

FORBES & KISHORN ROAD, APPLECROSS RESIDENTIAL TOWER

Noise Impact Assessment for Development Application

Prepared for:

Apex View Pty Ltd

Architects: WOHA Designs PTE LTD



MJA Studio



Project No: 18236 Date: 5th September 2018 Issue No: B



FORBES & KISHORN ROAD, APPLECROSS RESIDENTIAL TOWER

NOISE IMPACT ASSESSMENT FOR DEVELOPMENT APPLICATION ACOUSTIC SERVICES

This register identifies each issue of and each amendment to this document by Revision No, Page No, the details of each amendment and date of issue.

		AMENDMEN	REGISTER			
Rev. No	Section & Page No.	Issue/ Amendment	Author	Project Engineer	Checked	Date
A	-	Original Issue	JC Jenenes	JC Jenenes	TB ubaby	23/08/2018
В	-	Development Application Issue	JC Jananas	JC Jananas	TB ichabed	05/09/2018

PERTH Level 6, 2 Mill Street, Perth WA 6000 POSTAL PO Box 7070, Cloisters Square, WA 6850 PHONE +61 8 6162 2396 EMAIL perth@floth.com.au ABN 23 808 082 432

www.floth.com.au

SYDNEY BRISBANE PERTH MELBOURNE JAKARTA



EXECUTIVE SUMMARY

Floth Pty Ltd (Floth) has been commissioned by Apex View Pty Ltd to provide Acoustic Engineering Services for the proposed residential development located at 10-14 Forbes Road & 40, A, B, C Kishorn Road (corner of Forbes Road), Applecross in Western Australia (WA).

This report presents the noise impact assessment for the proposed development as part of the Development Application from the local authority, City of Melville.

Noise intrusion and noise emission has been considered as part of the assessment and assessed according to the City of Melville Local Planning Scheme No. 6 (LPS 6), *State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4)* noise criteria and the WA Environmental Protection Noise Regulation 1997 (EPNR).

The assessment found that the existing ambient noise levels at site complied with the noise targets specified in SPP 5.4. As such, additional noise control measures such as high-performance glazing are not required. It is expected that standard façade glazing will provide sufficient noise reduction to satisfy the internal noise criteria.

The dominant noise emission sources from the proposed development are expected to be:

- Rooftop mechanical plant and equipment on Level 20,
- Loading bay and refuse facility on Ground Level, and
- Resident / entertainment noise from the Level 15 outdoor entertainment area (e.g. pool and deck).

The predicted noise levels from rooftop mechanical plant and equipment were found to comply with the EPNR noise criteria. As the design progresses and mechanical plant selections are made, calculations to confirm the noise criteria are achieved at surrounding noise sensitive receivers shall be conducted.

The loading bay and refuse facility are located on the Ground level and contained within the building envelope. Refuse and waste collection activities are exempt from the Regulation 7 of the EPNR provided that they meet the requirements nominated in Section 4.2.1 of this report. The noise predictions of loading bay activities were found to comply with the noise criteria with consideration of the building envelope construction at all times of day.

The noise emission from the outdoor entertainment area on Level 15 was modelled to determine the 'worstcase' noise emissions from a large gathering. It was found that the noise emissions comply for very large gatherings (i.e. up to 100 people with background music played through portable speakers), during all periods with the exception of the night period (i.e. 2200 – 0700 Monday to Saturday and 2200 to 0900 on Sundays and Public Holidays). It is recommended that during the night period, the use of amplified music should be restricted and that gatherings are limited to approximately 15 people or monitored by Building Management to ensure that negative noise impacts are not experienced at the surrounding Noise Sensitive Receivers.

In conclusion, the noise impact assessment has shown that compliance with the relevant noise criteria can be achieved, and that adverse noise impacts on surrounding NSRs are not expected to arise.



CONTENTS

1.	INTRODUCTION	1
2.	PROPOSED DEVELOPMENT SITE AND SURROUNDING AREA	2
2.1 2.2	PROPOSED DEVELOPMENT NEAREST NOISE SENSITIVE RECEIVERS	2 3
3.	EXISTING NOISE LEVELS	4
3.1	AMBIENT NOISE	4
4.	NOISE CRITERIA	5
4.1 4.2 4.3	ROAD TRAFFIC NOISE INTRUSION NOISE EMISSIONS INTERNAL NOISE LEVELS	5 5 8
5.	NOISE IMPACT ASSESSMENT	10
5.1 5.2	NOISE INTRUSION NOISE EMISSION	10 10
6.	SUMMARY	15
APPE	NDIX A – NOISE MONITORING DATA	



1. INTRODUCTION

Floth Pty Ltd (Floth) has been commissioned by Mustera Property Group Ltd to provide Acoustic Engineering Services for the proposed residential development located at 10-14 Forbes Road & 40, A, B, C Kishorn Road (corner of Forbes Road), Applecross in Western Australia (WA).

