

MARSHALL DAY Acoustics

82 AUSTIN AVENUE, KENWICK BUDDHIST STUPA AND CARPARK NOISE ASSESSMENT

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Report No.: **Rp 001 20260850**

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1.0 INTRODUCTION

The Sri Lankan Sinhalese Buddhist Society (SLSBS) has engaged Marshall Day Acoustics (Australia) Pty Ltd (MDA) to provide an acoustic assessment for a proposed Buddhist stupa and carpark at Lot 52 (#82) Austin Avenue, Kenwick.

A development application for the proposed works has been submitted to the City of Gosnells. The City requires an acoustic report addressing the following:

- Vehicle noise: noise associated with vehicles entering and leaving the carpark, with a maximum vehicle speed of 10 km/h.
- Annual outdoor religious event: a separate assessment of one outdoor religious event held annually in May, including the use of an outdoor PA system.

This report addresses the above issues and provides details of the site, the relevant noise criteria, an assessment of noise levels at the nearest receivers and recommendations for noise management.

A glossary of acoustic terminology used in this report is provided in Appendix A.

2.0 SITE DESCRIPTION

2.1 Site location

The site is located on the northern side of Austin Avenue, Kenwick. It comprises Lot 132 (#78) and Lot 52 (#82) Austin Avenue, together with the adjoining Lot 127 (#76), all of which are owned by the SLSBS and operate as the Sri Lanka Buddhist Vihara (temple).

The existing temple facilities are located on Lot 132, and include a multi-purpose building (shrine room, dana hall and kitchen), the monks' living quarters and a carpark. The proposed stupa and new carpark are located on Lot 52, to the east of the existing facilities.

A copy of the proposed site plan is included in Appendix B.

The surrounding area is predominantly residential with industrial land to the south across Austin Avenue. An extract from the town planning map is included in Appendix C.

An aerial photograph showing the site and surrounds is presented in Figure 1. The lots belonging to the temple are marked and labelled in red. The nearest representative noise sensitive receivers are labelled in blue and described in Table 1.

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Figure 1: Aerial photograph of the site and surrounds (Image: MetroMap)

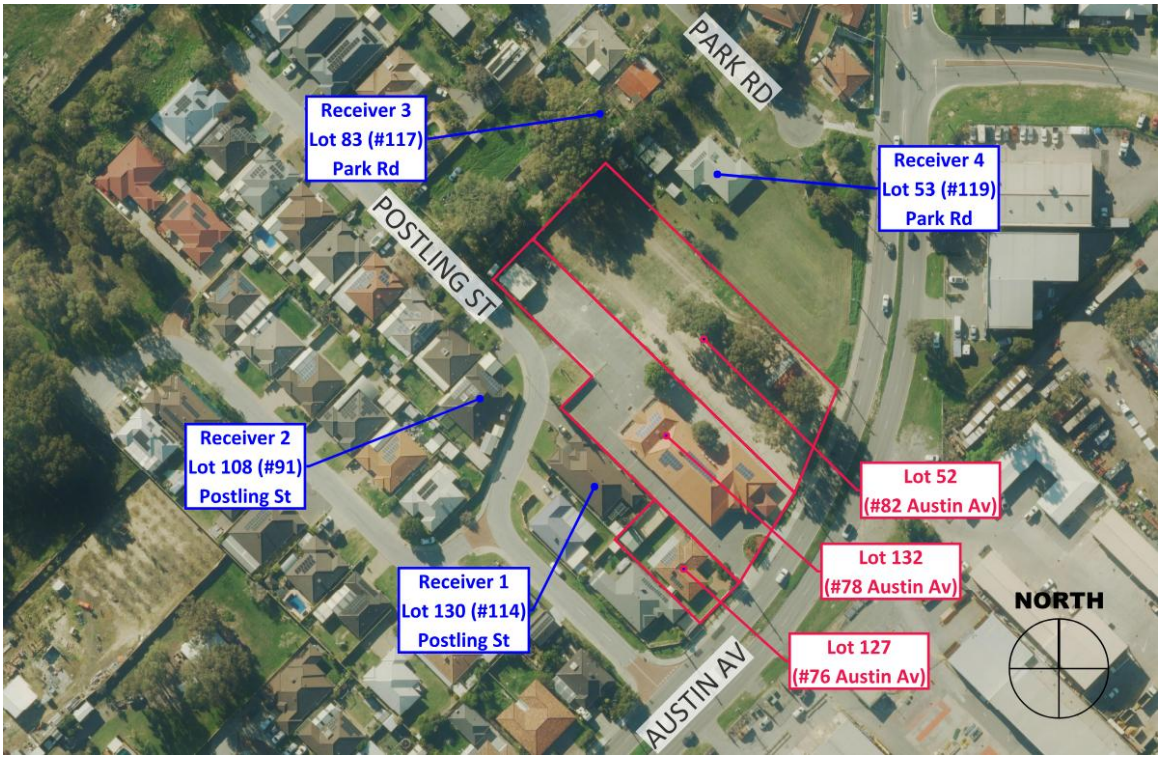


Table 1: Nearest noise-sensitive receivers

Receiver ID	Address	Description
R1	Lot 130 (#114) Postling Street	Residential dwelling to the south-west of the site
R2	Lot 108 (#91) Postling Street	Residential dwelling to the west of the site
R3	Lot 83 (#117) Park Road	Residential dwelling to the north of the site
R4	Lot 53 (#119) Park Road	Residential dwelling to the north of the site

2.2 Development description

The proposed development on Lot 52 comprises:

- a new Buddhist stupa (a religious monument), approximately 7.7 m in height
- a new carpark, increasing the total number of parking bays across all lots from 49 to 112
- removal of the fence between Lot 132 and Lot 52 to merge the two lots
- a new Colorbond fence along the rear (northern) boundary, together with new and relocated gates and new lighting. Existing fencing is otherwise retained along the site boundaries.

