

**PROPOSED LARGE FORMAT RETAIL DEVELOPMENT
LOT 701 ARMADALE ROAD
TREEBY**

ENVIRONMENTAL ACOUSTIC ASSESSMENT

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MEYER SHIRCORE

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1. INTRODUCTION

Herring Storer Acoustics were commissioned to undertake an acoustic assessment of noise emissions associated with the proposed large format retail development, located at Lot 701 Armadale Road, Treeby.

This report assesses noise emissions from the premises with regards to compliance with the requirements of the *Environmental Protection (Noise) Regulations 1997*. Noise sources considered as part of this assessment, as requested by council, include:

- Mechanical Services; and
- Delivery vehicles.

Comment is also provided with regards to noise associated with waste collection.

The food tenancies and gym are noted, however, these tenancies are located within buildings 4 and 5, which are located in the centre of the development site. Thus, with Buildings 1 and 2 providing a significant barrier between buildings 4 and 5 and the neighbouring residences, compliance with the requirements of the *Environmental Protection (Noise) Regulations 1997* would be achieved by some considerable margin.

For reference, the site plan for the proposed development is attached in Appendix A.

2. SUMMARY

As shown on Figure 3.1, the closest neighbouring residences to this development are to the south east and north east.

From the analysis undertaken, noise emissions from the proposed development have been assessed to comply with the requirements of the *Environmental Protection (Noise) Regulations 1997* at all times. However, the following are recommended to be imposed as conditions:

- The mechanical services design needs to be confirmed during design development phase. An acoustic study of the mechanical services be undertaken once the design has been finalised, to ensure compliance is achieved.
- Waste collections to be undertaken under in accordance with the requirements of Regulation 14A – “Waste collection and other works”.
- Deliveries by large trucks are restricted to the day (including Sundays and Public Holidays) and evenings (ie NO deliveries during the night period).

We note that there would be no restrictions on small delivery trucks or cars.

3. CRITERIA

3.1 ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997

The allowable noise level for noise sensitive premises in the vicinity of the proposed Large Format Retail development is prescribed by the *Environmental Protection (Noise) Regulations 1997*. Regulations 7 and 8 stipulate maximum allowable external noise levels or assigned noise levels that can be received at a premise from another premises. For residential premises, this noise level is determined by the calculation of an influencing factor, which is then added to the base levels shown below. The influencing factor is calculated for the usage of land within two circles, having radii of 100m and 450m from the premises of concern. The base noise levels for residential premises are listed in Table 3.1.

TABLE 3.1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise sensitive premises: highly sensitive area	0700 - 1900 hours Monday to Saturday (Day)	45 + IF	55 + IF	65 + IF
	0900 - 1900 hours Sunday and Public Holidays (Sunday / Public Holiday Day)	40 + IF	50 + IF	65 + IF
	1900 - 2200 hours all days (Evening)	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays (Night)	35 + IF	45 + IF	55 + IF

Note: L_{A10} is the noise level exceeded for 10% of the time.

L_{A1} is the noise level exceeded for 1% of the time.

L_{Amax} is the maximum noise level.

IF is the influencing factor.

It is a requirement that received noise be free of annoying characteristics (tonality, modulation and impulsiveness), defined below as per Regulation 9.

“impulsiveness” means a variation in the emission of a noise where the difference between L_{Apeak} and L_{Amax(Slow)} is more than 15 dB when determined for a single representative event;

“modulation” means a variation in the emission of noise that –

- (a) is more than 3 dB L_{Afast} or is more than 3 dB L_{Afast} in any one-third octave band;
- (b) is present for more at least 10% of the representative assessment period; and
- (c) is regular, cyclic and audible;

“tonality” means the presence in the noise emission of tonal characteristics where the difference between –

- (a) the A-weighted sound pressure level in any one-third octave band; and
- (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as L_{Aeq,T} levels where the time period T is greater than 10% of the

representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as L_{ASlow} levels. Where the noise emission is not music, if the above characteristics exist and cannot be practicably removed, then any measured level is adjusted according to Table 3.2 below.

TABLE 3.2 - ADJUSTMENTS TO MEASURED LEVELS

Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB.

For this development, the closest residential premises of concern are shown on Figure 3.1 below. Each individual premises has been considered in our assessment, however, to simplify reporting, only the highest noise level for each scenario considered has been reported.

