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# Acoustic Assessment Report

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## Kingsford Smith Street Apartments Rongotai Wellington



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Client/Applicant

**KSS Properties Limited**

Attention: Michael Cornell

Malcolm Hunt Associates Report Reference: 2378/07-17

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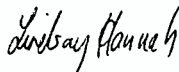

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### MalcolmHuntAssociates



#### Quality Control Statement

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#### Glossary of Noise Terms

##### ISO717-1

ISO717-1 *Acoustics – Rating of Sound Insulation in Buildings & Building Elements* using spectrum No.2 [A-weighted traffic noise spectrum]. Note: This Standard is also known as AS/NZS1276.1:1999 *Acoustics-Rating of sound insulation in buildings and of building elements Part 1: Airborne sound insulation*

##### ISO 140-5

ISO 140-5: *Acoustics - Measurement Of Sound Insulation In Buildings And Of Building Elements Part 5: Field Measurements Of Airborne Sound Insulation Of Facade Elements And Facades.*

##### External Sound Insulation Level

A calculated value to demonstrate compliance with the stated minimum standard of acoustic isolation against sounds arising from outside the building. If field testing of built structures is employed to verify predictions, these tests shall be carried out using ISO 140-5:1998 *Acoustics - Measurement Of Sound Insulation In Buildings And Of Building Elements Part 5: Field Measurements Of Airborne Sound Insulation Of Facade Elements And Facades.*

##### Habitable Room

in any of the categories of activity referred to in the definition of 'noise sensitive activity', means a space within a building that is commonly associated with domestic living [. Within the airborne boundary depicted on Map 35, habitable room also means a classroom used for teaching purposes or a sleeping room associated with an early childhood centre, any hospital, rest home, hospice, respite facility or any other activity with the primary purpose of care for the infirm. But in all areas it excludes any bathroom, laundry, water-closet, pantry, walk-in wardrobe, corridor, hallway, lobby, clothes-drying room, any room in an early childhood centre not used for sleeping, [any enclosed swimming pool, hall, theatre, gymnasium, or other space of a specialised nature occupied neither frequently nor for extended periods of time.

##### $D_{ntw}$

$D_{ntw}$  is the Weighted Standardised Level Difference

##### $C_{tr}$

$C_{tr}$  is the Spectrum Adaptation Term ISO 717-1:1996 Table A.1 Spectrum NUMBER TWO [2]

$L_{dn}$  **Level Day Night.** Day/Night level or day-night average sound level is the  $L_{eq}$  over a 24 hour period after the addition of 10 decibels to sound levels at night-time, defined as 2200 – 0700 unless specified otherwise.

**Sound Pressure Level** is defined as varying pressure fluctuations caused by sound waves. The ear converts these fluctuations into what we call audible sound, which is the sensation [as detected by the ear] of very small rapid changes in the air pressure above and below a static value. This "static" value is atmospheric pressure.

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# Acoustic Assessment Report

## Kingsford Smith Street Apartments

MalcolmHuntAssociates

noise and environmental consultants

### 1 Introduction

Malcolm Hunt Associates have been commissioned by the Applicant [KSS Properties Limited] to assess noise and acoustic issues related to the proposal to establish an apartment and commercial building development at 57 to 59 Kingsford Smith Street, Rongotai. Assessment has primarily been in terms of assessing relevant noise-related requirements of the Wellington City District Plan, for which we have adopted the definitions and acoustic terms defined therein.

In summary, this report sets out;

- *An assessment of the suitability of the site in terms of environmental noise including noise effects received within the proposed apartments and within outdoor areas. This includes noise from retail and business activities as well as noise from aircraft using Wellington International Airport;*
- *A description of the acoustic insulation proposed for habitable spaces based on plans and information provided.*
- *An assessment of noise emitted by proposed to take place on the site including from vehicle movements, waste handling and retail activities.*
- *A cursory assessment of potential effects during construction; and*
- *Recommended noise mitigation measures;*

This report is presented in three sections;

- A. **Section A** covers a description of the application site and proposed development based on plans and information regarding the site and surrounding environs. This section includes the results of short duration sample measurements of outdoor noise found in and around the site.
- B. **Section B** assess the acoustic insulation to be provided within habitable rooms of the proposed apartments. This information demonstrates via calculation that the acoustic insulation standards set out in *Chapter 34* of the Wellington City District Plan are able to be fully complied with.
- C. **Section C** assesses noise emitted from the site in terms of the District Plan's noise emission rules of Chapter 34 as may affect surrounding land uses such as noise associated with retailing activities, on-site mechanical plant and vehicle noise. Only relatively modest noise effects are predicted based on the nature and scale of the proposed development, and taking into account the sensitivity of the receiving environment.