We understand the temple operates as follows:

- The temple is open to the public every day from 7 am to 9 pm.
- Religious activities, including prayers and meditation, are conducted quietly inside the shrine room. There are no significant outdoor noise-generating activities on normal operating days.
- Under regular operations, vehicles enter and leave the site periodically throughout the day. On weekdays, approximately 2–3 vehicles are anticipated in the morning, increasing to up to 10 vehicles in the evening. On weekends, particularly at prayer times, this is estimated to increase to approximately 30–40 vehicles in the evening.

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- Once a year, in May, the temple holds a significant religious event known as Vesak, which is attended by approximately 700 people who arrive and depart progressively between approximately 6 pm and 9 pm.
- Currently, attendees for the event are transported to and from the site by shuttle buses operating from a nearby Bunnings carpark. The proposed expanded carpark (112 bays total) is to accommodate more parking on site for the annual event. The Bunnings carpark will continue to be used for additional parking as required to reduce parking demand at the site.
- During Vesak, attendees on the site will be located both inside the building and outside. An outdoor public address (PA) system is used at the commencement of the event for speeches and Buddhist prayers only (no music). The PA system is expected to operate for approximately one hour, between approximately 6 pm and 7 pm.

The purpose of this assessment is to consider the potential new noise sources associated with the proposed development, namely carpark noise and noise from the annual outdoor event. The existing temple operations and building services are unchanged and are outside the scope of this assessment. The noise sources considered are discussed and assessed in Section 4.0.

3.0 LEGISLATION AND GUIDELINES

Acoustic design criteria for the project have been developed with reference to the publication listed in Table 2.

Table 2: Applicable statutory source for acoustic criteria

Criteria source	Status	Relevance to project
Western Australian Environmental Protection (Noise) Regulations 1997	Statutory requirement	Sets limits for noise emitted from the development to nearby noise sensitive premises.

3.1 Environmental Protection (Noise) Regulations 1997

External noise emission is governed by the Western Australian Environmental Protection (Noise) Regulations 1997 (the Noise Regulations). The Noise Regulations are a 'prescribed standard' under the Environmental Protection Act 1986.

The assessment of noise emission under the Noise Regulations is based on external noise level limits that apply at a receiver position. The calculation of the noise level limits takes into account the local road network, the land use in the surrounding area and the time of day. These calculated noise level limits are known as 'assigned noise levels'.

Noise emissions from a proposed development site are assessed over an assessment period which can vary between 15 minutes and 4 hours. The assessment period must be appropriate for the assessment of the emission and depends on the type and character of the noise source(s).

The assigned noise levels are defined in terms of statistical A-weighted and Slow-weighted sound pressure levels as follows:

- L_{A10}, the noise level not to be exceeded for more than 10% of the assessment period
- L_{A1}, the noise level not to be exceeded for more than 1% of the assessment period
- L_{Amax}, the noise level not to be exceeded at any time.

In determining the assigned noise levels applicable to the development, reference has been made to the City of Gosnells town planning maps referred to in Appendix C.

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3.1.1 Assigned noise levels

The assigned noise levels applicable to the representative most-affected receivers are presented in Table 3. Full details of the parameters used in the calculation of the assigned noise levels are provided in Appendix C.

Table 3: Summary of assigned noise levels

Type of premises receiving noise	Time of day		Assigned noise level (dB)		
			L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700-1900	Monday to Saturday	47	57	67
	0900-1900	Sunday and public holidays	42	52	67
	1900-2200	all days	42	52	57
	2200-0700 2200-0900	Monday to Saturday or Sunday and public holidays	37	47	57
Noise sensitive premises: any area other than highly sensitive area	All hours		60	75	80
Commercial premises	All hours		60	75	80
Industrial and utility premises	All hours		65	80	90

In addition, the noise emissions must be free of intrusive or dominant noise characteristics, which are defined as impulsiveness, modulation and tonality. Adjustments are also applicable where the noise emission is music. These adjustments are presented in Table 4.

Table 4: Adjustments for intrusive or dominant noise characteristics

Adjustment where noise emission is not music. These adjustments are cumulative to a maximum of 15 dB.			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB	+10 dB	+15 dB

3.1.2 Community noise

Division 5 of the Noise Regulations states that 'Regulation 7 does not apply to community noise'. Community noise is defined in Schedule 2 and includes:

> *Noise emitted from an assembly convened solely for the purpose of divine worship where -*
>
> *a) the noise is not noise of a kind referred to in regulation 15(2); and*
>
> *b) the premises or public place on which the worship takes place is land which is referred to in section 6.26(2)(d), (e) or (f) of the* Local Government Act 1995.

While some activities associated with the site may fall under the definition of 'community noise', use of the carpark and outdoor PA system would be assessable against the assigned levels.

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3.1.3 Non-complying events

Events that cannot reasonably comply with the assigned levels are often approved subject to suitable noise management procedures being implemented. The process is sometimes managed through approvals under Regulation 18 of the Noise Regulations.

