Noise Impact Assessment

Request for Planning Proposal: Mixed-Use Subdivision at 1055 Bruxner Highway, Goonellabah

Nimble Estates

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Executive Summary

This Noise Impact Assessment (Road Traffic and Operational Noise Impact Assessment) report has been prepared by ATP Consulting to accompany a Request for Planning Proposal to amend the *Lismore Local Environmental Plan 2012* (**LLEP)** to enable mixed use development of land referred to as 1055 Bruxner Highway, Goonellabah (**the site**) comprising residential, employment and public open space lands.

This report has been prepared for the noise impacts from Bruxner Highway on the proposed residential lots, which runs along the northern boundary of the proposed development. In addition, this report addresses the noise impacts of the proposed employment lots to the proposed and existing surrounding lots.

The NSW Road Noise Policy specifies criteria for assessment of traffic noise impact on developments near existing, new, re-developed or modified roads. These criteria are applied to façades of future dwellings, and is as follows, ≤60dB(A) $L_{eq,15hr}$ during daytime; and ≤55 dB(A) $L_{eq,9hr}$ during night-time.

Compliance with the NSW Road Noise Policy criterion has been achieved for all of the proposed residential lots in the development through the addition of a noise barrier fence along the northern boundary of the proposed development. The height and alignment of the noise barrier fence has been optimised to meet the compliance and is presented in Figure 5.1. Summary of the results is presented in Table 3.7.

The results of the operational noise propagation modelling indicate that there is a potential for noise impacts on the nearest noise sensitive land uses from the operation of the proposed industrial lots. The nearest noise sensitive receivers include the existing residential and commercial buildings and proposed residential lots of the development.

The indicative development layout provides sufficient setback distance between the proposed industrial and residential lots. Within the proposed setback distance it includes mixed use and public recreation lots, which provides a transitional section to reduce the industrial noise impact on the proposed residential lots.

However, existing residential properties are located close to the southern boundary of the proposed development. As such, noise mitigation measures will be required along this boundary of the development. Summary of the results is presented in Tables 4.11, 4.12, 4.13 and 4.14.

The operational noise propagation model was carried out considering two scenarios for the proposed development. The scenarios are as follows:

- Scenario 1 – (General Industrial) includes noise sources of low and high impact associated with an industrial area (warehouse and metal fabrication operations). As part of the scenario the southern row of plots of Lot 19 were considered low impact noise sources (typical warehouse operation). This is presented in Figure 5.2.

- Scenario 2 – (High Impact) considers the worst-case scenario with all proposed industrial lots operating high noise producing activities concurrently (typical sheet metal fabrication).

Operational acoustic compliance will be met along the southern boundary of the proposed development if **one** of the following noise mitigation measures is implemented:

- The southern row of allotments of Lot 19 within the proposed development, as presented in Figure 5.2 is limited to low noise impact industrial uses. Low noise impacts include, but not limited to warehouse operations (order fulfilments), commercial uses for public use and storage facilities. OR

- A noise barrier fence must be constructed along south-western boundary of the proposed development. The height and alignment of the noise barrier fence has been optimised to meet the compliance and is presented in Figures 5.3.

All high impact noise activities within the proposed industrial lots should be conducted during day-time hours (7:00am to 6:00pm).

Provided the recommended traffic noise and operational control measures are implemented at the establishment of the proposed mixed-used development at 1055 Bruxner Highway in Goonellabah, the road traffic noise from Bruxner Highway and the operational noise from the proposed industrial lots will not impose any further constraints on the development.

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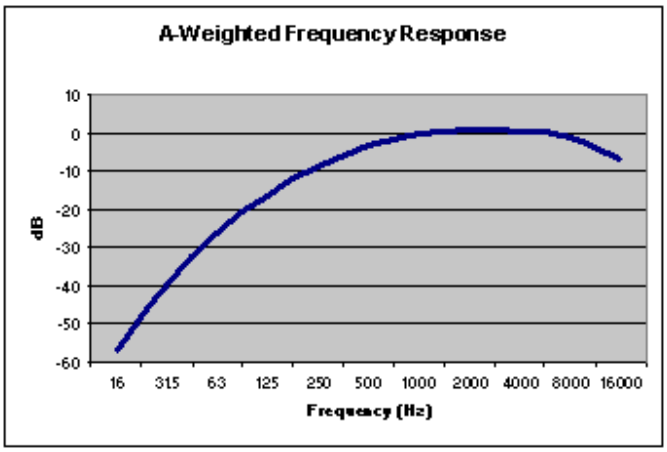
Acoustics Glossary

A-weighting

The A-weighting filter suppresses low frequency sounds and some of the higher frequency sounds to which the human ear is less sensitive. It is a correction to sound pressure levels to mimic the response of the human ear at low sound pressure levels. The A-weighted sound pressure level correlates well with the perceived loudness at low sound levels. The A-weighted sound pressure level is used extensively for general purpose noise measurements.



AADT

Annual average daily traffic. The total traffic flow over a 24-hour period along a specific segment of road.

Broadband sound

Sound distributed across the whole audible frequency range.

dB(A)

The A-weighted sound pressure level.

Façade adjusted

The noise level at 1m from a building façade is calculated by adding 2.5dB to the free field noise level to account for sound reflected from the building façade. The external noise levels at the buildings façades are "façade-adjusted".

Fast time-weighting

The Fast ("F") time-weighting is defined in AS 1259.1-1990. Instruments with F time weighting use a time constant of 125 milliseconds in their exponential averaging circuit.

Free field

Noise level without any reflected sound from buildings or other hard, reflective surfaces (except for the ground plane).

Hz (Hertz)

Hertz is the standard measure of the frequency of oscillations in a wave motion. The frequency is most often measured in cycles per second (cps) or Hertz (Hz). Frequency of 1 Hz is one cycle per second.

Impulsive noise and impulsiveness adjustment

Noise having a high peak of short duration or a sequence of such peaks. Impulsive noise is present if the difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2dB. Impulsiveness adjustment (penalty) of up to 5dB should be applied to the component noise level.

$L_{Aeq,T}$

"Average-energy" sound level used in situations where sound varies over time. $L_{Aeq,T}$ is the A-weighted sound pressure level that has the same energy as the fluctuating sound over the time period T sec.

$L_{A01,T}$

Measure of the maximum sound level. $L_{A01,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 1% of the measurement time T.

$L_{A10,T}$	$L_{A10,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 10% of the measurement time T. Used as a traffic noise descriptor in Queensland.
$L_{A10,18hr}$	The arithmetic average of the 18 individual $L_{A10,1hr}$ values between 6:00am and 12:00am (midnight). It is a derived descriptor which is used as a main traffic noise descriptor in the Calculation of Road Traffic Noise (CoRTN) procedure developed by the UK Department of Environment, Welsh Office, HMSO, 1988.
$L_{A90,T}$	Background sound level. $L_{A90,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 90% of the measurement time T.
Noise	Unwanted sound.
Octave bands and 1/3 octave bands	A range of frequencies whose upper frequency limit is twice that of its lower frequency limit. In acoustics, the audible spectrum (20Hz to 20kHz) is divided into 10 parts (octaves) with centre frequencies of 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz. For more detailed frequency analysis, octave bands are further divided into more discrete bands. For examples, 1/3 octaves bands are where each octave band is divided into three parts. IEC 61260:1995, *Electroacoustics — Octave-band and fractional-octave band filters*
Rating background level (RBL)	The overall single-figure background level representing each assessment period (e.g. standard hours, non-standard hours). The RBL is the background noise level for each work period using the tenth percentile method of measured $L_{A90,15\text{-minute}}$.
Sound power	The sound energy radiated per unit time by a sound source in all directions, measured in Watts (W).
Sound Power Level, L_w (SWL)	The sound power level in decibels (dB) is 10 times the base 10 logarithm of the ratio of the sound power in W to the reference sound power of 1×10^{-12} W (hearing threshold).
Sound pressure	The difference between the pressure caused by a sound wave and the ambient pressure of the medium the sound wave is passing through. Measured in Pascals (Pa).
Sound Pressure Level, L_p (SPL)	The sound power level in decibels (dB) is 20 times the base 10 logarithm of the ratio of the sound pressure in Pa to the reference sound pressure of 2×10^{-5} Pa (hearing threshold).
Tonal noise, tonality, and tonality adjustment	Tonal noise is characterised by one or more distinct frequency components (“tones”) that emerge audibly from the total sound. In accordance with the *NSW EPA Noise Policy for Industry* (2017), tonal noise is assessed with one-third octave band analysis using the “objective method for assessing the audibility of tones in noise – simplified method” (ISO 1996.2:2007 – Annex D). Tonal noise is penalised by the addition of up to 5dB to the component noise level.
Weighted Sound Reduction Index (R_w)	A single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies.

1. Introduction

1.1 Project Background

This Noise Impact Assessment (Road Traffic and Operational Noise Impact Assessment) report has been prepared by ATP Consulting to accompany a Request for Planning Proposal to amend the *Lismore Local Environmental Plan 2012* (**LLEP)** to enable mixed use development of land referred to as 1055 Bruxner Highway, Goonellabah (**the site**) comprising residential, employment and public open space lands.

This report has been prepared for the noise impacts from Bruxner Highway on the proposed residential lots, which runs along the northern boundary of the proposed development. In addition, this report addresses the noise impacts of the proposed employment lots to the proposed and existing surrounding lots.

1.2 Study Objectives

Study objectives are as follows:

- Site-specific noise measurements using automated noise logger to obtain data on the existing traffic and background noise levels over a typical seven-day period.
- Consideration of the relevant performance outcomes and traffic noise criteria applicable to the proposed development.
- Development of a 3D models (using SoundPLAN software) of the proposed development and the immediate surroundings for each Noise Impact Assessment (Operational and Traffic Noise Impacts).
    - The Traffic Noise Impact Assessment will take into consideration the existing and future (within a 10-year planning horizon) traffic on Bruxner Highway.
    - 3D noise propagation modelling, considering typical noise emissions associated with operation of a typical industrial area to determine the potential noise impact on the nearest noise sensitive places.
- Each Noise Impact Assessment will be compared against the relevant noise criteria.
    - Assessment of traffic noise levels ($L_{10,18hr}$) from Bruxner Highway, within a 10-year planning horizon (2035), considering the traffic noise impact on the facades of the future dwellings.
    - Assessment of the operational noise levels against the relevant noise criteria from the NSW *Noise Policy for Industry*.
- Recommendation of noise mitigation measures to prevent noise impacts within and the surrounding of the proposed mixed-use development.

1.3 Site Description

The proposed subdivision site is located at 1055 Bruxner Highway in Lismore, and it is described as Lot 1 on DP957677 and Lot 42 on DP868366, covering a total area of 375,123 m^2, within the Lismore City Council (LCC) local government area.

The location of the proposed development is presented in Figure 1.1.

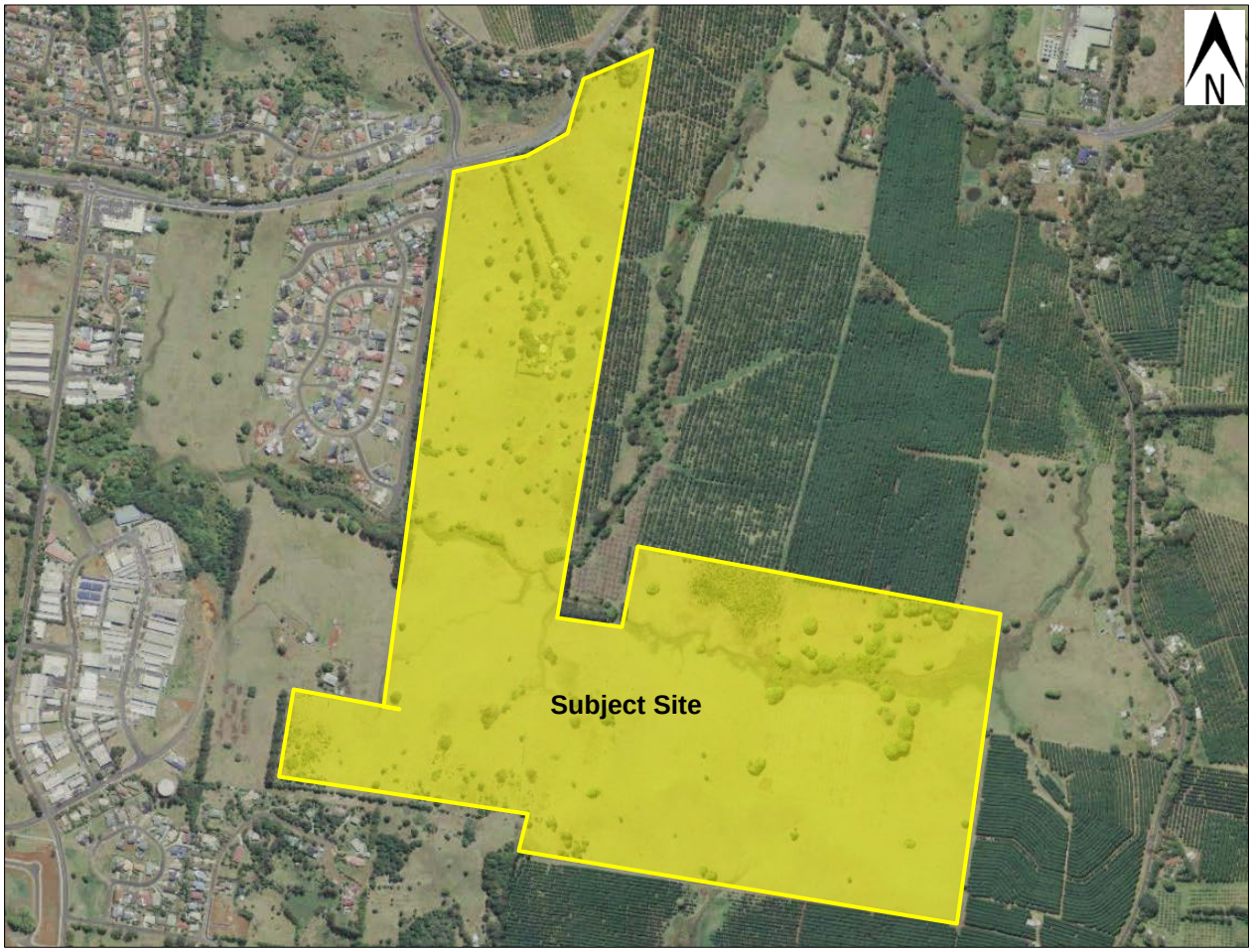


Figure 1.1 Site Location

1.4 Proposed Subdivision/Development

The proposed subdivision comprises of 13 residential, 11 Industrial, 3 business allotments and a local centre.

The indicative layout plan of the proposed subdivision/development is presented in Appendix A.

2. Existing Noise Amenity

2.1 Site Specific Noise Measurements

Site specific noise measurements were carried out at 1055 Bruxner Highway in Lismore to obtain information about the existing traffic and background noise levels.

The noise measurement methodology is summarised in Table 2.1.

Table 2.1 Noise Measurements

Relevant Legislation, Standards and Guidelines	The noise measurements were carried out in accordance with: • Australian Standard AS1055-2018 (*Acoustics – Description and measurement of environmental noise*); and • Australian Standard AS2702-1984 (*Acoustics – Methods for measurement of road traffic noise*).
Measurement Location	The traffic and background noise monitoring locations were carried out at 1055 Bruxner Highway. The traffic noise monitoring was conducted at a location that allowed for clear exposure to traffic noise from Bruxner Highway, as presented in Figure 2.1. The background noise monitoring was conducted at a location that was unaffected from traffic noise from Bruxner Highway, as presented in Figure 2.1. Photos showing the noise measurement locations are presented in Appendix B.
Measurement Period	Continuous noise monitoring was carried out 24 hours a day from 24 August to 6 September 2022.
Measurement Equipment	The following noise measurement equipment was used: • Environmental noise logger – SVAN 977a (Serial No. #92109); • Environmental noise logger – ARL EL-315 (Serial No. #34615224); and • Calibration – RION NC-74 Sound Level Calibrator (Serial No. #34615224). The noise measurement instruments conform to Australian Standard AS IEC61672.1-2004. Calibration was performed during set up and download of the data from the noise logger. The calibration drift was <0.1 dB(A).
Meteorological Conditions	The weather conditions during the monitoring period were fine with no rain or strong winds.[1] Full meteorological data for the monitoring period is presented in Appendix C.

[1] Daily weather observation data sourced from www.bom.gov.au for Sunshine Coast Airport weather station (ID #040861).

Analysis of Data	The noise measurement data was analysed to determine the following traffic and operational noise descriptors: **Traffic Noise Impact Assessment:** • **$L_{10,18hr}$:** L_{10} is the level of noise exceeded for 10% of any time period; $L_{10,18hr}$ is the typical traffic noise descriptor, and is the arithmetic average of 18 hourly $L_{10,1hr}$ levels over consecutive hours between 6am and 12am. **Operational Noise Impact Assessment:** • **$L_{A90,T}$**: Background noise level during daytime (7am to 6pm), evening (6pm to 10pm) and night-time (10pm to 7am); and • **RBL:** Rating Background Level during daytime (7am to 6pm), evening (6pm to 10pm) and night-time (10pm to 7am). The RBL was calculated from the $L_{A90,15min}$ noise levels using the procedure described in the NSW *Noise Policy for Industry*. The RBL noise levels are used to determine the Background Creep noise criteria as per Section 4 of this report.

Figure 2.1 Noise Measurement Locations

2.2 Measurement Results

The results of the unattended noise measurements, relevant for the **traffic noise** impact assessment, at 1055 Bruxner Highway in Goonellabah from 24 August to 5 September 2022 are presented in Table 2.2 and in Appendix D.

Table 2.2 Traffic Noise Measurement Results

Date	Traffic noise levels		Background noise levels	
	$L_{10,18hr}$ (6:00am-12:00am)	$L_{10,1hr\ max}$ (6:00am-12:00am)	$L_{90,18hr}$ (6:00am-12:00am)	$L_{90,8hr}$ (10:00pm-6:00am)
24 August 2022 (Wed)	—	—	—	29.9
25 August 2022 (Thu)	71.1	73.5	55.9	32.6
26 August 2022 (Fri)	71.3	73.6	56.0	32.4
27 August 2022 (Sat)	71.0	73.1	53.0	28.3
28 August 2022 (Sun)	69.5	71.8	49.7	30.1
29 August 2022 (Mon)	70.9	74.1	55.3	30.2
30 August 2022 (Tue)	70.9	73.4	55.6	36.0
31 August 2022 (Wed)	70.7	74.0	56.5	31.1
1 September 2022 (Thu)	71.1	73.1	55.9	31.8
2 September 2022 (Fri)	72.8	74.1	58.8	42.8
3 September 2022 (Sat)	72.7	75.9	57.4	46.0
4 September 2022 (Sun)	70.1	73.8	54.8	35.1
5 September 2022 (Mon)	70.3	73.2	54.2	32.4
Arithmetic average (Weekdays only)	**59.9**	**64.5**	**43.3**	**39.1**

Data for periods of inclement weather were disregarded in determination of average noise levels.