The assessment is based on the plans and specifications provided to MHA from the Applicant, as attached as **Appendix 2** to the Assessment of Environmental Effects included within the Application. The plans and drawings have been by Reve Architecture and are dated 6<sup>th</sup> June 2017 [Ref: 06-006-08\_Kingsford Smith Street Apartments Consultant Information.pdf].

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## Section A - Site and Environment

The application site is located at 57 to 59 Kingsford Smith Street and is legally described as Lot 2 DP 80510 and [approx. 1278m<sup>2</sup> in size] and Lot 1 80510 [approx. 788m<sup>2</sup> in size]. The site fronts Kingsford Smith Street to the west, Lyall Parade to the south and is currently used as a rental car depot and Park N Depart services.

Adjacent the site to the east is an existing accommodation service, being a hotel. Beyond the site to the east is Wellington International Airport and the Rongotai retail centre which hosts a number of high profile, large format retail stores with associated vehicle parking activities and pedestrian movements. Business Areas, spread throughout the city, provide focal points for business activity outside the Central Area and make a substantial contribution to the City's economy by generating jobs and economic development. Business Areas also provide for residential uses within the range of permitted activities, subject to acoustic insulation for habitable rooms.

## 2 Proposed Development

The proposal is a mixed-use commercial and residential apartment building covering the entire two properties of the development site. The building will be 7 storeys tall in total including a basement car park. A total of 55 apartment units will be built across the top 5 floors of the building. The ground floor comprises of retail units, interior car parking and the apartment lobbies. Due to the large footprint of the site, the top 5 apartment levels are arranged around an interior shared private open space courtyard built on level 1. This planning arrangement is also advantageous for shielding environmental noise to the interior courtyard open space.

### 2.1 Site Location

The subject site is located at the southern end of Rongotai at the corner of Kingsford Smith Street and Lyall Parade. The site's southern boundary has direct outlook over Lyall Parade and out over Lyall Bay itself towards the horizon of Cook Strait. The site and immediate surrounds are essentially flat with little of topographical significance in the immediate vicinity. Topographical surveys have identified the existing slab levels of the existing buildings on the site to be about 4.8m above mean sea level. **Figure 1** indicates a site location map of the and the nearby commercial retail area.