Regulation 18 allows sporting, cultural and entertainment events to be approved as non-complying events. This applies where an event is likely to exceed the assigned levels and would lose its character or usefulness if required to comply.

Regulation 18(8) also requires the event organiser to pay the cost of noise monitoring during the event if the CEO determines that noise received at noise-sensitive premises is likely to exceed 65 dB between 7 am and 7 pm, or 60 dB between 7 pm and 7 am.

3.1.4 Assessment criteria

The identified noise sources and expected times of occurrence on site are as follows:

Carpark use

- Noise from vehicles (including door slams) and patrons talking in the carpark.
- Between 7 am and 9 pm any day of the week. Peak time is evenings when there can be up to approximately 40 cars on site.

Annual outdoor event

- Noise from amplified speech (outdoor PA system) and from patrons.
- Visitors arrive and depart progressively between approximately 6 pm and 9 pm.
- The event can occur any day of the week (based on lunar calendar).

The assessment criteria are based on the types of noise and expected hours of occurrence, as outlined above. As both the carpark and the annual event can occur on any day of the week and extend into the evening period (after 7 pm), the most stringent applicable assigned levels have been adopted as a worst case. These are the evening (7 pm to 10 pm) assigned levels, which also correspond to the daytime L_{A10} assigned level on Sundays and public holidays.

The assessment criteria are summarised in Table 5.

Table 5: Assessment criteria

Site use	Noise sources	Assessment criteria / assigned levels	
		Overall noise levels	Maximum noise levels
Typical operations	Vehicles and patrons in carpark	42 dB L_{A10}	57 dB L_{Amax}
Annual events	Patrons and PA use outside	42 dB L_{A10}	57 dB L_{Amax}

The L_{A1} assigned levels will also apply, but these levels cannot be reliably predicted through desktop modelling and they have therefore been excluded from this assessment.

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4.0 NOISE ASSESSMENT

To estimate noise levels at the nearest receivers, a 3D model of the proposed development and the surrounding environment has been created using SoundPLAN proprietary noise modelling software (version 9.1). Details of the modelling method, inputs and source levels are provided in Appendix D.

4.1 Carpark noise

Modelling of carpark noise has been carried out for both a 'typical daily use' and an 'annual event' scenario. The assessments are based on the expected vehicle movements for each scenario, assuming an even distribution of vehicles across the carpark.

4.1.1 Overall noise levels

Results of the noise modelling for typical daily carpark use are presented in Table 6. The results are based on 40 one-way vehicle movements occurring within a one-hour period.

Table 6: Carpark noise assessment – typical daily use

Receiver	Address	Predicted level (L_{A10})	Assigned level (L_{A10})	Compliance demonstrated?
R1	Lot 130 (#114) Postling Street	37	42	Yes (-5)
R2	Lot 108 (#91) Postling Street	40	42	Yes (-2)
R3	Lot 83 (#117) Park Road	36	42	Yes (-6)
R4	Lot 53 (#119) Park Road	39	42	Yes (-3)

Results of the noise modelling for event day carpark use are presented in Table 7. The results are based on a potential worst-case scenario in which 112 one-way vehicle movements occur within a one-hour period – i.e. all vehicles arrive or depart within one hour.

Table 7: Carpark noise assessment – annual event use

Receiver	Address	Predicted level (L_{A10})	Assigned level (L_{A10})	Compliance demonstrated?
R1	Lot 130 (#114) Postling Street	43	42	No (+1)
R2	Lot 108 (#91) Postling Street	46	42	No (+4)
R3	Lot 83 (#117) Park Road	42	42	Yes (0)
R4	Lot 53 (#119) Park Road	45	42	No (+3)

Intrusive or dominant noise characteristics would not typically be associated with this type of noise and no adjustments have been applied on this basis.

The modelling demonstrates that the assigned levels can be achieved for typical carpark use. Event day use could exceed the assigned levels by up to 4 dB. This is discussed further below.

4.1.2 Maximum noise levels

An assessment of maximum noise levels from vehicles in the carpark has been carried out by modelling point sources representing car door slams within each parking bay. The reported noise levels represent the highest potential noise level at each receiver – i.e. noise from the nearest parking bay to each receiver. This is a conservative assumption, as it represents worst-case potential noise that is unlikely to regularly occur.

Results of the maximum noise level modelling are presented in Table 8.

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Table 8: Carpark noise assessment – maximum noise levels

Receiver	Address	Predicted level (L_{Amax})	Assigned level (L_{Amax})	Compliance demonstrated?
R1	Lot 130 (#114) Postling Street	52	57	Yes (-5)
R2	Lot 108 (#91) Postling Street	52	57	Yes (-5)
R3	Lot 83 (#117) Park Road	46	57	Yes (-11)
R4	Lot 53 (#119) Park Road	50	57	Yes (-7)

The modelling demonstrates that the assigned levels can be achieved. A 10 dB adjustment for impulsiveness can sometimes apply to maximum noise levels from carparks, and this could affect compliance. This is discussed below.

4.1.3 Discussion

For typical day-to-day use, the modelling indicates that carpark noise achieves the L_{A10} assigned level at all receivers. On the annual event day, carpark noise could exceed the L_{A10} assigned level by up to 4 dB. Predicted maximum noise levels from car door slams achieve the L_{Amax} assigned level; however, if a 10 dB adjustment for impulsiveness were applied, the L_{Amax} assigned level would be exceeded at R1, R2 and R4.