The results of the unattended noise measurements, relevant for the **operational noise** impact assessment, at 1055 Bruxner Highway in Goonellabah from 30 August to 5 September 2022 are presented in Table 2.3 and in Appendix D.

Table 2.3 Measured background noise levels

Date	Background noise levels L_{90} dB(A)			Assessment Background Levels (ABL) dB(A)		
	$L_{90,11hr,Day}$ (7am–6pm)	$L_{90,4hr,Evening}$ (6pm–10pm)	$L_{90,9hr,Night}$ (10pm–7am)	$L_{90,11hr,Day}$ (7am–6pm)	$L_{90,4hr,Evening}$ (6pm–10pm)	$L_{90,9hr,Night}$ (10pm–7am)
30 Aug 2022 (Tue)	—	32	31	—	27	28
31 Aug 2022 (Wed)	37	33	28	36	30	24
1 Sep 2022 (Thu)	38	33	29	35	28	26
2 Sep 2022 (Fri)	39	34	28	33	28	24
3 Sep 2022 (Sat)	41	35	31	39	30	27
4 Sep 2022 (Sun)	38	31	28	36	28	23
5 Sep 2022 (Mon)	38	33	27	35	29	24
Arithmetic Average	**45**	**42**	**40**	—	—	—
Rated Background Levels (RBLs)				**35**	**28**	**24**

Data for periods of inclement weather were disregarded in determination of average noise levels.

3. Traffic Noise Impact Assessment

3.1 Traffic Noise Criteria

3.1.1 Outdoor Noise Criteria

The NSW Road Noise Policy specifies criteria for assessment of traffic noise impact on developments near existing, new, re-developed or modified roads.

The proposed development is a new noise-sensitive development in the vicinity of an existing road where the road is not subject to re-development. Hence, the target noise levels from Table 8 of the policy are applicable.

The applicable target noise levels are presented in Table 3.1.

Table 3.1 Target Noise Levels for existing roads

Time of Day	Target Noise Level (External façade corrected)[2]
Day 7:00am – 10:00pm	$L_{eq(15\ hours)}$ = 60 dB(A)*
Night 10:00pm – 7:00am	$L_{eq(9\ hours)}$ = 55 dB(A)*

**Façade adjusted*

3.1.2 Design Sound Levels for Different Occupancy Activities

Internal criteria as specified in AS/NZS2107:2000 is applicable if the external target noise levels are exceeded. The recommended design sound levels (L_{Aeq} dB(A)) for residential uses are presented in Table 3.2.

Table 3.2 Internal Design Sound Levels

Type of occupancy	Satisfactory L_{Aeq}	Maximum L_{Aeq}
Living areas	35 dB(A)	45 dB(A)
Sleeping areas	30 dB(A)	40 dB(A)

The building should be constructed with material that have sufficient sound attenuation properties to prevent traffic noise ingress. The sound attenuation properties are expressed in terms of weighted sound reduction index (R_w) for the construction components (i.e. external walls; roof/ceilings; windows/doors) of the proposed dwellings. The R_w are determined based on calculations in accordance with AS3671-1989, to allow specific acoustic design specifications for each construction component (external walls; roof/ceiling and windows/doors).

3.2 Traffic Noise Calculation Methodology

Traffic noise levels at the proposed development, within a planning horizon of 10 years (year 2033), were calculated using SoundPLAN noise propagation modelling software. SoundPLAN calculates traffic noise as per the procedure specified in the UK Department of Transport Welsh Office *Method of Calculation of Road Traffic Noise* (CoRTN). CoRTN is an accepted traffic noise calculation procedure applied widely in Australia.

The '*Calculation of Road Traffic Noise'* (CoRTN'88) calculates traffic noise in terms of $L_{A10(1\text{-hour})}$ and $L_{A10(18\text{-hour})}$ descriptors. NSW RNP expresses the noise criteria in terms of $L_{Aeq(15\text{-hour})}$ and $L_{Aeq(9\text{-hour})}$, thus adjustments have to be made to the calculated traffic noise levels.

In accordance with the policy, to convert the traffic noise levels calculated in terms of $L_{A10(18\text{-hour})}$ to $L_{Aeq(15\text{-hour})}$ and $L_{Aeq(9\text{-hour})}$ it is necessary to apply an appropriate conversion factor. Based on site- specific noise measurements the following conversion factors are presented in Table 3.3.

Table 3.3 Traffic Conversion Factors

Noise Descriptor	Traffic Conversion Factors
$L_{A10(15\text{-hour})}$	$L_{A10(18\text{-hour})}$ - 1 dB(A)[3]
$L_{Aeq(9\text{-hour})}$	$L_{A10(18\text{-hour})}$ - 10 dB(A)[4]

3.2.1 Modelling Assumptions

The assumptions and data used in development of the traffic noise propagation model are presented in Table 3.4.

Table 3.4 Data and Assumptions – Traffic Noise Model

Terrain	• Spatial Services – NSW Department of Finance (LiDAR) 1 metre data was used to determine the existing ground surface levels of the proposed development. • Ground surface absorption factor of 0 was applied to all paved surfaces and 1 for all grassed areas.
Development Layout	• The proposed development layout, as per the site plan prepared by Urbis (*Oliver Avenue, Lismore Goonellabah – Illustrative Concept Plan*, Job No.: #P0040564, dated 10 August 2022) was considered in the SoundPLAN model.
Road Traffic	• Traffic volumes for Bruxner Highway were sourced from the Lismore City Council. Traffic count report was completed 260m west of Oliver Avenue (Co. -28.8122, 153.3514) for the road section norther of the proposed development on 3 August 2022. The traffic count report provided by Lismore City Council is presented in Appendix E. The road traffic data provided is as follows: o 2022 AADT of 21,842 vehicles in both directions; o 6.62% heavy vehicles in both directions; and o Mean speed data (kph) is 60.3 for both directions. • Future traffic volumes were calculated based on 2.5% growth per annum. • Bruxner Highway is one lane in either direction as it passes the development site. • The pavement surface on the Bruxner Highway is dense graded asphalt, which requires no correction factor.

	• The CoRTN procedure requires traffic volume data input for 18 hours. Traffic volume for 18-hour period (6:00am to midnight) was considered as per the hourly traffic data provided by the Lismore City Council.
Calculation Receivers	• 1m grid spacing was used for calculation of noise contour maps. • Free field and facade-adjusted noise contour maps were generated: o Free field: No adjustment for facade reflection. Represents the traffic noise levels that are applicable to private open spaces. o Facade-adjusted: +2.5dB(A) facade adjustment has been applied to the calculated noise levels to account for noise reflection from building facades. Represents the traffic noise levels that are applicable to building facades. • Traffic noise levels were calculated at three different heights: o 1.5m above ground level (Ground floor private open spaces) o 1.8m above ground level (Ground floor building facades) o 4.6m above ground level (First floor building facades)
Noise Mitigation Measures	• The recommended noise control measures are discussed in Section 6 of this report.

3.2.2 Road Traffic Volumes

Traffic flow data, as considered in the SoundPLAN model, is presented in Table 3.5.

Table 3.5 Traffic Flow Data

Road	Traffic volumes		Heavy vehicles (%)	Average Speed (kph)
	2022 AADT	2035 AADT (10-year planning horizon)		
Bruxner Highway (East direction)	21,842	30,109	8.80%	60.0

3.2.3 Road Traffic Noise Model Validation

The noise data collected during the monitoring period (as presented in Table 2.2) was used to validate the accuracy of the SoundPLAN model prior to undertaking calculations of the future road traffic noise levels within a 10-year planning horizon.

The results of the SoundPLAN model validation are presented in Table 3.6 and in Appendix F.

Table 3.6 SoundPLAN Validation Results

Receiver	Traffic noise level $L_{10,18hr}$ dB(A)*		Difference dB	Validation factor
	Measured	Calculated		
Noise logger	59.9	62.7	+2.8	-0.8

**Free field*

The free field calculated road traffic noise level is outside of the acceptable tolerance of ±2 dB(A), thus an addition of a validation factor (-0.8 dB(A)) to the road traffic noise levels will be included within the planning horizon (year 2035). Excerpt from the 3D SoundPLAN noise propagation model is presented in Figure 3.1.

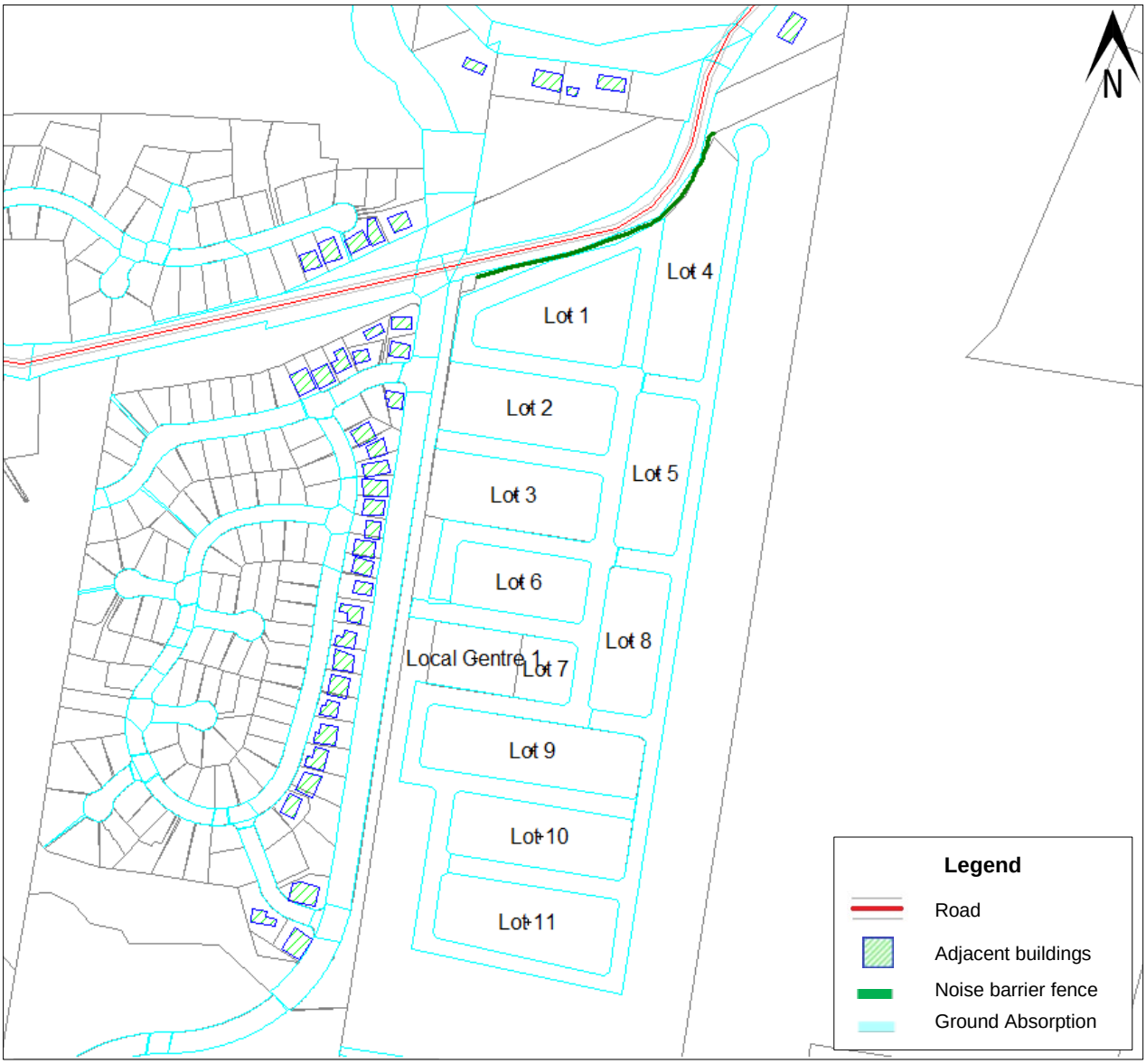


Figure 3.1 3D Traffic Noise Model – SoundPLAN Excerpt

3.3 Calculated Traffic Noise Levels

The road traffic noise levels were determined at the ground and upper floors of the future dwellings and the private open spaces on the ground floors of the future dwellings, considering the noise control measures as per Section 6 of this report.

The calculated noise levels were then assessed against the traffic noise criteria (≤60dB(A) $L_{eq,15hr}$ facade adjusted for building facades during daytime; and ≤55 dB(A) $L_{eq,9hr}$ during night-time.

The traffic noise levels are represented as noise contours and are also tabulated relative to compliance with the traffic noise criteria.

Summary of the results is presented in Table 3.7.

Table 3.7 Traffic Noise Calculation Results (Year 2035)

Lot No.	Daytime (15hr)		Night-time (9hr)	
	$L_{eq-15hr}$ (Façade-adjusted)	Compliance with ≤60dB(A) criterion	L_{eq-9hr} (Façade-adjusted)	Compliance with ≤55dB(A) criterion
Lot 1	60	Yes	51	Yes
Lot 2	55	Yes	48	Yes
Lot 3	51	Yes	48	Yes
Lot 4	60	Yes	51	Yes
Lot 5	51	Yes	48	Yes
Lot 6	49	Yes	48	Yes
Lot 7	49	Yes	48	Yes
Lot 8	49	Yes	48	Yes
Lot 9	49	Yes	48	Yes
Lot 10	48	Yes	48	Yes
Lot 11	48	Yes	48	Yes

Noise contours showing the propagation of traffic noise across the development site are presented in Appendix G.

4. Operational Noise Assessment

4.1 Nearest Noise Sensitive Places

The nearest noise sensitive land uses to the subject site are listed in Table 4.1.

Table 4.1 Nearest noise sensitive places

Street address	Use
52 Alphadale Road	Residential
63 Alphadale Road	Residential
93 Alphadale Road	Residential
94 Alphadale Road	Residential
98 Alphadale Road	Residential
119 Alphadale Road	Residential
179 Alphadale Road	Residential
30 Blue Hills Avenue	Residential
23 Napier Street	Residential
31 Napier Street	Residential
37 Napier Street	Residential
41 Napier Street	Residential
43 Napier Street	Residential
45 Napier Street	Residential
47 Napier Street	Residential
239 Oliver Avenue	Commercial
243 Oliver Avenue	Commercial
7 Kallee Place	Residential
8 Kallee Place	Residential

The nearest noise sensitive places are identified in Figure 4.1, overlaid over the zoning map from the *Lismore Local Environmental Plan 2012*.

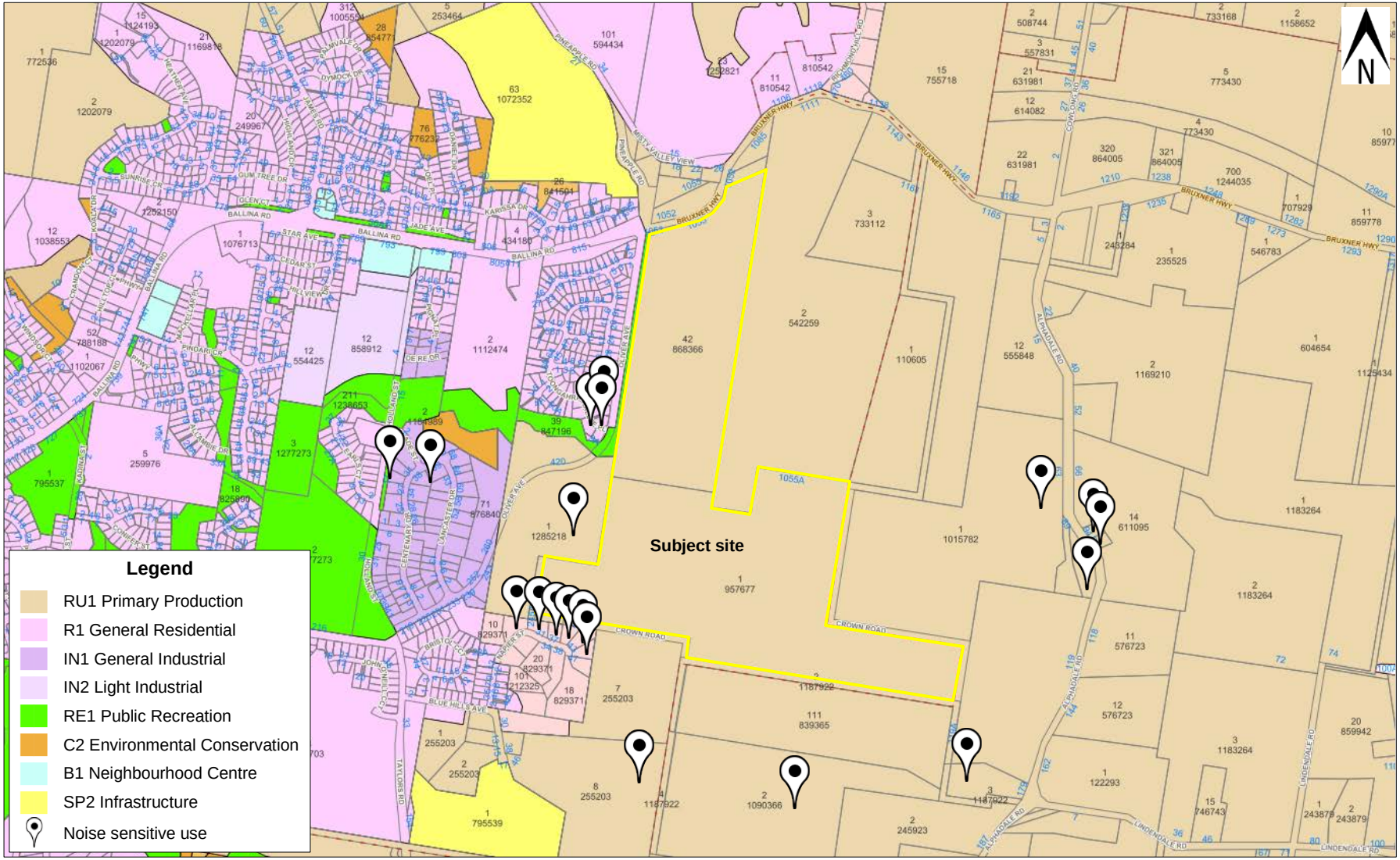


Figure 4.1 Nearest noise sensitive places (Lismore City Council – LEP 2012)

4.2 Operational Noise Criteria

4.2.1 Noise Policy for Industry

The NSW EPA *Noise Policy for Industry* identifies three criteria for assessing the impact of noise from a premise:

- Intrusiveness noise levels: – noise limits set relative to existing background levels;
- Amenity noise levels: – absolute noise limits set according to surrounding land uses; and
- Maximum noise levels: – maximum noise levels and number of events during night-time.

The project noise trigger level is the lower value of the project intrusiveness noise level and project amenity noise level.

