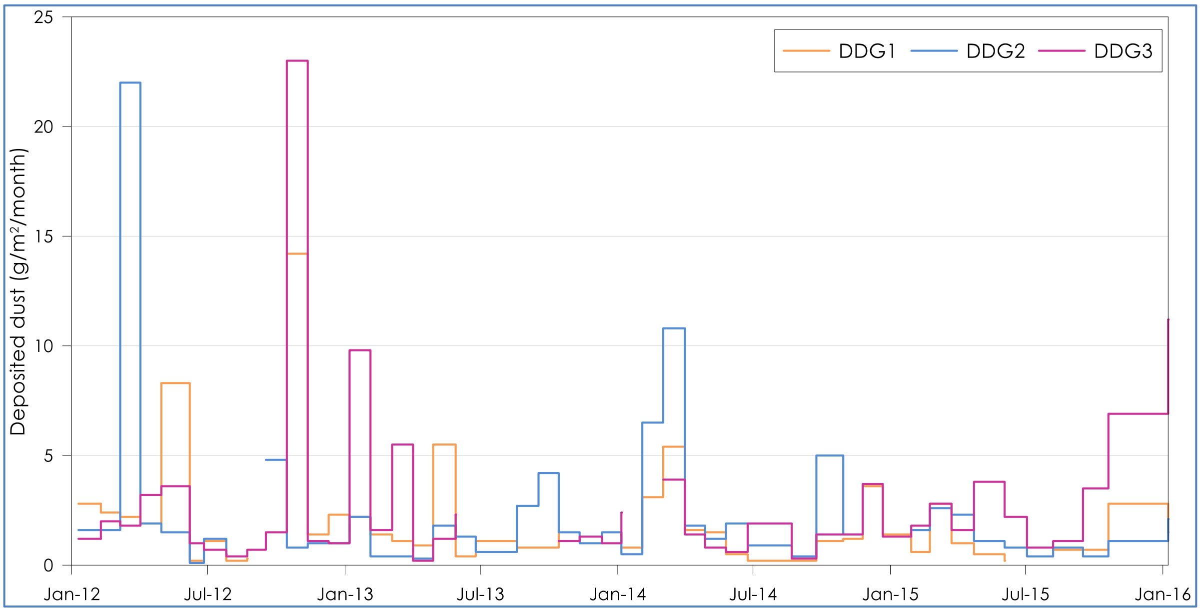

Figure 3-10: Graph showing recorded monthly deposited dust concentrations

3.1.6 Existing noise levels

Noise monitoring has previously been conducted in the vicinity of the SAP investigation area to quantify the existing noise environment. A review of the existing technical documentation listed below indicates that unattended noise monitoring has been conducted for a number of operations, including the following facilities/ developments:

- Moree Solar Farm (**Atkins, 2010**);
- Inland Rail Programme, Narrabri to North Star Project (**GHD, 2017**);
- Moree Town Centre Bypass, Gwydir Highway connection (**RTA, 2009**); and,
- Newell Highway Heavy Duty Pavements, North Moree (**RMS, 2018**).
- Louis Dreyfus Commodities (LDC) (**SMK Consultants, 2017**)

Note that LDC noise monitoring has been reviewed over the 2010 to 2017 period and the 2016 year was found to suitably represent the background noise levels of the ambient environment.

The results of the monitoring are summarised in **Table 3-7**. The locations selected for the unattended noise measurements are presented in **Figure 3-11**.

Table 3-7: Summary of unattended noise measurement results (dBA) from monitoring conducted for a number of operations in the vicinity of the SAP investigation area

Location	Background Level L_{A90}			Equivalent Continuous Level L_{Aeq}			Date	Source
	Day	Evening	Night	Day	Evening	Night		
Atkins 1	29.3	32.4	29	53.9	52.3	55	November, 2010	**Atkins Acoustics, 2010**
Atkins 2	37.1	42.9	36.6	60.9	56.3	54.6	November, 2010	**Atkins Acoustics, 2010**
GHD 1	41	34	29	48	47	42	March, 2016	**GHD, 2017**
GHD 2	36	38	28	53	52	47	March, 2016	**GHD, 2017**
GHD 3	35	36	37	54	50	47	March, 2016	**GHD, 2017**
GHD 4	42	37	29	54	52	48	March, 2016	**GHD, 2017**
GHD 5	43	38	35	65	64	60	March, 2016	**GHD, 2017**
GHD 6	38	38	39	54	57	53	March, 2016	**GHD, 2017**
RTA 1	48	39	31	65	62	56	June-July 2008	**RTA, 2009**
RMS 1	39	40.4	37.4	56.7	59	54.7	Nov-Dec 2017	**RMS, 2018**
LDC 1	33	34	28	50	56	52	2016	**SMK Consultants, 2017**

Many of the recorded night time background levels are close to or below 30 dB(A), as might be expected in a quiet rural area. There are also a number of readings above 35dB(A), which appear to be linked to noise from nearby roads and industry.

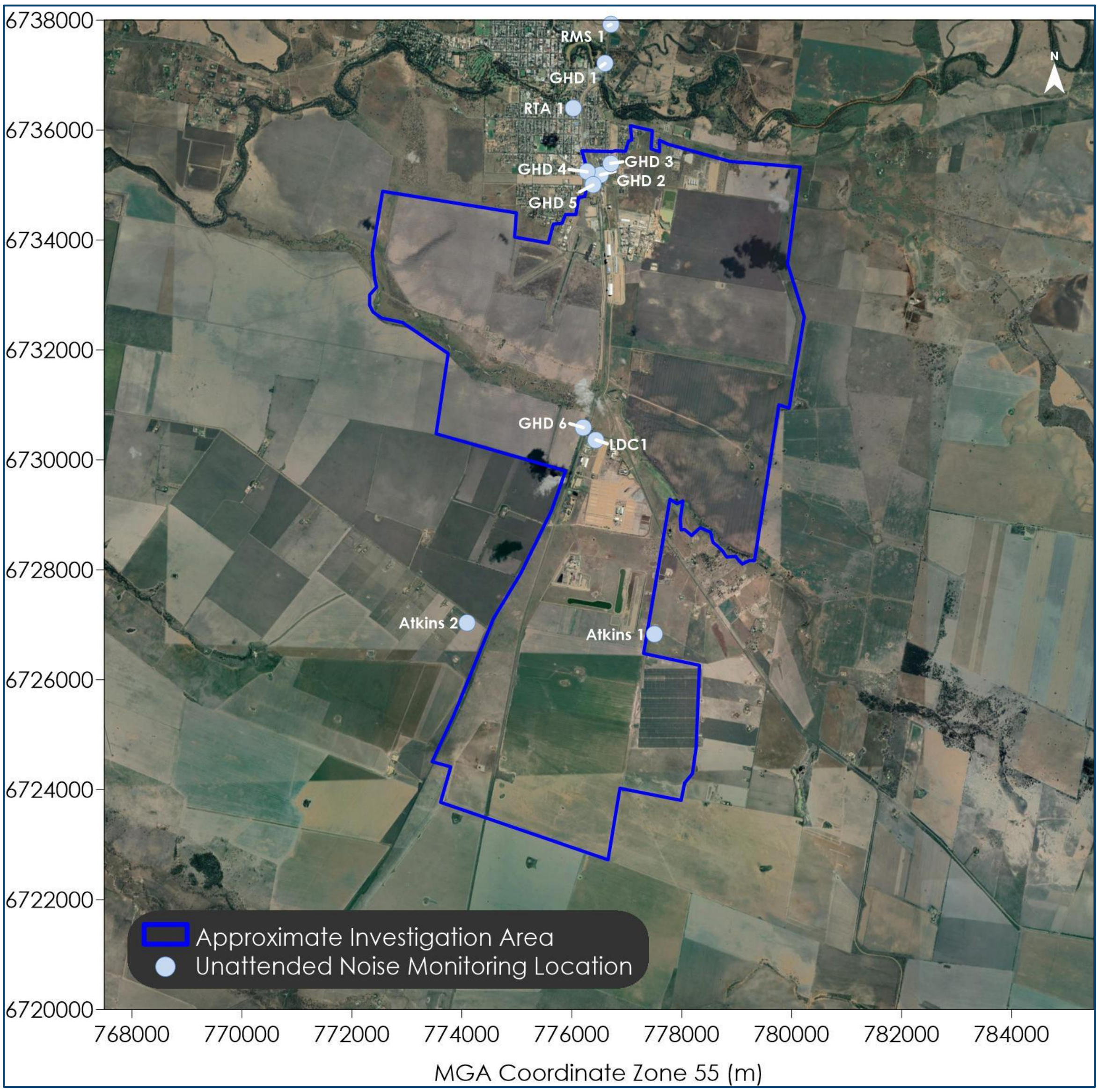

Figure 3-11: Figure showing locations selected for the unattended noise measurements

3.2 Key findings of existing environment

3.2.1 Air quality and odour

In general, the baseline analysis found that there are elevated particulate levels in the SAP investigation area, with short term particulate levels exceeding the EPA criteria relatively often. Short term PM_{10} and $PM_{2.5}$ levels in the area are most likely to be associated with dust from the land, or in effect the state of ground cover in the region (which is affected by rain and drought conditions and agricultural activities). We are informed that dust appears to be relatively higher during peak harvesting and grain handling periods. We note that harvesting occurs all year round.

Sources of short-term (24-hour average) dust levels originating from the SAP investigation area would include grain handling, and other industries as shown in **Table 3-2**, and associated plant and heavy vehicles operating on exposed dirt surfaces in the SAP investigation area.

Site inspections of the industrial facilities in the SAP investigation area were undertaken on 22 and 23 July 2020. The investigations do not indicate any major sources of continuous PM_{10} and $PM_{2.5}$ likely to make a large impact on the annual average particulate levels experienced by the population.

The annual average background dust levels appear to be below the NSW EPA criteria for particulates in these locations (only by a small margin) despite the recent fires and dust storms which elevated levels significantly. Overall, annual average background dust levels flux, but are generally stable. Maximum 24-hour averages have shown an increasing trend over the last few years which have occurred as a result of increasing bushfires and dust storms.

It is generally expected that land uses should meet EPA criteria, and hence the design of the SAP should be such as to enable these criteria to be met. However, regional fires and dust events, land clearing and climate change will govern any degree of compliance, and in the future are almost certain to result in exceedances, as occurs across most of NSW. Due to this, it is advisable to pre-define how exceedances of this nature are dealt with in this locality. Land uses in the SAP would be required to demonstrate they can meet the cumulative air quality criteria unless in the event of extraordinary event conditions (such as bushfires and dust storms).

It is noted that there may be higher tolerance from the community to potential impacts due to the prominent agricultural industry in the region. As a guide, for individual industrial projects in NSW, the approach taken in similar circumstances is that the proposed land use is required to meet best practice levels of emissions and to not lead to an unacceptable increase in pollution levels that may affect health. The same approach is applied to developments such as major state infrastructure projects, which in similar circumstances adopt health-based criteria based on acceptable incremental increases in particulate levels above the background level (which may or may not exceed criteria). The approach for this assessment would be to consider that the industry within the SAP area would operate as required by EPA should it be approved.

The SAP process allows a standardised approach to be developed to minimise possible excessive additional dust impacts arising. However, as outlined above, there is a relatively low risk of any major levels of particle emissions to arise from either the existing development or future development of the SAP. Elevated dust events will be more likely to be driven by external sources of dust, such as dust storms and bushfires.

Furthermore, as there is currently no significant industrial activity, such as power generation, metal production, petroleum and fuel production, etc, there is also no reason to consider that other pollutants such as nitrogen dioxide (NO_2) or sulfur dioxide (SO_2) would be elevated in this region.

The only two foreseeable exceptions to this would be fertiliser manufacturing, and grain fumigation. Fertiliser manufacturing can have relatively high ammonia and NO_2 emissions, however the means to control these emissions are well established and are fitted on any modern new plant, limiting the extent of any impacts. Grain fumigation is currently practiced in the SAP investigation area, however with the correct ventilation procedures (or the use of the new generation of less toxic fumigants) is generally able to be controlled within a reasonable distance.

Hence other than particles, air pollutant levels in the Moree region can reasonably be expected to be low and would not significantly constrain development of the SAP investigation area.

3.2.2 Noise

Overall, the existing noise levels show some limited areas close to existing industrial operations in the north of the SAP investigation area, or along roads, to be near (above and/or below) current noise criteria levels. The results are generally consistent with expected noise levels in proximity to an industrial area, when considering the local environment and proximity to any specific noise sources.

The modelling for the Narrabri to North Star Inland Rail Project identifies numerous affected dwellings in the Moree township and along the rail corridor in the SAP investigation area that may be impacted by noise from that project and would be eligible for consideration for noise mitigation.

3.3 Constraints and opportunities

3.3.1 Constraints

The baseline analysis showed only moderate existing constraints may arise due to air quality (dust) and potentially noise. Depending on the final design of the SAP, where for example, the proposed land uses are in close proximity to dwellings, noise may become a more significant factor, and will be considered throughout the design and planning process.

The baseline analysis found a likely medium risk level of impact between existing land uses and receptors in the northern-most and north-west parts of the SAP investigation area, and also a cluster of residences in the approximate centre of the SAP investigation area (Gwydirville). The impact, or land use conflict, arises due to the relatively close proximity of these existing receptors to existing land use activities.

For air operations safety at the Moree Regional Airport, there will be constraints on stacks and buildings within the Obstacle Limitation Surface (OLS) in relation to height controls and due to hot stack exhausts from plume rise (refer to the *Environmental Planning and Assessment Act 1979, Section 9.1, Direction 3.5)*. Generally, this issue would not overly constrain the potential to develop industry given the large amount of suitable unconstrained land which is available for stacks and hot stack exhaust away from the airport. The airport itself is relatively close to residential areas (approximately 0.6km) and airport operations may be restricted in the longer term due to noise at residential or sensitive industrial receptors (refer to the *Australian Standard 2021:2015, Acoustic – Aircraft Noise Intrusion – Building siting and construction)*.