The following context is relevant when considering how likely the noise levels are to result in issues or complaints on typical days and on the event day:

- The modelling is conservative, as the levels presented are for car door slams in the nearest parking bay to each receiver. On typical days, many of the new parking bays are further from the temple and are unlikely to be used regularly as the carpark will not be full.
- The calculated highest noise levels – 52 dB L_{Amax} at R1 and R2 – are for receivers that are adjacent to the existing carpark on Lot 132, and the carpark development is not expected to increase the maximum noise levels that these receivers are already exposed to.
- The event day L_{A10} predictions assume a worst case in which all 112 vehicle movements occur within a single hour. In practice, movements are likely to be spread over a longer period, and event day parking only occurs once per year.

Based on the above, on typical days the risk of disturbance from car doors closing is considered low, as the modelled worst case is unlikely to occur regularly.

On the annual event day, the risk is higher: all parking bays are likely to be in use, the bays nearest to receivers will be occupied, and overall (L_{A10}) levels could exceed the assigned level by up to 4 dB. As the event occurs once per year and the predictions represent a worst case, this risk is considered manageable.

Measures for managing event day parking are provided in Section 5.2.

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4.2 Annual event

The annual Vesak event is held once per year in May, between approximately 6 pm and 9 pm. An outdoor PA system is used for speeches and Buddhist prayers at the commencement of the event, for approximately one hour (typically between 6 pm and 7 pm).

Noise from the PA system and patrons on site (assuming 700 patrons outside) has been modelled.

4.2.1 Overall noise levels

Predicted overall (L_{A10}) noise levels from the PA system and patrons at the nearest receivers are presented in Table 9.

Table 9: Event noise assessment – overall noise levels

Receiver	Address	Predicted level (L_{A10})	Assigned level (L_{A10})	Compliance demonstrated?
R1	Lot 130 (#114) Postling Street	40	42	Yes (-2)
R2	Lot 108 (#91) Postling Street	46	42	No (+4)
R3	Lot 83 (#117) Park Road	53	42	No (+11)
R4	Lot 53 (#119) Park Road	55	42	No (+13)

The results show potential exceedances of up to 13 dB. Intrusive or dominant noise characteristics would not typically be associated with this type of noise and no adjustments have been applied on this basis.

4.2.2 Maximum noise levels

Predicted maximum (L_{Amax}) noise levels from the PA system and patrons at the nearest receivers are presented in Table 10.

Table 10: Event noise assessment – maximum noise levels

Receiver	Address	Predicted level (L_{Amax})	Assigned level (L_{Amax})	Compliance demonstrated?
R1	Lot 130 (#114) Postling Street	54	57	Yes (-3)
R2	Lot 108 (#91) Postling Street	55	57	Yes (-2)
R3	Lot 83 (#117) Park Road	55	57	Yes (-2)
R4	Lot 53 (#119) Park Road	57	57	Yes (0)

The modelling demonstrates that the L_{Amax} assigned level can be achieved.

4.2.3 Discussion

Noise from the outdoor PA system and patrons during the annual Vesak event is likely to exceed the assigned levels at the nearest receivers.

However, the event only occurs once a year and the outdoor PA system runs for about one hour in the day period (6 pm to 7 pm). Noise from the event is therefore unlikely to cause significant disturbance, provided that suitable management procedures are applied.

Recommendations for managing event noise are provided in Section 5.2.

If necessary, event noise could be managed through use of Regulation 18 (see Section 3.1.3). The highest predicted level of 57 dB L_{Amax} is below the Regulation 18(8) thresholds, so noise monitoring is not expected to be required as a condition of approval.

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5.0 RECOMMENDATIONS FOR NOISE MANAGEMENT

5.1 Managing carpark noise

We recommend the following procedures be adopted by the venue operator to manage noise from the carpark:

- Attendees should be made aware of the proximity of residential neighbours, including encouragement not to loiter in the carpark and to depart from the site in a quiet manner.
- A maximum vehicle speed of 10 km/h should be maintained within the carpark, with appropriate signage installed.
- Consideration should be given to the location of speed bumps and drainage grates, which have the potential to cause noise when vehicles pass over them. These should be located away from receivers wherever practicable, and drainage grates should be firmly fastened to reduce impact noise.

5.2 Managing annual event noise

Noise modelling of the annual Vesak event predicts that noise received at the nearest noise-sensitive premises could exceed the assigned levels. The exceedances are limited in duration and frequency; therefore, the event is unlikely to cause significant disturbance, provided that suitable management procedures are applied.

The following procedures are recommended to manage event noise:

- The temple should notify nearby residents before the event and provide a contact name and phone number for any noise concerns during the event. This should include all noise-sensitive premises within the notification area shown on the noise map in Appendix E.
- The outdoor sound system should be oriented so that loudspeakers face away from the nearest receivers wherever practicable and set to the minimum level necessary for the audience.
- The amplified component of the event should be limited in duration and, wherever practicable, completed earlier in the evening (for example by approximately 7 pm).
- The sound system must be used for speech only and not for amplified music.
- Carpark attendants should be used to direct cars on site and redirect cars away once the carpark is at capacity.

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6.0 CONCLUSIONS

This report has been prepared as part of the development application for the proposed Buddhist stupa and carpark at Lot 52 (#82) Austin Avenue, Kenwick.

An assessment of noise from the proposed carpark and the annual Vesak event has been undertaken at the nearest noise-sensitive receivers against the assigned levels in the Noise Regulations.