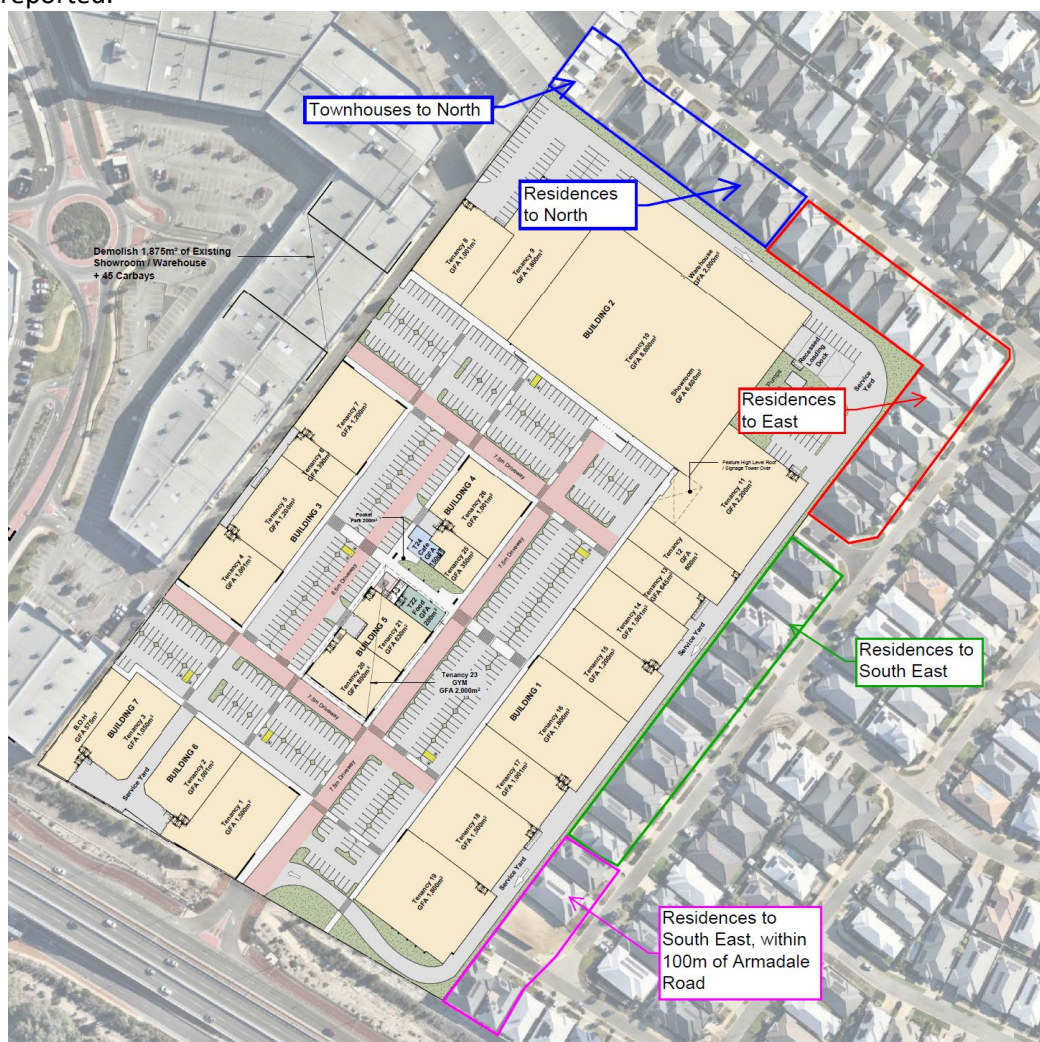


FIGURE 3.1 – AREA AROUND PROPOSED DEVELOPMENT

The influencing factor at the nearest residential locations have been determined as summarised in Table 3.3.