Overall, the following was determined:

1. The most impacted residential receptors close to existing industrial operations will be affected by dust and noise. It is likely that there may be existing air quality or noise impacts or levels near to criteria at these locations.

2. To minimise or prevent potential future impacts arising at these receptor/sensitive receiver locations due to the delivery of the SAP a low impact regional enterprise area to the North of the SAP was incorporated into the preferred structure plan scenario.

3. Impacts from the existing volume sources, such as ponds, land surfaces and fugitive emissions from buildings predominantly relate to odour or grain fumigant emissions. Emissions from stacks include odour, but also toxic air pollutants.

    a. The volume sources tend to cause impacts near the source. More distant receptors may be affected by emissions from such sources due to late evening, night and early morning temperature inversions and katabatic drift, which may not be favourable in this locality.

    b. The potential impacts from stack sources would be limited, as there are no surrounding high points in the landscape which may be most susceptible to impact. In general, impacts from stacks are generally relatively smaller due to greater dispersion between source and receiver and can be adequately controlled by good stack design.

4. Sources of dust include harvesting and grain handling, wheel generated dust from dirt roads, and vehicles driving off road. This arises in the region generally and within the SAP. The handling of grain in the SAP would also generate dust at harvest time which can occur at any time of the year. Opportunities to reduce traffic generated dust exist by limiting vehicles to clearly defined roads and sealing heavily used dirt roads. Problems may also arise when dust and mud is tracked from dirt surfaces onto sealed roads, and a range of specific, detailed options may be available to ameliorate this, depending on the expected traffic numbers, vehicle types, speed and road design.

5. There are approximately 12 dwellings located at Gwydirville located in the middle of the SAP investigation area. The residences at Gwydirville limit the potential for major industrial development nearby.

3.3.2 Opportunities

The baseline analysis found the following strategies useful to manage potential land use conflicts and in this way to enable industries to operate without undue compliance burden while at the same time provide residents with adequate amenity and health protection. These strategies have been incorporated into the preferred structure plan scenario:

1. Co-locate high impact industrial land uses to minimise buffer requirements within the SAP.

2. A low impact regional enterprise area to the north of the preferred structure plan scenario between existing residences and any other sensitive receivers to the north and any major new industrial developments with a focus on volume sources of air emissions in the modelling.

3. There are approximately 12 dwellings located at Gwydirville located in the middle of the SAP investigation area that limit the potential for major industrial development nearby. As this is known at present it provides the opportunity to redesign the SAP to prevent this land use conflict arising. Various strategies need to be considered to prevent the likely land use conflict should the industrial land use be developed fully.

4 MODELLING METHODOLOGY

4.1.1 Introduction

The relationship between the permissible level of air pollution emissions from any source (e.g. Regulatory limit) and the permissible level at receptor (i.e. ground level or ambient air quality criteria set out in the NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (**NSW EPA, 2016**)) was analysed to determine the limiting pollutants that will govern the findings of the air quality assessment. The limiting pollutants are those with the smallest ratio between the level that could be emitted (at the source) and the level permitted in the ambient air (at the receiver). This is the limiting pollutant ratio, as set in the applicable criteria.

For noise, the difference between the sound energy released at the source and the applicable noise criteria at the receiver was determined. This is the noise residual. The sound energy is derived for a typical array or mix of noise sources in an industrial area, and the applicable night time criteria (assuming 24/7 operations) to govern the noise residual limit. For a 24/7 operation it is taken that the sound energy from the source is the same, and as the criteria are stricter at night-time, when the night-time criteria are met the evening and daytime criteria are also met.

Noise modelling was used to determine the noise attenuation between all potential sources and all receivers (the modelling is detailed later). Risks were assigned per the limiting criteria at the receiver, thus at any receiver where the noise attenuation approaches the noise residual, there is a high risk of exceeding the criteria and a high risk of noise impacts arising.

The air pollutant levels (for any air pollutant) at the source are related to the level at the receiver by the degree of air dispersion or dilution of the pollutant as it travels from the source to the receptor. In a similar way for noise, the sound energy at the source is related to the noise level at the receiver by the degree of noise attenuation between the source and receiver. Thus for air pollution we apply a ratio, division or multiplication calculation, and for noise we use subtraction or addition calculations, however the same big picture principles apply.

Air dispersion modelling was used to determine the dilution ratio between all potential sources and all receptors (the modelling method is detailed later). At any receptor where the air dilution ratio approaches the limiting pollutant ratio, there is a high risk of exceeding the criteria for the limiting pollutant i.e. a high risk of air quality impacts arising. Medium and low risks are also defined according to the range of source emissions that can be expected to arise from industrial sources, and/or for other pollutants.

The modelled outputs are thus presented as risk levels to allow the risks from several pollutants, which may be dispersed differently (see **Section 5**), but also noise to be compared on a like-for-like basis. The ability to make a valid comparison between all types of industries, air pollutants and noise pollutants is crucial for making good planning decisions.

The NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (**NSW EPA, 2016**) define a range of criteria for many air pollutants. However, the pollutants can be categorised in simple terms according to how they are released. In general:

- Stacks will release; air toxics (such as metals, dioxins etc.) after capture and treatment, and common criteria pollutants (such as SO_2, NO_2 and fine particles) from a combustion process or a material handling process.
- The key fugitive emissions are dust and odour. These emissions may arise from wind erosion of an exposed site (dust), a pond (sewage, or process water odours), the openings of a building (paint fumes, dust, welding fumes etc.), or a land surface (manure, compost etc.).

The type of industry land use and how the pollutant is released is the key in determining the degree of dispersion and dissipation which occurs between the source and the receiver.

In general, fugitive emissions result in the most impact nearest the source and at ground level nearby, with less and less impacts as one moves further away. The spatial extent of the impact is generally governed by low wind conditions and inversions. In general, the greatest impacts would tend to occur when fugitive emissions are confined to a valley.

Noise, and especially noise at night time, is most affected by inversions and gradient winds and is most similar to the fugitive sources. However, noise propagation is significantly affected by barriers, thus terrain is a significant factor. The landscape and built form can also play a role but is more complex to model. Similar to the fugitive sources, noise impacts can be confined within a valley (if the source is in the central part of the valley and the valley terrain is significant).

Unlike fugitive sources and noise, stacks are designed to disperse pollutant away from the ground. Emissions released from a stack will have their highest impacts on the surrounding elevated terrain, and often somewhat away from the source. Placing stacks at the bottom of a valley is generally counterproductive as taller, more costly stacks will be needed to prevent impacts. On the other hand, whilst stack sources would ideally be placed atop ridges and hills, the types of industries that have stacks are generally large, and visually such industries can be an imposing eyesore (in the view of many).

Recognising the above meant that the air dispersion modelling between source and receiver could be limited to stacks and fugitive sources. The limiting pollutant ratio for stack emissions was determined to be air toxics and dust, whilst the limiting pollutant ratio for fugitive emissions was odour.

The prevailing weather of the locality of the SAP is a key factor for air and noise modelling. The terrain conditions for Moree SAP Investigation Area are unlikely to be a major component in the model as it is a relatively flat terrain.

For both the air and noise model, the modelling was “reverse engineered” such that the same risk profile could be applied to the sources as well as the receivers/ receptors. This was done so that it is possible to tell which sources cause the impact at receptors. Only high risk sources can cause high risk impacts. Removing either the high risk source or high risk impacted receptor (or both) eliminates the risk of impacts arising.

Technical details of the modelling are set out in the next section.

4.2 Technical Detail of Air Dispersion and Noise Modelling Methodology

The following sections are included to provide the reader with an understanding of the model and modelling approach.

For this assessment the CALPUFF modelling suite is applied to dispersion modelling. The CALPUFF model is an advanced "puff" model that can deal with the effects of complex local terrain on the dispersion meteorology over the entire modelling domain in a three dimensional, hourly varying time step. CALPUFF is an air dispersion model approved by NSW EPA for use in air quality impact assessments. The model setup used is in general accordance with methods provided in the NSW EPA document *Generic Guidance and Optimum Model Setting for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (**TRC Environmental Corporation (TRC)**, **2011**).

4.2.1 Modelling methodology

Modelling was undertaken using a combination of The Air Pollution Model (TAPM) and the CALPUFF Modelling System. The CALPUFF Modelling System includes three main components: CALMET, CALPUFF and CALPOST and a large set of pre-processing programs designed to interface the model to standard, routinely available meteorological and geophysical datasets.

TAPM is a prognostic air model used to simulate the upper air data for CALMET input. The meteorological component of TAPM is an incompressible, non-hydrostatic, primitive equation model with a terrain-following vertical coordinate for 3D simulations. The model predicts the flows important to local scale air pollution, such as sea breezes and terrain induced flows, against a background of larger scale meteorology provided by synoptic analysis.

CALMET is a meteorological model that uses the geophysical information and observed/simulated surface and upper air data as inputs and develops wind and temperature fields on a 3D gridded modelling domain.

CALPUFF is a transport and dispersion model that advects "puffs" of material emitted from modelled sources, simulating dispersion processes along the way. It typically uses the 3D meteorological field generated by CALMET.

CALPOST is a post processor used to process the output of the CALPUFF model and produce tabulations that summarise the results of the simulation.

4.2.2 Meteorological modelling

TAPM was applied to the available data to generate a 3D upper air data file for use in CALMET. The centre of analysis for TAPM was 29deg32min south and 149deg51min east. The simulation involved an outer grid of 30km, with three nested grids of 10km, 3km and 1km with 35 vertical grid levels.

The CALMET domain was run on a 18 x 18km area with 0.18km grid resolution. The available meteorological data for the 2018 calendar year from the Bureau of Meteorology (BoM) Moree Aero (Station No. 053115) were included in this run.

Local land use and detailed topographical information was included in the simulation to produce realistic fine scale flow fields (such as terrain forced flows) in surrounding areas, as seen in **Figure 4-1**.

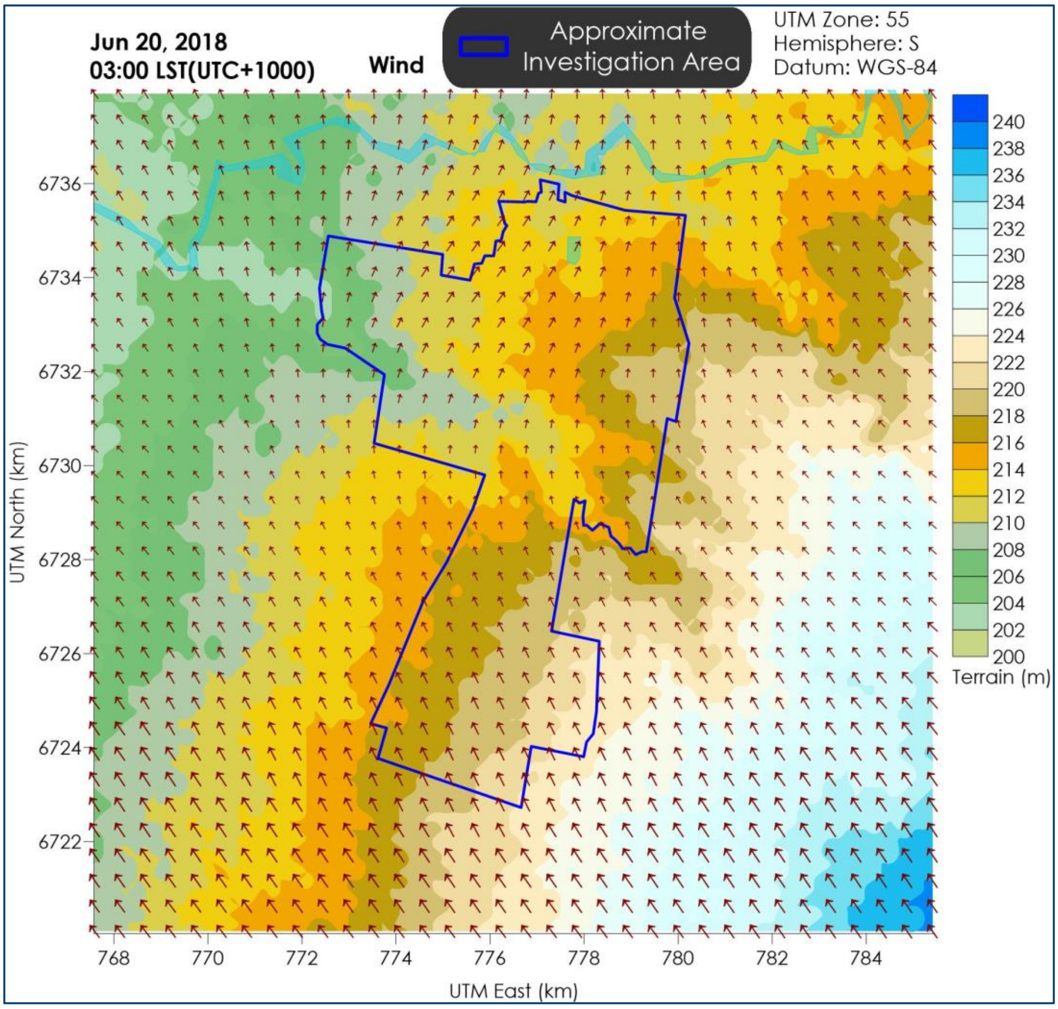

Figure 4-1: Figure showing representative snapshot of wind field for the SAP investigation area

CALMET generated meteorological data were extracted from a point within the CALMET domain and are graphically represented in **Figure 4-2** and **Figure 4-3**.