Carpark noise is predicted to meet the assigned levels at all receivers for typical daily use. Maximum noise levels from car doors closing are also predicted to meet the assigned levels, although compliance could be affected if an adjustment for impulsiveness were applied. Given the conservative modelling, the risk of disturbance is considered low for regular operations. On annual event days, when the carpark is expected to be full, carpark noise could exceed the assigned levels by up to 4 dB L_{A10}.

Noise from the outdoor PA system and patrons during the annual event is predicted to exceed the L_{A10} assigned level by up to 13 dB, while maximum noise levels are predicted to meet the L_{Amax} assigned level. The highest predicted level of 57 dB L_{Amax} is below both noise monitoring thresholds in Regulation 18(8).

As the event occurs only once a year, with the outdoor PA system used for about one hour, event noise is unlikely to cause significant disturbance provided the noise management measures in Section 5.2 are applied. If necessary, event noise could also be managed through an approval under Regulation 18 (see Section 3.1.3). With these measures in place, noise from the proposed development is expected to be managed to an acceptable level for nearby residents.

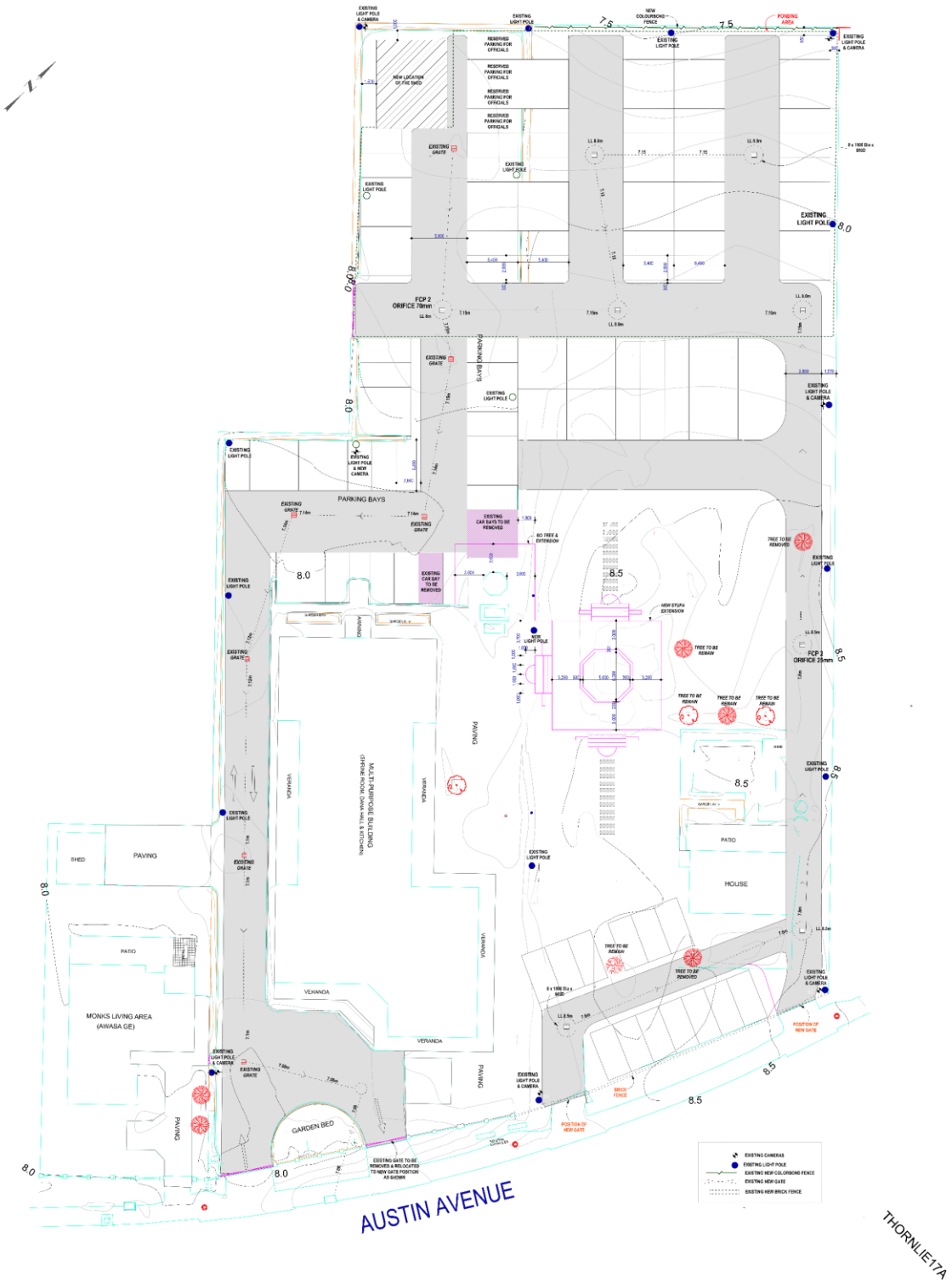
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APPENDIX A GLOSSARY OF TERMINOLOGY

Term	Definition
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel. The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr = 20 µPa, i.e. dB = 20 × log(P/Pr).
Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
Hertz (Hz)	The unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
L_{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
L_{A1}	The noise level exceeded for 1% of the assessment period, measured in dB.
L_{A10}	The noise level exceeded for 10% of the assessment period, measured in dB.
L_{Amax}	The A-weighted maximum noise level, measured in dB.
Octave band	A range of frequencies where the highest frequency is twice the lowest. Octave bands are referred to by their logarithmic centre frequencies: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz and 16 kHz.
SPL or L_p	Sound Pressure Level. A logarithmic ratio of a sound pressure measured at a distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
SWL or L_W	Sound Power Level. A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels.