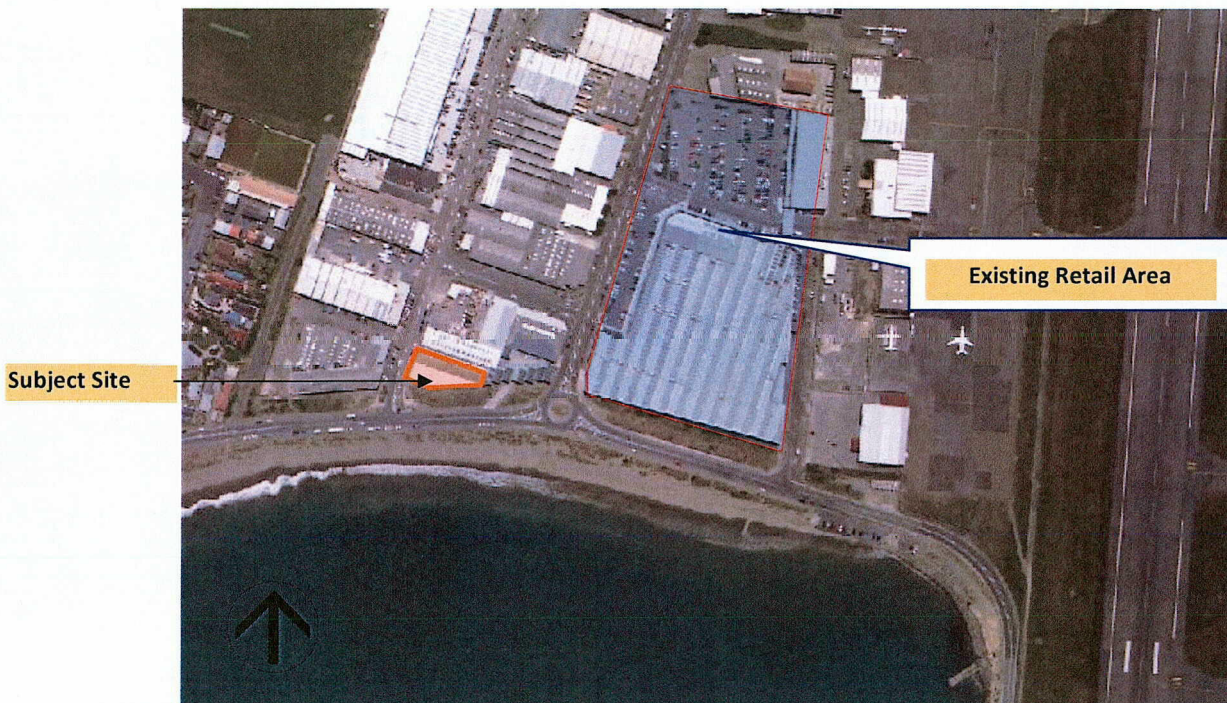


Figure 1: Site location Map. Reference Wellington City Council GIS Mapping. Referenced May 2017

## 2.2 Site Map

Figure 2 indicates a site overlay map indicating the site location and existing sites and surrounds, as shown in Figure 2 the site is located across two existing sites being described as No 59 and No 57 Kingsford Smith Street.

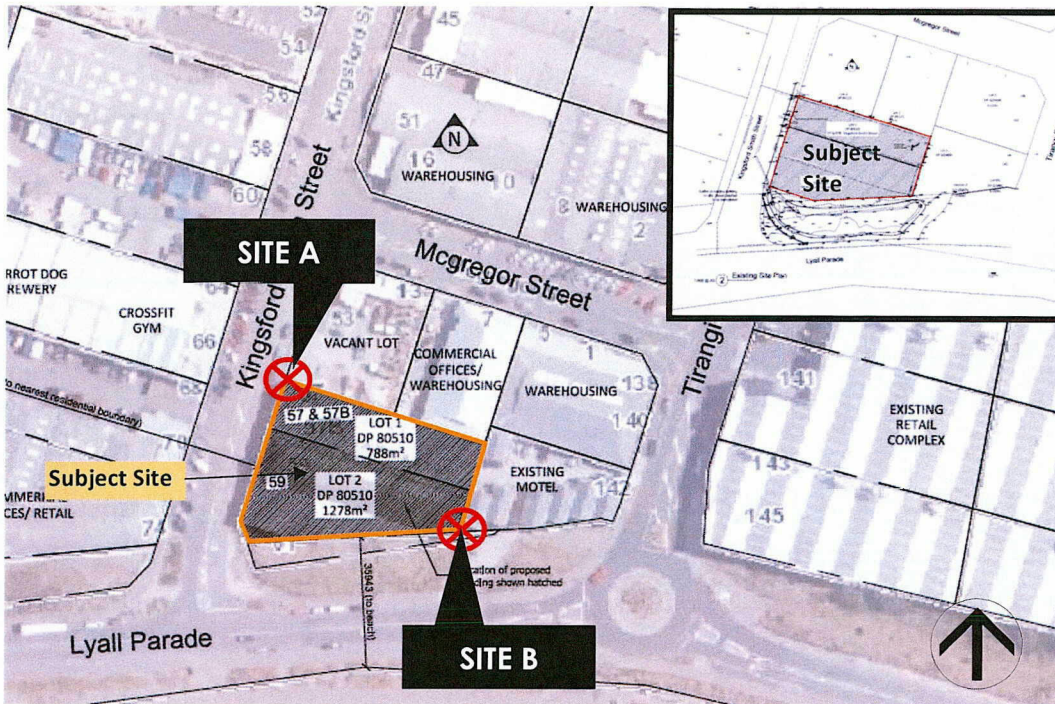


Figure 2: Overlay of site and surrounds, also showing noise measurement sites A and B. Reference Reve Architects.