Figure 4-2 presents the annual and seasonal windroses from the CALMET data. On an annual basis winds are predominately from the northeast quadrant. The wind distributions during summer and spring are generally similar to the annual wind distribution. In autumn, winds predominantly range from the northeast to the southeast. In winter winds are predominantly from the east-northeast.

Overall, the windroses generated in the CALMET modelling reflect the expected wind distribution patterns of the area as determined based on the available measured data and the expected terrain effects on the prevailing winds. **Figure 4-3** includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period and show sensible trends considered to be representative of the area.

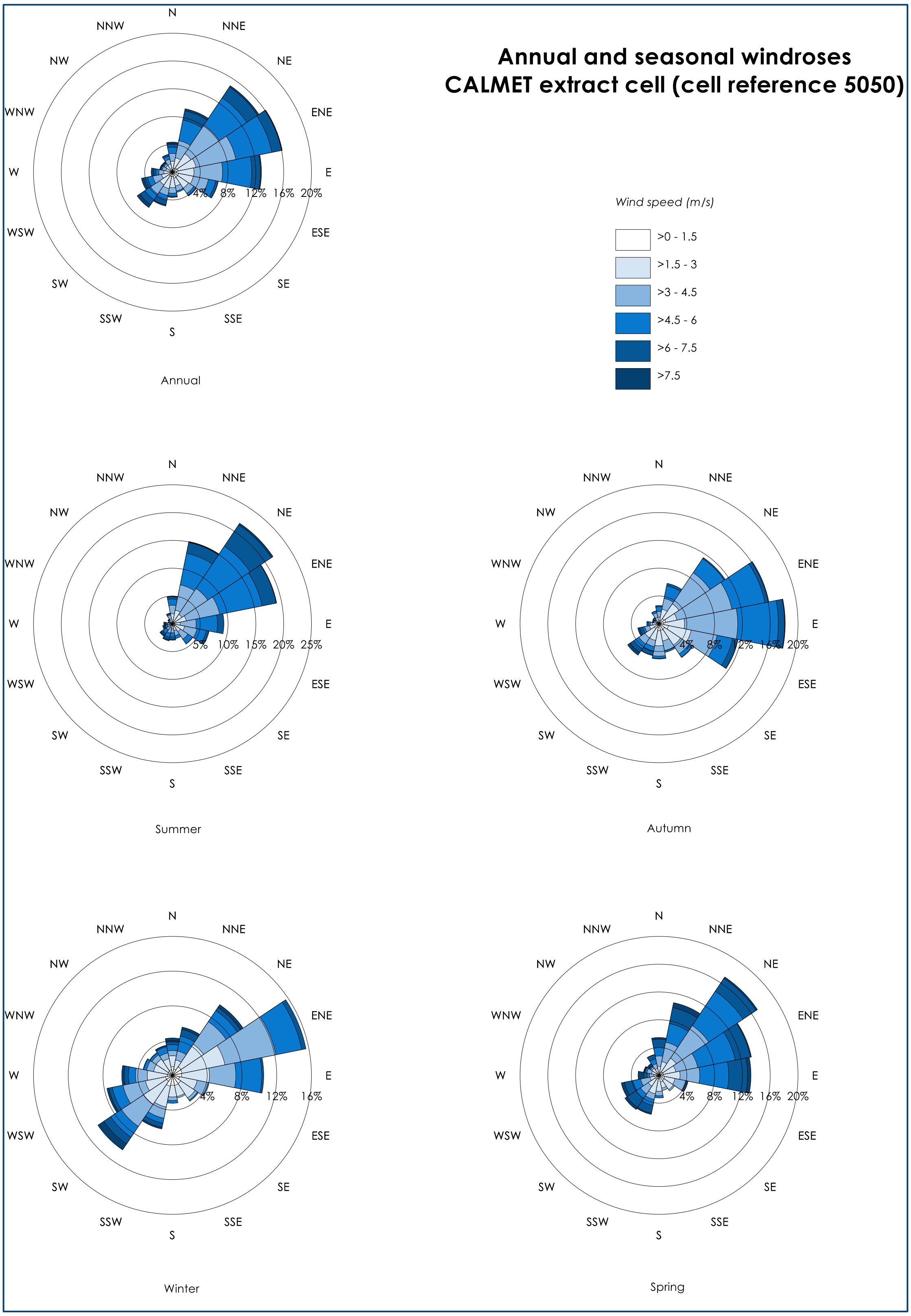

Figure 4-2: Annual and seasonal windroses generated by CALMET (cell ref 5050)

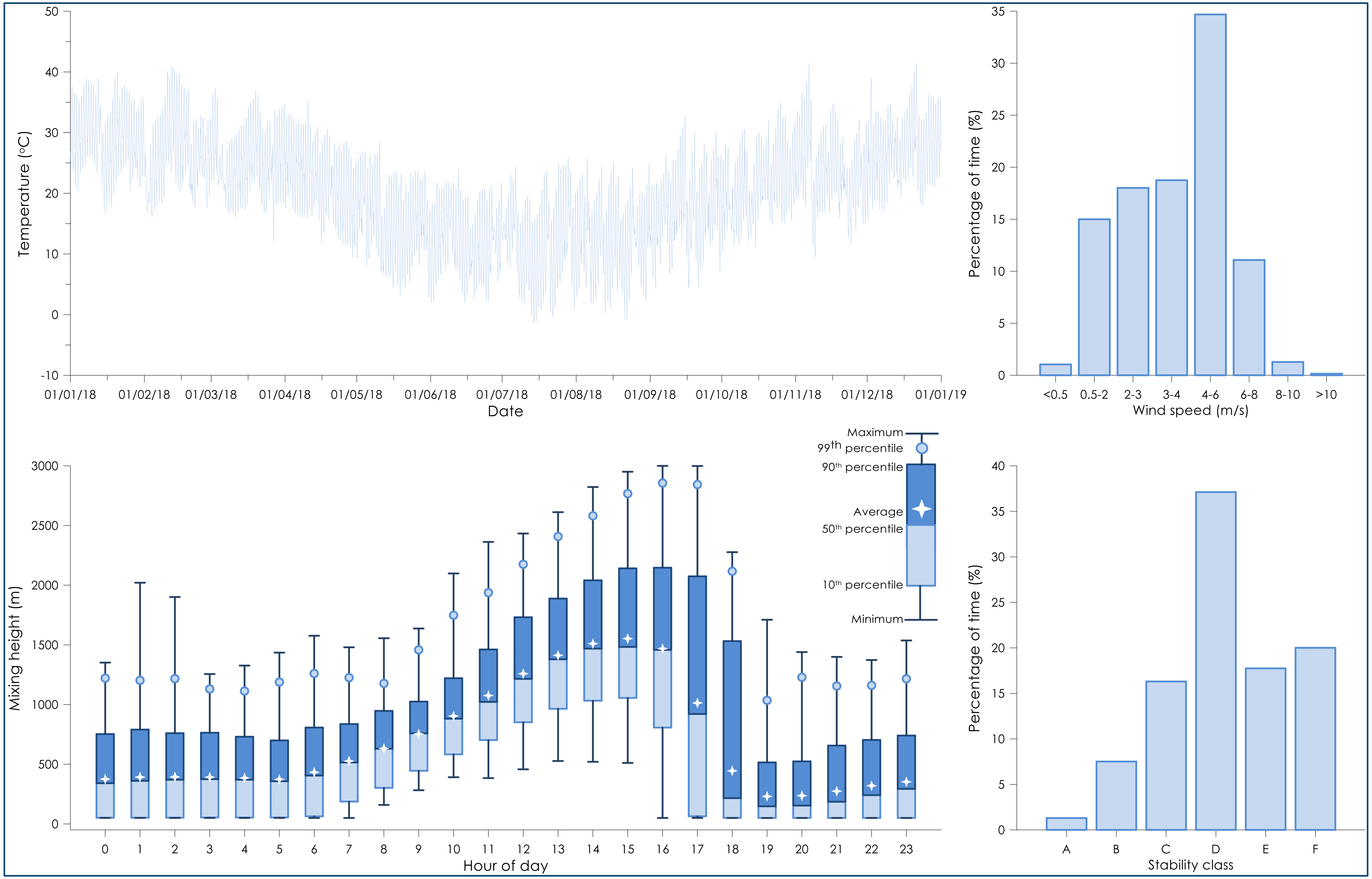

Figure 4-3: Graphs of temperature, wind speed, mixing height and stability classification - CALMET (cell ref 5050)

4.2.3 Dispersion modelling

The CALPUFF dispersion modelling is based on the emission of pollutants from sources within the meteorological modelling domain. The model was setup to include all existing and potential future source locations arranged in a grid within the Moree SAP. The locations of all the modelled air and odour source locations are presented in **Figure 4-4**.

Each source was modelled separately as a point (stack) source and as a fugitive (volume) source with emission release parameters that would represent relatively standard sources associated with industrial activities. The point sources were setup to represent emissions from a stack with generalised flow parameters (e.g. exit velocity, temperature) and an emission point which is elevated above the ground. The volume sources represent diffuse, fugitive ground based sources which commonly include dust and odour emitting sources.

These sources were modelled over the entire year and are assumed to emit air emissions continuously using a unit emission rate. The emissions were modelled for only the key pollutants with scope to exceed EPA criteria. The different rates of emission of various key pollutants were accounted for, allowing source or receptors impact risk to be shown on a like-for-like basis, irrespective of the pollutant emitted.

Dispersion modelling impacts from the stack and volume sources were determined at the modelled receptor locations, as presented in **Figure 4-5**. Modelled receptor locations have considered whether "sensitive receptors" could exist at the location in question or would be expected to be used for sensitive land use in the future, e.g. such as dwellings, schools and hospitals. Modelled receptor locations have included sensitive receptors at the potential hotel/ motel development within the Gateway Precinct within the SAP.

The modelled receptor locations have considered all existing and potential sensitive receptors outside of the proposed SAP boundary (see **Figure 3-6)** with the exception of receptor locations along part of the western proposed SAP boundary, south of the Moree Regional Airport. This study has assumed no future sensitive receptor locations would be considered beyond these locations due to potential constraints on already existing land uses south of the Moree Regional Airport along the western proposed SAP boundary,

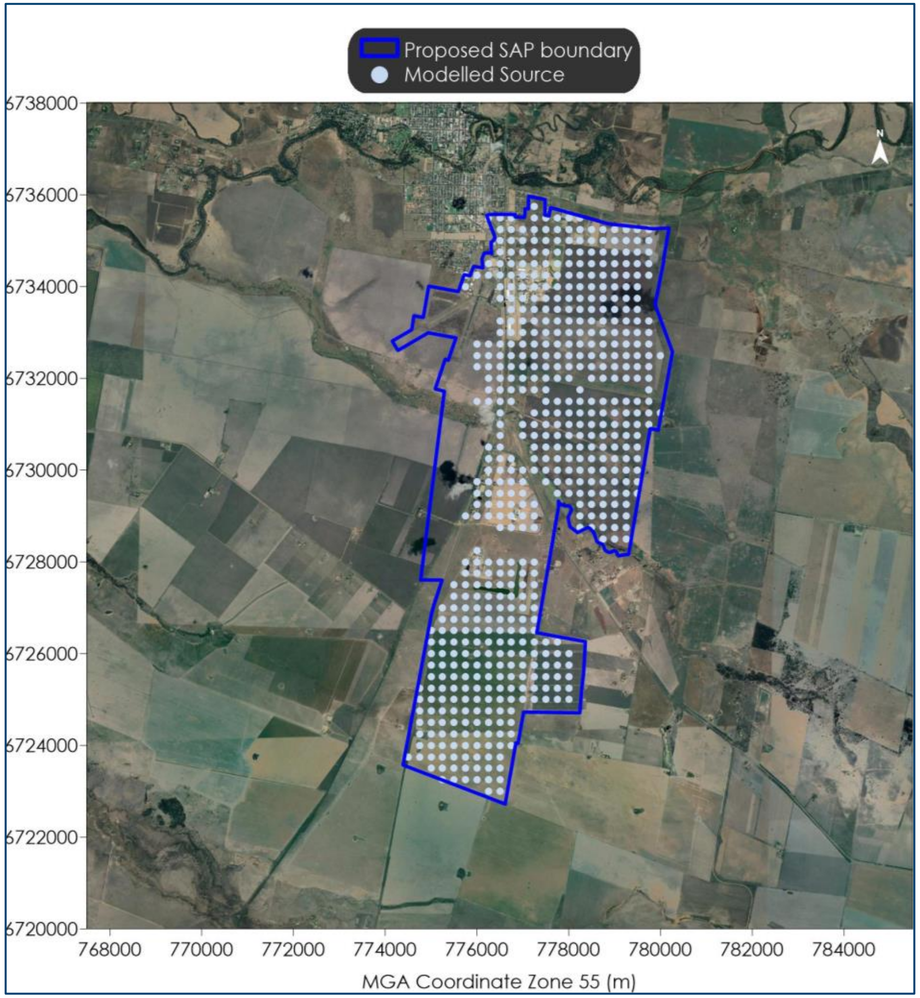

Figure 4-4: Figure showing locations of all the modelled air and odour source locations