4.2.2 Intrusiveness Noise Levels

Noise from the premises may generally be considered acceptable if the equivalent continuous A-weighted level of noise from the premises (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the RBL measured in the absence of noise from premises by more than 5 dB, as presented in Table 4.2.

Table 4.2 Intrusiveness noise levels

Period	**Intrusiveness noise level $L_{Aeq,15min}$, dB(A)**	
Day	RBL + 5dB(A)	**40** (35 + 5)
Evening	RBL + 5dB(A)	**33** (28 + 5)
Night	RBL + 5dB(A)	**29** (24 + 5)

Intrusiveness noise levels are only applicable to residential receivers, in accordance with Section 2.1 of the *Noise Policy for Industry*.

> *"Intrusive noise levels are only applied to residential receivers (residences). For other receiver types identified in Table 2.2, only the amenity levels apply."*

The intrusiveness noise levels are only applicable to the residential receivers. The intrusiveness noise levels are not applicable to the nearby commercial uses at 239 and 243 Oliver Avenue.

4.2.3 Amenity Noise Levels

The *Noise Policy for Industry* defines two planning noise levels:

- *Recommended amenity noise level:* – the objective for total industrial noise at a receiver location.
- *Project amenity noise level:* – the objective for noise from a single industrial development at a receiver location. To ensure that industrial noise levels (existing plus new) remain within the *recommended amenity noise levels* for an area, a *project amenity noise level* applies for each new source of industrial noise as follows:

  Project amenity noise level for industrial developments = *Recommended amenity noise level* minus 5dB(A)

The *recommended amenity noise level* is set according to the surrounding land uses (receiver category) and the existing background noise levels. The receiver categories and typical existing background noise levels are presented in Table 4.3.

Table 4.3 Residential receiver categories

Receiver category	Typical planning zoning – standard instrument	Typical existing background noise levels	Description
Rural residential	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime RBL <40dB(A) Evening RBL <35dB(A) Night RBL <30dB(A)	**Rural** – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.
Suburban residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime RBL<45dB(A) Evening RBL<40dB(A) Night RBL <35dB(A)	**Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime RBL> 45dB(A) Evening RBL> 40dB(A) Night RBL >35dB(A)	**Urban** – an area with an acoustical environment that: • is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources • has through-traffic with characteristically heavy and continuous traffic flows during peak periods. • is near commercial districts or industrial districts. • has any combination of the above.

Note: *This table is reproduced from Table 2.3 of the Noise Policy for Industry*

The Land zoning map from the *Lismore Local Environmental Plan 2012* indicates that the subject site is zoned "B6 Enterprise Corridor". The nearest residential zone is the "R2 Low Density Residential" zone located 15m to the south-west of the site.

Considering the above, the recommended amenity noise levels to be used in this assessment are presented in Table 4.4.

Table 4.4 Recommended amenity noise levels

Receiver	Receiver category based on zoning and existing RBLs	Time of day	Recommended amenity noise level $L_{Aeq,adj,T}$, dB(A)
Commercial	–	Any time	65
Residential receivers in Low-density Residential zones	Urban	Day	60
		Evening	50
		Night	45

The resulting *project amenity noise levels* are presented in Table 4.5.

Table 4.5 Project amenity noise levels

Receiver	Receiver category based on zoning and existing RBLs	Time of day	Project amenity noise level $L_{Aeq,adj,T}$, dB(A)[2]	Project amenity noise level $L_{Aeq,adj,15min}$, dB(A)[3]
Commercial	–	When in use	**60** (65 – 5)	**63** (65 – 5 + 3)
Residential receivers In Low-density Residential zones	Urban	Day	**55** (60 – 5)	**58** (60 – 5 + 3)
		Evening	**45** (50 – 5)	**48** (50 – 5 + 3)
		Night	**40** (45 – 5)	**42** (45 – 5 + 3)

[2] In accordance with Section 2.4 of the *Noise Policy for Industry*, the project amenity noise level is 5dB(A) lesser than the recommended amenity noise levels (from Table 2.2 of the *Policy*). The reason for the minus 5dB(A) adjustment is to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels.
[3] In accordance with Fact Sheet E of the *Noise Policy for Industry*, +3dB(A) adjustment is needed to convert from a period level (T = 11hr day, 4hr evening, 9hr night) to a 15-minute level (T = 15min).

4.2.4 Project Trigger Level

The project noise trigger levels (lower value of the project intrusiveness noise level and project amenity noise level) are presented in Table 4.6.

Table 4.6 Project trigger level

Nearest noise sensitive place	Use	Noise criteria, dB(A)			
		Time of day	Intrusiveness noise level $L_{Aeq,15min}$	Project amenity noise level $L_{Aeq,15min}$	Project trigger level $L_{Aeq,15min}$
52 Alphadale Road	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
63 Alphadale Road	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
93 Alphadale Road	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
94 Alphadale Road	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
98 Alphadale Road	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
119 Alphadale Road	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
179 Alphadale Road	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
30 Blue Hills Avenue	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
23 Napier Street	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
31 Napier Street	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
37 Napier Street	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
41 Napier Street		Day	55	58	**55**

	Residential low-set house	Evening	47	48	**47**
		Night	42	42	**42**
43 Napier Street	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
45 Napier Street	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
47 Napier Street	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
239 Oliver Avenue	Commercial	When in Use	N/A	60	63
243 Oliver Avenue	Commercial	When in Use	N/A	60	63
245 Oliver Avenue	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
7 Kallee Place	Residential low-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
8 Kallee Place	Residential High-set house	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**
Proposed Residential Lots	Residential houses	Day	55	58	**55**
		Evening	47	48	**47**
		Night	42	42	**42**

4.2.5 Maximum Noise Level Events During Night-time

Extract from the *Noise Policy for Industry* is as follows:

> *''The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.*
>
> *Where the subject development/premises night-time noise levels at a residential location exceed:*
>
> - $L_{Aeq,15min}$ *40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
> - L_{AFmax} *52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*
>
> *a detailed maximum noise level event assessment should be undertaken.*

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period''.

There is considerable published research into sleep disturbance caused by short duration or intermittent noise events. For example, sleep disturbance is addressed in the *Night Noise Guidelines for Europe* (World Health Organization, 2009). The *Night Noise Guidelines for Europe* states that the likelihood of awakening is related to the maximum instantaneous noise levels (L_{Amax}), ambient noise levels and number of events during night-time. As a rule, in planning for short-term or transient noise events, for good sleep over eight hours, the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45dB(A) L_{max} more than 10-15 times per night. The corresponding external noise level, assuming partially closed windows, is 52dB(A) L_{max}, measured in the free field.

Considering the night-time RBL of 37 dB(A), the resulting noise limits are presented in Table 4.7.

Table 4.7 Maximum noise level criteria

Time of Day	Noise limit, $L_{Aeq,15min}$, dB(A)	Noise limit, L_{AFmax}, dB(A)
Night	Criteria 1: 40dB(A) Criteria 2: 33dB(A) (33 + 5) Criteria 1 is applicable	Criteria 1: 52dB(A) Criteria 2: 44dB(A) (29 + 15) Criteria 1 is applicable

Assessment of maximum noise levels is only applicable to residential receivers, in accordance with Section 2.5 of the *Noise Policy for Industry*.

4.3 Noise Propagation Modelling

4.3.1 Modelling Methodology

A 3D model of the development and surroundings was developed using SoundPLAN noise propagation software considering the location and sound power levels of the dominant noise sources at the development.

The calculations were carried out as per the procedures specified in the International Standard ISO 9613 (*Acoustics – Attenuation of sound during propagation outdoors*).

The calculation method for a single frequency is as follows:

$$L_S = [\ L_W + K_0\ ] - [\ A_{dI} + A_{div} + A_{gr} + A_{bar} + A_{atm} + d_{Lrefl} + d_{Lw}\ ]$$

Where:

L_S	Sound pressure for a single frequency
L_W	Sound power of source
K_0	Correction for propagation in limited spatial angle
A_{DI}	Mean directivity correction
A_{div}	Mean attenuation due to geometrical spreading
A_{gr}	Mean attenuation due to ground effect
A_{bar}	Mean attenuation due to screening
A_{atm}	Mean attenuation due to air absorption
d_{Lrefl}	Level increase due to reflections
d_{Lw}	Correction due to source operation time

The noise propagation losses are calculated as a combination of distance attenuation (geometrical spreading), screening, ground attenuation and other factors.

The assumptions and data used in development of the operational noise propagation model are presented in Table 4.8.

Table 4.8 Data and assumptions – Operational noise model

Terrain	• Six Maps 1 metre data was used to determine the elevation of the surrounding terrain. • Ground surface absorption factor of 0 was applied to all paved surfaces and 1 for all grassed areas.
Buildings	• Existing noise sensitive buildings were included in the noise propagation model. • The indicative development layout is presented in Appendix A.
Noise sources	• Scenario 1 (General Industrial) – Noise sources associated with low to high impact industrial zones. • Scenario 2 (High Impact) – Noise sources associated with high impact industrial zones. • Refer to Section 4.9 of this report for further details.
Receivers	• Receivers were attached to the façades of the noise sensitive buildings at a height of 1.5m above each floor level. • SoundPLAN adds +2.5dB(A) to the calculated noise levels when the receivers are attached to the buildings, thus the tabulated operational noise levels are façade adjusted. • 1m grid spacing was used for calculation of noise contour maps.
Noise mitigation measures	• The recommended noise control measures are discussed in Section 5 of this report.
Distance attenuation	• 3D model of the subject site and surroundings was developed using cadastral and survey data using SoundPLAN software. The source-receiver distances and geometrical spreading are automatically calculated in SoundPLAN to a high level of accuracy in accordance with the ISO9613 procedure. • Separation distances and distance attenuation values are presented in Appendix I.
Barrier attenuation / screening	• Screening by walls and roofs was considered in the model. The screening was calculated in SoundPLAN in accordance with the ISO9613 procedure. • Barrier attenuation / screening values are presented in Appendix I.
Ground attenuation	• Sound reflecting surfaces such as pavement are modelled with ground absorption coefficient of 0 (no absorption). Grassed and vegetated areas were modelled with ground absorption coefficient of 1 (100% absorption) in accordance with ISO9613. • Ground attenuation values are presented in Appendix I.

4.3.2 Noise Sources (Scenario 1 – General Industrial)

Details of the noise sources at the development with a potential to impact on the nearest noise sensitive places are presented in Table 4.9.

Table 4.9 Noise sources – Scenario 1 – (General Industrial)

Operational noise source	Location	Sound power level dB(A) (re 10^{-12}W)	Operational scenario	Tonality/ impulsiveness
Industrial Noise Source – Sheet Metal	All industrial lots (except southern plots on Lot 19).	Sound power of 55.7dB(A) (ATP library – Breakout noise through sheet metal)	Daytime (6:00am to 6:00pm) • 100% - Full operation (6:00 am to 9:00 am, 10:00 am to 1:00 pm and 2:00 pm to 4:00pm). • 45% - Moderate operation (9:00am to 10:00am and 1:00pm to 2:00pm) Evening (6:00pm to 10:00pm) • No activity Night (10:00pm to 7:00am) • 25% - Moderate operation (6:00 am to 7:00 am).	N/A
Industrial Noise Source – General Industrial	Southern plots on Lot 19	Sound power of 55.7dB(A) (ATP library – Breakout noise through general industrial)	Daytime (6:00am to 6:00pm) • 100% - Full operation (6:00 am to 9:00 am, 10:00 am to 1:00 pm and 2:00 pm to 4:00pm). • 45% - Moderate operation (9:00am to 10:00am and 1:00pm to 2:00pm) Evening (6:00pm to 10:00pm) • No activity Night (10:00pm to 7:00am) 25% - Moderate operation (6:00 am to 7:00 am).	N/A
Heavy Vehicle Movements	Along proposed industrial roads	Sound power of 59.6dB(A) as Lw/m (Line Source)	Daytime (6:00am to 6:00pm) • 100% - Full operation (6:00 am to 9:00 am, 10:00 am to 1:00 pm and 2:00 pm to 4:00pm). • 45% - Moderate operation (9:00am to 10:00am and 1:00pm to 2:00pm) Evening (6:00pm to 10:00pm) • No activity Night (10:00pm to 7:00am) 25% - Moderate operation (6:00 am to 7:00 am).	N/A

Excerpt from the SoundPLAN 3D noise propagation model is presented in Figure 4.2.

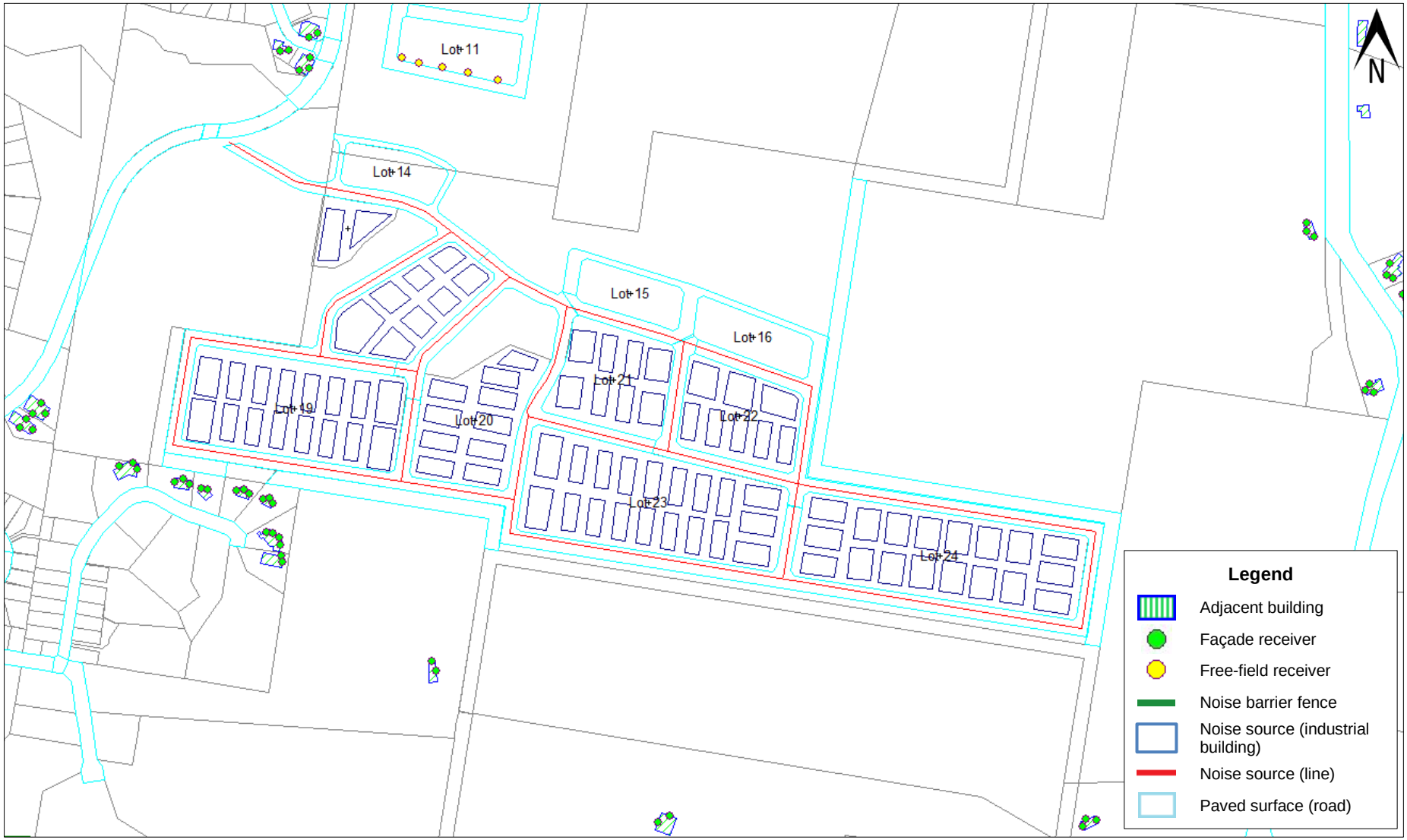


Figure 4.2 3D operational noise model – SoundPLAN excerpt – Scenario 1 – (General Industrial)

4.3.3 Operational Noise Calculation Results

The highest calculated noise levels at the nearest noise sensitive places (residential and commercial), relative to the project trigger levels, are presented in Table 4.10.

Table 4.10 Operational noise levels – Scenario 1 – (General Industrial)

Receiver name	Calculated noise levels			Complies with noise criteria?
	$L_{eq,adj,15min}$ day dB(A)	$L_{eq,adj,15min}$ evening dB(A)	$L_{eq,adj,15min}$ night dB(A)	
Project trigger levels: Residential	40	33	29	
63 Alphadale Road	30	—	24	Yes
93 Alphadale Road	26	—	19	Yes
94 Alphadale Road	27	—	20	Yes
98 Alphadale Road	24	—	18	Yes
119 Alphadale Road	33	—	27	Yes
179 Alphadale Road	26	—	20	Yes
30 Blue Hills Avenue	33	—	26	Yes
5 Kallee Place	34	—	28	Yes
7 Kallee Place	35	—	29	Yes
8 Kallee Place	35	—	29	Yes
23 Napier Street	31	—	24	Yes
31 Napier Street	36	—	28	Yes
37 Napier Street	35	—	27	Yes
41 Napier Street	35	—	28	Yes
43 Napier Street	35	—	28	Yes
45 Napier Street	30	—	23	Yes
47 Napier Street	28	—	21	Yes
Proposed Lot 11	34	—	28	Yes
Project trigger levels: *Commercial*	*60*	*60*	*60*	
239 Oliver Avenue	30	—	23	Yes
243 Oliver Avenue	30	—	23	Yes

The maximum noise levels associated with night-time operation (6:00am to 7:00am) at the proposed development during night-time are presented in Table 4.11.

Table 4.11 Calculated L_{max} noise levels – Scenario 1 – (General Industrial)

Receiver name	Calculated noise levels	Complies with noise criteria?
	L_{AFmax} night dB(A)	
Night time criteria (L_{AFmax} noise levels) Residential	52	
63 Alphadale Road	24	Yes
93 Alphadale Road	19	Yes
94 Alphadale Road	20	Yes
98 Alphadale Road	18	Yes
119 Alphadale Road	27	Yes
179 Alphadale Road	20	Yes
30 Blue Hills Avenue	26	Yes
5 Kallee Place	28	Yes
7 Kallee Place	29	Yes
8 Kallee Place	29	Yes
23 Napier Street	24	Yes
31 Napier Street	28	Yes
37 Napier Street	27	Yes
41 Napier Street	28	Yes
43 Napier Street	28	Yes
45 Napier Street	23	Yes
47 Napier Street	21	Yes
Proposed Lot 11	28	Yes

Tabulated SoundPLAN results and ISO9613 calculation details are presented in Appendix H.

SoundPLAN noise contour maps are presented in Appendix I.