## 2.3 Proposed Development

The project will involve the demolition of the existing buildings and structures on site with the construction of a 7 level mixed use building.

The building will comprise of a basement level parking for 49 cars, four retail spaces and 11 double car parks on ground floor and 5 levels of 63 residential units comprising single and dual key units, a swimming pool and gym facilities. As noted on the proposed plans the building will have car parking and storage lockers for residents in the underground basement level.

The ground floor level which will be level with street there will be additional car parking and storage lockers to the north of the building foot footprint with retail spaces facing Lyall Parade. Vehicle entry to both the basement and ground floor will be via Kingsford Smith Street. The first floor will also host a cinema room, gym, sauna and swimming pool. The second, third, fourth and fifth floors will host residential units. The plans show 55 apartments are proposed in total. Figure 3 illustrates a 3d schematic view of the building.

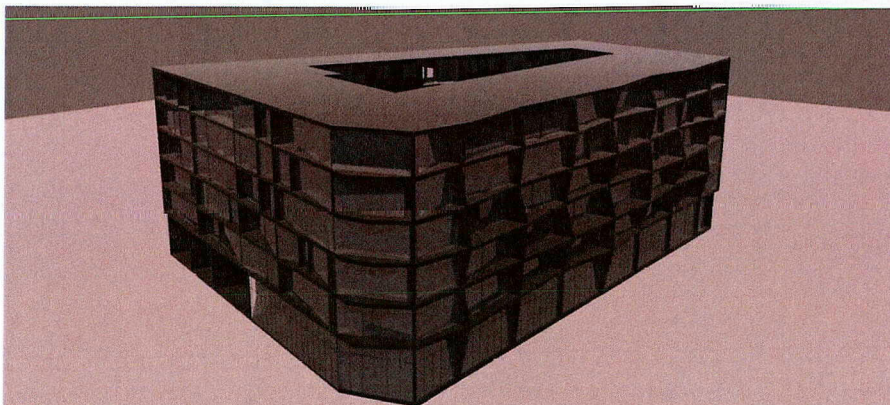


Figure 3: 3d Plan. Reference Reve Architecture.

06132017 Figure 4 below illustrates an elevation of the building.

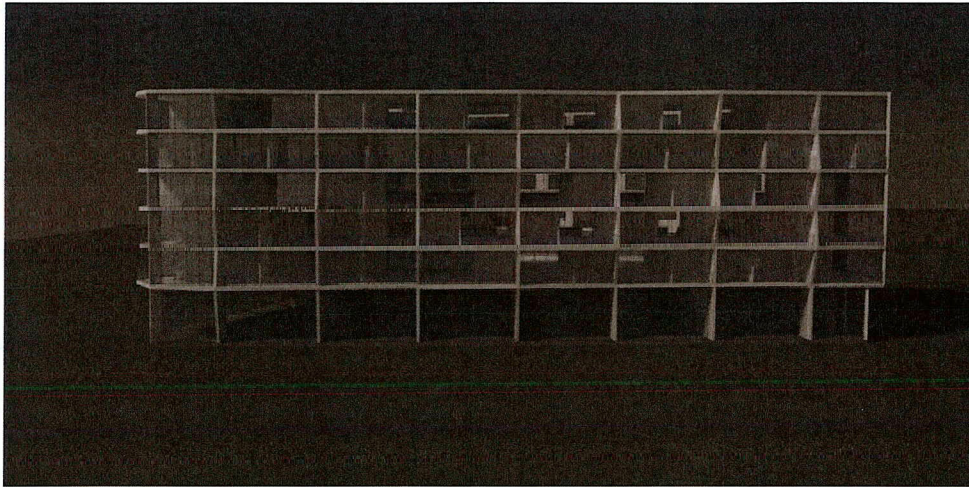


Figure 4: Elevation of Ground to Fifth Floor Level, as viewed from Lyall Bay. Reference Reve Architecture.