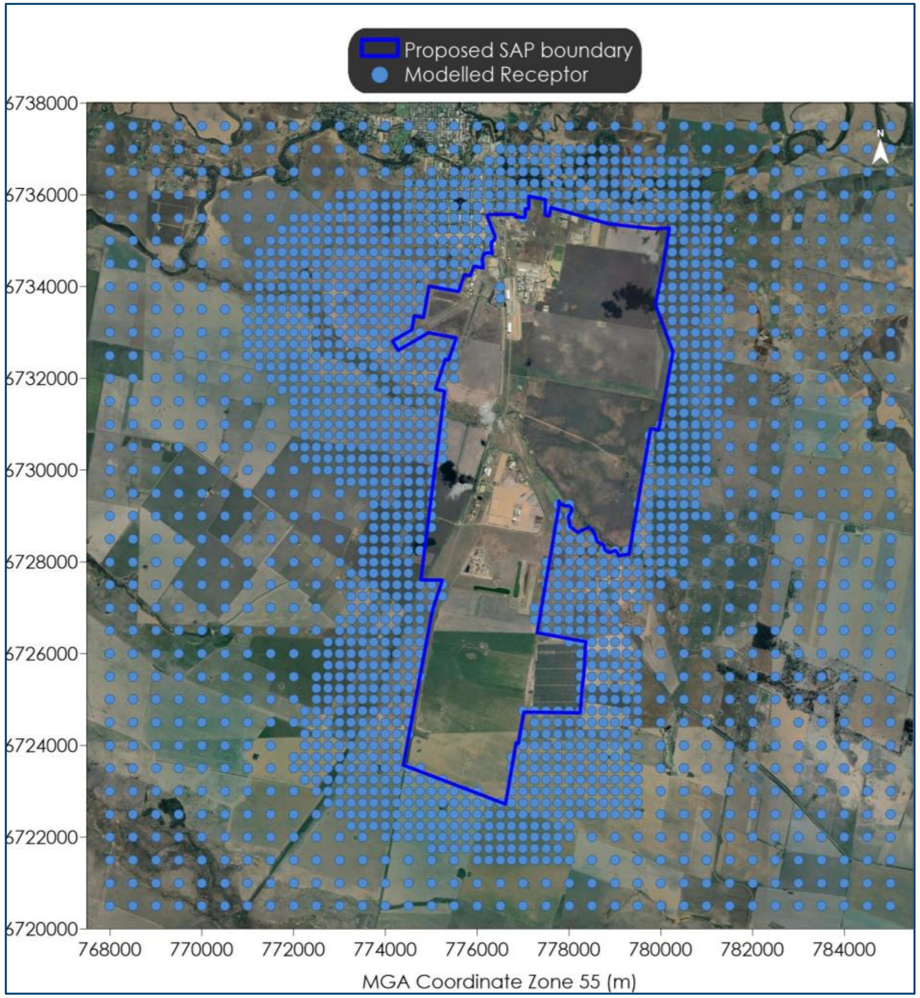

Figure 4-5: Figure showing locations of modelled receptor locations

4.2.4 Noise modelling

Noise emissions were modelled in a similar manner to the air emissions with all existing and potential future industrial source locations arranged in a grid within the SAP. The same grid of sources and receptors were used between air and noise models for consistency between the models. The same terrain information was also applied in both models.

Noise sources were modelled using the ENM noise model under strong inversion conditions and generalised noise emissions profiles typical of industrial activities.

5 AIR, NOISE AND ODOUR ASSESSMENT OF PREFERRED SCENARIO

5.1 Air, Noise and odour assessment

Figure 5-1 presents the preferred structure plan scenario. The preferred structure plan scenario incorporates majority of the SAP Investigation Area. A relatively large extent and majority of the proposed SAP boundary is focused on development and industrial land use.

Planning considerations to minimise or control land use conflicts for air, odour and noise are set out in this section.

The approach provides numerical criteria applicable to the land. This is only possible for noise and odour given that there is a limiting criterion for an emission (noise or odour), whereas for air, there are many criteria for many pollutants which apply at various locations and averaging periods. As such, only preferences or guidance can be provided for air emissions.

The key consideration in making the assessment is that there are no sensitive receptors within the precinct boundary with the exception of sensitive receptors included at the proposed Airport Hotel development within the northern part of the proposed SAP boundary. This means that any existing receptors within the precinct boundary (such as the residences at Gwydirville) may otherwise be re-zoned.

The objective of the modelling and assessment task is to define the maximum extent of emissions from within the industrial area that do not cause impacts at sensitive receptor locations. The corresponding noise and odour emissions from any part of the industrial area are also identified.

For air, only general good practice guidance can be provided.

Note due to the model granularity in the northern part of the SAP in close proximity to potential or existing receptors, additional conservatism was applied to the sources along the boundary by reducing the emissions from the source. At this interface, the noise emissions were reduced by 5dB, odour emissions were reduced by 0.3 OU, and air emissions were reduced 20 mg/m^3.

Aircraft noise is regulated differently to industrial noise. This is because people can easily tell if the noise is related to the airport or industrial noise. Hence there are different criteria which apply to each specific source. These criteria are not inter-related, and the existing approach for managing airport noise would continue, irrespective of the SAP proceeding or not. Managing aircraft noise from the airport is specific to only the airport, and how it is managed is not affected by the SAP, nor would it affect the potential noise management at the SAP. Hence the airport is not assessed for noise in detail as has been done for industrial noise for the SAP. (It is noted that a Hotel is proposed at the airport and it may become a new receiver for industrial noise. As it could limit how much industrial noise can be made in the SAP, this potential new receiver has been considered).

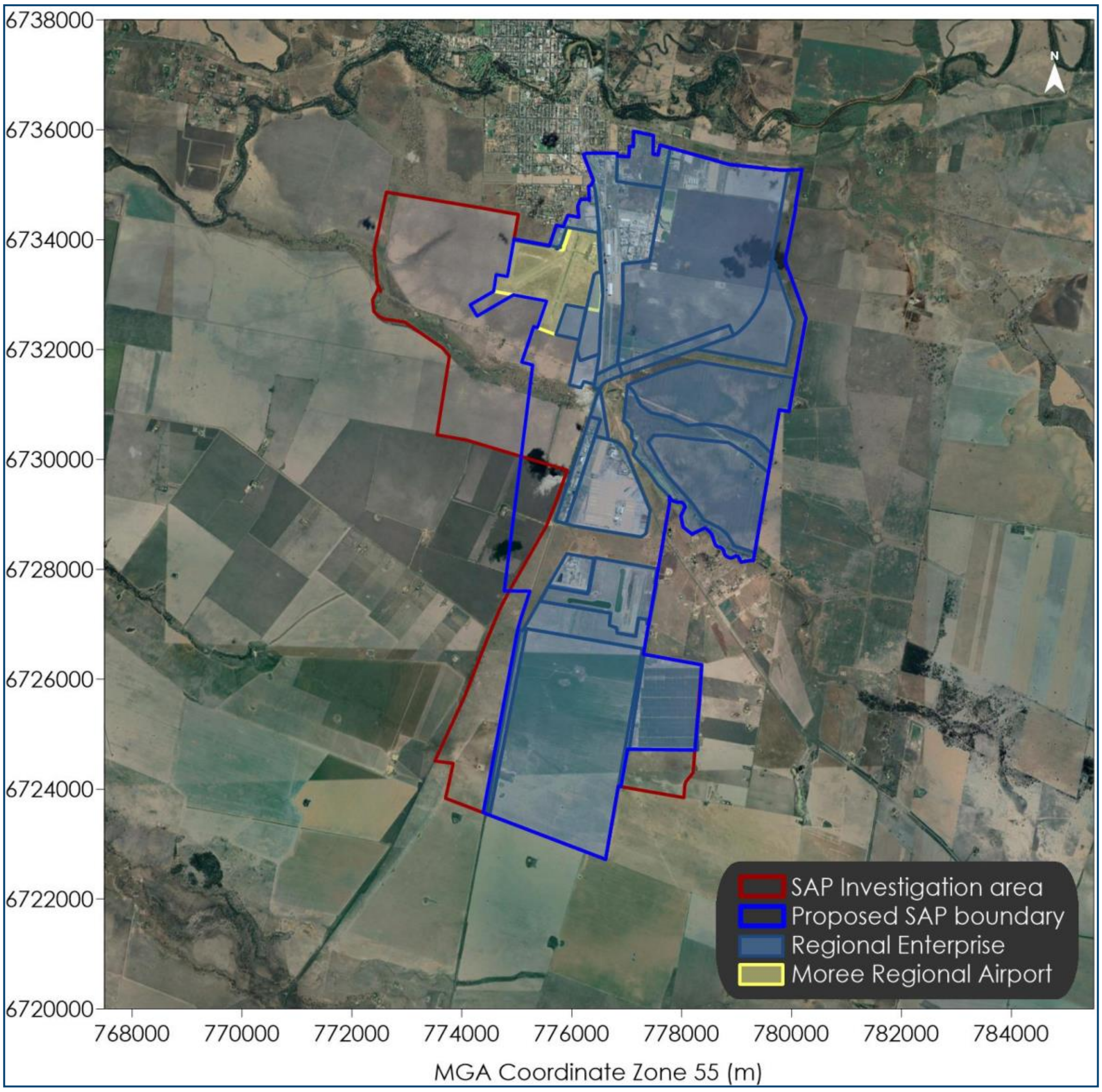

Figure 5-1: Figure displays preferred structure plan scenario

5.1.1 Noise

Figure 5-2 shows the results for noise. The left hand side of the figure shows sound power levels as 5dB contour lines within the SAP industrial area. The right hand side shows the noise level outside of the SAP area.

The contour lines within the industrial area represent the maximum attenuated sound power level per hectare (i.e. noise that can leave the site, per hectare).

The following formula can be used to convert the contour line value crossing the middle of a specific lot into that lots' permitted sound power level based on the lot size. Per the formula, bigger lots get more sound power, smaller lots get less.

Equation 1: PWL (lot) = PWL(ha) + 10 log(A/10,000), where:

PWL(lot) = Allowed attenuated sound power level per lot, dB(A)
PWL(ha) = Sound power level of contour line crossing middle of the lot (OK to use a decimal if between lines);
A = Lot area in square metres

Upon subdivision, this sound power (PWL(lot)) can be set as a property right for the lot, perhaps as part of a Section 10.7 Notice attached to the property, and/ or as part of the total tally of lot sound power within a database or electronic register/ tool for managing the approval of developments in the industrial area.

From a regulatory view point, measuring PWL(lot) at the site is more swift, direct and reliable than measuring the intrusive noise level at receivers, especially for a lot within a large industrial area where it can be very hard to determine which source/ lot/ operation is causing the noise at the receiver.

From an application/ assessments/ approval point of view, this pre-set allowance for the lot's sound power level reduces the work a noise consultant may need to do, saving time and money. It may however prompt some operators to design the plant to pollute up to the limit so to speak. However, this occurs currently, but at least per this approach the PWL(lot) is easily measurable and so potential transgressions can be swiftly and efficiently regulated.

The right hand side of **Figure 5-2** shows the sound pressure levels outside of the industrial area.

As per the Noise Policy for Industry (**NSW EPA, 2017**), the limiting criterion is the amenity criterion of 40dB(A) which is a 9-hour average noise level over the night time period (10pm to 7am) and applies to the cumulative noise of all industrial noise sources, whereas the intrusive criteria is 35dB(A) and applies to each individual site. As the noise sources in the industrial area will be a mix of constant sources (e.g. fan or transformer that is always on) and intermittently noisy sources such as vehicles and mobile plant, and other batch activities, many sources will only make noise intermittently over 9 hours. Thus the measured cumulative 9-hour noise level will be less than the maximum measured 15-minute level (from all sources) in that same 9-hour period.

The sound power limits above correspond with all lots operating at the individual intrusive noise limit for each lot which is set at 35dB, LAeq(15min) to protect the amenity of the nearest receptor outside of the SAP boundary, and both limits are commensurate with the industrial area meeting the cumulative noise amenity level of 40dB, LAeq(9hr).

The pink line **Figure 5-2** represents the 35dB, LAeq(15min) individual site intrusive criteria compliance boundary line (or the location of the nearest sensitive receptors at which the intrusive criteria apply (see **Figure 4-5)**) and also the cumulative noise amenity level extent for 40dB, LAeq(9hr). This represents the area outside of which any receptors/sensitive receivers would not experience sound power levels above the criteria. The land within the pink line is not suitable for residential/sensitive use.