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APPENDIX B PROPOSED SITE PLAN



PROPOSED CAR PARKING PLAN

SLSBS - PERTH (WA)
#82 AUSTIN AVENUE, KENWICK

DETAIL SURVEY
SRI LANKA BUDDHIST VIHARA
(PERTH WESTERN AUSTRALIA)

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APPENDIX C ASSIGNED NOISE LEVEL CALCULATIONS

The determination of the Influencing Factor (IF) which affects the assigned levels applicable at the nearest residential receivers is based on the following:

- The number of major and secondary roads in proximity to the receiver
- The area of commercial and industrial zoned land surrounding the receiver

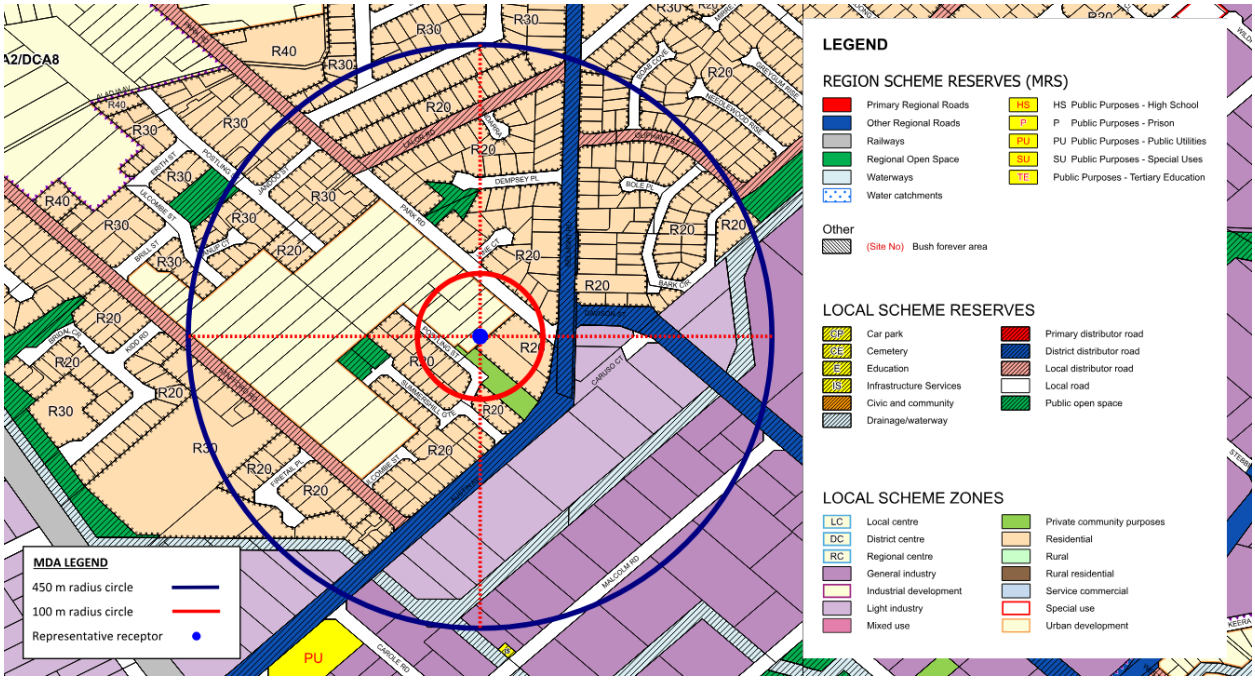
The procedure defined in the Noise Regulations considers the land use and road types with two circles centred on the receiver location, one of 450 m radius, and one of 100 m radius.

The land use has been determined from:

- City of Gosnells Local Planning Scheme Map No. 24: Kenwick Locality (dated 30 September 2025)

The IF has been calculated at R3 – Lot 83 (#117) Park Road – and applied to all receivers. R3 has the least industrial zoned land within the 450 m circle of the nearest receivers, so it gives the lowest IF and therefore the most conservative (lowest) assigned levels. An extract of the planning map showing the 100 m and 450 m radius circles centred at the sensitive receiver at Lot 83 (#117) Park Road is presented in Figure 2.

Figure 2: Extract of planning map with 100 m and 450 m radius areas used to determine the IF shown



Transport factors of 6 dB and 2 dB apply if there are any Major Roads – a road carrying more than 15,000 vehicles per day (VPD) – within the 100 m and 450 m circles respectively. For each Secondary Road – a road carrying between 6,000 and 15,000 VPD – within the 100 m circle, a 2 dB transport factor applies. The total transport factor that is included in the IF is limited to 6 dB.

Traffic data for the nearby roads obtained from Main Roads is presented in Table 11.

Table 11: Traffic data and classifications for nearby roads (source: Main Roads)

Road	Average weekday traffic volume, AADT/VPD	Classification
Austin Avenue	5,792 (2026)	-

A summary of the input parameters used to determine the IF is presented in Table 12.