TABLE 3.3 – INFLUENCING FACTOR

Influencing Factor Parameter	Influencing Factor (dB)			
	Residences to SE. Within 100m of Armadale Rd	Residences to South East	Residences to East	Residences to North
Commercial land use with inner circle	+1.25 (25%)	+2.5 (50%)	+1.2 (24%)	+2.0 (40%)
Commercial land use within outer circle	+1.0 (20%)	+1.0 (20%)	+0.9 (18%)	+1.0 (20%)
Industrial land use within outer circle	-	+0.3 (6%)	+0.9 (9%)	+1.5 (15%)
Major Road within 100m (Armadale Road)	+6	-	-	-
Major Road between 100 and 450m (Armadale Road)	-	+2	+2	+2
TOTAL IF	+8	+6	+5	+6

Based on the above, the assigned noise levels are as listed in Tables 3.4 to 3.6.

**TABLE 3.4 - ASSIGNED OUTDOOR NOISE LEVEL
FOR RESIDENCES TO SOUTH EAST, WITHIN 100M OF ARMADALE ROAD**

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L _{A 10}	L _{A 1}	L _{A max}
Noise sensitive premises: Highly sensitive area	0700 - 1900 hours Monday to Saturday	53	63	73
	0900 - 1900 hours Sunday and Public Holidays	48	58	73
	1900 - 2200 hours all days	48	58	63
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	43	53	63

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

**TABLE 3.5 - ASSIGNED OUTDOOR NOISE LEVEL
FOR RESIDENCES TO SOUTH EAST AND NORTH**

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L _{A 10}	L _{A 1}	L _{A max}
Noise sensitive premises: Highly sensitive area	0700 - 1900 hours Monday to Saturday	51	61	71
	0900 - 1900 hours Sunday and Public Holidays	46	56	71
	1900 - 2200 hours all days	46	56	61
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	41	51	61

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

**TABLE 3.6 - ASSIGNED OUTDOOR NOISE LEVEL
FOR RESIDENCES TO EAST**

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L _A 10	L _A 1	L _A max
Noise sensitive premises: Highly sensitive area	0700 - 1900 hours Monday to Saturday	50	60	70
	0900 - 1900 hours Sunday and Public Holidays	45	55	70
	1900 - 2200 hours all days	45	55	60
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	40	50	60

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

3.2 WASTE COLLECTION

It is noted that under the *Environmental Protection (Noise) Regulations 1997*, the noise received at a premise from the collection of waste does not need to comply with the Assigned Noise levels, provided it is carried out in accordance with Regulation 14A of the Regulations.

In summary, waste collection carried out during the following times do not need to comply with the Assigned noise levels:

- 0700 hours and 1900 hours on any day that is not a Sunday or a public holiday.

Or

- 0900 hours and 1900 hours on a Sunday or public holiday.

For information waste collection carried out during the above times is classified as **class 1 works**. **Class 2** works means specified works carried out otherwise than between the hours specified in the definition of class 1 works.

Note: Class 2 works, also do not need to comply with the assigned noise levels, provided certain requirements, including operating under an approved Noise Management Plan, are followed.

For information it is also noted that, under the Regulations, the above requirements apply to “specified works”. Specified works, includes:

- (a) the collection of waste; or
- (b) the cleaning of a road or the drains for a road; or
- (c) the cleaning of public places, including footpaths, cycle paths, car parks and beaches; or
- (d) the maintenance of road verges and public open space (including the collection of rubbish and the planting, trimming, watering or removal of trees); or
- (e) the periodic collection of household items or other things placed on street verges by residents for the purpose of such a collection; or
- (f) activities associated with hazard or emergency management.

Waste *means* waste from domestic or commercial sources and includes:

- (a) putrescible waste; and
- (b) non putrescible waste; and
- (c) recyclable materials.

Thus, based on the above, noise emissions from waste collections do not need to be assessed and does not form part of the acoustical assessment.

4. MODELLING

Modelling of the noise propagation from the proposed development was carried out using an environmental noise modelling computer program, "SoundPlan". Calculations were carried out using the EPA worst case weather conditions as stated in the Environmental Protection Authority's "Draft Guideline on Environmental Noise for Prescribed Premises".

The acoustic assessment has been undertaken for the following noise sources:

- Mechanical Services; and
- Delivery Trucks.

The food tenancies and gym are noted, however, these tenancies are located within buildings 4 and 5, which are located in the centre of the development site. Thus, with Buildings 1 and 2 providing a significant barrier between buildings 4 and 5 and the neighbouring residences, compliance with the requirements of the Environmental Protection (Noise) Regulations 1997 would be achieved by some considerable margin.