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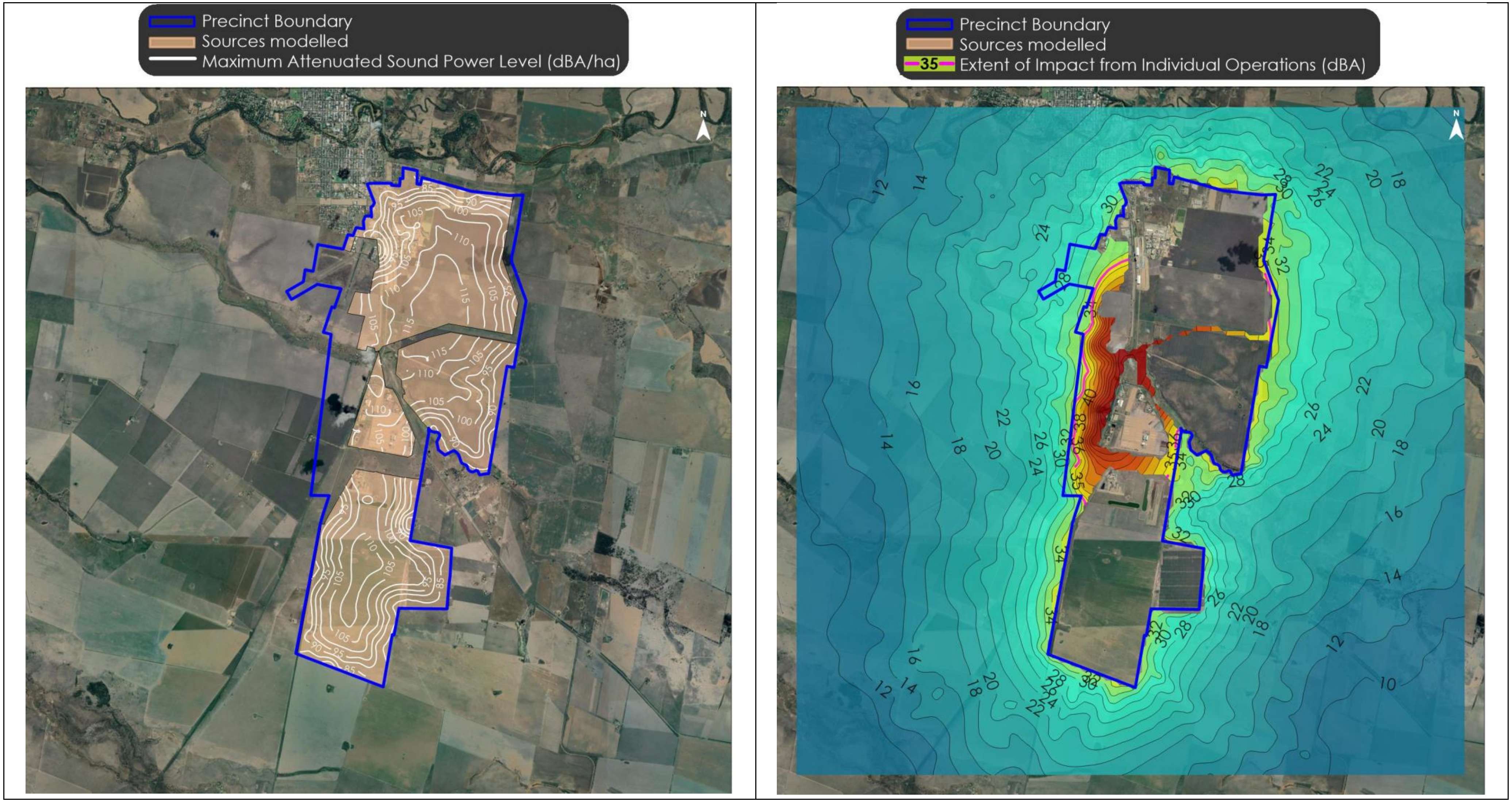

Figure 5-2: Displayed source sound power level per Ha (left) and received sound pressure level (right) due to noise emissions from the industrial area

5.1.2 Odour

5.1.2.1 Regulation of odour and odour criteria

Odour in a regulatory context needs to be considered in two similar, but different ways depending on the situation.

NSW legislation (*Protection of the Environment Operations Act, 1997)* prohibits emissions which cause offensive odour to occur at any off-site receptor. Offensive odour is evaluated in the field by authorised officers, who are obliged to consider the odour in the context of its receiving environment, frequency, duration, character and so on and to determine whether the odour would interfere with the comfort and repose of the normal person unreasonably. In this context, the concept of offensive odour is applied to operational facilities and relates to actual emissions in the air.

However, in the approval and planning process for proposed new operations or modifications to existing projects, no actual odour exists, and it is necessary to consider hypothetical odour. In this context, odour concentrations are used and are defined in odour units. The number of odour units represents the number of times that the odour would need to be diluted to reach a level that is just detectable to the human nose. Thus by definition, odour less than one odour unit (1 OU), would not be detectable to most people.

The range of a person's ability to detect odour varies greatly in the population, as does their sensitivity to the type of odour. The wide ranging response in how any particular odour is perceived by any individual poses specific challenges in the assessment of odour impacts and the application of specific air quality goals related to odour. The NSW Odour Policy (**NSW DEC, 2006**) sets out a framework specifically to deal with such issues.

It needs to be noted that the term odour refers to complex mixtures of odours, and not "pure" odour arising from a single chemical. Odour from a single, known chemical very rarely occurs (when it does, it is best to consider that specific chemical in terms of its concentration in the air). In most situations odour will be comprised of a cocktail of many substances which is referred to as a complex mixture of odour, or more simply odour.

5.1.2.2 Project odour criteria

As per the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (**NSW EPA, 2017**) the more stringent 2 OU NSW criteria applicable to densely populated urban areas has been applied. The NSW odour goals are based on the risk of odour impact within the general population of a given area. Thus, in sparsely populated areas the criteria assume there is a lower risk that some individuals within the community would find the odour unacceptable, hence higher criteria apply.

An odour criterion of 2 OU is used in this study at existing and potential future sensitive receptors.

5.1.2.3 Interpreting the study odour results

Figure 5-3 presents the results for odour. The left hand side of the figure shows the odour emission rate per hectare for sources of odour in the industrial area and the right hand side shows the recieved odour level outside of the industrial area.

Referring to the left hand side of **Figure 5-3**, the contour lines within the industrial area represent the maximum attenuated odour emission rate ($OU.m^3/s/ha$) (i.e. rate of release of odour that can leave the site, per second per hectare).

Similar to noise, this odour emission rate allowance can be set as a property right for the lot, perhaps as part of a Section 10.7 Notice attached to the property. However, unlike the logarithmically scaled noise criterion, the odour criterion converts linearly to any lot's odour emission allowance. For example, if the lot is half a hectare, it can emit odour at half the rate of the contour line level passing through the middle of the lot. If the lot area is two hectares it can emit double the contour line level.

Referring to the right hand side of **Figure 5-3**, the pink line represents the 2 OU criteria boundary line (or the location of the nearest sensitive receptors at which the criteria apply (see **Figure 4-5**)). This represents the area outside of which any receptors/sensitive receivers would not experience unacceptable odour levels above the criteria. The land within the pink line is not suitable for residential/sensitive use.

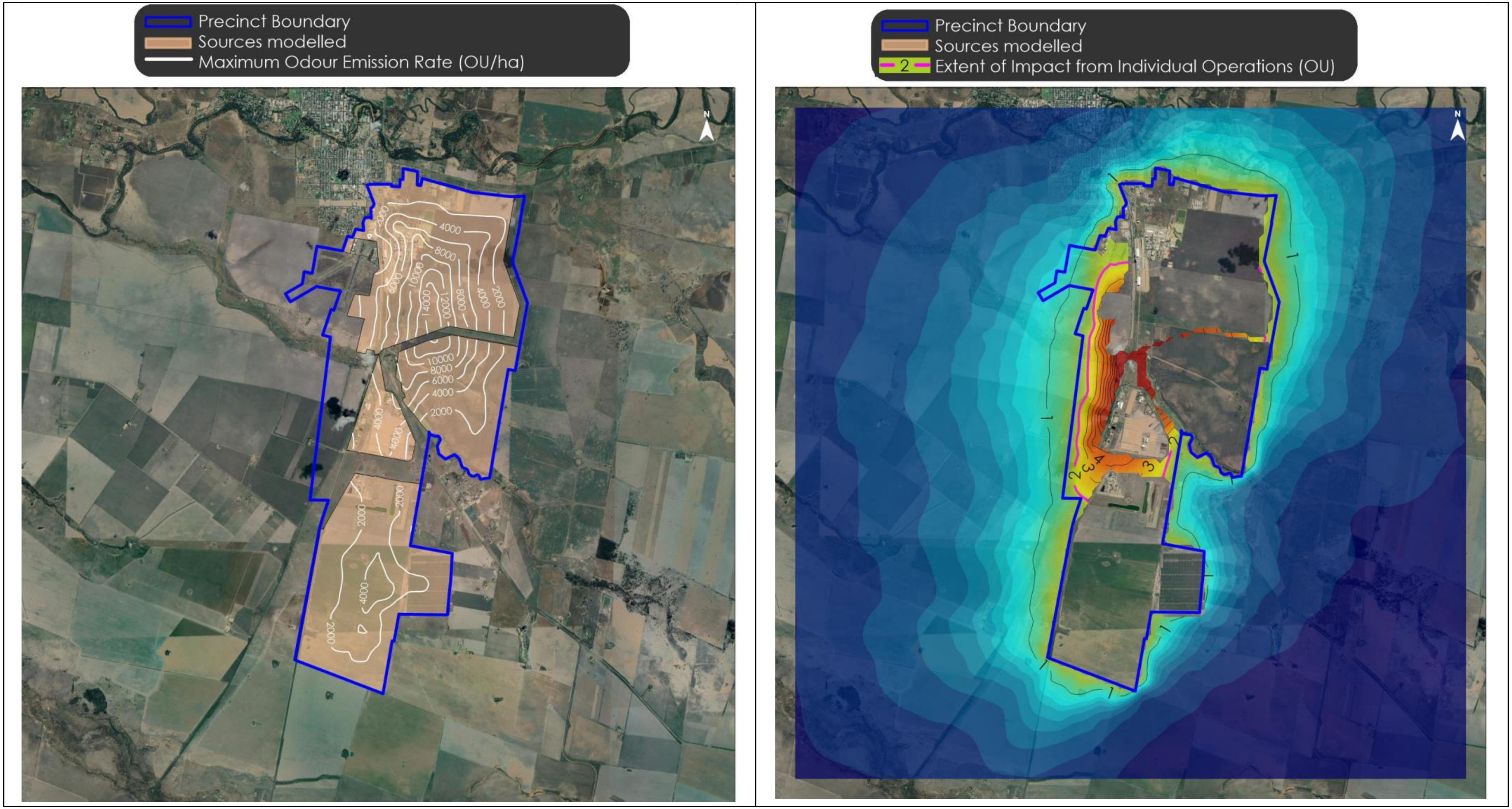

Figure 5-3: Display of source odour emissions rate per Ha (left) and received odour (right) due to odour emissions from the industrial area

5.1.3 Air

For air emisions, it is not possible to ascribe a maximum quantity of emissions per hectare, given that there may be hundereds of different types of air emissions, each with differing criteria averaging periods or locations for compliance.

For air, the approach taken is to accept that all air toxic emissions must be minimised to the maximum practicable extent, as set out in Section 7.2.1 of the EPA Approved Methods (**EPA, 2017**). Previous work identified that for fugitive air emissions, odour is the most limiting emission affecting potential compliance. As fugitive emissions will arise from area or volume sources, their zone of potential impact is considered as part of the odour assessment (see 5.1.2). Thus stack emissions are considered in more detail here.

Stacks have the potential to cause most impact at locations where the dispelled plume may reach the ground. For stacks, this is most likely to arise in elevated locations in the surrounding terrain but may also occur nearby due to plume down wash effects. As the earlier work has shown it is prefereable to locate stacks in more elevated areas. This however is not mandatory as it is feasible for an applicant to simply specify a taller, higher velocity or higher temperature stack that has better dispersion and can perform equally well in a low lying area than a less highly performing stack in an elevated area.

Figure 5-4 shows the results for a generic source of air emissions represented by a typical industrial boiler stack modelled per earlier stack modelling and assumptions in **Section 4.2.3**. The figure shows no constraints beyond those for noise and odour.

The left side of **Figure 5-4** shows the concentration of NO_X emissions within the industrial area which can be emitted from the stack (mg/m^3) that would meet an NO_2 concentration at receivers of 95 µg/m^3, which when combined with an assumed background level of 85 µg/m^3 at 100% conversion of NO_x to NO_2, is a little below the proposed new NEPM limit for 1-hour averge NO_2. This concentration is also shown in the right hand side of the figure as the pink line (or the location of the nearest sensitive receptors at which the criteria apply (see **Figure 4-5**)). The land within the pink line is not suitable for residential/sensitive use.

Note that there are two equally applicable limits/ criteria for a stack; the emissions concentration limits which apply to emissions in the stack (as set out in the POEO Clean Air Regulation); and, the ambient or ground level concentration limits which apply at a receptor (as set out in (**EPA, 2017**)). The left hand side of the figure shows the in-stack concentrations. An orange contour line is drawn within the industrial area corresponding to the POEO Clean Air Regulation limit for a boiler (350mg/m^3) and a green line for other levels approximately 150% above this. Hence where the level shown in the industrial area is greater than POEO Regulation limit for a stack, this means more emissions than are lawful for the stack would need to be emitted in order to cause an exceedance of the criteria at a receptor. (It does not mean that more than the lawful level of stack emissions is proposed in this industrial area).