### 3 Building Specifications and Design

Refer to **Appendix 2** attached the AEE report for full drawings and plans. The plans show;

- Basement Level = 49 car parks, 39 storage lockers plus lifts and stair wells;
- Ground Level = 11 car parks (2 can be tandem), 14 storage lockers, 2 apartment lobbies serving separate entrances to the building, 4 retail complexes (although the partitioning between them is flexible to alter the number and size) plus vehicular driveways;
- First Floor Level = 11 single storey apartments, large open space courtyard consisting of shared open space and private yards for 11 apartments, interior shared amenities consisting of a swimming pool, spa pool, sauna, changing facilities, fitness gym and private cinema room plus lift and stair wells;
- Second Floor Level = 13 single storey apartments access either directly off this level or via open stairs landing on open space courtyard below plus lift and stair wells;
- Third Floor Level = 13 individual apartments of which 5 a single level apartments accessed from this level and 8 are double storey apartments accessed from the level above, plus lift and stair wells;
- Fourth Floor Level = 23 individual apartments to this level. Of which 3 are single level apartments solely accessed off this level. The remainder are double storey apartments with 8 apartments stepping down to the floor below and 12 apartments stepping up to the floor above;
- Fifth Floor Level = 15 individual apartments of which 3 apartments are single storey apartments. The remainder are double storey apartments with their second level being the floor level below.
- Roof Level = Low-slope membrane roof plus green roof planting to lip of roof;

#### 3.1 Exterior Building Elements

The individual exterior building elements included within the calculations for the extension are described as follows:

##### 3.1.1 Exterior Wall Construction Specifications

- 152mm [min] thick concrete walls. It is noted that concrete walls to be strapped and lined with 10mm Gibboard board or higher specifications.



**3.1.2 Exterior Roof/Ceiling Construction Specifications [5th Floor]**

**152mm [min] thick concrete roof structure.** It is noted that concrete ceilings to be strapped and lined with 13mm Gibboard board or similar specifications.

**3.1.3 Exterior Window and Exterior Glazing Suites Construction Specifications**

- o Aluminium window and door framing with full perimeter rubber seals - [double glazed units including sliding doors] **6.38mm acoustic laminated glass [external glass pane] / 10mm air gap/ 6mm float glass [internal glass pane].**

**3.1.4 Interior Wall Construction Specifications**

- o **152mm thick interior concrete walls.** It is noted that internal concrete walls will be strapped and lined with 10mm Gibboard board or higher specifications. Note: The interior walls are not an incident sound path for aircraft or environmental sound.

**3.1.5 Exterior Floor Construction Specifications**

- o 100mm [min] thick Floor Structure. Note: The interior floor is not an incident sound path for aircraft or other environmental sound.

The above generic building descriptions have been adopted within acoustic insulation calculations set out in Part B of this report.