4.3.4 Noise Sources (Scenario 2 – High Impact)

Details of the noise sources at the development with a potential to impact on the nearest noise sensitive places are presented in Table 4.12.

Table 4.12 Noise sources – Scenario 2 – (High Impact)

Operational noise source	Location	Sound power level dB(A) (re 10^{-12}W)	Operational scenario	Tonality/ impulsiveness
Industrial Noise Source – Sheet Metal	All industrial lots	Sound power of 55.7dB(A) (ATP library – Breakout noise through sheet metal)	Daytime (6:00am to 6:00pm) • 100% - Full operation (6:00 am to 9:00 am, 10:00 am to 1:00 pm and 2:00 pm to 4:00pm). • 45% - Moderate operation (9:00am to 10:00am and 1:00pm to 2:00pm) Evening (6:00pm to 10:00pm) • No activity Night (10:00pm to 7:00am) • 25% - Moderate operation (6:00 am to 7:00 am).	N/A
Heavy Vehicle Movements	Along proposed industrial roads	Sound power of 59.6dB(A) as Lw/m (Line Source)	Daytime (6:00am to 6:00pm) • 100% - Full operation (6:00 am to 9:00 am, 10:00 am to 1:00 pm and 2:00 pm to 4:00pm). • 45% - Moderate operation (9:00am to 10:00am and 1:00pm to 2:00pm) Evening (6:00pm to 10:00pm) • No activity Night (10:00pm to 7:00am) 25% - Moderate operation (6:00 am to 7:00 am).	N/A

Excerpt from the SoundPLAN 3D noise propagation model is presented in Figure 4.3.

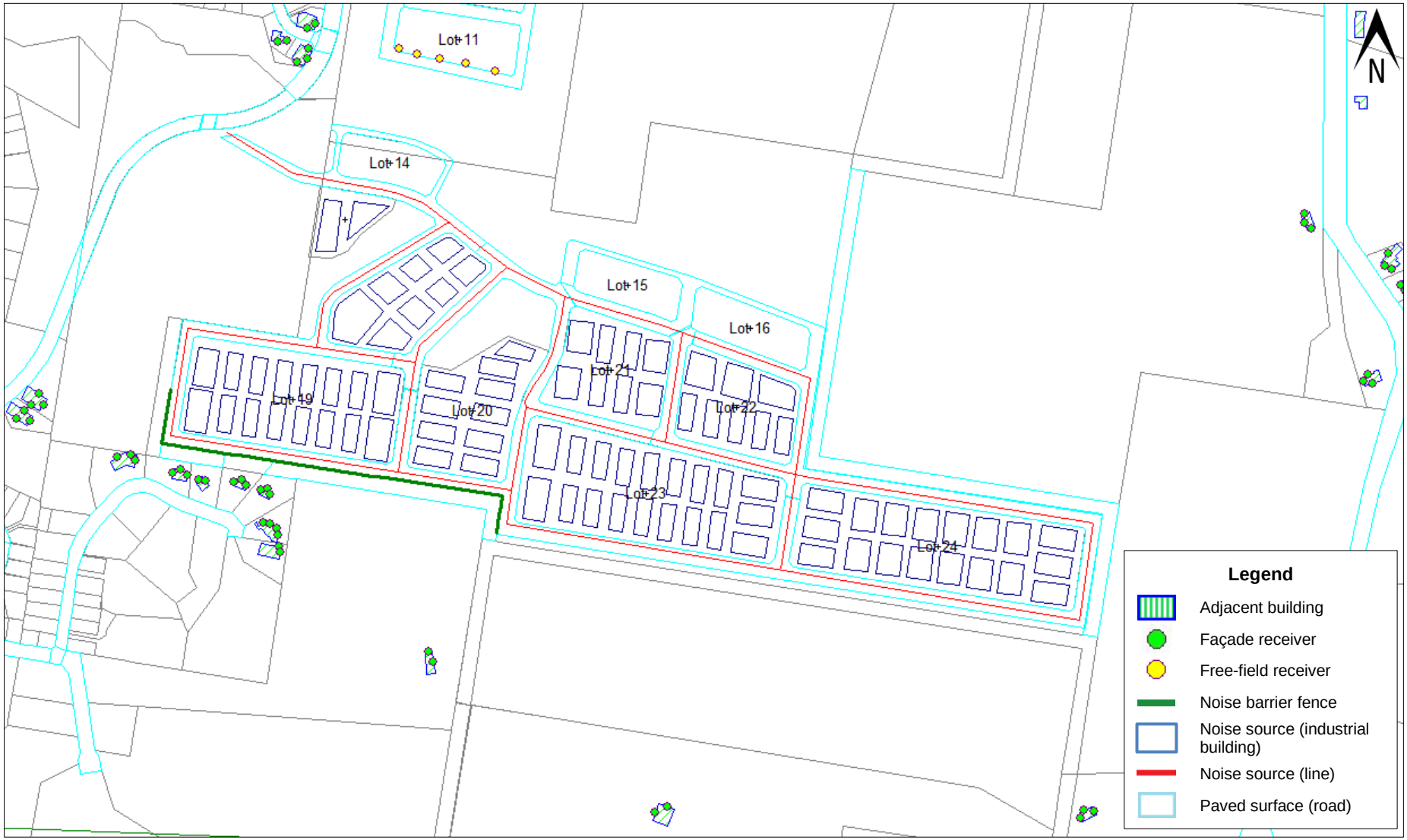


Figure 4.3 3D operational noise model – SoundPLAN excerpt – Scenario 2 – (High Impact)

4.3.5 Operational Noise Calculation Results

The highest calculated noise levels at the nearest noise sensitive places (residential and commercial), relative to the project trigger levels, are presented in Table 4.13.

Table 4.13 Operational noise levels – Scenario 2 – (High Impact)

Receiver name	Calculated noise levels			Complies with noise criteria?
	$L_{eq,adj,15min}$ day dB(A)	$L_{eq,adj,15min}$ evening dB(A)	$L_{eq,adj,15min}$ night dB(A)	
Project trigger levels: Residential	40	33	29	
63 Alphadale Road	30	—	24	Yes
93 Alphadale Road	26	—	19	Yes
94 Alphadale Road	27	—	21	Yes
98 Alphadale Road	24	—	18	Yes
119 Alphadale Road	33	—	27	Yes
179 Alphadale Road	26	—	20	Yes
30 Blue Hills Avenue	33	—	26	Yes
5 Kallee Place	34	—	29	Yes
7 Kallee Place	35	—	29	Yes
8 Kallee Place	35	—	29	Yes
23 Napier Street	31	—	24	Yes
31 Napier Street	34	—	27	Yes
37 Napier Street	33	—	27	Yes
41 Napier Street	35	—	28	Yes
43 Napier Street	35	—	29	Yes
45 Napier Street	31	—	24	Yes
47 Napier Street	28	—	22	Yes
Proposed Lot 11	34	—	28	Yes
Project trigger levels: *Commercial*	*60*	*60*	*60*	
239 Oliver Avenue	30	—	24	Yes
243 Oliver Avenue	31	—	24	Yes

The maximum noise levels associated with night-time operation (6:00am to 7:00am) at the proposed development during night-time are presented in Table 4.14.

Table 4.14 Calculated L_{max} noise levels – Scenario 2 – (High Impact)

Receiver name	Calculated noise levels	Complies with noise criteria?
	L_{AFmax} night dB(A)	
Night time criteria (L_{AFmax} noise levels) Residential	52	
63 Alphadale Road	24	Yes
93 Alphadale Road	19	Yes
94 Alphadale Road	21	Yes
98 Alphadale Road	18	Yes
119 Alphadale Road	27	Yes
179 Alphadale Road	20	Yes
30 Blue Hills Avenue	26	Yes
5 Kallee Place	29	Yes
7 Kallee Place	29	Yes
8 Kallee Place	29	Yes
23 Napier Street	24	Yes
31 Napier Street	27	Yes
37 Napier Street	27	Yes
41 Napier Street	28	Yes
43 Napier Street	29	Yes
45 Napier Street	24	Yes
47 Napier Street	22	Yes
Proposed Lot 11	28	Yes

Tabulated SoundPLAN results and ISO9613 calculation details are presented in Appendix H.

SoundPLAN noise contour maps are presented in Appendix I.

5. Discussion and Recommendations

5.1 Road Traffic Noise Assessment – Noise Mitigation Measures

Traffic noise propagation modelling was carried out considering the future traffic flows on Bruxner Highway for a planning horizon of 2035. The results of the noise propagation modelling indicate that without noise mitigation measures the facades of the future dwellings will be impacted by traffic noise.

Traffic noise mitigation measures are required to ensure compliance with the noise criteria at the facades of the future dwellings.

Under the NSW Road Noise Policy, there is a requirement to ensure that ≤60dB(A) $L_{eq,15hr}$ (façade adjusted) is met for all proposed residential lots.

Compliance with the NSW Road Noise Policy criterion has been achieved for all of the proposed residential lots in the development through the addition of a noise barrier fence along the northern boundary of the proposed development.

The height and alignment of the noise barrier fence has been optimised to meet the compliance and is presented in Figure 5.1.

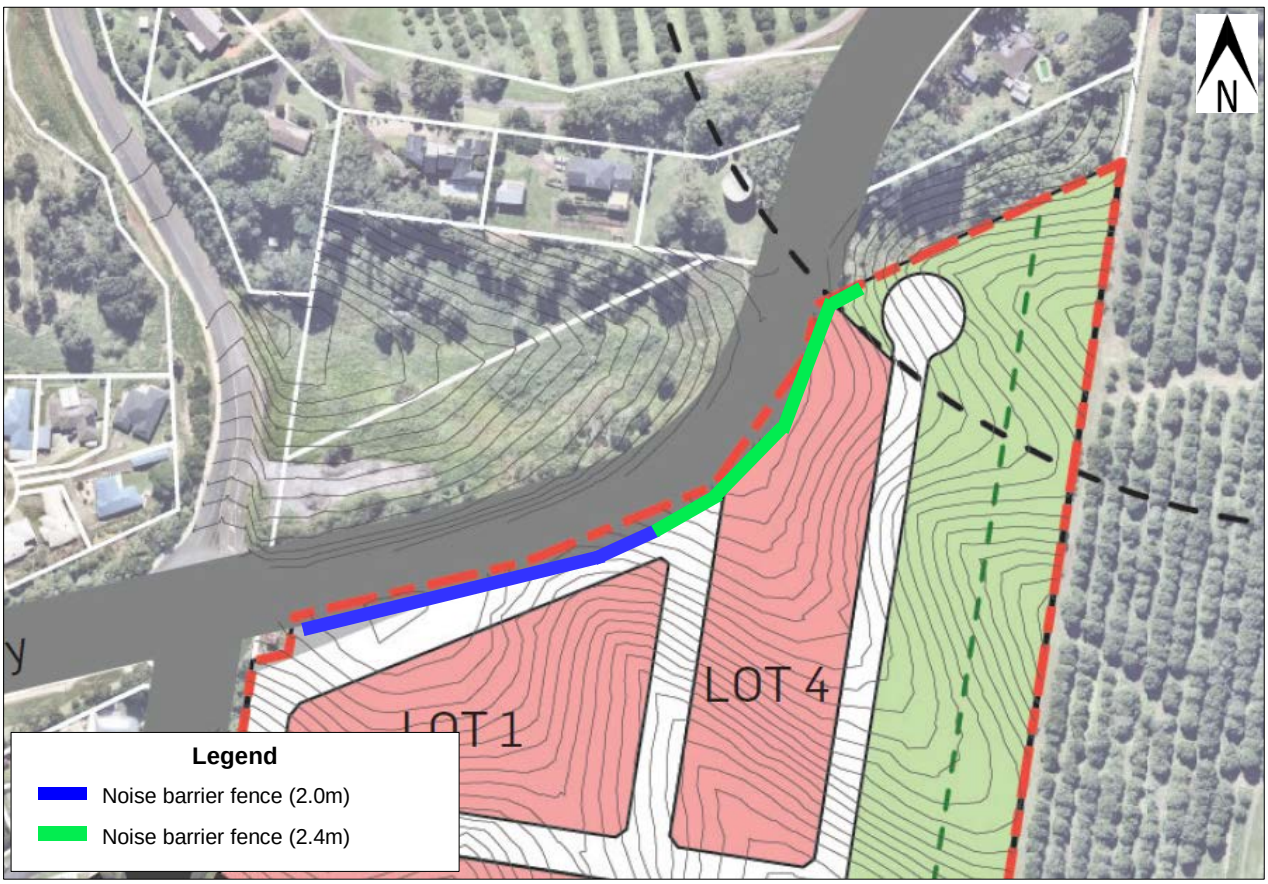


Figure 5.1 Noise Barrier Fence Height and Alignment – Site Plan

The proposed subdivision site is located on complex terrain, which includes substantial terrain differences between each of proposed residential lots. As such, the eastern side of the northern boundary noise barrier fence requires an upgraded height of 2.4m.

The acoustic fences must be constructed as follows:

- Must be free of any gaps on the surface and at the base (except for drainage).
- Must be constructed of a material with minimum surface density of 12.5 kg/m^2, e.g. compressed fibre cement sheeting with minimum thickness of 8mm; masonry; aerated concrete; minimum 12mm thick Perspex or Plexiglass; or minimum 6mm thick toughened glass.
- Must be of long lasting and durable construction. Overlapping timber paling construction is not appropriate for the acoustic fence and must not be used.

With the attenuation provided by the proposed noise barrier fence, the highest calculated traffic noise levels (free field) at the proposed residential lots is 60dB(A) and is within the noise criterion of 60dB(A) $L_{eq,15hr}$ (Façade adjusted). All calculated noise levels are presented in Table 3.7.

5.2 Operational Noise Impact Assessment – Noise Mitigation Measures

The results of the operational noise propagation modelling indicate that there is a potential for noise impacts on the nearest noise sensitive land uses from the operation of the proposed industrial lots. The nearest noise sensitive receivers include the existing residential and commercial buildings and proposed residential lots of the development.

The indicative development layout provides sufficient setback distance between the proposed industrial and residential lots. The setback distance includes mixed use and public recreation lots, which provides a transitional section to reduce the industrial noise impact on the proposed residential lots.

However, existing residential properties are located close to the southern boundary of the proposed development. As such, noise mitigation measures will be required along this boundary of the development.

The operational noise propagation model was carried out considering two scenarios for the proposed development. Scenario 1 – (General Industrial) includes noise sources of low and high impact associated with an industrial area (warehouse and metal fabrication operations). As part of the scenario the southern row of plots of Lot 19 were considered low impact noise sources (typical warehouse operation). This is presented in Figure 5.2.

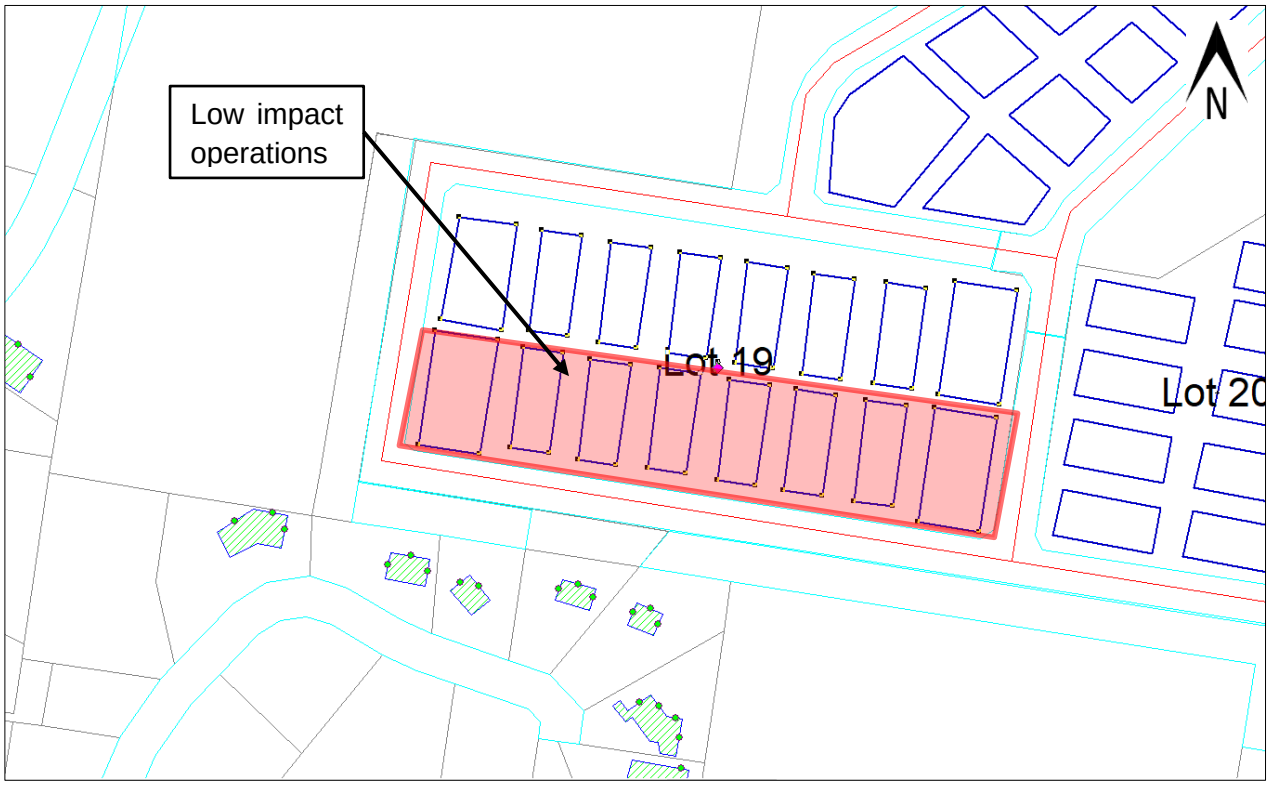


Figure 5.2 Scenario 1 - (General Industrial) – Low Impact Area

Scenario 2 – (High Impact) considers the worst-case scenario with all proposed industrial lots operating high noise producing activities concurrently (typical sheet metal fabrication).

To prevent noise impact on the nearest noise sensitive places, the following noise control measures must be implemented:

- Operational acoustic compliance will be met along the southern boundary of the proposed development if **one** of the following noise mitigation measures is implemented:
    - The southern row of allotments of Lot 19 within the proposed development, as presented in Figure 5.2 is limited to low noise impact industrial uses. Low noise impacts include, but not limited to warehouse operations (order fulfilments), commercial uses for public use and storage facilities. OR
    - A noise barrier fence must be constructed along south-western boundary of the proposed development. The height and alignment of the noise barrier fence has been optimised to meet the compliance and is presented in Figures 5.3.
- The noise barrier fence must be constructed as follows:
    - Must be free of any gaps on the surface and at the base (except for drainage).
    - The acoustic barriers must be constructed of a material with minimum superficial mass of 15 kg/m^2, such as concrete blockwork, brick, autoclaved aerated concrete, minimum 9mm thick compressed fibre cement sheeting, minimum 25mm thick overlapping timber palings or approved modular wall system by Modular Walls, Poly-

Tek or equivalent. There shall be no gaps on the surface and at the base of the acoustic barriers.