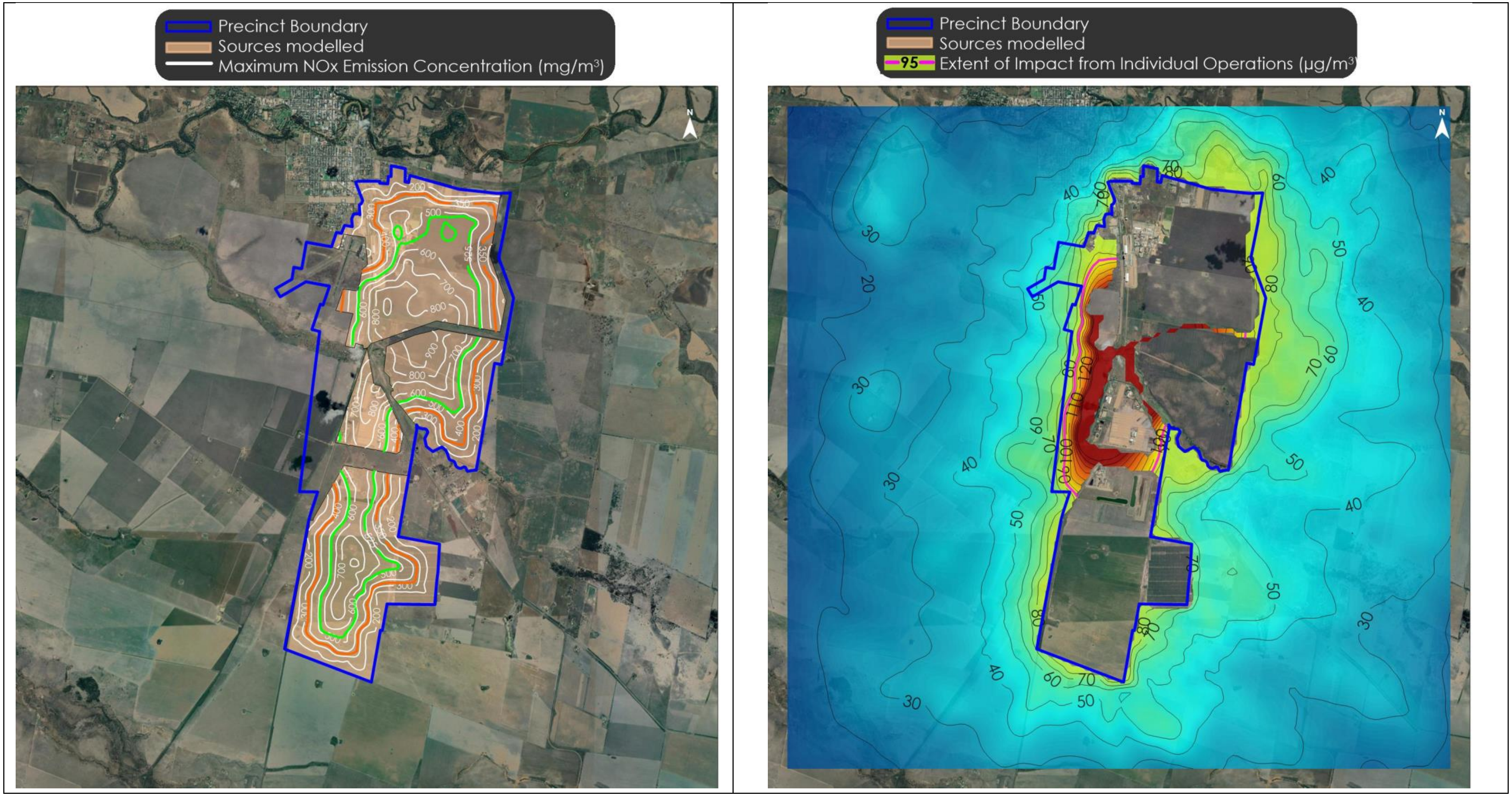

Figure 5-4: Display shows examples of Air emissions rate per stack (left) and received air pollutant concentrations (right) due to NO_x emissions from the industrial area

Figure 5-5 shows generalised guidance for locating industries with stacks. The general preferences shown cannot be used in planning documents other than for general guidance. The figures aim to assist applicants to identify locations within the industrial area where installing a stack will be less costly (preferrred locations) and also guide approval bodies as to the level of scrutiny warranted for applications with a stack, for example a stack with higher specifications may be needed in the zone between the "preferred" and "not preferred areas" for stacks and a high level of regulatory scrutiny would be needed for approval of stack applications in the "not preferred" for stack area.

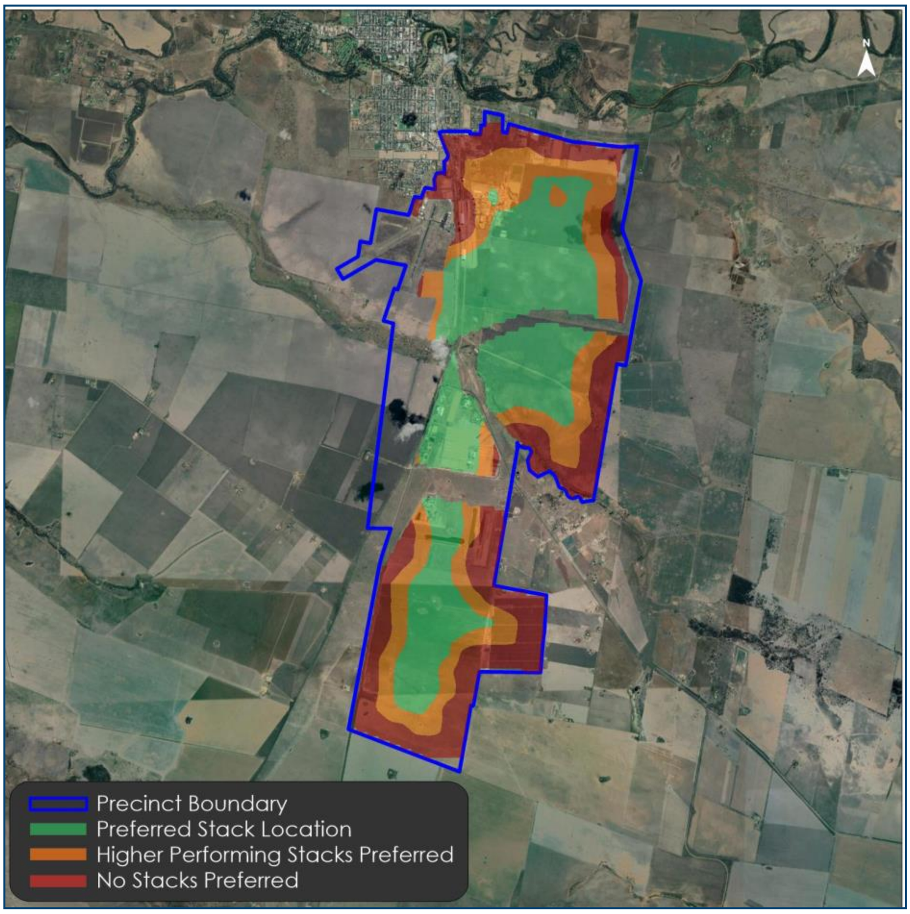

Figure 5-5: Map showing generalised guidance for locating industries with stacks

5.2 Opportunities and constraints

5.2.1 Consideration of windshear and plume rise

Whilst strictly a meteorological, rather than an air quality issue, it is relevant to be aware of the need to prevent potential impact upon aircraft operations due to the wake effects of structures near the runway. Depending on the scale, shape and location of a building, its downwind wake can affect the ability of aircraft to land and take off safely under weather conditions that would otherwise be safe.

The guideline for determining the risk of building generated windshear and turbulence is Attachment A of Guideline B: "*Managing the Risk of Building Generated Windshear and Turbulence at Airports*", (**DIRDC, 2018**).

The assessment trigger is presented below in grey italics for which a detailed assessment is required.

Buildings that could pose a safety risk are those located within a rectangular 'assessment trigger area' around the runway ends (see **Figure 5-6**).

a. 1200m or closer perpendicular from the runway centreline (or extended runway centreline);

b. 900m or closer in from of runway threshold (towards the landside of the airport); and,

c. 500m or closer from the runway threshold along the runway.

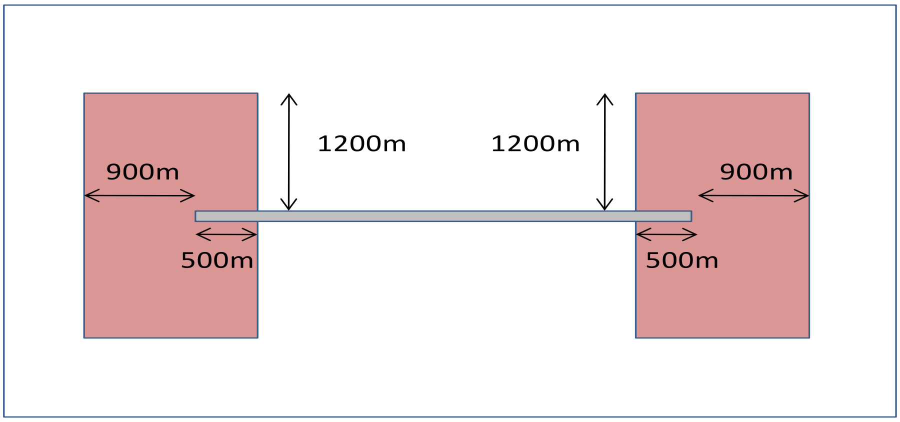

Figure 5-6: Diagram of assessment trigger area around runways, within which buildings should be assessed

The windshear assessment trigger area for the Moree Regional Airport is overlaid on the SAP investigation area in **Figure 5-7.** As some of the precincts for the preferred scenario extend within the area identified in **Figure 5-6** and **Figure 5-7,** windshear and turbulence would need to be assessed at these locations. However, it is expected that the majority of any potential buildings within these areas would pass the simple trigger screening level assessment and would not require a detailed wind assessment. For example, a section of the nearest regional enterprise precinct to the southern airport runway is approximately 350m from the runway and therefore buildings less than 10m in height would not require any further examination. Buildings outside 1200m from the runway would not require any examination under the Guideline B.

Buildings within the vicinity of the Moree Regional Airport would need to comply with the Obstacle Limitation Surface (OLS) and Procedures for Air Navigational Services—Aircraft Operations (PANS-OPS) surfaces, which are surfaces above the airport adopted to maintain protected airspace for safe operation of the airport.

The Department of Infrastructure, Transport, Cites and Regional Development (DIRDC) notes that "*the OLS is generally the lowest surface and is designed to provide protection for aircraft flying into or out of the airport when the pilot is flying by sight. The PANS-OPS surface is generally above the OLS and is designed to safeguard an aircraft from collision with obstacles when the aircraft's flight may be guided solely by instruments, in conditions of poor visibility*" (**DIRDC, 2020**). It is understood that the Moree Regional Airport does not currently have a PANS-OPS surface.

The Moree Regional Airport OLS is shown in **Figure 5-8** and illustrates that the northern regional enterprise precinct within the proposed SAP boundary is located within the 256.5m (AHD) zone of the OLS with an approximate ground level of 212m at the airport. The OLS defines the height at which obstacles, including exhaust plumes with a vertical velocity greater than 6.1m/s, cannot exceed to ensure the safety of aircraft.

For industrial facilities that produce emissions though stacks or vents, if the gaseous efflux velocity from the stack exceeds a critical velocity it can be hazardous to aircraft operations. A plume rise assessment is required for industries in close proximity to the airport to determine the plume velocity and this will restrict some types of industrial operations that can occur in the SAP.

It is noted that the Moree Regional Airport is expected to receive a runway extension. Whilst maintaining compliance with the OLS and ensuring safety risks to aircrafts are minimised, there is an opportunity to review the current OLS and investigate the possibility to increase the slope of the OLS over the high impact areas of the SAP which would allow for more headroom for potential stacks in the high impact zones and a larger diversity of potential industries in these areas.