This report presents the noise impact assessment for the proposed development as part of the Development Application from the local authority, City of Melville. The noise assessment has been prepared in accordance with the City of Melville Local Planning Scheme No. 6 (LPS 6), *State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4)* noise criteria and the Western Australian Environmental Protection (Noise) Regulations 1997.

The noise impacts that have been considered as part of this assessment are as follows:

- Road traffic noise intrusion from local roads;
- Environmental noise emissions from mechanical plant and equipment to nearby noise sensitive uses;
- Refuse Facility and Loading Bay noise emission; and
- Entertainment and resident noise emission from the outdoor entertainment area located on Level 15.



2. PROPOSED DEVELOPMENT SITE AND SURROUNDING AREA

2.1 PROPOSED DEVELOPMENT

The proposed development will consist of predominately residential apartments (92 units) and short-stay accommodation (20 units), as well as retail and commercial tenancies on Ground and Level 1. The composition of the proposed development is presented in Table 1.

Table 1: Proposed Development Composition

Levels	Use
B3	Car Parking
B2	Car Parking
B1	Car Parking
Ground	1 x Retail tenancy, 2 x Retail (Food & Beverage), Commercial Office Space, Commercial End-of-Trip (EOT) Facility, Refuse Facility and Loading Bay
1	Commercial Office Space, Residential EOT, Short-Stay Accommodation
2	Short-Stay Accommodation
3–14	Residential Apartments
15	Recreation Area including Pool, Deck, Lounge, Gym and Spa
16 – 19	Residential Apartments
20	Rooftop Garden and Mechanical Plant

The subject site and surrounding area is presented in Figure 1. The WA Department of Planning, Lands and Heritage Mapping Tool indicates that the site is located within the Urban Zone (Centre R-AC0), with property details as presented in Table 2.

Table 2: Property Details of the Subject Site

Property Address	12 Forbes Rd, Applecross	14 Forbes Rd, Applecross	40 Kishorn Rd, Applecross	10 Forbes Rd, Applecross	
Title Area	193 m ²	212 m ²	606 m ²	1012 m ²	
Planning Scheme	City of Melville Scheme No. 6				
Zone Name	Centre R-AC0				
State Planning Policy	State Planning Policy 3.1 – Residential Design Codes				

The State Planning Policy 3.1 – Residential Design Codes (Part 3.1) indicates that information (and control of) any sources of nuisance emissions, including noise, shall be provided to support the Development Application. As such, any potential noise emission sources will be assessed in this report.

The main sources of noise emission from the proposed development that will be controlled to satisfy the noise limits at the surrounding Noise Sensitive Receivers (NSRs) are from rooftop mechanical plant and equipment, loading bay and refuse facility noise emission, and noise from residents on the Level 12 outdoor entertainment area (e.g. pool and deck). The onsite car parking is contained within the basement levels, and as such are not expected to cause any negative noise impacts at the surrounding NSRs.





Figure 1: Subject Site and Surrounding Area (Ref: Nearmap)

It can be seen from Figure 1 that the site is located approximately 130 metres (at the closest point) from the Canning Highway. The Canning Highway is a primary freight and transport route connecting to the Perth Metropolitan Area, as nominated in Schedule 1 of the *Primary Freight Road of Perth Metropolitan Area*. The Canning Highway is the jurisdiction of Main Roads Western Australia (MRWA) and developments affected by noise from a major road (including the Canning Highway) may be subject to *State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4).*

SPP 5.4 applies to new noise-sensitive developments in the vicinity of existing or future major transport corridors or freight handling facilities. By definition, a development is considered to be 'in the vicinity of' a transport route when it meets the following criteria:

- (i) Abutting; or
- (ii) Separated by only a road, access way or other land that is likely to remain substantially open and undeveloped in terms of buildings, up to a maximum distance of 300 metres.