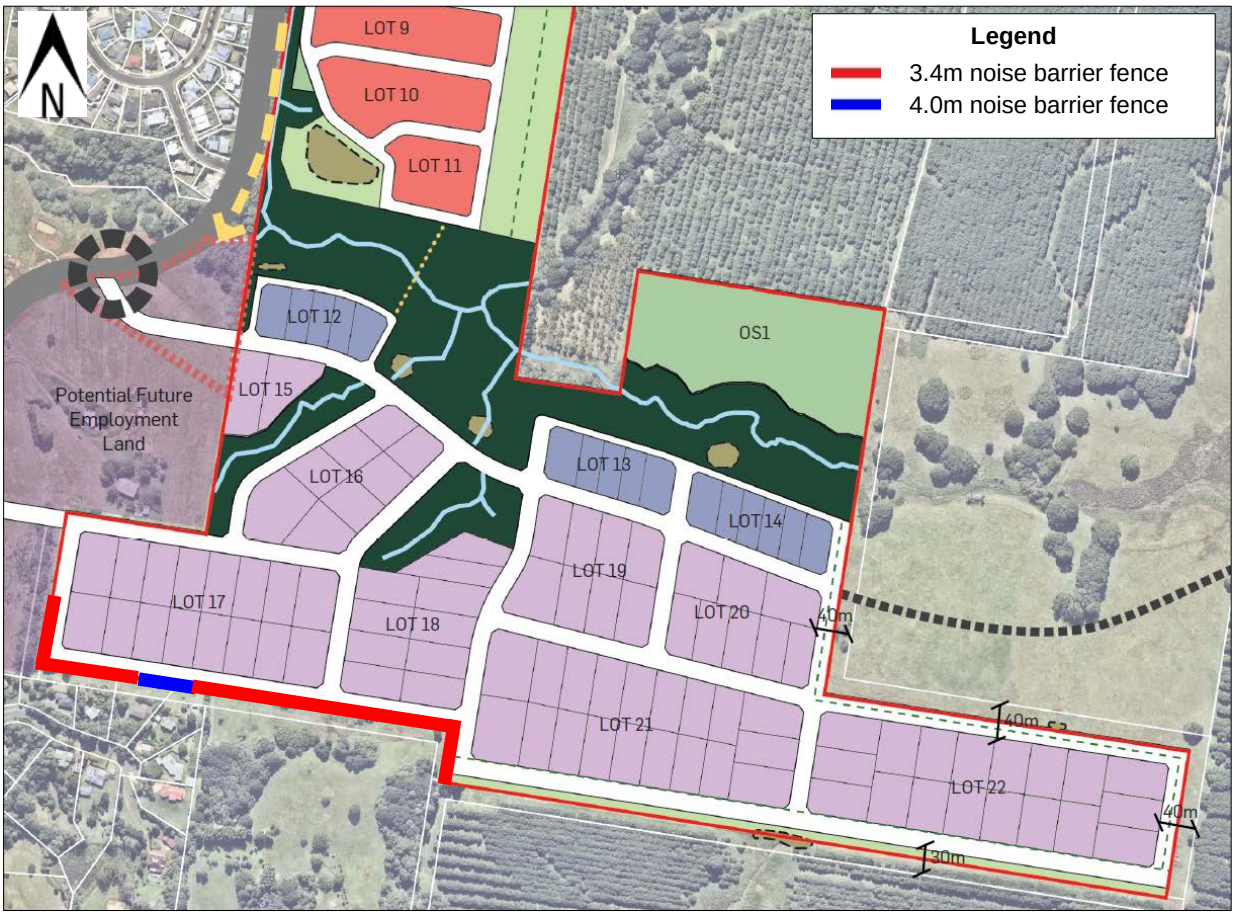


Figure 5.3 Scenario 2 – (High Impact) – Alignment of recommended noise barrier fence

6. Conclusions

Based on the results of the operational and traffic noise impact assessment for the proposed development at 1055 Bruxner Highway in Goonellabah, the following is concluded:

- Without noise mitigation measures the facades of the future dwellings will be impacted by traffic noise. Traffic noise mitigation measures are required to ensure compliance with the noise criteria at the proposed residential lots.
- The NSW Road Noise Policy specifies criteria for assessment of traffic noise impact on developments near existing, new, re-developed or modified roads. These criteria are applied to facades of future dwellings, and is as follows, ≤60dB(A) $L_{eq,15hr}$ during daytime; and ≤55 dB(A) $L_{eq,9hr}$ during night-time.
- Compliance with the NSW Road Noise Policy criterion has been achieved for all of the proposed residential lots in the development through the addition of a noise barrier fence along the northern boundary of the proposed development. Summary of the results is presented in Table 3.7.
- The results of the operational noise propagation modelling indicate that there is a potential for noise impacts on the nearest noise sensitive land uses from the operation of the proposed industrial lots. The nearest noise sensitive receivers include the existing residential and commercial buildings and proposed residential lots of the development.
- The indicative development layout provides sufficient setback distance between the proposed industrial and residential lots. Within the proposed setback distance it includes mixed use and public recreation lots, which provides a transitional section to reduce the industrial noise impact on the proposed residential lots.
- The operational noise propagation model was carried out considering two scenarios for the proposed development.
    - Scenario 1 – (General Industrial) includes noise sources of low and high impact associated with an industrial area (warehouse and metal fabrication operations). As part of the scenario the southern row of plots of Lot 19 were considered low impact noise sources (typical warehouse operation). This is presented in Figure 5.2.
    - Scenario 2 – (High Impact) considers the worst-case scenario with all proposed industrial lots operating high noise producing activities concurrently (typical sheet metal fabrication).
- However, existing residential properties are located close to the southern boundary of the proposed development. As such, noise mitigation measures will be required along this boundary of the development. Summary of the results is presented in Tables 4.10, 4.11, 4.13 and 4.14.
- All high impact noise activities within the proposed industrial lots should be conducted during day-time hours (7:00am to 6:00pm).

- Operational acoustic compliance will be met along the southern boundary of the proposed development if **one** of the following noise mitigation measures is implemented:
    - The southern row of allotments of Lot 19 within the proposed development, as presented in Figure 5.2 is limited to low noise impact industrial uses. Low noise impacts include, but not limited to warehouse operations (order fulfilments), commercial uses for public use and storage facilities. OR
    - A noise barrier fence must be constructed along south-western boundary of the proposed development. The height and alignment of the noise barrier fence has been optimised to meet the compliance and is presented in Figures 5.3.
- The noise barrier fence must be constructed as follows:
    - The acoustic barriers must be free of any gaps on the surface and at the base (except for drainage).
    - The acoustic barriers must be constructed of a material with minimum superficial mass of 15 kg/m^2, such as concrete blockwork, brick, autoclaved aerated concrete, minimum 9mm thick compressed fibre cement sheeting, minimum 25mm thick overlapping timber palings or approved modular wall system by Modular Walls, Poly-Tek or equivalent. There shall be no gaps on the surface and at the base of the acoustic barriers.

Provided the recommended traffic noise and operational control measures are implemented at the establishment of the proposed mixed-used development at 1055 Bruxner Highway in Goonellabah, the road traffic noise from Bruxner Highway and the operational noise from the proposed industrial lots will not impose any further constraints on the development.

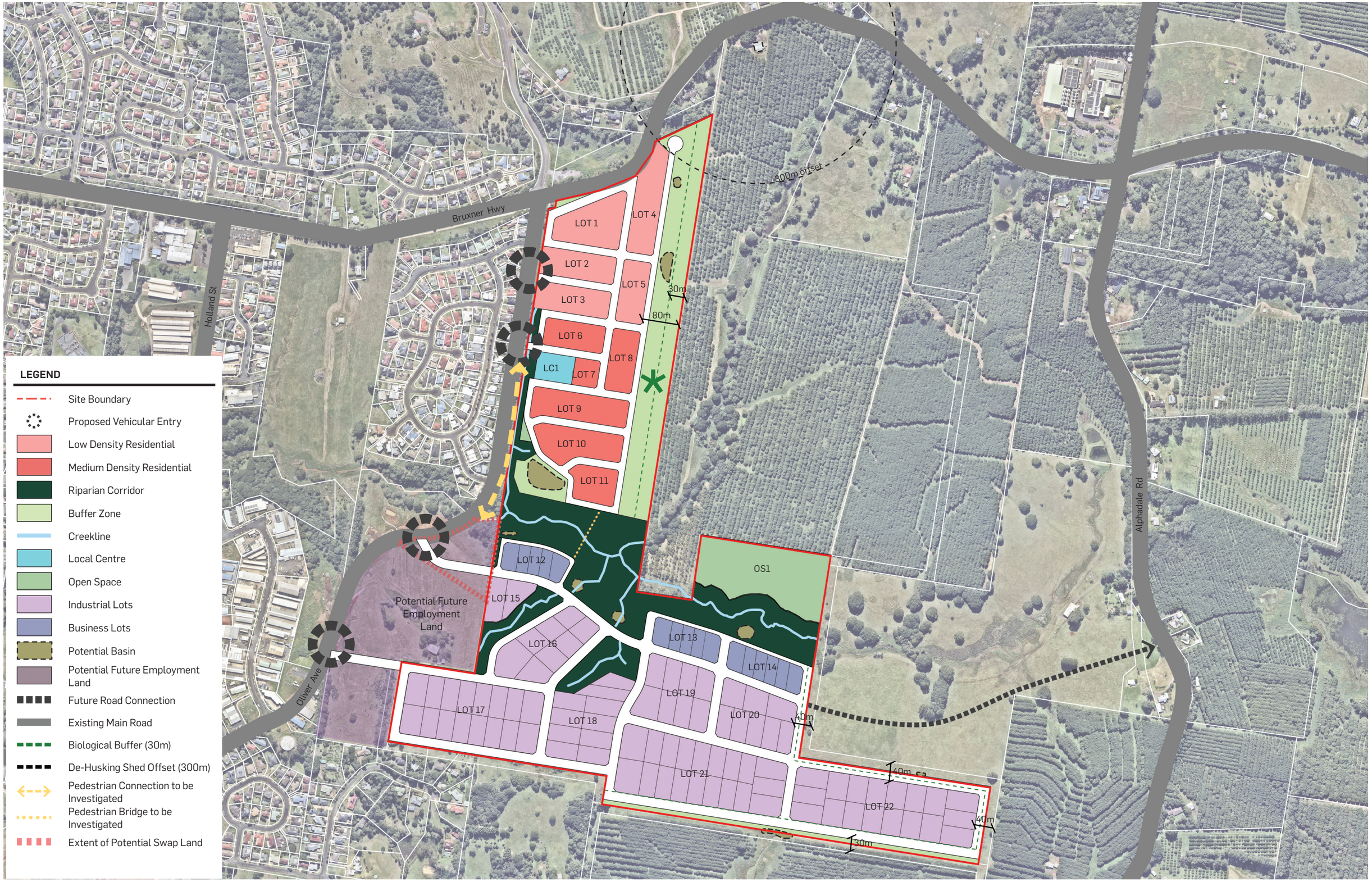
7. References

- Australian Standard AS1055.1-2018 (*Acoustics - Description and Measurement of Environmental Noise*)
- Australian Standard AS2702-1984 (*Acoustics – Methods for the measurement of road traffic noise*)
- Australian Standard AS/NZS2107-2016 (*Acoustics – Recommended design sound levels and reverberation times for building interiors*)
- Australian Standard AS3671-1989 (*Acoustics – Road Traffic Noise Intrusion – Building sitting and construction*)
- Australian Standard AS/NZS IEC61672.1-2019 (*Electroacoustics - Sound level meters – Specifications*)
- Department of Environment and Heritage Protection, 2013, *Noise Measurement Manual*
- International Standard ISO9613 (*Acoustics – Attenuation of sound during propagation outdoors*)
- NSW EPA, NSW Road Noise Policy 2011
- NSW Planning & Environment, State Environmental Planning Policy (SEPP) Infrastructure 2007
- NSW Planning & Environment, Development Near Rail Corridors and Busy Roads – Interim Guideline (The Guideline)

8. Appendices

Appendix A – Development Layout
Appendix B – Site Photos
Appendix C – Meteorological Data
Appendix D – Unattended Noise Measurement Results
Appendix E – Bruxner Highway Traffic
Appendix F – Validation of CoRTN Traffic Noise Model
Appendix G – Traffic Noise Contours 2035
Appendix H – Operational Noise Levels and ISO9613
Appendix I – Operational Noise Contours

Appendix A – Development Layout



URBIS

OLIVER AVE, LISMORE GOONELLABAH
ILLUSTRATIVE CONCEPT PLAN

DISCLAIMER:

This plan is conceptual and is for discussion purposes only and is subject to further detail study, Council approval, engineering input, and survey. Cadastral boundaries, areas and dimensions are approximate only. Written figured dimensions shall take preference to scaled dimensions.

DATE: 26 SEP 2022
JOB NO: P0040564

1:7,500 @ A3

0 100 200 300 400

Appendix B – Site Photos

Photo 1: Noise measurement location – Traffic Measurements (facing Bruxner Highway)

Photo 2: Noise measurement location – Traffic Noise Measurements

Photo 3: Noise measurement location – Background Noise Measurements

Photo 4: Noise measurement location – Background Noise Measurements

Appendix C – Meteorological Data

Lismore, New South Wales
August 2022 Daily Weather Observations

Observations from Lismore Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Mo	10.3	20.7	0			N	26	13:14	14.6	84	8	N	13	1022.3	19.5	63	8	N	19	1017.9
2	Tu	7.1	21.8	0			SSE	24	14:23	14.7	88	2	SSE	6	1021.6	20.6	52	1	SE	15	1017.4
3	We	6.9	23.0	0.2			NNE	20	12:48	13.5	94	8	N	7	1020.9	22.4	58	8	NE	7	1016.6
4	Th	8.2	25.2	0			NW	35	12:46	14.4	95		NNW	9	1016.7	24.0	48		N	24	1011.9
5	Fr	11.0	23.5	0.2			NW	43	13:09	19.7	75		NNE	13	1011.9	17.3	89	8	NNW	20	1011.2
6	Sa	14.6	22.9	1.8			NNW	39	00:06	17.6	62	6	NW	15	1013.9	22.6	48	1	NW	7	1009.9
7	Su	5.5	20.9	0			WSW	39	12:50	15.1	60		NNW	13	1017.0	20.6	35		W	19	1013.7
8	Mo	3.6	20.3	0			SSW	35	11:06	13.3	66		NNW	9	1020.1	18.7	46	1	SSW	13	1017.0
9	Tu	4.5	19.6	0			SSE	35	15:00	13.9	75		NNE	9	1021.9	17.7	49	4	SSE	22	1019.2
10	We	3.5	19.4	0			SSE	43	14:03	14.1	62		SSW	17	1026.2	18.2	46		SSE	24	1024.3
11	Th	3.5	20.2	0			ESE	26	14:39	12.4	88	4	NE	7	1026.4	18.0	67	7	ESE	17	1021.8
12	Fr	9.0	20.5	0			NE	26	14:49	14.2	89	7		Calm	1022.2	18.5	74	8	NE	15	1018.1
13	Sa	12.9	17.7	2.6			N	24	09:20	15.1	94	8	NNW	11	1017.0	16.6	86	4	N	13	1012.6
14	Su	5.5	21.5	2.2			WNW	48	10:38	14.8	71		N	13	1015.1	21.0	30		NW	24	1010.5
15	Mo	4.3	20.7	0.2			NW	43	12:29	15.8	49		NW	22	1015.2	20.0	34		NW	13	1009.9
16	Tu	4.9	21.5	0			S	41	16:43	13.4	72		NNE	9	1012.2	20.9	33	1	NW	13	1008.6
17	We	2.3	20.9	0			SSE	35	13:40	13.4	73		N	2	1017.5	20.0	50	6	SSE	22	1016.3
18	Th	5.0	23.7	0			ENE	31	16:40	13.9	84		N	9	1019.3	23.4	39		NNW	4	1015.0
19	Fr	6.1	27.6	0.2			WNW	44	13:43	15.0	79		N	13	1015.5	27.2	25		NW	22	1010.4
20	Sa	5.4	22.7	0			NNE	30	14:59	16.3	60		SSE	4	1021.6	21.7	48		NNE	20	1017.8
21	Su	6.9	20.2	0			SE	37	14:33	14.8	64	8	SW	11	1025.3	18.6	58	1	SE	22	1023.8
22	Mo	5.6	21.7	0			NE	31	16:40	11.7	98	8	N	11	1026.0	20.2	50	7	NE	11	1020.0
23	Tu	7.6	25.0	0			W	57	17:51	18.1	68		N	9	1017.7	24.2	41		NNW	28	1009.6
24	We	8.5	21.0	3.6			W	50	00:48	13.7	51		NW	20	1017.8	20.8	31		W	17	1015.8
25	Th	2.7	21.2	0.2			NE	30	16:03	12.4	72		N	9	1023.0	21.1	25		NE	7	1019.7
26	Fr	2.7	21.2	0			SSE	26	15:35	13.8	78		N	7	1026.1	20.9	39		SSW	7	1022.7
27	Sa	5.6	19.2	0			S	39	13:03	15.5	77	8	SSW	13	1028.2	18.0	73	5	SE	13	1025.5
28	Su	11.5	22.3	2.0			ESE	24	16:40	16.0	87	8	SW	4	1029.9	19.8	69	8	ESE	13	1026.1
29	Mo	8.0	22.3	0.8			ENE	37	13:21	15.2	98	8	NNW	7	1028.0	20.3	62	5	NE	20	1023.2
30	Tu	10.4	20.2	0			SW	19	08:35	15.2	87	8	SW	13	1023.4	20.0	69	8	NE	7	1019.0
31	We	13.3	20.6	6.0			SSE	33	14:48	18.2	87	8	SW	4	1021.7	20.5	71	3	SE	19	1020.1
Statistics for August 2022																					
	Mean	7.0	21.6							14.8	77	7		9	1020.7	20.4	51	4		16	1017.0
	Lowest	2.3	17.7							11.7	49	2		Calm	1011.9	16.6	25	1	NNW	4	1008.6
	Highest	14.6	27.6	6.0			W	57		19.7	98	8	NW	22	1029.9	27.2	89	8	NNW	28	1026.1
	Total			20.0																	