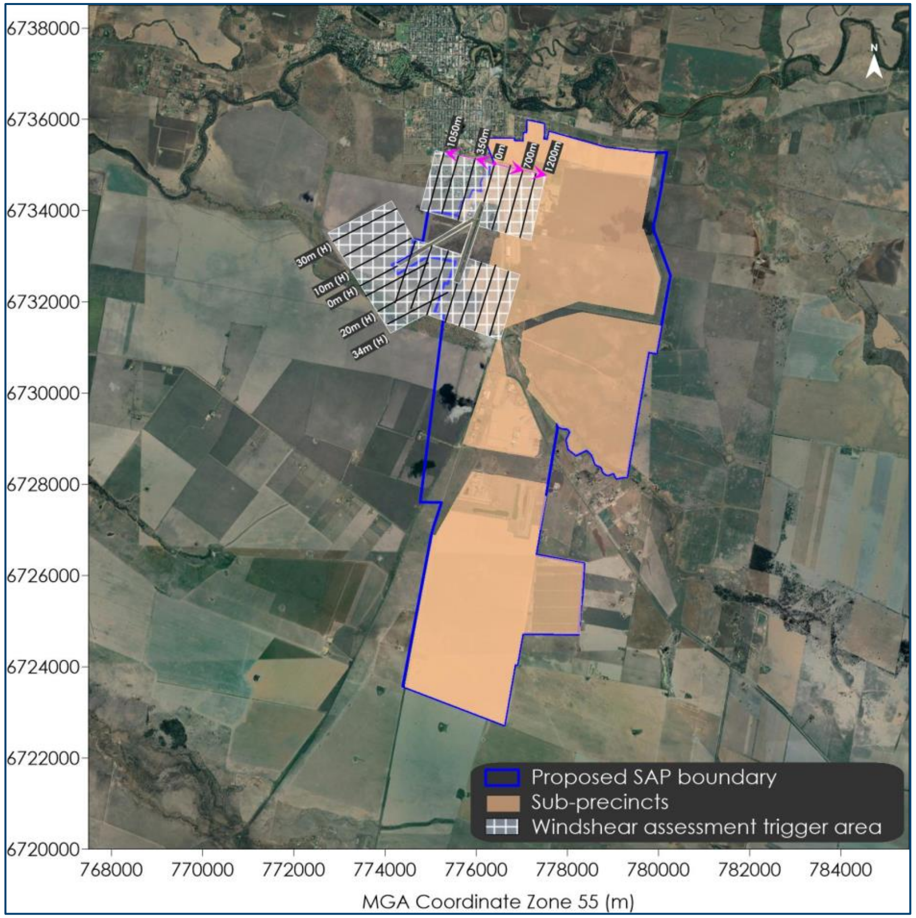

Figure 5-7: Map of Moree Regional Airport windshear assessment trigger area

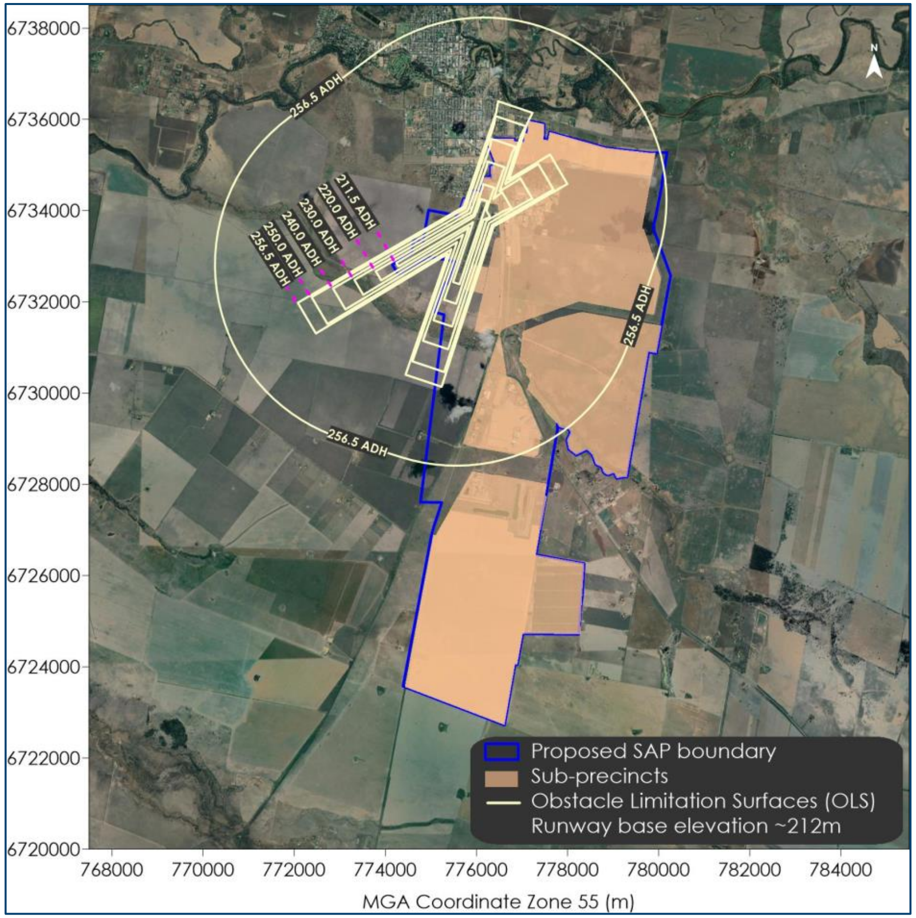

Figure 5-8: Map of Moree Regional Airport including Obstacle Limitation Surface

5.2.2 Opportunities

The preferred scenario lends itself to the following strategies to manage potential land use conflicts and in this way to enable industries to operate without undue compliance burden while at the same time provide residents with adequate amenity and health protection.

1. Co-locating and centralising high impact industrial land uses to minimise buffer requirements within the SAP.

2. Locating the high impact and potential hazardous industry to the south of the SAP away from any existing or potential receptors nearby (see **Figure 3-6)** and other precincts provides a good setback around the proposed sources of emissions in the SAP investigation area. Furthermore, it is less likely there will constraints on stacks and buildings in this precinct area as it is outside the Obstacle Limitation Surface (OLS) of the airport.

3. A low impact regional enterprise area to the north of the preferred structure plan scenario between existing residences and any other sensitive receivers to the north and any major new industrial developments with a focus on volume sources of air emissions in the modelling.

4. Sources of dust include harvesting and grain handling, wheel generated dust from dirt roads, and vehicles driving off road. This arises in the region generally and within the SAP. The handling of grain in the SAP would also generate dust at harvest time which can occur at any time of the year. Opportunities to reduce traffic generated dust exist by limiting vehicles to clearly defined roads and sealing heavily used dirt roads.

5. The low impact precinct to the north of the SAP has been located with consideration of further residential expansion in the areas immediately north outside of the SAP. The land uses within this area must meet the sound power levels and emissions as specified in **Section 5.1** and would be comparatively lower than other industrial areas in the proposed SAP boundary.

6. Existing sensitive receptors in Gwydirville that are overlapped by industry and other impacted residential receptors close to industrial operations (see **Figure 3-6**), will be affected by dust and noise. As this is known at present it provides the opportunity to redesign the SAP to prevent this land use conflict arising. Various strategies need to be considered to prevent the likely land use conflict should the industrial land use be developed fully.

5.2.3 Constraints

Overall, the following constraints relating to the preferred scenario have been determined:

1. Existing sensitive receptors in Gwydirville that are overlapped by industry and other impacted residential receptors close to industrial operations (see **Figure 3-6**), will be affected by dust and noise. Without careful consideration of the design, this may significantly constrain nearby industrial development.

2. Impacts from volume sources, such as ponds, land surfaces and fugitive emissions from buildings predominantly relate to odour or grain fumigant emissions. Emissions from stacks include odour, but also toxic air pollutants.

    a. The volume sources tend to cause impacts near the source. More distant receptors may be affected by emissions from such sources due to late evening, night and early morning temperature inversions and katabatic drift, which may not be favourable in this locality.

    b. The potential impacts from stack sources would be limited, as there are no surrounding high points in the landscape which may be most susceptible to impact. In general, impacts from stacks are generally relatively smaller due to greater dispersion between source and receiver and can be adequately controlled by good stack design.

3. Problems may arise when dust and mud is tracked from dirt surfaces onto sealed roads, and a range of options may be available to ameliorate this, depending on the expected traffic numbers, vehicle types, speed and road design. Specific details would be needed to develop the best approach in each circumstance.

4. Obstacle Limitation Surface (OLS) height restrictions and wind shear and turbulence wake impacts from buildings situated near the Moree Regional Airport may pose restrictions on the adjacent precincts. This will have constraints on stacks and buildings within the Obstacle Limitation Surface (OLS) in relation to height controls and due to hot stack exhausts from plume rise. Windshear and OLS height restrictions are explored in more detail in **Section 5.2.1**.

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6 MITIGATION MEASURES AND STRATEGIES

6.1 Noise mitigation options

As for any operation in NSW, as a minimum, general or commonly used noise mitigation is expected for industries in an industrial area that have potential to release noise emissions.

The industrial area and SAP boundary is designed such that industries incorporating general levels of control should be able to operate within the industrial precinct without causing impacts. However there are limitations, for example a facility that would have high levels of noise emissions may need to have extra noise mitigation if it chooses to locate near to the edge of the SAP near potential receptors. Such a location is better suited to an operation that has noise emissions within the specified allowance as it is unlikely to need extra abatement.

The left hand side of **Figure 5-2** provides an allowance per hectare for potential noise emissions. This allowance can be used in the approvals process,. For example, a proposed development with less emissions per hectare than the allowance for the proposed lot would be suitable, and could potentially be provided with a complying development pathway. The figure also serves to help potential new industries to identify the more suitable lots where, depending on their emissions, the facility can reasonably expect to be able to operate without causing impacts (outside of the SAP boundary) or to require extra noise controls. The details of any such approval framework in this locality needs to be determined after careful consideration of any feedback from the public consultation process. The work at this stage only provides the information needed to develop an approvals and regulation framework that has scope to streamline the approvals and regulation process. However, whether such a framework is the best option for this locality relies on many factors, and the best path forward is to be determined at later stages.

General mitigation options for industries to manage noise emissions would vary depending on the nature of the source and the effectiveness of potential mitigation options need to be considered in each case. Some examples of general noise mitigation measures include:

- Mitigation at the source;
    - Selection of equipment – select equipment with low sound power levels when purchasing new equipment or substituting equipment.
    - Modifying equipment – silencers, mufflers and dampeners may be retrofitted to existing equipment to reduce noise emissions.
    - Operational time – consider adjusting operating times for when equipment is in use.
    - Implementing quiet work practices – using equipment in ways to minimise noise, this includes reducing throttle setting and turning off equipment when not being used.
    - Maintain equipment – regularly inspect and maintain equipment to ensure it is in good working order.
    - Limit equipment use – reduce the amount of equipment operating simultaneously, avoid clustering of equipment.

- Mitigation along the path between source and receiver;
    - Barriers – construct barriers between source and receiver.
    - Direction – orient noise emissions away from receiver.
    - Distance – provide as much distance as possible between source and receiver.
- Mitigation at the receiver;
    - Barriers – construct barriers at the receiver.
    - Architectural treatments – treatment options will vary depending on the level of noise at the receiver.

6.2 Odour mitigation options

As for any operation in NSW, as a minimum general or commonly used pollution controls are expected for industries in the industrial area which have potential to release air emissions.

The industrial area and SAP boundary is designed such that industries incorporating general levels of control should be able to operate within the industrial precinct without causing impacts. However there are limitations, for example a facility that would have high levels of odour emissions may need to have extra odour mitigation if it chooses to locate near to the edge of the SAP near potential receptors. Such a location is better suited to an operation which has odour emissions within the specified allowance as it is unlikely to need extra abatement.

The left hand side of **Figure 5-3** provides an allowance per hectare for potential odour emissions. This can be used as part of the approvals process where a proposed development with less emissions per hectare than the allowance for the proposed lot would be suitable. The figure also serves to help potential new industries to identify the more suitable lots where depending on their emissions, the facility can reasonably expect to be able to operate without causing impacts (outside of the SAP boundary) or to require extra pollution controls. The details of any such approval framework in this locality need to be determined after careful consideration of any feedback from the public consultation process. The work at this stage only provides the information needed to develop an approvals and regulation framework which has scope to streamline the approvals and regulation process. However, whether such a framework is the best option for this locality relies on many factors, and the best path forward is to be determined at later stages.

General mitigation options for industries to manage odour emissions would vary depending on the nature of the source and the effectiveness of potential mitigation options need to be considered in each case. Some examples of general odour mitigation options include:

- Mitigation at the source;
    - Handling of malodourous material within enclosed building or within a closed system. Aim to minimise exposure of material and prevent odour emissions into the environment.

  - Capture and ventilation of odour emissions at the source (e.g. hooding and extraction, negative pressure enclosures, etc.).
  - Exhaust odour emissions via a stack to allow for adequate dispersion.
  - Treatment of odour emissions before release (e.g. biofilter, carbon filter, thermal oxidiser, ozone reactors, etc.).
  - Regular cleaning of work space, clean up any spills.
  - Routine preventative maintenance on equipment.
  - Reduce amount of odorous material stored and handled at site.
  - Regular inspection of work place areas to identify odour.
  - Build continuous dense landscaping (bunds and vegetation) along odour source boundaries to assist in odour dispersion from the odour source. Provide guidance and training to on-site personnel to assist identification of problematic odour sources at the site and taking proactive action.
  - Position the most odorous sources as far away as possible from receivers (the odour allowance will be higher there also).
  - Establish incident or complaint management system to assist with identifying odour sources and take preventative measures.
- Mitigation at the receiver may only provide small benefits but is appropriate for new dwellings outside of the precinct boundary;
  - Orientate buildings to provide adequate air flow around the building and design buildings to encourage air flow in a particular direction. (This can be aided by block size and shapes and understanding of prevailing wind flows). Avoid construction of dead end courtyards or long narrow spaces perpendicular to the prevailing winds where air can lay dormant and stagnate;
  - Design buildings so living spaces do not face odorous sources and position any air conditioning and ventilation intakes away from the odour source.

6.3 Air mitigation options

As for any operation in NSW, as a minimum, general or commonly used pollution controls and mitigation is expected for industries in the industrial area which have potential to release air emissions.

The industrial area and SAP boundary is designed such that industries incorporating general levels of control should be able to operate within the industrial area without causing impacts. However there are limitations, for example a facility which would have high levels of air emissions may need to have extra pollution controls if it chooses to locate near to the edge of the SAP near potential receptors. Such a location is better suited to an operation that does not require a stack to manage pollution.

The right hand side of **Figure 5-4** and **Figure 5-5** provides a guide for new industries to help identify the more suitable lots where, depending on the type of industry and emissions, the facility can reasonably expect to be able to operate without causing impacts (outside of the SAP boundary) or requiring extra pollution controls.

General mitigation options for industries to manage air emissions from stacks include:

- Mitigation at the source;
    - Increase stack height to allow for additional dilution.
    - Increase stack velocity to promote dispersion.
    - Increase stack temperature to promote dispersion of exhaust gases.
    - Treatment of air emissions before release (e.g. carbon filter, thermal oxidiser, Bag filter etc.).
    - Maintain equipment – regularly inspect and maintain equipment to ensure it is in good working order.

6.4 Dust mitigation options

It is noted that due to the prominent agricultural industry in the region, fugitive dust emissions may arise from harvesting and grain handling, wheel generated dust from dirt roads, and vehicles driving off road. It is understood that the handling of grain in the SAP would also generate dust at harvest time which can occur at any time of the year.

With appropriate dust collection systems and a dust management plan in place from the existing and proposed extensions to the agricultural industry within the SAP, fugitive dust emissions can effectively be managed and are unlikely to be an issue.

General mitigation options for industries to manage dust emissions include:

- Mitigation at the source;
    - Installation of appropriate dust collection system.
    - Limit vehicles to clearly defined roads and sealing heavily used dirt roads.
    - Vehicles and plant are to be fitted with appropriate pollution reduction devices where practicable.
    - When material is handled, the drop height should be minimised as far as practicable, and the material should be handled within an enclosure if possible.
    - Routine preventative maintenance and servicing on vehicles and equipment according to manufacturer's specifications.
    - Visual monitoring of activities is to be undertaken to identify visible dust plume generation, and where identified plume is to be minimised or prevented.

- Exposed surface and stockpile areas are kept to a minimum.
- Exposed areas and stockpiles or any significant scale, and present for any significant time are to be watered, covered or chemically treated to minimise the generation of visible dust emissions.
- Internal hauling roads are to be covered with well graded materials to minimise the potential for dust emissions.
- Regular watering of non-sealed internal roads.
- Driveways and hardstand areas to be swept/cleaned regularly as required, (especially at interface with any non-sealed road or exposed surface) etc.
- Speed limits are to be enforced.
- Vehicle loads are to be covered when travelling off-site.

7 SUGGESTED MONITORING FRAMEWORK

Monitoring can be conducted to ensure air, odour and noise impacts are managed within criteria.