It can be seen from Figure 1 that although the proposed development is located within 300 metres of the Canning Highway, there are already significant intervening buildings and as such, it does not meet the criteria for 'in the vicinity of' and is not subject to a noise assessment from road traffic on the Canning Highway.

Road traffic noise from local roads including Forbes Road and Kishorn Road will be undertaken to derive façade noise reduction requirements.

2.2 NEAREST NOISE SENSITIVE RECEIVERS

The nearest potentially affected NSRs are the residential dwellings located immediately adjacent to the proposed development on the northern and western boundaries as shown in Figure 1. Any potential noise impacts from the development will be assessed at these NSRs.



3. EXISTING NOISE LEVELS

3.1 AMBIENT NOISE

The existing ambient noise levels in the local area were measured at the subject site between the 7th and 13th August 2018 as shown in Figure 1.

The noise logger was positioned at grade and the top of the microphone was 1.5 metres above ground level.

Site observations identified the dominant noise source at the site as road traffic on local roads and construction noise from a nearby site.

The test instrumentation consisted of:

- Logger: Norsonic Nor139 Class 1 sound level meter, serial number: 15749372
- Calibrator: Pulsar Model 105 sound level calibrator, serial number: 77507

The instrumentation had current NATA laboratory calibrations during the monitoring period. Field calibration conducted prior to and at the completion of logging did not find any significant drift in the calibration of the logger (< ± 0.5 dB). The applicable noise descriptors derived from the noise logging results are summarised in Table 3. The noise logging data is presented in graphical form in Appendix A.

Table 3: Existing (Free-Field) Ambient Noise Descriptors

Time of Day	L _{Aeq} ¹ (dB(A))	L _{A90} ² (dB(A))	Rating Background Level (RBL ³)(dB(A))
Day (6 am – 10 pm)	55	-	-
Night (10 pm – 6 am)	48	-	-
Day (7 am – 6 pm)	55	46	45
Evening (6 pm – 10 pm)	53	43	42
Night (10 pm – 6 am)	48	41	37

¹ L_{Aeq} is the A-weighted equivalent sound pressure level over a specified time period

 $^{^{2}}$ L_{Aeq} is the A-weighted sound pressure level exceeded for 90% of the time

³ RBL is determined from the median of the daily assessment background levels (ABLs). The ABLs are determined from the 10^{th} percentile of the hourly L_{A90} noise level measured during the day, evening and night-time periods.



4. NOISE CRITERIA

4.1 ROAD TRAFFIC NOISE INTRUSION

Although not directly applicable to the proposed development as demonstrated in Section 2 of this report, SPP 5.4 outlines a procedure for assessing road traffic noise intrusion on a new residential development. SPP 5.4 defines an outdoor noise target and an outdoor noise limit as shown in Table 4.

Table 4: Outdoor Noise Criteria (Ref. Table 1 of SPP 5.4)

Time of Day	Noise Target	Noise Limit
Day (6 am – 10 pm)	$L_{Aeq(Day)} = 55 \text{ dB}(A)$	$L_{Aeq(Day)} = 60 \text{ dB}(A)$
Night (10 pm – 6 am)	$L_{Aeq(Night)} = 50 \text{ dB}(A)$	$L_{Aeq(Night)} = 55 \text{ dB}(A)$

Section 5.3.1 of SPP 5.4 states:

In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –

- Acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and
- A reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot.

If a noise-sensitive development takes place in an area where outdoor noise levels will <u>meet the</u> <u>noise target</u>, no further measures are required under this policy

4.2 NOISE EMISSIONS

The noise emission sources from the proposed development are assessed in accordance with the WA Environmental Protection (Noise) Regulations 1997 (EPNR). The EPNR sets out the maximum allowable noise levels based on the time of day and land use. These noise limits are applicable at noise sensitive premises in the vicinity of the proposed development. The maximum allowable noise levels are determined based on the assigned noise levels (L_{A10}, L_{A1} and L_{Amax}) adjusted with the Influencing Factor (IF). The IF is calculated with consideration to the land use zoning in the vicinity of the NSRs⁴. Table 5 presents the maximum assigned noise levels at NSRs surrounding the proposed development.