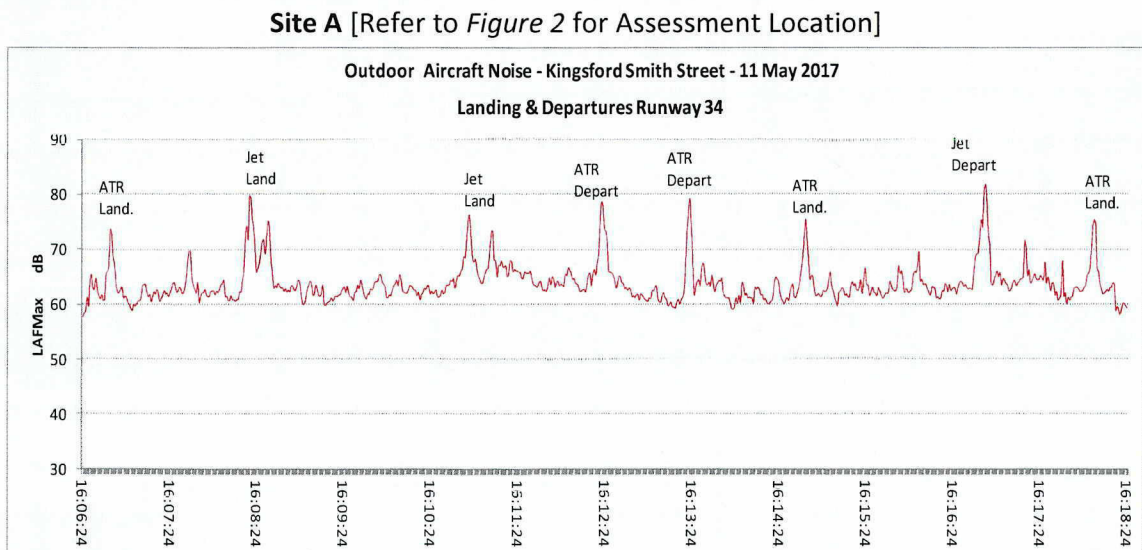
**4 Outdoor Noise Environment**

The area is affected by noise from aircraft operating to and from Wellington International Airport. This has a significant effect on outdoor sound levels experienced in the area, however this noise is not unusual or unexpected in this area.

Measurements of outdoor sound levels to quantify the existing ambient noise climate of the area were undertaken during daytime on May 11<sup>th</sup> and 13<sup>th</sup> 2017, in general accordance with the recommendations of New Zealand Standard NZS 6801:2008 *Acoustics – Measurement of Environmental Sound*.

The measurements were taken at two locations [Site A and Site B, as shown in **Figure 2**] under both northerly and southerly wind conditions, enabling aircraft noise levels to be measured for future receptor locations. These measurements taken on or near the east and west site boundaries, were taken with the microphone mounted upon a tripod 1.2 metres above ground level.

The results of outdoor time-varying sound level measurements taken during aircraft take-off and landing activities at Site A and B [**Figure 2**] during May 2017 are set out in **Figure 5** as follows;



## Site B [Refer to Figure 2 for Assessment Location]

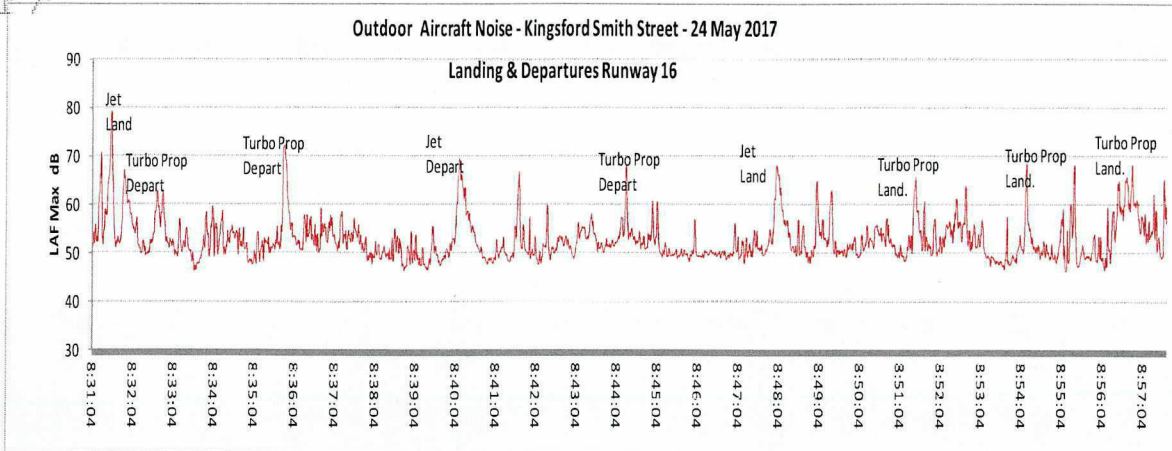


Figure 5: Results of ambient sounds and aircraft noise events measured at Site A and B. Refer to measurement locations as indicated within Figure 2 above.

The above readings confirm the chief determinant of outdoor noise levels in the vicinity of the site are due to aircraft operating to and from Wellington International Airport. In addition, some sounds arise due to passing road traffic and commercial activities in the area. Being located close to Lyall Bay beach, the sea state will determine the background sound levels found in this area (especially at night time when other sound sources are reduced).