4.1 MECHANICAL SERVICES

It is noted that mechanical services have not been selected at this stage of the development, thus, it is not possible to use actual equipment selections in our calculations. Hence, typical noise levels for air conditioners associated with tenancies of the size proposed has been utilized. The noise modelling is conservative, as it does not include any diversity in load, which would occur (particularly during the night period).

The calculations for the mechanical services were based upon the sound power levels listed in Tables 4.1.

**TABLE 4.1 – SOUND POWER LEVELS
MECHANICAL SERVICES**

Item of Equipment	Sound Power Level, (dB(A))
Building 1	AC - 13 @ 78 Exhaust Fans 9 @ 66
Building 2	AC - 7 @ 78 Exhaust Fan 4 @ 66
Building 3	AC 7 @ 78 Exhaust Fans 4 @ 66
Building 4	AC - 3 @ 78 Exhaust Fan 3 @ 66 and 1 @ 81
Building 5	AC - 3 @ 78 Exhaust 2 @ 66 and 1 @ 81
Building 6	AC - 4 @ 78 Exhaust Fans 2 @ 66
Building 7	AC - 2 @ 78 Exhaust Fans 2 @ 66

It is noted equipment selected during the design phase of the development will need to have noise emissions confirmed in relation to the above assumed noise levels.

With regards to noise emissions, the following are noted:

- 1 Noise associated with the mechanical services does not take into account any diversity of operation. Such diversity would occur during the evening and night periods (whilst cooler). Thus, this is a conservative assessment.
- 2 The location of the mechanical plant has been assumed to be on the roof of the tenancies, with screening to the plant.

4.2 DELIVERIES

The L_{A1} assigned noise level would be the pertinent prescribed noise level in this instance (for deliveries) as the duration of time that the noise of the deliveries is present is less than 10% of a representative time period. The noise associated with the delivery is the manoeuvring of the truck into place, upon which the truck is switched off – hence – even if the delivery takes some time (i.e. 30 – 60 minutes) the noise level associated with the truck is not present throughout the duration of the delivery.

The calculations for delivery trucks were based in the sound power levels listed in Tables 4.2. The large delivery truck being for furniture retailers etc; and the small delivery being for the other tenancies, such as clothing and homewares, etc.

TABLE 4.2 – GENERAL SOUND POWER LEVELS

Item of Equipment	Sound Power Level, (dB(A))
Large Delivery Truck	89
Small Delivery Truck	83

5. PREDICTED NOISE EMISSIONS

Calculations were undertaken to all the residences noted on Figure 3.1. The resultant noise levels are listed in Table 5.1.

NOTE: Noise levels were calculated at all adjacent noise sensitive premises, however, for simplicity of reporting, only the highest noise levels have been included below.

TABLE 5.1 – CALCULATED NOISE LEVELS

Item	Residences (dB(A))			
	Residences to SE. Within 100m of Armada Rd	Residences to South East	Residences to East	Residences to North
Mechanical services	34 L_{A10}	34 L_{A10}	33 L_{A10}	35 L_{A10}
Deliveries (Large Trucks)	54 L_{A1}	56 L_{A1}	55 L_{A1}	55 L_{A1}
Deliveries (Small Trucks)	48 L_{A10}	50 L_{A1}	49 L_{A1}	49 L_{A1}

6. ASSESSMENT

The following provided the acoustic assessment for the noise sources requiring compliance, as listed in Table 5.1.

6.1 L_{A10} NOISE EMISSIONS

Noise emissions from the mechanical services would be steady state and would operate for the majority of time. Hence noise received from the mechanical services needs to comply with the assigned L_{A10} noise level.

Given the resultant noise level at the residences and likely background noise level in the area, we believe that noise emissions from the mechanical services could be tonal, hence, a +5 dB(A) penalty has been applied to the calculated noise level associated with these noise sources. Table 6.1 lists the characteristics that should be included in the assessable noise level.

TABLE 6.1 – APPLICABLE ADJUSTMENTS AND ASSESSABLE L_{A10} NOISE LEVELS, dB(A)
MECHANICAL SERVICES

Location	Calculated Noise Level, dB(A)	Applicable Adjustments to Measured Noise Levels, dB(A)			Assessable Noise Level, dB(A)
		Where Noise Emission is NOT music			
		Tonality	Modulation	Impulsiveness	
Residences to SE. Within 100m of Armadale Rd	34	+5	-	-	39
Residences to South East	34	+5	-	-	39
Residences to East	33	+5	-	-	38
Residences to North	35	+5	-	-	40

Table 6.2 shows the applicable Assigned Noise Levels, and assessable noise level emissions associated for the scenarios associated with the mechanical services.