Type of premises	Time of day	Assigned Level (dB)		
receiving noise	Time of day	L _{A10}	L _{A1}	L _{Amax}
Noise sensitive	0700 to 1900 hours (Monday to Saturday)	45 + IF	55 + IF	65 + IF
sensitive area	0900 to 1900 hours (Sunday and Public Holidays)	40 + IF	50 + IF	65 + IF
	1900 to 2200 hours (All days)	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours on Sunday and Public Holidays	35 + IF	45 + IF	55 + IF

Table 5: Assigned Noise Level at Nearby Residential Noise Sensitive Receivers (Ref. Table 1 of EPNR)

The EPNR states the following:

7. Prescribed standard for noise emissions

⁴ The influencing factor for the nearby NSRs (i.e. within the inner circle with radius of 100m) was calculated using the *Applecross and Mount Pleasant Localities* zoning map and the methodology described in the EPNR to be 0 dB



- (1) Noise emitted from any premises or public place when received at other premises
 - (a) Must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and
 - (b) Must be free of
 - (i) tonality; and
 - (ii) impulsiveness; and
 - (iii) modulation,
 - When assessed under regulation 9.
- (2) For the purposes of sub regulation (1)(a), a noise emission is taken to **significantly contribute to** a level of noise if the noise emission as determined under sub regulation (3) exceeds a value which is 5 dB below the assigned level at the point of reception.
- (3) A level of noise emission may be determined by
 - (a) Measurement at its point of reception when, to the extent practicable, other noises that would contribute to the measured noise level are not present; or
 - (b) Calculation of the level at its point of reception based on measurement of the noise emission at a reference point determined by the inspector or authorised person to be a point where the relationship between the noise emission as measured at the reference point and at the point of reception can be established.

The noise emission limits based on the noise criteria presented in the EPNR are presented in Table 6. These noise emission limits are applicable at the nearest noise sensitive receivers identified in Section 2.2.

Table 6: Noise Emission Limits at the Nearby NSRs

Type of premises	Time of day	Assigned Level (dB)			
receiving noise	Time of day	5 L _{A10,adj} 5	6 L _{A1,adj}	7 L _{Amax,adj}	
Residential	0700 to 1900 hours (Monday to Saturday)	40	50	60	
uwennig	0900 to 1900 hours (Sunday and Public Holidays)	35	45	60	
	1900 to 2200 hours (All days)	35	45	50	
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours on Sunday and Public Holidays	30	40	50	

 $^{^{5}}$ L_{A10,adj} is the A-weighted sound pressure level exceeded for 10% of the time, and adjusted for tonality, impulsiveness and modulation

 ⁶ L_{A1,adj} is the A-weighted sound pressure level exceeded for 1% of the time, and adjusted for tonality, impulsiveness and modulation
 ⁷ L_{Anax,adj} is the maximum A-weighted sound pressure level measured using the slow time filter, and adjusted for tonality,

impulsiveness and modulation



4.2.1 Waste Collection

Regulation 14 of the EPNR states that noise emission from waste collection is not required to comply with the noise criteria in Table 6 if it is conducted in accordance with the following:

- (a) Is conducted between 0700 hours and 1900 hours on any day that is not a Sunday or a public holiday; and / or
- (b) Is conducted between 0900 hours and 1900 hours on a Sunday or public holiday;
- (c) The works are carried out in the quietest reasonable and practicable manner; and
- (d) The equipment used to carry out the works is the quietest reasonably available.

Waste collection outside of these hours must be conducted in accordance with an approved Noise Management Plan (NMP).



4.3 INTERNAL NOISE LEVELS

Intruding noise from external sources such as road traffic as well as the mechanical services within the building must achieve compliance with the recommended levels specified in Table 1 of Australian Standard AS/NZS 2107:2016 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors. The appropriate design sound limits and reverberation times for office, retail / shops and residential apartment buildings are presented in Table 7 to Table 9 respectively.

Table 7	December and decl	Internal Declara	Council overla	ACAITC	0407.004Cfam	Commence	D I al in an a
Table /	: Recommended	Internal Design	Sound Levels t	TOM AS/NZS	2107:2016 for	Commercial	Buildings
		internal Deelign				•••••••••••••••••••••••••••••••••••••••	Dananigo

Type of Occupancy/Activity	Recommended Sound Level Range, L _{Aeq,T} (dBA)	Reverberation Time (s)
Board and conference rooms	30 to 40	0.6 – 0.8
Cafeterias	45 to 50	< 1.0
Call centres	40 to 45	0.1 to 0.4
Corridors and lobbies	45 to 50	< 1.0
Executive office	35 to 40	0.4 to 0.6
General office areas	40 to 45	0.4 to 0.6
Meeting room (small)	40 to 45	< 0.6
Open plan office	40 to 45	0.4
Public spaces	40 to 50	0.5 to 1.0
Quiet rooms	40 to 45	< 0.6
Reception areas	40 to 45	0.6 to 0.8
Rest rooms & break-out spaces	40 to 45	0.4 to 0.6
Toilets	45 to 55	N/A
Undercover carparks	< 65	N/A
Video/audio conference rooms	30 to 40	0.2 to 0.4