#### 4.1 Aircraft Noise Levels

As the effects of high levels of aircraft noise can impact on outdoor amenity and quality of life in living areas, aircraft noise is controlled in the District Plan. The effects of concern are both the direct effects of noise on people's well-being and living conditions, but also 'reverse sensitivity' effects on airport operations whereby noise effects on people living near airports cause complaints leading to unwanted restrictions or limitations of airport flying activities. At Wellington, the district plan sets out effective curfew controls which is very effective in limiting aircraft noise events though the night time period, providing a basic level of sleep protection for residents of the area. The district plan curfew operates at the airport between 12 midnight (or 1 am for international arrivals) and 6 am in the morning. During this time all aircraft activity is severely restricted such that only emergencies and not more than four movements by certified low-noise small aircraft are able to take place.

The relevant NZ Standard dealing with managing the effects of aircraft noise is New Zealand Standard NZS 6805:1992 "Airport Noise Management and Land Use Planning". This standard recommends defining an Air Noise Boundary ("ANB") and an Outer Control Boundary ("OCB") based on the 65 and 55 dB Ldn contours for a future level of activity at an airport.

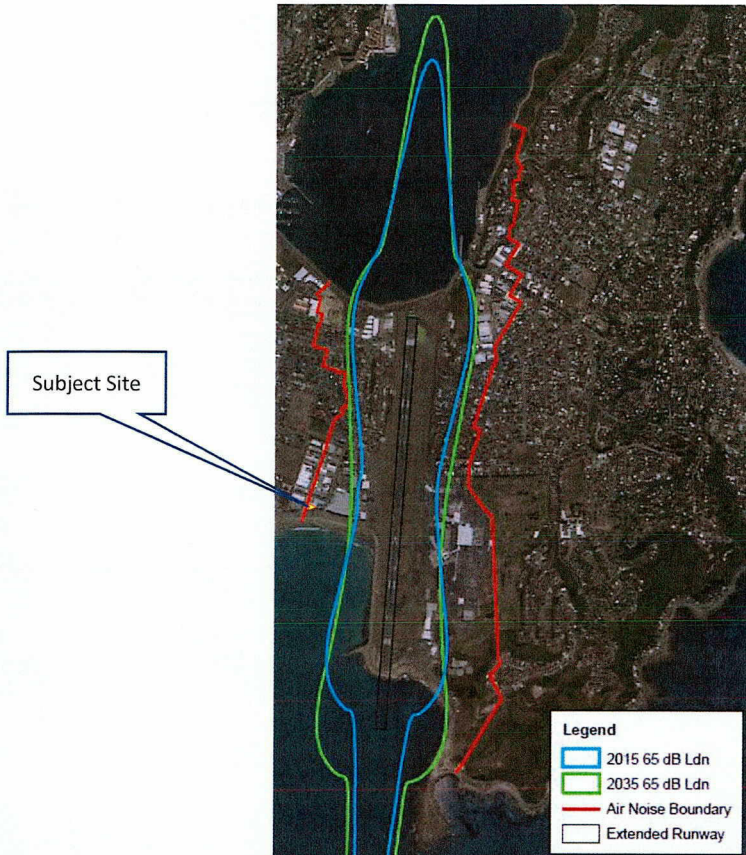
Ldn is the day/night weighted average noise exposure level averaged over a three month period. The Ldn night weighting means that aircraft noise events between 10pm and 7am are weighted by an additional 10 decibels to account for the heightened sensitivity to noise at night. International research has found that the Ldn metric correlates well with community annoyance to aircraft noise and other transportation noise. Much of this research was taken into account when NZS 6805 was developed.

NZS 6805 recommends that noise from aircraft operations be restricted to 65 dB Ldn at the ANB and land use restrictions apply to noise sensitive activities inside the ANB. The controls for Wellington Airport are based on the NZS 6805 approach although there is just an ANB and no OCB at Wellington. Planning map 35 of the Wellington City district plan sets out the ANB location (reproduced below in Figure 6). According to this map the site is expected to receive around Ldn 66 dB in the future, once the maximum flying activity levels are achieved.