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Table 12: Influencing Factor (IF) calculation parameters

	100 m circle	450 m circle	IF
Land use:			
Industrial %	0%	22%	+2
Commercial %	0%	0%	-
Transport Factor:			
Major road	0	0	-
Secondary roads	0	n/a	-
		Influencing Factor:	**2 dB**

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APPENDIX D NOISE MODELLING DETAILS

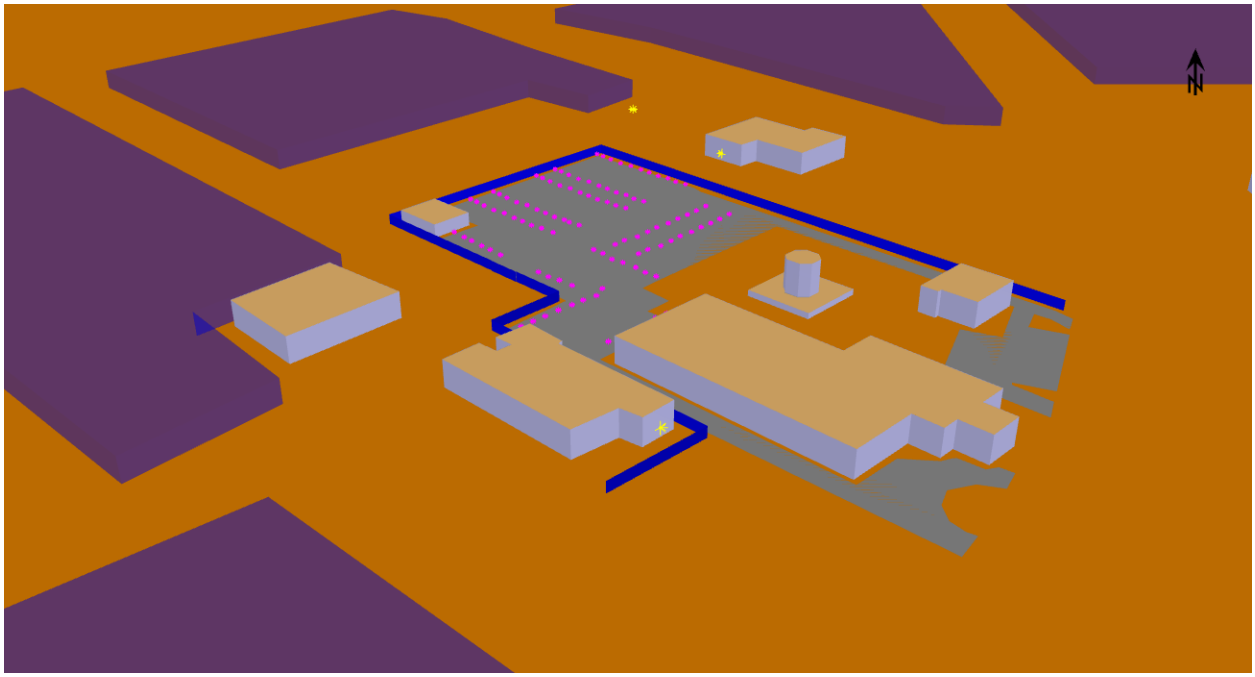
D1 Modelling method

A 3D model of the proposed building, carpark and surrounding environment has been created using SoundPLAN proprietary noise modelling software (version 9.1).

Geometry data for the model has been sourced from public aerial photography and building heights defined on the basis of standard assumed heights per floor level. The geometries in the model are simplified representations of the built environment that have been configured to a level of detail that is appropriate for noise calculation purposes.

A screenshot from the noise model is shown in Figure 3.

Figure 3: Screenshot from SoundPLAN noise model



The SoundPLAN model has been used to calculate noise levels in accordance with the International Standard *ISO 9613-2: 2024 Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors* (ISO 9613-2). ISO 9613-2 is a general environmental noise calculation standard that has been used extensively throughout Australia, New Zealand, and Europe since it was first published in 1996 (revised in 2024).

The implementation of ISO 9613-2 within proprietary noise modelling software enables multiple sound transmission paths, including reflected and screened paths, to be accounted for in the calculated noise levels.

ISO 9613-2 predicts noise levels for conditions favourable to propagation. The meteorological conditions assumed in the noise modelling are 10°C with 70% humidity.

Carpark noise

Overall noise levels from carparks (L_{A10}) are modelled based on the Bavarian[1] prediction method using ISO 9613-2 for the propagation calculation. The Bavarian method defines source levels for different carpark types and is a widely accepted method for predicting carpark noise that is used by acoustic consultants throughout Australia.

[1] Bavarian State Agency for the Environment 2007, Parking Area Noise, 6th Edition, Bavarian State Ministry for the Environment, Germany

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The 'visitors and staff' carpark type has been adopted for the predictions. This is considered to be the most suitable category defined in the Bavarian method and is representative of the expected noise levels at the proposed facility.

Maximum noise levels in carparks are based on our measurements of a typical worst-case car door slam.

D2 Noise modelling inputs

Selected key inputs for the noise model are presented in Table 13.

Table 13: Noise modelling inputs

Parameter	Input
Noise source data	Refer to Table 14 below
Topography data	5 m digital elevation model (publicly available from ELVIS elevation and depth)
Receiver height	1.5 m above ground
Ground attenuation	
- Site / carpark	G = 0.0 (hard)
- Wider area	G = 0.5 (mixed)
Barriers	Fences surrounding the site modelled as 1.8 m high 0.4 mm steel (R_w 17) Gate near 91 Postling Street modelled as 1.8 m high louvres (R_w 3)

Buildings on site and on the nearest neighbouring properties have been included in the model to factor in screening and reflected sound to the nearest receivers. Propagation losses from more distant residential dwellings were factored in for noise mapping using 'housing' attenuation areas (A_{hous}), as defined in ISO 9613-2, assuming a nominal 4 m effective height.