Table 8: Recommended Internal Design Sound Levels from AS/NZS 2107:2016 for Retail / Shop Buildings

Type of Occupancy/Activity	Recommended Sound Level Range, L _{Aeq,T} (dBA)	Reverberation Time (s)	
Department Stores			
Main Floor	< 55	See Note 1	
Upper Floor	< 50	See Note 1	
Enclosed car parks	< 65	-	
Small retail stores (general)	< 50	See Note 1	
Shopping Malls	< 55	See Note 1	
Show Rooms	< 50	See Note 1	
Speciality Shops	< 45	See Note 1	
Supermarkets	< 55	See Note 1	

Note 1: Reverberation time should be minimised for noise control.

Table 9: Recommended Internal Design Sound Levels from AS/NZS 2107:2016 for Residential Buildings

Type of Occupancy/Activity	Recommended Sound Level Range, L _{Aeq,T} (dBA)	Reverberation Time (s)			
Houses and apartments in suburban areas or near minor roads -					
Apartment common areas (e.g. foyer, lift lobby)	45 to 50	-			
Living areas	30 to 40	-			
Sleeping areas (night time)	30 to 35	-			
Work areas	35 to 40	-			



5. NOISE IMPACT ASSESSMENT

5.1 NOISE INTRUSION

Site observations revealed that the dominant noise source affecting the site was from local road traffic. There was also noise contribution from nearby construction noise, which is temporary in nature.

The onsite noise monitoring presented in Table 3 revealed that the existing ambient noise levels comply with the outdoor noise targets nominated in SPP 5.4 as presented in Table 4. According to SPP 5.4:

If a noise-sensitive development takes place in an area where outdoor noise levels will <u>meet the</u> <u>noise target</u>, no further measures are required under this policy

As such, additional noise control measures are not required. It is expected that standard façade glazing will provide sufficient noise reduction to satisfy the internal noise criteria for the different uses presented in Section 4.

During the detailed design phases, the methodology outlined in AS 3671 '*Acoustics – Road traffic noise intrusion – building siting and construction*' shall be used to ensure that the façade noise reduction is adequate to achieve the recommended internal noise levels in AS/NZS 2107 as shown in Section 4.3.

5.2 NOISE EMISSION

The noise emission sources from the proposed development include:

- Rooftop mechanical plant and equipment on Level 20,
- Loading bay and refuse facility on Ground Level, and
- Resident / entertainment noise from the Level 15 outdoor entertainment area (e.g. pool and deck).

The onsite car parking is contained within the basement levels, and as such are not expected to cause any negative noise impacts at the surrounding NSRs.

5.2.1 Rooftop Mechanical Plant

The preliminary design of the rooftop mechanical plant includes provisions for the following:

- 20-off vertical discharge air-cooled VRF condensers (e.g. Daikin 50 kW Model with Sound Powel Level of 87 dB(A)).
- Gas fired hot water plant contained within a plant room (expected to have insignificant noise emission).

The preliminary rooftop design includes parapet walls that extend approximately 2 metres above the roof level. These walls will act as a noise barrier and provide shielding to surrounding NSRs. The predicted noise levels from the rooftop mechanical plant were found to comply with the most stringent noise criteria (i.e. during the night period) as shown in Table 10. The combination of a 2-metre-high solid parapet and distance separation between source and receiver provide significant noise attenuation. In addition, we expect that the units will also operate in night-mode, and as such, the noise levels would be expected to be even lower during the critical night period.

It is recommended that the assumed 87 dB(A) sound power level for individual units is not exceeded without further assessment.

Table 10: Predicted Noise Levels from Rooftop Mechanical Plant at Surrounding NSRs

Noise Source	Location	NSRs	Predicted Noise Level	Most Stringent Noise Criteria	Assessment
20-off 50kW vertical discharge air-cooled VRF Condensers	Rooftop (RL 73.7)	NSR1; NSR2; NSR3	25 dB(A)	30 dB(A) L _{A10, adj}	Complies



5.2.2 Refuse and Loading Bay

The refuse and waste collection activities are not required to be assessed provided that they meet the requirements of Regulation 14 in the EPNR, as summarised in Section 4.2.1 of this report.