TABLE 6.2 – ASSESSMENT OF L_{A10} NOISE LEVEL EMISSIONS
MECHANICAL SERVICES

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable Assigned L_{A10} Noise Level (dB)	Exceedance to Assigned Noise Level (dB)
Residences to SE. Within 100m of Armadale Rd	39	Day Period	53	Complies
		Sunday Day Period	48	Complies
		Evenings	48	Complies
		Night	43	Complies
Residences to South East	39	Day Period	51	Complies
		Sunday Day Period	46	Complies
		Evenings	46	Complies
		Night	41	Complies
Residences to East	38	Day Period	50	Complies
		Sunday Day Period	45	Complies
		Evenings	45	Complies
		Night	40	Complies
Residences to North	40	Day Period	51	Complies
		Sunday Day Period	46	Complies
		Evenings	46	Complies
		Night	41	Complies

6.2 L_{A1} NOISE EMISSIONS

Noise emissions from delivery vehicles would be present for less than 10% of a representative time period, hence noise received from this noise source needs to comply with the assigned L_{A1} noise level.

Based on the definitions of tonality, noise emissions from these sources, being an L_{A1} and being present for less than 10% of the time, would not be considered tonal. Thus, no penalties would be applicable to the noise associated with delivery trucks. Hence, Tables 6.3 and 6.4 shows the applicable Assigned Noise Levels, and assessable noise level emissions associated with large and small delivery trucks.

**TABLE 6.3 – ASSESSMENT OF L_{A1} NOISE LEVEL EMISSIONS
DELIVERIES (LARGE TRUCKS)**

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable Assigned L _{A10} Noise Level (dB)	Exceedance to Assigned Noise Level (dB)
Residences to SE. Within 100m of Armadale Rd	54	Day Period	63	Complies
		Sunday Day Period	58	Complies
		Evenings	58	Complies
		Night	53	Complies
Residences to South East	56	Day Period	61	Complies
		Sunday Day Period	56	Complies
		Evenings	56	Complies
		Night	51	Complies
Residences to East	55	Day Period	60	Complies
		Sunday Day Period	55	Complies
		Evenings	55	Complies
		Night	50	Complies
Residences to North	55	Day Period	61	Complies
		Sunday Day Period	56	Complies
		Evenings	56	Complies
		Night	51	Complies

**TABLE 6.4 – ASSESSMENT OF L_{A1} NOISE LEVEL EMISSIONS
DELIVERIES (SMALL TRUCKS / VANS)**

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable Assigned L _{A10} Noise Level (dB)	Exceedance to Assigned Noise Level (dB)
Residences to SE. Within 100m of Armadale Rd	48	Day Period	63	Complies
		Sunday Day Period	58	Complies
		Evenings	58	Complies
		Night	53	Complies
Residences to South East	50	Day Period	61	Complies
		Sunday Day Period	56	Complies
		Evenings	56	Complies
		Night	51	Complies
Residences to East	49	Day Period	60	Complies
		Sunday Day Period	55	Complies
		Evenings	55	Complies
		Night	50	Complies
Residences to North	49	Day Period	61	Complies
		Sunday Day Period	56	Complies
		Evenings	56	Complies
		Night	51	Complies

7. CONCLUSION

From the above assessments, the noise received at the neighbouring residences complies with the requirements of the *Environmental Protection (Noise) Regulations 1997* at all times. However, the following are recommended to be imposed as conditions:

- The mechanical services design needs to be confirmed during design development phase. An acoustic study of the mechanical services be undertaken once the design has been finalised, to ensure compliance is achieved.
- Waste collections to be undertaken under in accordance with the requirements of Regulation 14A – “Waste collection and other works”.
- Deliveries by large trucks are restricted to the day (including Sundays and Public Holidays) and evenings (ie NO deliveries during the night period).

We note that there would be no restrictions on small delivery trucks or cars.

APPENDIX A

SITE PLAN