D3 Noise source levels

For this assessment, we sourced noise level data from our noise database, which compiles measurements of many sources made by our staff. These measurements have been used to calculate suitable inputs for the noise model.

The sound levels presented in Table 14 have been used in this assessment.

Table 14: Sound levels for noise sources used in assessment

		Octave band centre frequency, Hz (dB)							
Noise source	**Metric**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**dBA**
Car door slam	$L_{wS,Max}$	108	101	94	88	85	83	80	93
Outdoor PA system (speech)	L_p at 1 m	80	82	89	92	88	84	79	93
Carpark typical – 40 vehicle movements per hour	$L_{w,eq}$	95	93	89	83	81	77	77	87
Carpark event day – 112 vehicle movements per hour	$L_{w,eq}$	100	98	94	88	86	82	82	92
700 patrons outdoors	$L_{w,eq}$	85	87	88	95	93	89	82	97

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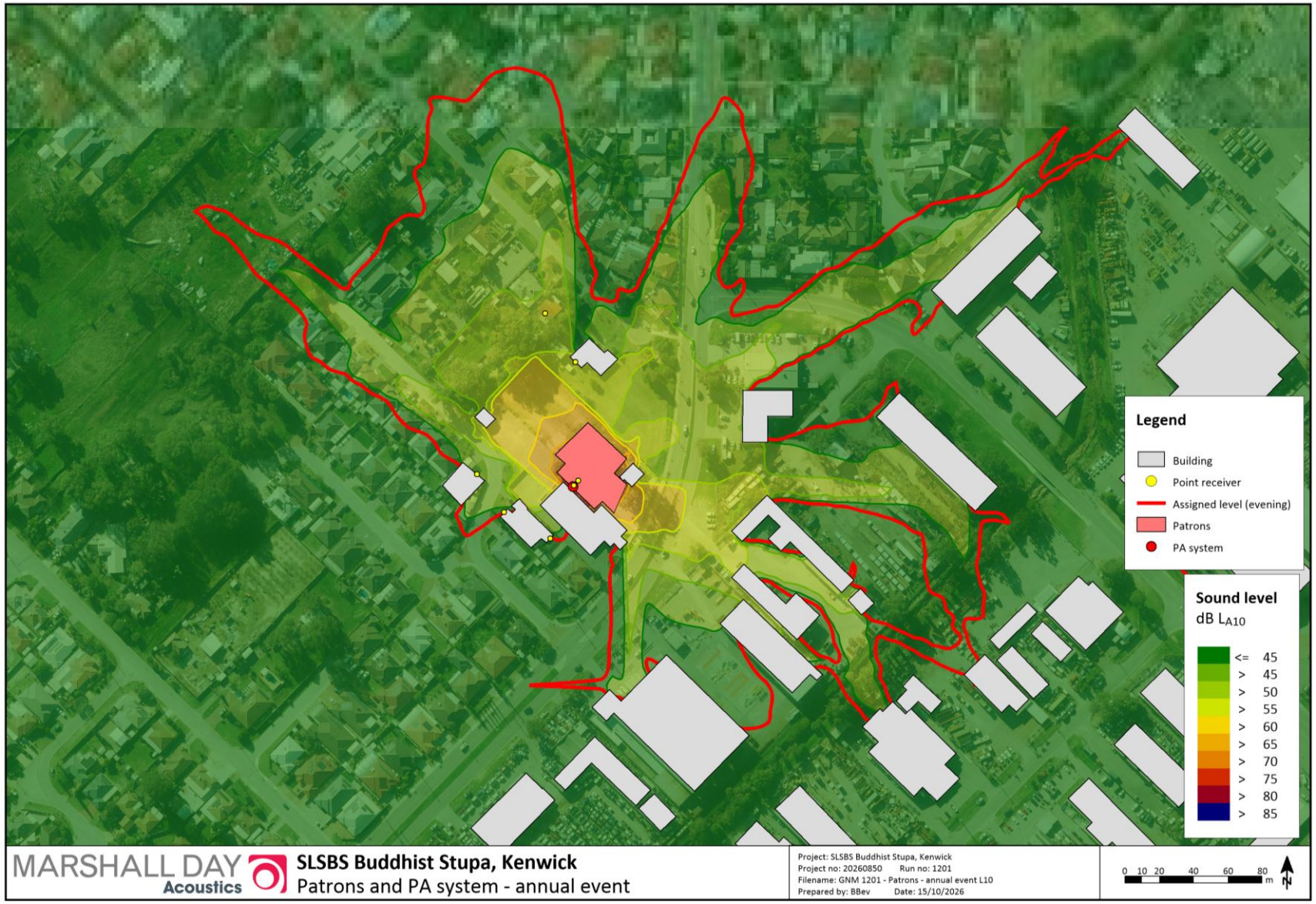
APPENDIX E NOISE MAP FOR EVENT NOTIFICATIONS

A noise map showing the predicted noise levels from the PA system and patrons on site during the annual Vesak event is provided in Figure 4. The red solid contour represents the 'evening' period assigned level (42 dB L_{A10}) at noise-sensitive receivers.

We recommend that all noise-sensitive premises within the red contour line be notified in advance of the annual Vesak event. This would typically be done by letter drop.

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Figure 4: Noise map – annual event (notification area)



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