However, the loading bay may be used regularly by the retail / commercial tenancies located on ground floor and therefore the noise emission from the loading bay must satisfy the noise criteria presented in Table 6 at the surrounding NSRs.

The ground floor plans show the location of the loading bay along the eastern side of the site, with access via Kishorn Road. The swept path shows that the vehicle would perform the following manoeuvres:

- Enter the driveway from Kishorn Road;
- Travel along the driveway;
- Reverse into the loading bay (with reverse beepers when fitted);
- Vehicle operator to enter / exit the vehicle as required to load / unload (door closures);
- Exit the driveway onto Kishorn Road (after loading / unloading).

The noise source definitions associated with these activities are presented in Table 11.

Table 11: Loading Bay Noise Source Definitions

Vehicle Type	Activity	Parameter	Sound Pressure Level @ 10m (dBA)
MB\/ (Modium	Travel at slow speed	LAmax	64
Digid Vehicles	Reverse with beepers	LAmax	75
Rigiu verticies)	Door Closure	LAmax	64
	Engine start	LAmax	70
	Travel at slow speed	LAmax	64

The loading bay is enclosed with masonry walls as shown in Figure 2. The nearest noise sensitive uses are located at the rear of the loading bay, with no direct line-of-sight to the driveway as shown in Figure 1. The buildings located immediately adjacent to and directly opposite of the driveway are commercial uses and not considered to be noise sensitive. The noise criteria for a commercial premise is 80 dB L_{Amax} as per Table 1 of the EPNR.

The noise attenuation provided by the enclosed masonry walls will exceed 40 dB. The strictest L_{Amax} noise criteria applicable at a noise sensitive use is 50 dB(A) during the night period as shown in Table 6. As such, the noise criteria are expected to be met at all times without additional noise controls as shown in Table 12 and no further restrictions or noise controls are required.

Table 12: Loading Bay Noise Predictions at NSR 3

Vehicle Type	Activity	L _{Amax} Sound Pressure Level @ 10m (dBA)	Additional Attenuation from Building Envelope (dB)	Predicted Sound Pressure Level at NSR 3
MRV (Medium	Travel at slow speed	64	40	24
	Reverse with	75	40	35
Rigiu Veriicies)	beepers			
	Door Closure	64	40	24
	Engine start	70	40	30
	Travel at slow speed	64	40	24





Figure 2: Enclosed Loading Bay Facility (Ref. WOHA Pte Ltd, Project No. 214)



5.2.3 Resident / Entertainment Noise from the Outdoor Entertainment Area

We understand that the Building Management will enforce a Noise Management Plan to restrict noise levels at the Outdoor Entertainment Area on Level 15 to reasonable levels and to discourage anti-social behaviour that may negatively impact the surrounding noise sensitive receivers.

A preliminary plan view of the Outdoor Entertainment Area is presented in Figure 3. It can be seen that the design includes landscaped areas around the perimeter, which will provide a buffer distance between noise source and slab edge.



Figure 3: Preliminary Plan View of the Outdoor Entertainment Area on Level 15 (Ref. WOHA Pte Ltd, Project No. 214)

We expect that noise emission from the Outdoor Entertainment Area on Level 15 may consist of the following:

- Background music from portable speakers (owned and operated by residents);
- Noise from residents in the pool and alfresco / deck area.

In order to assess the potential noise emissions from the Level 15 area at nearby NSRs, the following worst-case scenario was modelled:

- The total outdoor area is approximately 400 m². We have assumed a maximum of 100 people could comfortably interact and converse (1 person / 4m² on average).
- Of the total 100 people, a maximum of 50 could be talking at any given time (i.e. it is assumed that for every speaker there is at least one listener).
- Given the outdoor environment, we have assumed that the 50 people could be speaking with a raised voice.



• We have assumed that background music (approximately 70 dB(A) at 1m from the speaker) could be distributed across the area.

Based on this scenario, the noise source definition is presented in Table 13.