Observations were drawn from Lismore Airport AWS {station 058214}

Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

IDCJDW2074.202208 Prepared at 13:00 UTC on 2 Sep 2022

Lismore, New South Wales
September 2022 Daily Weather Observations

Observations from Lismore Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Th	10.1	23.1	1.2			ESE	24	16:18	17.5	73		SW	9	1024.3	22.1	59		SE	13	1020.7
2	Fr	10.9	19.5	0			N	43	09:22	14.6	99		N	11	1022.7	19.3	81		NNE	9	1018.2
3	Sa	13.2	16.2	45.2			SSW	46	23:10	13.5	96		S	17	1015.5	15.4	91		SSW	19	1012.8
4	Su	12.5	19.6	14.2			S	65	12:07	14.9	81		SSW	33	1016.4	18.8	60		S	33	1016.5
5	Mo	11.1		0.2						15.8	60		SSW	20	1021.6	19.1	52		SE	20	1019.1
6	Tu		20.8				S	33	12:03	15.5	68		SSW	13	1024.2	18.0	59	8	SE	20	1021.4
7	We	6.3		0						14.1	93	1	N	9	1025.4						
Statistics for the first 7 days of September 2022																					
Mean		10.7	19.8							15.1	81	1		16	1021.4	18.8	67	8		19	1018.1
Lowest		6.3	16.2							13.5	60	1	#	9	1015.5	15.4	52	8	NNE	9	1012.8
Highest		13.2	23.1	45.2			S	65		17.5	99	1	SSW	33	1025.4	22.1	91	8	S	33	1021.4
Total				60.8																	

Observations were drawn from Lismore Airport AWS {station 058214}

Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

IDCJDW2074.202209 Prepared at 00:36 UTC on 7 Sep 2022

Appendix D – Unattended Noise Measurement Results

Unattended Noise Measurements - Traffic Measurements
Data

Noise Levels - 18hr Day (Traffic Noise)

Logger Location - Northern boundary of lot

ARL Environmental Noise Logger	
Logger Serial Number	346-152-24
Measurement Title	Traffic Measurements
Measurement started at	24/08/2022
Measurement stopped at	6/09/2022
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

Note

— No noise data available

Rainfall recorded on this day

		$L_{A10,T}$			$L_{Aeq,T}$		$L_{A90,T}$	
Date	**Day**	**18hr day 6am-12am**	**1hr max 6am-12am**	**Time for 1hr max**	**18hr day 6am-12am**	**8hr night 10pm-6am**	**18hr day 6am-12am**	**8hr night 10pm-6am**
24/08/2022	Wednesday	—	—	—	—	59.5	—	29.9
25/08/2022	Thursday	71.1	73.5	0.3	68.3	60.7	55.9	32.6
26/08/2022	Friday	71.3	73.6	0.3	68.2	58.9	56.0	32.4
27/08/2022	Saturday	71.0	73.1	0.6	67.6	58.6	53.0	28.3
28/08/2022	Sunday	69.5	71.8	0.4	66.0	59.9	49.7	30.1
29/08/2022	Monday	70.9	74.1	0.3	68.0	59.6	55.3	30.2
30/08/2022	Tuesday	70.9	73.4	0.3	67.9	62.0	55.6	36.0
31/08/2022	Wednesday	70.7	74.0	0.3	67.9	59.4	56.5	31.1
1/09/2022	Thursday	71.1	73.1	0.3	68.1	60.2	55.9	31.8
2/09/2022	Friday	72.8	74.1	0.8	69.7	62.7	58.8	42.8
3/09/2022	Saturday	72.7	75.9	0.3	69.0	60.2	57.4	46.0
4/09/2022	Sunday	70.1	73.8	0.5	67.0	59.2	54.8	35.1
5/09/2022	Monday	70.3	73.2	0.3	67.4	59.0	54.2	32.4
Average		**71.2**	**73.5**		**68.2**	**60.2**	**55.6**	**33.3**
Average (weekdays only)		**71.2**	**73.6**		**68.2**	**60.4**	**56.0**	**34.0**

Unattended Noise Measurements - Background Measurements
Data

Environmental Noise Levels Day, Evening and Night

Logger Location - Western boundary of lot

ARL Environmental Noise Logger	
Logger Serial Number	92109
Measurement Title	202208_1130
Measurement started at	30/08/2022 - 11:30:00
Measurement stopped at	6/08/2022 - 11:30:00
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	93.9
Engineering Units	dB SPL

		$L_{Aeq,T}$ dB(A)			$L_{A01,T}$ dB(A)			$L_{A10,T}$ dB(A)			$L_{A90,T}$ dB(A)			Assessment Background Level, dB(A)		
Date	**Day**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
30/08/2022	Tuesday	—	45	40	—	57	49	—	45	40	—	32	31	—	27	28
31/08/2022	Wednesday	52	48	39	63	60	50	55	49	37	37	33	28	36	30	24
1/09/2022	Thursday	52	46	41	62	58	52	55	47	41	38	33	29	35	28	26
2/09/2022	Friday	52	45	37	62	57	46	54	45	36	39	34	28	33	28	24
3/09/2022	Saturday	53	46	39	63	58	49	55	45	40	41	35	31	39	30	27
4/09/2022	Sunday	52	46	38	63	59	47	54	46	37	38	31	28	36	28	23
5/09/2022	Monday	52	46	39	63	57	49	54	46	38	38	33	27	35	29	24
Average		**52**	**46**	**39**	**63**	**58**	**49**	**55**	**46**	**38**	**39**	**33**	**29**	—	—	—
Rating Background Level dB(A)														**35**	**28**	**24**

Note

— No noise data available

Day (D): 7:00am to 6:00pm

Evening (E): 6:00pm to 10:00pm

Night (N): 10:00pm to 7:00am

Rainfall recorded on this day

Appendix E – Bruxner Highway Traffic

From: Barry Goodwin
To: Samuel Cahill; Records
Cc: Sasho Temelkoski; Bojan Todorovski; Lucas Myers; Vicki Walker
Subject: RE: Traffic Count Request for Bruxner Highway
Date: Friday, 2 September 2022 7:28:55 AM
Attachments: image002.png
image006.png
image001.png
image007.png
image008.png
image009.png

Dear Samuel, oddly enough about a month ago , I engaged a consultant to install a counter on Ballina Road, west of Oliver Avenue/Pineapple Road intersection
Traffic counts on the bruxner highway are usually managed by TfNSW

Attached is a copy of this report which includes ADT and heavy vehicle component in both directions
We have a directional breakdown if required
We have no data on traffic growth rates

Hourly Volume By Day (Speed and Classification)

Ballina Road (Bruxner Hwy)
260m west of Oliver Avenue
Goonellabah
Eastbound and Westbound - Two Way Traffic

Site Number:	LIS004
Client:	Lismore City Council
LGA:	Lismore City Council
Count Type:	Volume/Class/Speed
Coordinates:	-28.8122 153.3514

70
Posted Speed Limit

Day	Thu	Fri	Sat	Sun	Mon	Tue	Wed	7 day Average	Weekday Average
Time	28/07/22	29/07/22	30/07/22	31/07/22	01/08/22	02/08/22	03/08/22		
0:00	34	51	94	85	44	38	36	55	41
1:00	29	33	50	49	30	38	32	37	32
2:00	34	33	35	45	31	45	33	37	35
3:00	66	66	57	38	64	54	61	58	62
4:00	136	128	66	47	138	135	129	111	133
5:00	456	449	188	118	440	451	461	366	451
6:00	1304	1161	429	237	1227	1329	1242	990	1253
7:00	1972	1841	658	409	1862	2101	1949	1542	1945
8:00	2340	2299	1072	670	2249	2440	2404	1925	2346
9:00	1714	1763	1352	1093	1733	1680	1748	1583	1728
10:00	1357	1488	1509	1308	1333	1334	1422	1393	1387
11:00	1499	1449	1488	1241	1369	1396	1419	1409	1426
12:00	1402	1545	1497	1384	1434	1559	1483	1472	1485
13:00	1525	1587	1347	1291	1369	1369	1431	1417	1456
14:00	1775	1831	1337	1257	1587	1683	1632	1586	1702
15:00	2314	2386	1282	1284	2101	2236	2293	1985	2266
16:00	2314	2047	1201	1142	2079	2224	2297	1901	2192
17:00	2011	1886	1067	891	1832	1911	2007	1658	1929
18:00	1026	1059	659	568	847	1014	1022	885	994
19:00	575	547	439	337	416	433	530	468	500
20:00	432	428	375	262	330	368	362	365	384
21:00	347	437	324	232	218	285	322	309	322
22:00	214	331	211	135	174	182	172	203	215
23:00	85	138	131	62	66	64	71	88	85
7am-7pm	21249	21181	14469	12538	19795	20947	21107	18755	20856
24hr Total	24961	24983	16868	14185	22973	24369	24558	21842	24369
Cars	22831	22932	16118	13530	21207	22461	22460	20220	22559
Trucks	1763	1590	641	488	1612	1647	1741	1355	1511
Articulated	367	323	116	101	285	327	357	268	299

SITE DETAILS
Two Way Traffic

Speed Distribution		
> 40 km/hr		99.5%
> 50 km/hr		96.5%
> 60 km/hr		57.1%
> 70 km/hr		5.5%
> 80 km/hr		0.2%
> 90 km/hr		0.0%
> 100 km/hr		0.0%

Peak Survey Results		
AM	8:00	2440
PM	15:00	2386
24hr Volume		24983
Cars		22932
Trucks		1763
Articulated		367
7am to 7pm Volume		21249

Avg Traffic Composition		
Cars		92.6%
Trucks		6.2%
Articulated		1.2%

Avg Speed Data (kph)		
85th Percentile		69.0
Mean		60.3
Minimum		10.0
Maximum		130.0
Std. Deviation		6.1

Ballina Road (Bruxner Hwy)
260m west of Oliver Avenue
Goonellabah
Eastbound and Westbound - Two Way Traffic

Site Number:	LIS004
Client:	Lismore City Council
LGA:	Lismore City Council
Coordinates:	-28.8122 153.3514

Validation of Data - % of Total Data (Excluding Errors)											
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
91.0%	1.6%	5.3%	0.7%	0.3%	0.1%	0.1%	0.1%	0.5%	0.4%	0.0%	0.0%

Regards

Barry Goodwin I Design Services Engineer I Lismore City Council
PO Box 23A, Lismore, NSW, 2480 | **T** 02 6625 0551 | **F** 02 6625 0597 | | **M** 0427 630 980 | **www.lismore.nsw.gov.au**
Lismore City Council acknowledges the people of the Bundjalung nation, traditional custodians of the land on which we work.

From: Samuel Cahill <s.cahill@atpconsulting.com.au>
Sent: Wednesday, 31 August 2022 4:46 PM
To: Records <Council@lismore.nsw.gov.au>
Cc: Sasho Temelkoski <Sasho@atpconsulting.com.au>; Bojan Todorovski <bojan@atpconsulting.com.au>
Subject: Traffic Count Request for Bruxner Highway

Our Ref: ATP220734

Hi Lismore City Council,

I am an acoustic engineering consultant working on a proposed mixed-use subdivision at 1055 Bruxner Highway in Lismore. I would like to request traffic count data for Bruxner Highway in Lismore, if available. The section of the road we are interested in that includes the section of the highway that passes by our development site at 1055 Bruxner Highway in Lismore.

We also require heavy vehicle percentages and traffic growth rates, if available.

Thank you for your assistance, looking forward to hearing from you.

Regards,

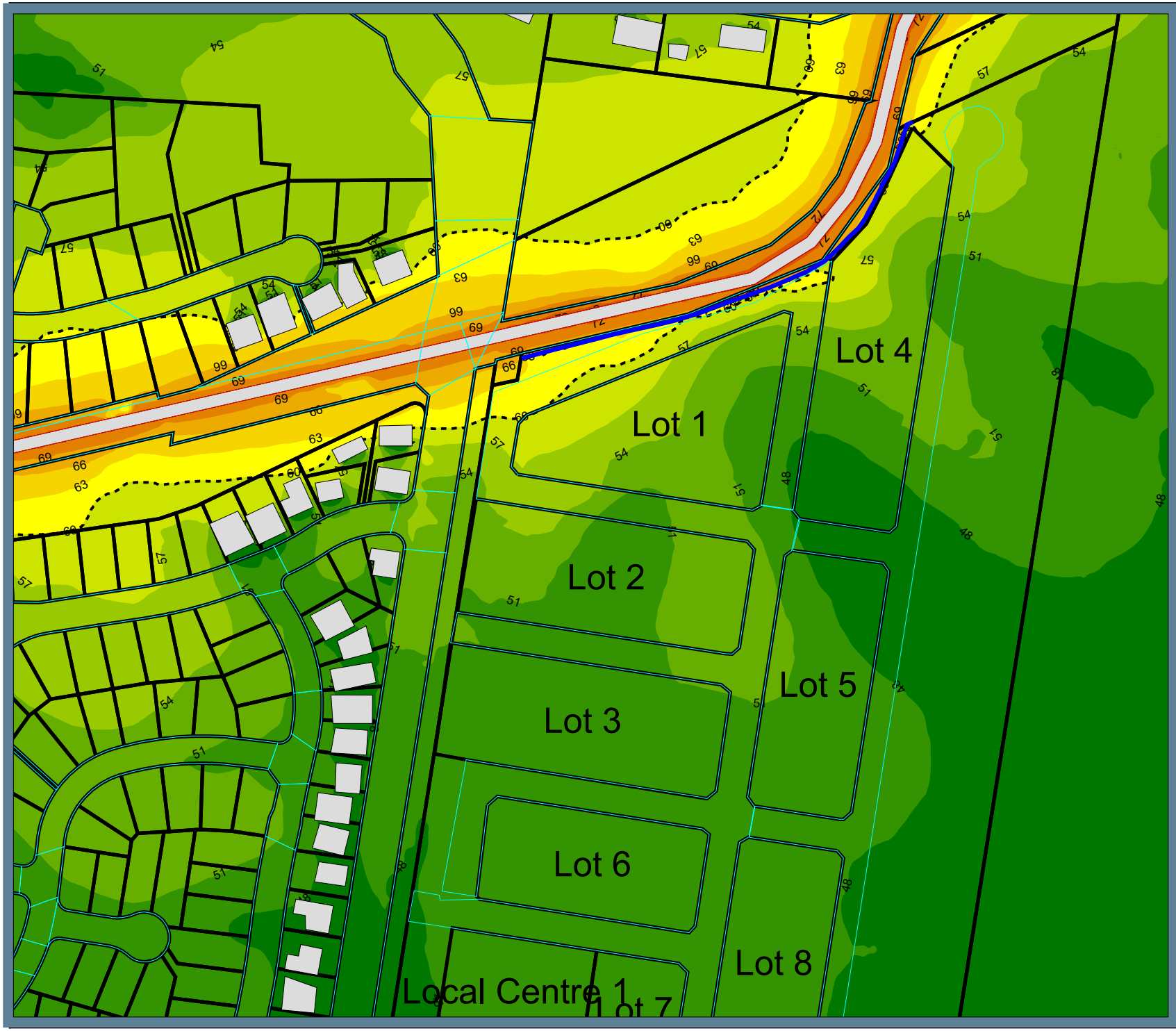
Samuel Cahill BEng(Mech) Hons GradIEAust
Acoustic Engineer
T: (07) 3256 1747 | **M:** 0499 015 150
E: s.cahill@atpconsulting.com.au
W: http://www.atpconsulting.com.au

Appendix F – Validation of CoRTN Traffic Noise Model

Proposed Mixed-use Development
1055 Bruxner Highway, Goonellabah, NSW
Calculated Traffic Noise Levels
TNIA Validation

Receiver Name	Leq,adj dB(A)
Logger Location	62.7

Appendix G – Traffic Noise Contours 2035



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Proposed Mixed-Use Subdivision Development
1055 Bruxner Highway, Goonellabah

Traffic Noise Modelling
Year 2035

Ground Floor
(@1.8m AGL)

Traffic noise level
Free-field
$L_{eq,adj,15h}$ Day dB(A)

	<= 48
48 <	<= 51
51 <	<= 54
54 <	<= 57
57 <	<= 60
60 <	<= 63
63 <	<= 66
66 <	<= 69
69 <	<= 72
72 <	<= 75
75 <	<= 78
78 <	<= 81
81 <	<= 84
84 <	<= 87
87 <	

Legend

- Existing buildings
- Noise Barrier Fence
- Ground absorption
- Line
- Emission line
- Surface
- Limit line - 60 dB(A)

SCALE @ A4 1:3000

0 15 30 60 90 120 150 m

N

Grid Spacing: 5m
Project Engineer: Sam Cahill
Created: 12/09/2022
Processed with SoundPLAN 8.2

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Proposed Mixed-Use Subdivision Development
1055 Bruxner Highway, Goonellabah

Traffic Noise Modelling Year 2035

Ground Floor (@1.8m AGL)

Traffic noise level
Façade-adjusted
$L_{eq,adj,9h}$ Night dB(A)

	<= 48
48 <	<= 51
51 <	<= 54
54 <	<= 57
57 <	<= 60
60 <	<= 63
63 <	<= 66
66 <	<= 69
69 <	<= 72
72 <	<= 75
75 <	<= 78
78 <	<= 81
81 <	<= 84
84 <	<= 87
87 <	

Legend

- Existing buildings
- Noise Barrier Fence
- Ground absorption
- Line
- Emission line
- Surface
- Limit line - 60 dB(A)

SCALE @ A4 1:3000

0 15 30 60 90 120 150 m

N

Grid Spacing: 5m
Project Engineer: Sam Cahill
Created: 7/09/2022
Processed with SoundPLAN 8.2

Appendix H – Operational Noise Levels and ISO9613

Oliver Avenue Subdivision
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Background Creep (T = 15min)

Receiver Name	Floor	Facade	Leq 15min Day dB(A)	Leq 15min Evening dB(A)	Leq 15min Night dB(A)
119 Alphadale Road	GF	N	33	18	27
119 Alphadale Road	GF	W	30	14	24
179 Alphadale Road	GF	NE	22	10	16
179 Alphadale Road	GF	NW	26	13	20
179 Alphadale Road	GF	W	25	11	19
23 Napier Street	GF	E	27	15	20
23 Napier Street	GF	N	27	16	20
23 Napier Street	GF	NW	24	14	17
239 Oliver Avenue	GF	NE	28	16	22
239 Oliver Avenue	GF	SE	29	17	22
239 Oliver Avenue	GF	SW	18	2	12
243 Oliver Avenue	GF	NE	29	18	22
243 Oliver Avenue	GF	SE	29	18	22
243 Oliver Avenue	GF	SW	22	11	15
30 Blue Hills Avenue	GF	E	32	18	25
30 Blue Hills Avenue	GF	N	32	19	26
31 Napier Street	GF	E	31	17	24
31 Napier Street	GF	N	30	17	23
31 Napier Street	GF	W	24	13	17
37 Napier Street	GF	NE	29	16	23
37 Napier Street	GF	NW	26	13	19
41 Napier Street	GF	E	29	15	23
41 Napier Street	GF	N	30	17	24
41 Napier Street	GF	W	27	13	20
43 Napier Street	GF	NE	30	17	24
43 Napier Street	GF	SE	29	14	23
43 Napier Street	GF	W	28	16	21
45 Napier Street	GF	E	26	10	20
45 Napier Street	GF	N	27	13	21
45 Napier Street	GF	NE	27	12	21
45 Napier Street	GF	NW	27	12	21
47 Napier Street	GF	E	26	9	20
47 Napier Street	GF	N	26	10	20
5 Kallee Place	GF	E	34	22	28
5 Kallee Place	GF	S	34	23	28
63 Alphadale Road	GF	NW	28	12	22
63 Alphadale Road	GF	S	26	14	20
63 Alphadale Road	GF	W	30	16	24
7 Kallee Place	GF	NE	25	15	19
7 Kallee Place	GF	SE	35	24	29
7 Kallee Place	GF	SW	34	24	29
8 Kallee Place	GF	E	34	21	28
8 Kallee Place	F 1	E	35	21	29
8 Kallee Place	GF	S	35	23	29
8 Kallee Place	F 1	S	35	23	29
93 Alphadale Road	GF	N	25	10	19
93 Alphadale Road	GF	S	24	12	18
93 Alphadale Road	GF	W	26	12	19
94 Alphadale Road	GF	NW	27	12	20