In general, where all facilities comply with the emission allowance contours, cumulative impacts should not arise. It is noted that the winds in the Moree area (see **Figure 3-3**) are predominantly on a northeast-southwest axis and relatively few winds blow from the SAP towards the town. Generally this is likely to result in a low risk of cumulative impacts for the majority of residents located in the town.

However should cumulative and ongoing compliance monitoring be required, a potentially suitable monitoring framework is set out below. The framework is based on establishing a number of unattended monitoring stations at locations along the SAP boundary that are representative of receiver locations and areas between industrial activity and receivers. The monitoring stations would be capable of measuring ambient air quality and noise levels.

Figure 7-1 presents recommended locations for potential continuous monitoring sites. The two locations are situated so as to provide upwind/ downwind measurements when the Moree township or receptors to the southeast are downwind of the SAP. Instruments at Monitoring Location 1 could be co-located with the Bureau of Meteorology (BoM) Moree Aero weather station to provide accurate and site representative meteorological data that would complement the concurrent pollutant recordings and assist with data review and analyses.

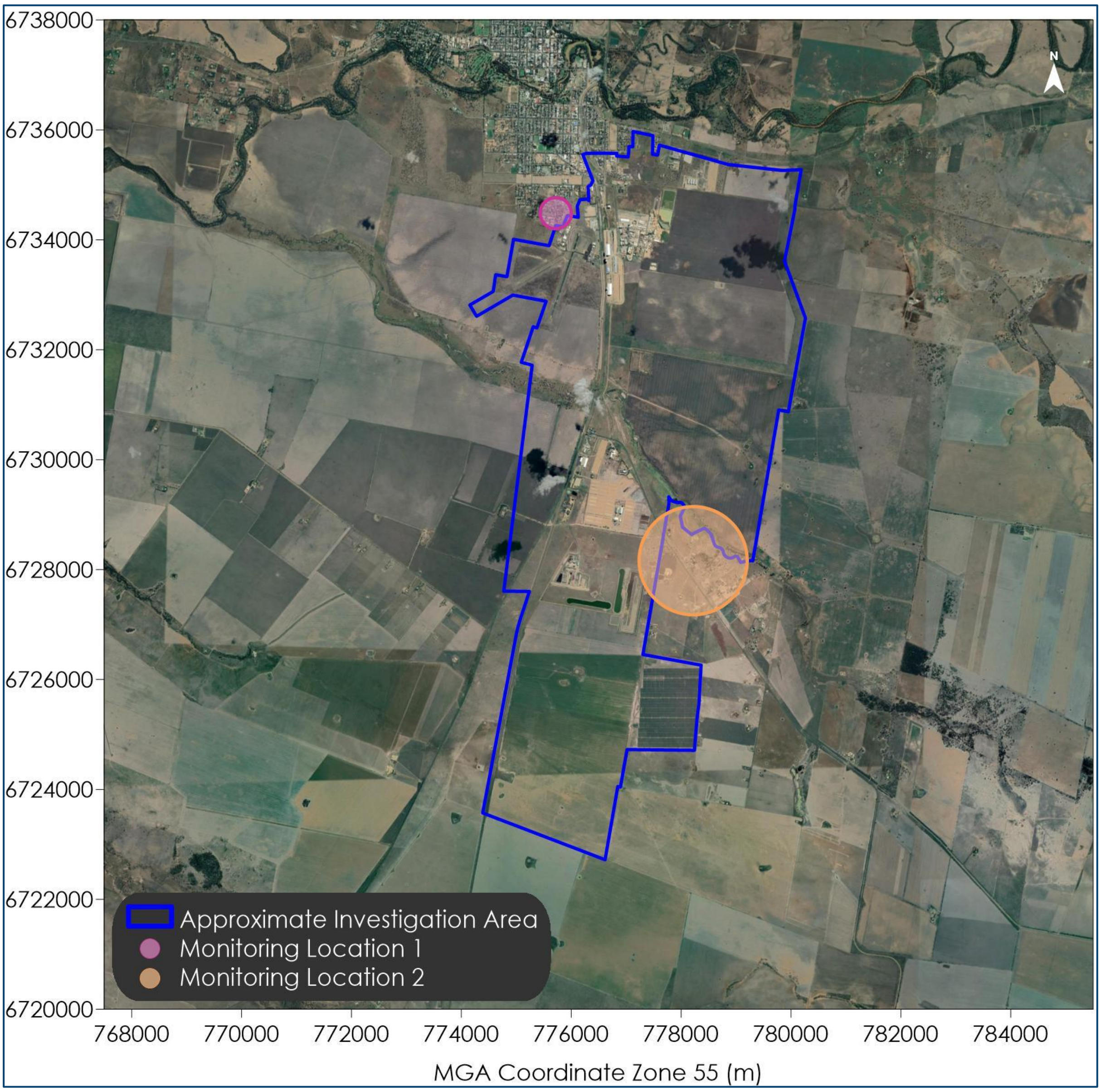

Figure 7-1: Map showing recommended locations for potential continuous monitoring sites

Recommended ambient air quality monitoring parameters are summarised in **Table 7-1** and **Table 7-2**. It is noted meteorological monitoring data are currently available within the SAP at the Moree Aero BoM weather station (Site No. 053115).

Table 7-1: Tabulated summary of recommended ambient air quality monitoring

Parameter	Averaging period	Criteria	Monitoring method
$PM_{2.5}$	24 hour average	25µg/m³	Continuous real-time monitor
	Annual average	8µg/m³	
PM_{10}	24 hour average	50µg/m³	Continuous real-time monitor
	Annual average	25µg/m³	
NO_2	1 hour average	246µg/m³	Continuous real-time monitor
	Annual average	62µg/m³	
SO_2	1 hour average	570µg/m³	Continuous real-time monitor
	24 hour average	228µg/m³	
	Annual average	60µg/m³	
CO	1 hour average	30mg/m³	Continuous real-time monitor
	Annual average	10mg/m³	
Noise	15 Minute average	40 dB, LAeq.	Continuous real-time monitor
Meteorological	15-minute, 1-hour	n. A.-	Refer to **Table 7-2**.

Table 7-2: Tabulated summary of recommended meteorological monitoring

Parameter	Units of measure	Frequency	Averaging period	Sampling method
Air temperature	°C	Continuous	1-hour	AM-4
Wind direction	Degrees	Continuous	15-minute	AM-2 & AM-4
Wind speed	Meters/second	Continuous	15-minute	AM-2 & AM-4
Sigma theta	Degrees	Continuous	15-minute	AM-2 & AM-4
Rainfall	Millimetres (mm)	Continuous	15-minute	AM-4
Relative humidity	Percentage (%)	Continuous	1-hour	AM-4

Annual monitoring reports should be conducted to assess the trends in pollutant and noise levels over time as a means of evaluating the overall performance of the SAP compared with relevant guidelines.

The suggested monitor type for this are any of the semi-portable, solar powered units, in the price range of $50,000 to $80,000 each. These units allow scope to progressively re-locate the monitor as more industry is developed or to re-locate away from areas which become unsuitable over time (e.g. a livestock dust bathing wallow forms nearby, or nearby trees grow and begin to generate excessive pollens which interfere with readings).

This type of monitoring however is not suitable for direct compliance assessment of noise and odour emissions as there are no instruments which can do this reliably at present. (However, it is noted that progress is being made with directional noise monitors).

Expert attended monitoring is thus necessary for any compliance assessment of noise and odour emissions.

7.1.1 Noise – attended

The framework for the SAP allows for more efficient monitoring at the source as opposed to the current regulatory framework where conducting an assessment at a receiver can make it difficult or impossible to isolate the noise contribution from a specific operation. However, where cumulative levels are within criteria at a receiver, there is no pressing need to conduct compliance monitoring at the source(s). The unattended continuous monitors serve to identify trends and the need for any attended monitoring.

Thus it is suggested that initially four, quarterly attended noise surveys are carried out over a 12 month period, thereafter followed by annual surveys. Where the continuous monitoring indicates increasing noise levels at or above the cumulative criteria of 40 dB(A), more frequent attended monitoring may be warranted to identify the issue and determine what (if any) action may be needed.

Occasional attended measurement of noise should be conducted at the edge of the precinct boundary near receptors to evaluate whether the noise is due to industry or other sources such as traffic or insects etc. This should also be done at selected operations (e.g. on-site or at the site boundary) to determine the total site sound power level and compare it with the allowance for the specific parcel of land.

The site specific attended noise monitoring could be conducted at any facility to assess compliance. This could potentially be conducted with only brief, on-site measurements, and would be a reasonable post-construction verification test that could be completed. This could also be done in the event of a specific noise complaint regarding a facility or a group of facilities in an area or by the operator or regulatory agencies as part of regular or random audits.

7.1.2 Odour – attended

Until a significant odour source begins operating near receptors, there is no need for any ambient odour monitoring at receptors near the SAP boundary monitoring.

As for noise, occasional attended measurement of ambient odour levels could be conducted at the edge of the precinct boundary near receptors to evaluate whether there is odour present due to industry or other sources. An odour survey based on the German/ European field olfactometry methods should be conducted over a sufficient number of days to ensure likely worst case weather conditions are considered. Such surveys are expensive in terms of high labour cost and require experienced specialists. There are very few individuals in NSW or QLD with the required skills, making it unreasonable to recommend such work on a routine basis, or where there is no significant, clearly discernible problem.

The odour emissions allowance set out in this study allows scope for a simpler and more reasonable means of assessing an individual site's odour, and where all sites are compliant it is reasonable to infer that total cumulative odour is acceptable.

It is recommended that odour sampling of sources at the site be conducted as part of a post commissioning verification survey for large new odour emitting facilities. (Such site sampling can also be done (required by the regulator) in the event of repeated valid complaints (or if an ambient survey is done and identifies excessive odour)). Odour samples taken directly at the source provide relatively accurate data which can be used to determine the total site odour emission rate and thus assess compliance with the odour emissions allowance for the specific parcel of land.

7.1.3 Air - attended

Routine stack testing is suitable for compliance assessment of specific industries, as would normally be carried out. The pollutants measured and their sampling frequency should be based on the normal evaluation of likely risk and consequence for the specific operation. This is exactly per the existing framework used to manage air quality from industrial activities in NSW. No changes in this regard arise for any specific industry with the SAP.

Similarly, monitoring of key air pollutants for the purpose of trend analysis could be conducted as per **Section 7**. This can be used at the SAP, as it is used elsewhere in NSW, to identify any significant change in emissions. For example, should there be some plant failure, the continuous monitors are likely to identify any significant increase in pollutants that may have occurred, and would alert industries and the regulator that there may be a problem which requires attention.

In our experience, this is best suited to ambient dust monitoring, which would be useful for the SAP. Whilst continuous monitoring of gaseous pollutants such as NO_2, and SO_2 could also be done at a reasonable cost, there would need to be a large source of fuel combustion or a source processing materials containing sulfur to justify this.

Occasional spot check monitoring, and post commissioning monitoring for any large source of gaseous pollutant emissions would be adequate to keep tabs on any potential trends in such emissions.

7.2 Other potential management systems

It is possible, but does not appear necessary, to utilise predictive or real-time systems for management of dust, odour and air emissions. These systems are best suited to industries that have capacity and discretion to conduct activities at the least impacting times or to cease or delay certain activities; for example a blast at a mine, or batching of hot-mix or asphalt products, maintenance of odorous plant, turning of windrows, etc. This would only appear to apply to a limited number of industries in this area and thus such emissions may be reasonably managed by reference to normal, widely available weather forecasts and real-time data from a weather station such as the Moree Aero BoM weather station.

8 SUMMARY AND RECOMMENDATIONS

The study found that it is possible to recommend appropriate noise and odour allocations per lot area, that if followed, would minimise individual and cumulative noise and odour impacts outside of the SAP boundary.

Appropriate allocations for both noise (sound power) and odour (odour emission rate) per hectare have been made in this study. These allocations can be applied in potential new planning instruments for the locality and used in the approvals process for any new and expanded industries. For example, a proposed development with less emissions per hectare than the allowance for the proposed lot would be suitable, and could potentially be provided with a complying development pathway. The information provided can also help potential new industries to identify the more suitable lots where, depending on their emissions, the facility can reasonably expect to be able to operate without causing impacts (outside of the SAP boundary) or to require any extra noise or odour controls. The details of any such approval framework in this locality need to be determined after careful consideration of any feedback from the public consultation process. The work at this stage only provides the information needed to develop an approvals and regulation framework which has scope to streamline the approvals and regulation process. However, whether such a framework is the best option for this locality relies on many factors, and the best path forward is to be determined at later stages.

However, it was not viable to make specific allowances for air emissions, given that there can be hundreds of different air pollutants with hundreds of different criteria. Some guidence is provided in this regard to assist both applicants and approval bodies in minimising impacts and cost burdens on new and expanded industries.

The allotment of appropriate noise and odour emissions per lot area, means that direct attended measurements of noise and odour can be made at a site to evaluate compliance, similarly to how stack testing may be done for stack sources. Presently, odour and noise impacts due to a single operation are generally evaluated at a receptor, which in some cases can be dificult or near to impossible to do reliably. The regulatory framework does however permit alternative standards and in this case it means that compliance can be measured accurately, in a short time and under a very wide range of weather conditions and times, making compliance evaluation for both operators and regulators more efficient and reliable. The proposed approach for the SAP is expected to provide more certainty to operators, regulators and the community alike and also provide a framework for managing total cumulative impacts and a more rapid means to identify any problematic operations.

The allotment of noise and odour emissions goes hand-in-hand with the SAP boundary. The SAP boundary is necessary for industry to be able to operate without causing undue impact on receivers. The land within the SAP boundary is therefore not suitable for residential/senstive use.

With appropiate controls and mitigation measures implement by industries, air, noise and odour impacts can be controlled at the source in their construction and operations. Additional mitigation strategies can be implemented at receptors to futher minimise air, noise and odour impacts.

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