Table 13: Noise Source Definition for the Level 15 Outdoor Area (Sound Pressure Level at 1 metre)

f (Hz)	Octave Band Noise Levels, dB, at 1 metre from Source							Total,	
	63	125	250	500	1k	2k	4k	8k	ав(А)
Raised Voice – Average of Male and Female	-	46	60	64	63	59	54	49	67
50 People talking in a raised voice		63	77	81	80	76	71	66	84
Background Music		76	69	66	65	63	54	46	70
Total Noise Level on Level 15 Outdoor Area*		86	81	82	81	78	71	66	86

*Note that a 10dB penalty has been applied to music noise emission in accordance with Table 2 of the EPNR.

Based on the scenario modelled and the noise source definition presented in Table 13, the predicted noise levels at the NSRs is shown in Table 14.

Table 14: Predicted Noise Levels from 'Worst-Case' Outdoor Entertainment Area Scenario

NSR	Predicted Noise Level (L _{A10,adi} dB(A))	Noise Criteria, L _{A10,adj} dB(A)						
		0700 – 1900 (Monday – Saturday)	0900 – 1900 (Sunday & Public Holiday)	1900 – 2200 (All days)	2200 – 0700 (Monday – Saturday); 2200 – 0900 (Sunday & Public Holidays)			
NSR 1, 2 and 3	33	40	35	35	30			

It can be seen from Table 14 that the noise emission from the 'worst-case' noise scenario on the Level 15 Outdoor Entertainment Area complies with the noise criteria during the daytime and evening periods (i.e. 0700 to 2200) at the nearby NSRs. The noise criteria would be exceeded by up to 3 dB(A) during the night period (i.e. 2200 to 0700), and as such, sensible management strategies should be put in place to discourage large gatherings and / or amplified music after 10PM on any night. It is noted however, that the noise scenario modelled would rarely occur, and smaller gatherings (i.e. approximately 15 people), would be expected to comply with the noise criteria during the night period.



6. SUMMARY

Floth has completed a noise impact assessment for the proposed residential development located at 10-14 Forbes Road & 40, A, B, C Kishorn Road (corner of Forbes Road), Applecross in Western Australia (WA). Noise intrusion and noise emission has been considered as part of the assessment and assessed according to the City of Melville Local Planning Scheme No. 6 (LPS 6), *State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4)* noise criteria and the WA Environmental Protection Noise Regulation 1997 (EPNR).

The assessment found that the existing ambient noise levels at site complied with the noise targets specified in SPP 5.4. As such, additional noise control measures are not required. It is expected that standard façade glazing will provide sufficient noise reduction to satisfy the internal noise criteria. During the detailed design phases, the methodology outlined in AS 3671 shall be used to confirm that the internal noise criteria specified in AS/NZS 2107 will be achieved.

The dominant noise emission sources from the proposed development are expected to be:

- Rooftop mechanical plant and equipment on Level 20,
- Loading bay and refuse facility on Ground Level, and
- Residents / entertainment noise from the Level 15 outdoor entertainment area (e.g. pool and deck).

The predicted noise levels from rooftop mechanical plant and equipment were found to comply with the EPNR noise criteria. As the design progresses and mechanical plant selections are made, calculations to confirm the noise criteria are achieved at surrounding noise sensitive receivers shall be conducted.

The loading bay and refuse facility are located on the Ground level and contained within the building envelope. Refuse and waste collection activities are exempt from the Regulation 7 of the EPNR provided that they meet the requirements nominated in Section 4.2.1 of this report. The noise predictions of loading bay activities were found to comply with the noise criteria with consideration of the building envelope construction at all times of day.

The noise emission from the outdoor entertainment area on Level 15 was modelled to determine the 'worstcase' noise emissions from a large gathering (within the constraints of a suitable NMP to manage noise emissions and discourage anti-social behaviour). It was found that the noise emissions comply for very large gatherings (i.e. up to 100 people with background music played through portable speakers), during all periods with the exception of the night period (i.e. 2200 – 0700 Monday to Saturday and 2200 to 0900 on Sundays and Public Holidays). It is recommended that amplified music be restricted during the night period, and that gatherings are limited to approximately 15 people and monitored by Building Management to ensure that negative noise impacts are not experienced at the surrounding Noise Sensitive Receivers.

In conclusion, the noise impact assessment has shown that compliance with the relevant noise criteria can be achieved, and that adverse noise impacts on surrounding NSRs are not expected to arise.



APPENDIX A – NOISE MONITORING DATA



























100 Lmax L01 L10 90 Leq L90 80 Free-Field Noise Level (dBA) 70 60 50 40 30
 0:00

 1:00

 1:00

 1:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 2:00

 1:00

 1:00

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100

 1:1100
 <

13/08/2018