Oliver Avenue Subdivision
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Background Creep (T = 15min)

Receiver Name	Floor	Facade	Leq 15min Day dB(A)	Leq 15min Evening dB(A)	Leq 15min Night dB(A)
94 Alphadale Road	GF	S	23	9	17
94 Alphadale Road	GF	SW	26	11	20
98 Alphadale Road	GF	S	24	9	18
98 Alphadale Road	GF	W	24	8	17
Proposed Lot 11	GF		34	21	28
Proposed Lot 11	GF		33	21	27
Proposed Lot 11	GF		34	21	28
Proposed Lot 11	GF		33	21	27
Proposed Lot 11	GF		33	20	27

Oliver Avenue Subdivision
Assessed receiver levels
ONIA_High Impact

2

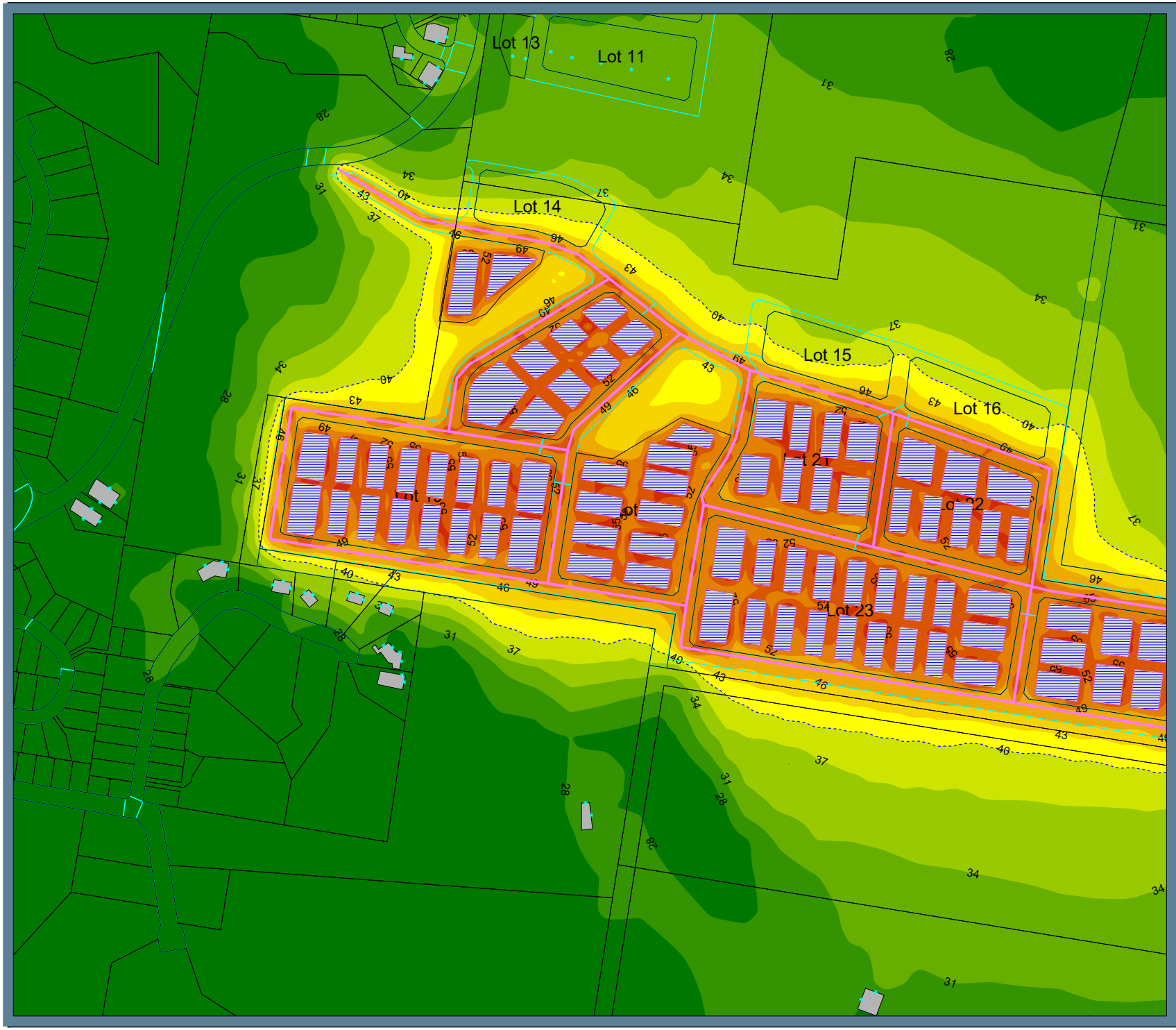
Receiver	Fl	Dir	.eq 15m,D dB(A)	.eq 15m,E dB(A)	.eq 15m,N dB(A)	
5 Kallee Place	GF	E	34	22	28	
5 Kallee Place	GF	S	34	23	28	
7 Kallee Place	GF	SW	34	24	29	
7 Kallee Place	GF	SE	35	24	29	
7 Kallee Place	GF	NE	25	15	19	
8 Kallee Place	GF	E	34	21	28	
	F 1		35	21	29	
8 Kallee Place	GF	S	35	23	29	
	F 1		35	23	29	
23 Napier Street	GF	NW	24	14	17	
23 Napier Street	GF	N	27	16	20	
23 Napier Street	GF	E	27	15	20	
30 Blue Hills Avenue	GF	E	32	18	25	
30 Blue Hills Avenue	GF	N	32	19	26	
31 Napier Street	GF	W	24	13	17	
31 Napier Street	GF	N	30	17	23	
31 Napier Street	GF	E	31	17	24	
37 Napier Street	GF	NE	29	16	23	
37 Napier Street	GF	NW	26	13	19	
41 Napier Street	GF	W	27	13	20	
41 Napier Street	GF	N	30	17	24	
41 Napier Street	GF	E	29	15	23	
43 Napier Street	GF	W	28	16	21	
43 Napier Street	GF	NE	30	17	24	
43 Napier Street	GF	SE	29	14	23	
45 Napier Street	GF	NE	27	12	21	
45 Napier Street	GF	E	26	10	20	
45 Napier Street	GF	NW	27	12	21	
45 Napier Street	GF	N	27	13	21	
47 Napier Street	GF	E	26	9	20	
47 Napier Street	GF	N	26	10	20	
63 Alphadale Road	GF	S	26	14	20	
63 Alphadale Road	GF	NW	28	12	22	
63 Alphadale Road	GF	W	30	16	24	
93 Alphadale Road	GF	W	26	12	19	
93 Alphadale Road	GF	S	24	12	18	
93 Alphadale Road	GF	N	25	10	19	
94 Alphadale Road	GF	NW	27	12	20	
94 Alphadale Road	GF	SW	26	11	20	
94 Alphadale Road	GF	S	23	9	17	
98 Alphadale Road	GF	S	24	9	18	
98 Alphadale Road	GF	W	24	8	17	

Oliver Avenue Subdivision
Assessed receiver levels
ONIA_High Impact

2

Receiver	Fl	Dir	.eq 15m,D dB(A)	.eq 15m,E dB(A)	.eq 15m,N dB(A)	
119 Alphadale Road	GF	N	33	18	27	
119 Alphadale Road	GF	W	30	14	24	
179 Alphadale Road	GF	W	25	11	19	
179 Alphadale Road	GF	NW	26	13	20	
179 Alphadale Road	GF	NE	22	10	16	
239 Oliver Avenue	GF	SW	18	2	12	
239 Oliver Avenue	GF	NE	28	16	22	
239 Oliver Avenue	GF	SE	29	17	22	
243 Oliver Avenue	GF	SE	29	18	22	
243 Oliver Avenue	GF	SW	22	11	15	
243 Oliver Avenue	GF	NE	29	18	22	
Proposed Lot 11	GF		34	21	28	
Proposed Lot 11	GF		34	21	28	
Proposed Lot 11	GF		33	21	27	
Proposed Lot 11	GF		33	21	27	
Proposed Lot 11	GF		33	20	27	

Appendix I – Operational Noise Contours



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Proposed Mixed-Use Development 1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development Scenario 1 - (General Industrial)

Ground Floor (@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Day dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67
67 <	

Legend

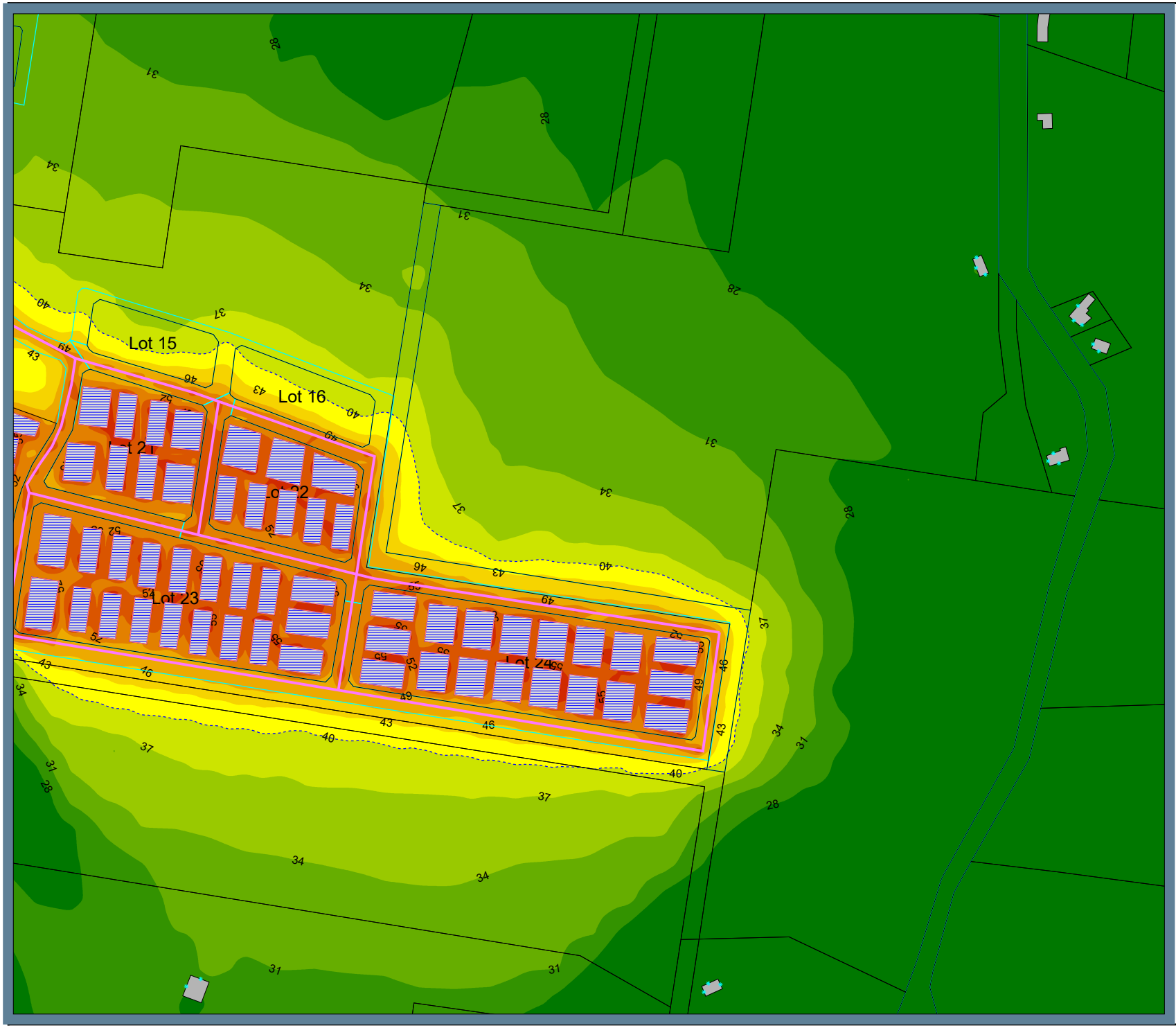
- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 20/09/2022
Processed with SoundPLAN 8.2



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Proposed Mixed-Use Development
1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development Scenario 1 - (General Industrial)

Ground Floor (@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Day dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67

Legend

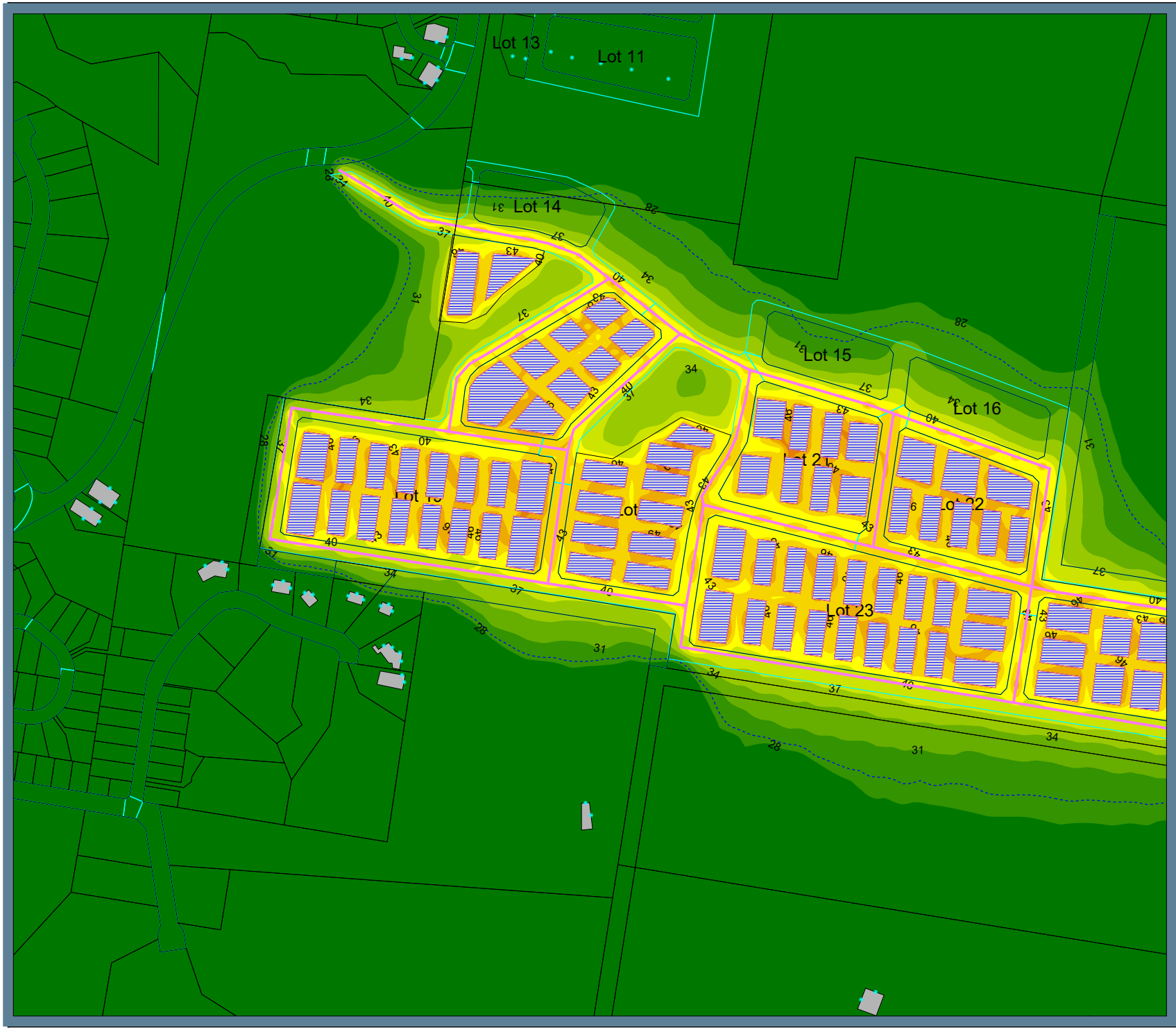
- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 20/09/2022
Processed with SoundPLAN 8.2



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Proposed Mixed-Use Development 1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development Scenario 1 - (General Industrial)

Ground Floor (@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Night dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67
67 <	

Legend

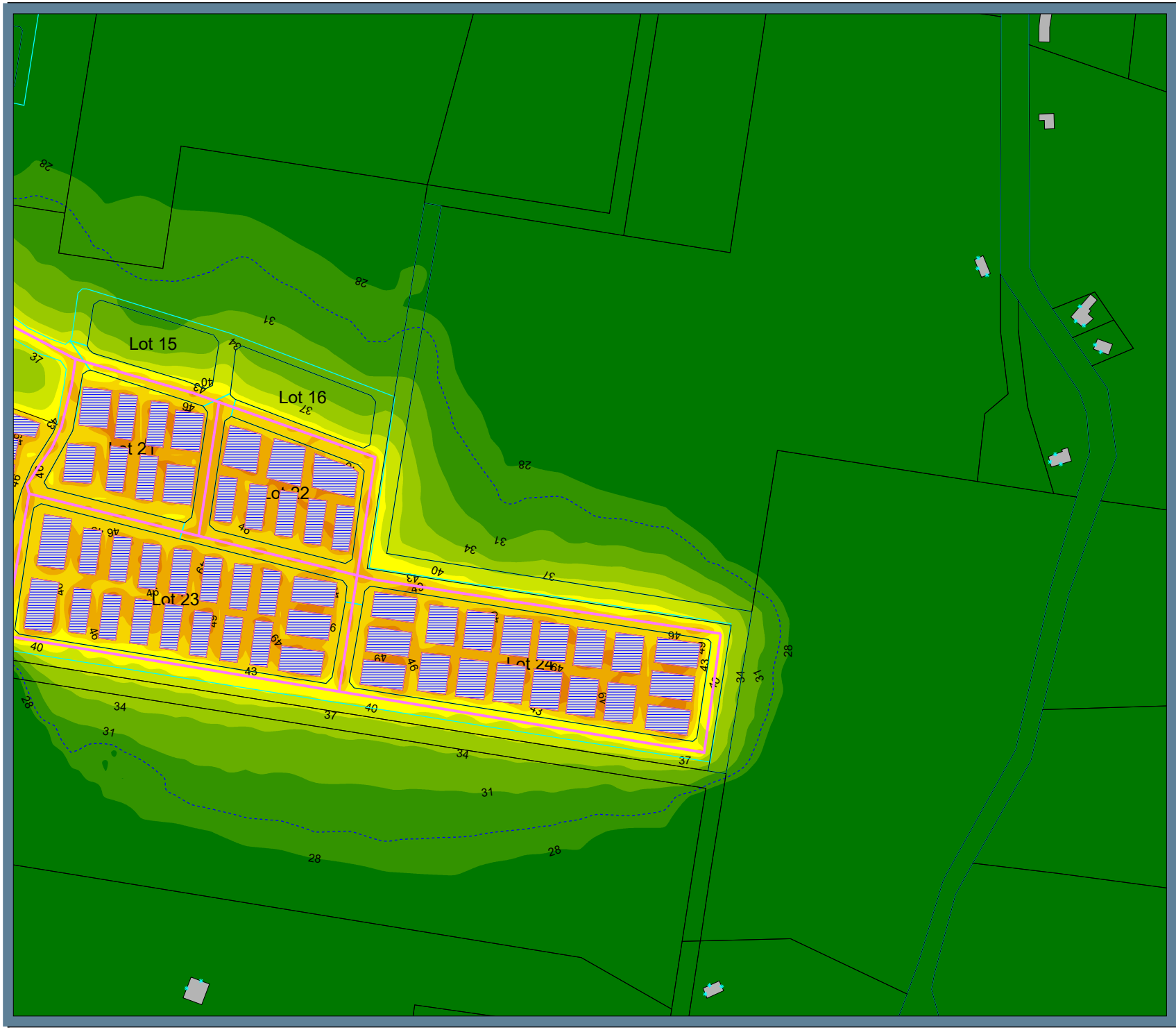
- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 20/09/2022
Processed with SoundPLAN 8.2



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Proposed Mixed-Use Development 1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development Scenario 1 - (General Industrial)

Ground Floor (@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Night dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67
67 <	

Legend

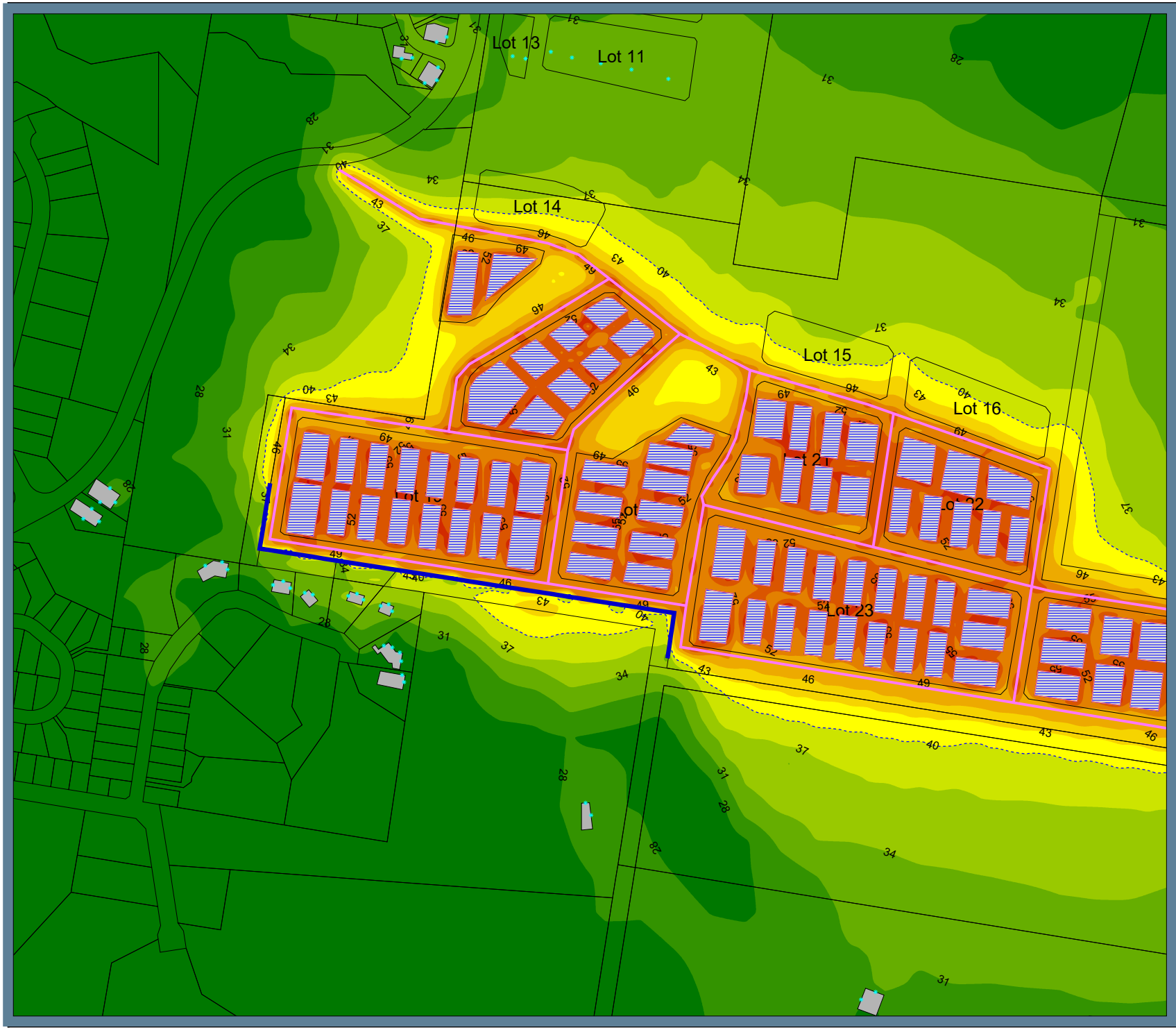
- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 20/09/2022
Processed with SoundPLAN 8.2



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Proposed Mixed-Use Development 1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development Scenario 2 - (High Impact)

Ground Floor (@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Day dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67
67 <	

Legend

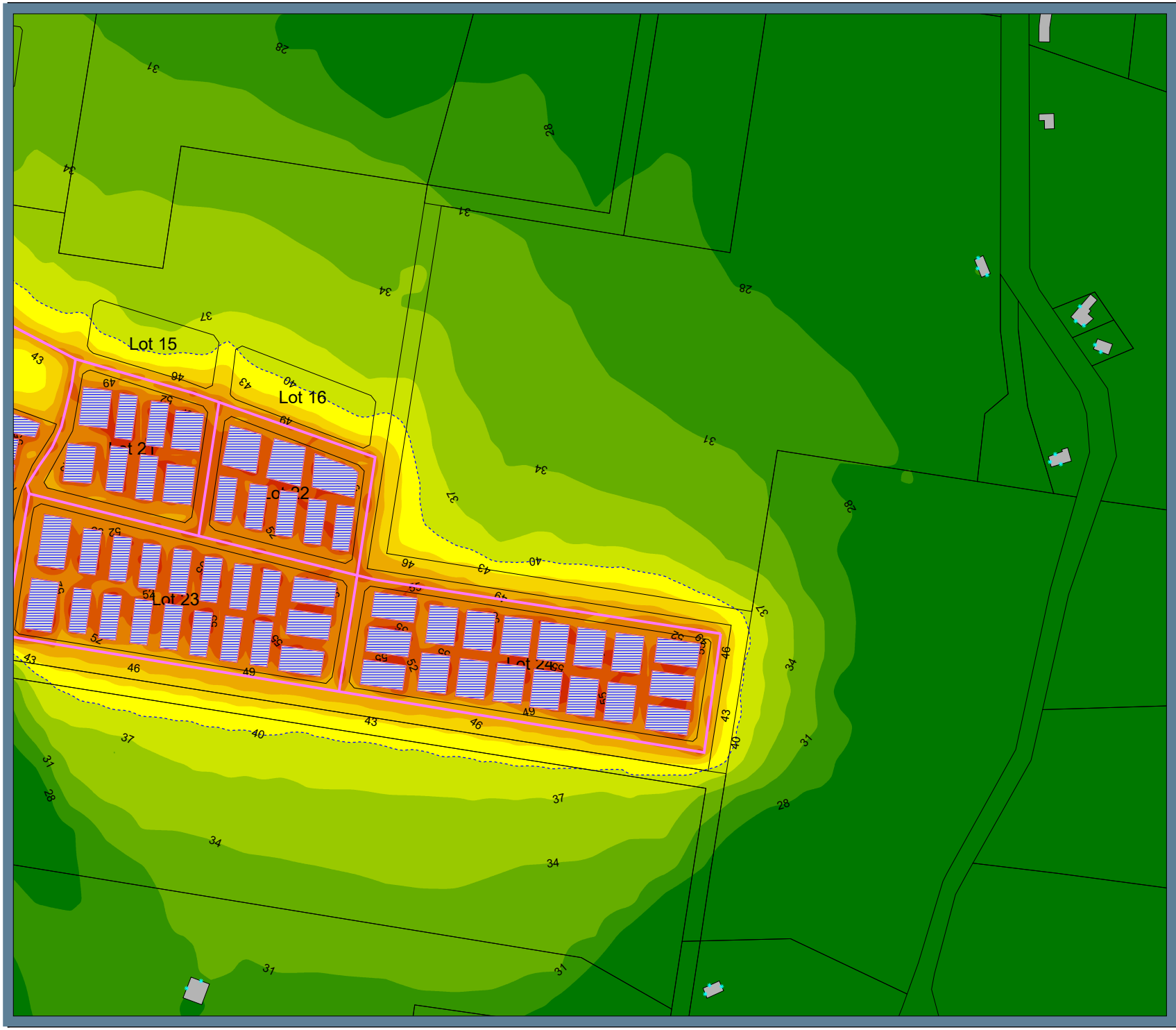
- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 20/09/2022
Processed with SoundPLAN 8.2



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Proposed Mixed-Use Development
1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development Scenario 2 - (High Impact)

Ground Floor (@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Day dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67

Legend

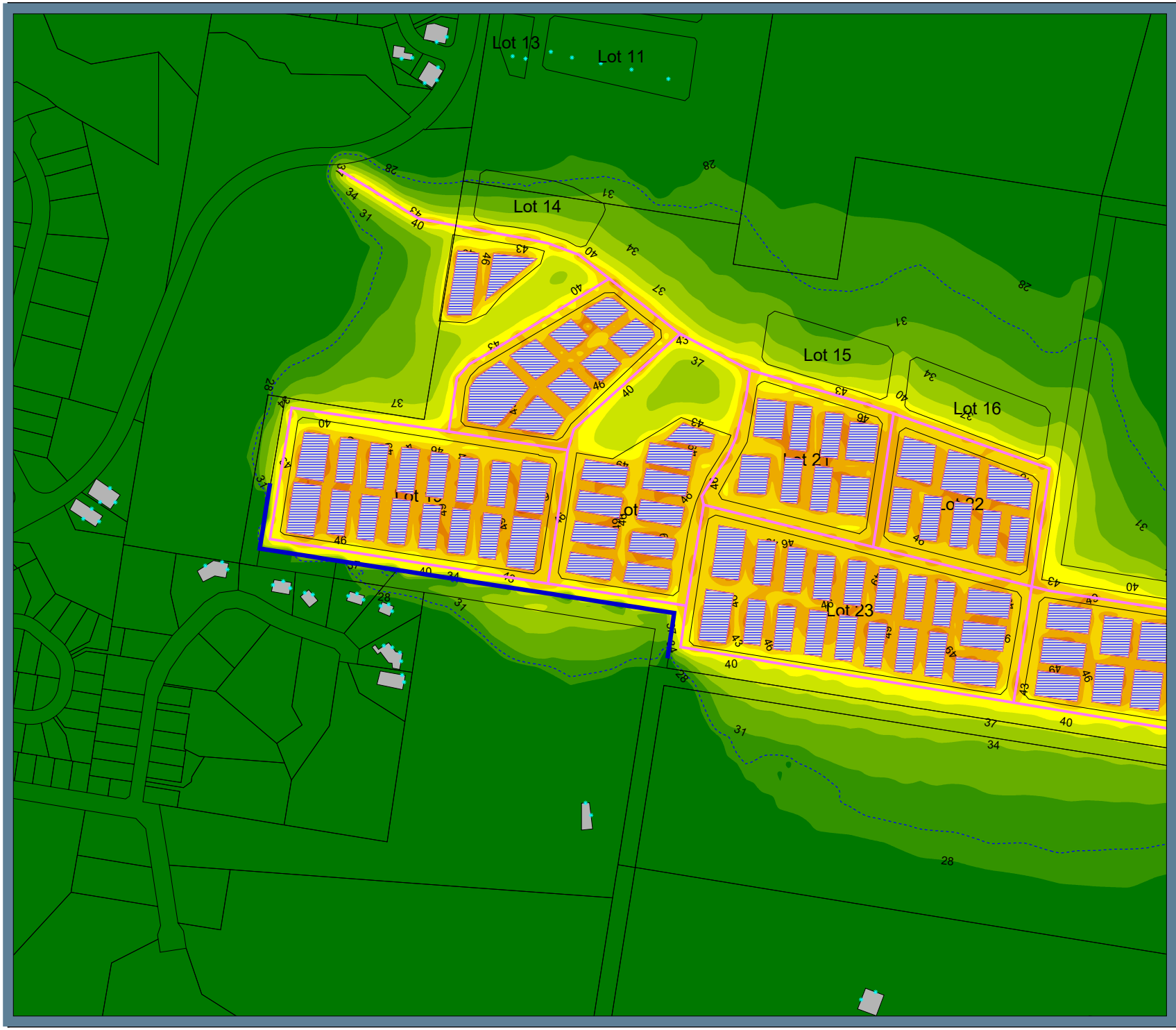
- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 20/09/2022
Processed with SoundPLAN 8.2



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Proposed Mixed-Use Development
1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development
Scenario 2 - (High Impact)

Ground Floor
(@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Night dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67

Legend

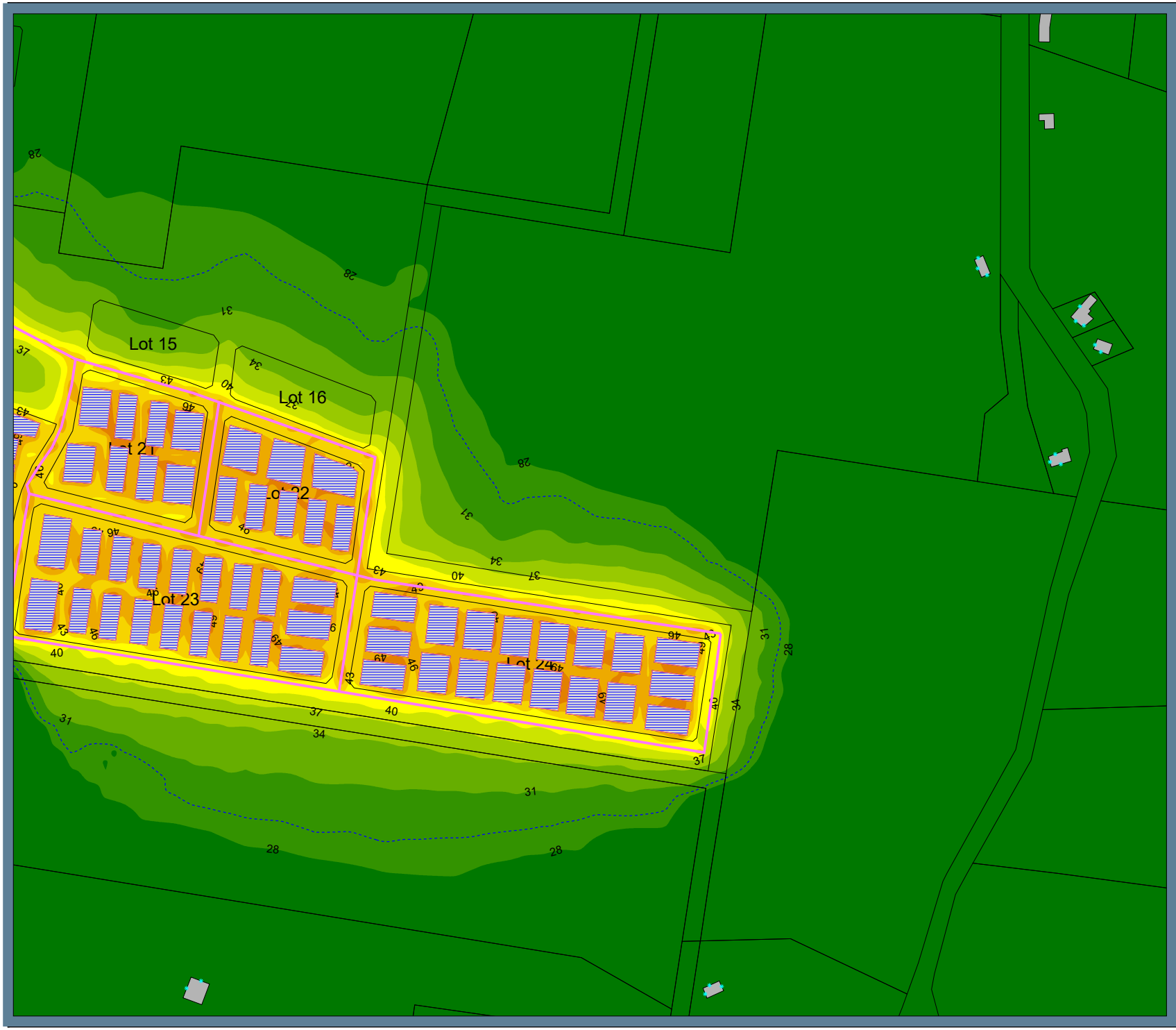
- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 19/09/2022
Processed with SoundPLAN 8.2



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Proposed Mixed-Use Development
1055 Bruxner Highway, Goonellabah

Noise Levels Associated with Proposed Development Scenario 2 - (High Impact)

Ground Floor (@1.8m AGL)

Operational noise level
$L_{eq,adj,15m}$ Night dB(A)

	<= 28
28 <	<= 31
31 <	<= 34
34 <	<= 37
37 <	<= 40
40 <	<= 43
43 <	<= 46
46 <	<= 49
49 <	<= 52
52 <	<= 55
55 <	<= 58
58 <	<= 61
61 <	<= 64
64 <	<= 67

Legend

- Proposed development
- Receiver
- Noise barrier fence
- Ground absorption
- Lot Boundaries
- Industrial building; Room
- Truck Movements
- Limit line

SCALE @ A4 1:6000

0 30 60 120 180 240 300 m

N

Grid Spacing: 10m
Project Engineer: Sam Cahill
Created: 20/09/2022
Processed with SoundPLAN 8.2