The ANB noise contour line is based on a future level of activity is based on a realistic forecast of aircraft types and number of movements practical for the airport. The future amount of aircraft noise signalled by the shape and size of the contours was originally justified based on evidence to the district plan appeal hearings but has been recently

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reviewed as part of the Runway Extension project. In this case, a recent forward projection by Marshall Day Acoustics<sup>1</sup> provides a snap shot of the existing noise levels and a comparison with the long term forecast aircraft noise levels at Wellington International Airport. The diagram below sourced from the Noise AEE report for the Runway Extension shows the location of the District Plan's ANB (red), the Long Term estimate of aircraft noise at Year 2035 (green) and the 'current' contour for Year 2015 (blue).



**Figure 6** Aerial photograph showing location of the District Plan's ANB contour (red), a long term estimate of aircraft noise at Year 2035 (green) and an estimate of 'current' contour for Year 2015 (blue).

Figure 6 indicates:

- a) The 'current' ANB (2015) lies well within the ANB (red line) meaning the Ldn 65 noise exposure level is not yet reached at locations close to the Airnoise Boundary (such as the development site).
- b) Even, as the Marshall Day runway extension report explains, the contours are corrected for the "Rongotai hill", exceedance of the district plan's ANB will occur in many other places along the contour than exceeding the Ldn 65 dB at the subject site at Kingsford Smith Street.
- c) Even if (by some remote chance) aircraft noise did increase to the maximum indicated by the Airnoise Boundary located in Kingsford Smith Street, daily aircraft noise exposure levels would not exceed Ldn 66 dB at the subject site considering air traffic growth up to and beyond Year 2035.

It is debateable whether the Ldn 65 dB contour will ever be achieved in this area of Rongotai. This is because Kingsford Smith Street appears to be some of the furthest areas from the runway to be included within the Airnoise Boundary. In addition, it is noted the airlines are making far better use of the aircraft in recent times. Considering trends in passenger numbers, aircraft traffic has been declining despite considerable growth in passenger traffic.

The above factors indicate the aircraft noise Ldn acoustic insulation assessment set out below (based on a long term future aircraft outdoor noise level of Ldn 66 dB on the most exposed external eastern side of the subject building) is an outdoor aircraft noise level that would be highly unlikely to ever occur at this site. Nevertheless, we set out below how the insulation standards that apply to buildings housing activities sensitive to aircraft noise are fully satisfied, even

<sup>1</sup> Wellington Airport Runway Extension: Technical Report 26 - Assessment Of Aircraft Noise Effects dated 21 March 2016. Marshall Day Acoustics Rp 001 R08 2015130A.

when assuming this unrealistically high estimate of future Ldn aircraft noise for this site.

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### 4.2 Aircraft Single Events

NZS6805:1992 considers that the Ldn contours alone are adequate to control such noise effects of aircraft activity such as startle or sleep awakening associated with individual aircraft single events. Clause 1.4.3.6 of NZS6805:1992 states amending the ANB using information on aircraft single event noise levels is only needed at airports which are “small” or where airports have “irregular or infrequent daily usage patterns”. Nevertheless, it is instructive to consider outdoor and aircraft noise based on both the Ldn and “LAFMax” values received on-site from near-by aircraft activity.

The loudest single aircrafts events measured at the Lyall Bay frontage site (Site B) for the Boeing 777-200 aircraft registered LAFMax 81.6 dB (landing on Runway 16) and LAFMax 81.7 dB for take-off on Runway 34. These two events are depicted in Figure 7.



Figure 7 measured B777-200 single event LAFMax sound levels at Wellington Airport, departure runway 34 and an arrival on Runway 16.

As the measurement location is near ground level, it is appropriate to consider the received LAFMax sound levels received at Level 5 apartments which, whilst aircraft will remaining partially screened, will be more less screened than the measurement position near to the ground. Based on the reduced screening of between +2 to +3 dB the following corrections have been provided as a basis to assess ‘worse case’ indoor LAFMax sound levels;

	LAFMax Measured near ground	LAFMax Estimated Level 5
B737 – 200 arrival	81.6 dB	83.6
B737 – 200 departure	81.7 dB	84.7 dB

Indoor sound levels based on the above outdoor maximum expected LAFMax aircraft noise levels.

It is instructive to consider the maximum expected outdoor LAFMax sound levels due to other typical daily activities, and compare these with the maximum levels of 83 to 85 dB expected outdoors at the most exposed apartments on the subject site .

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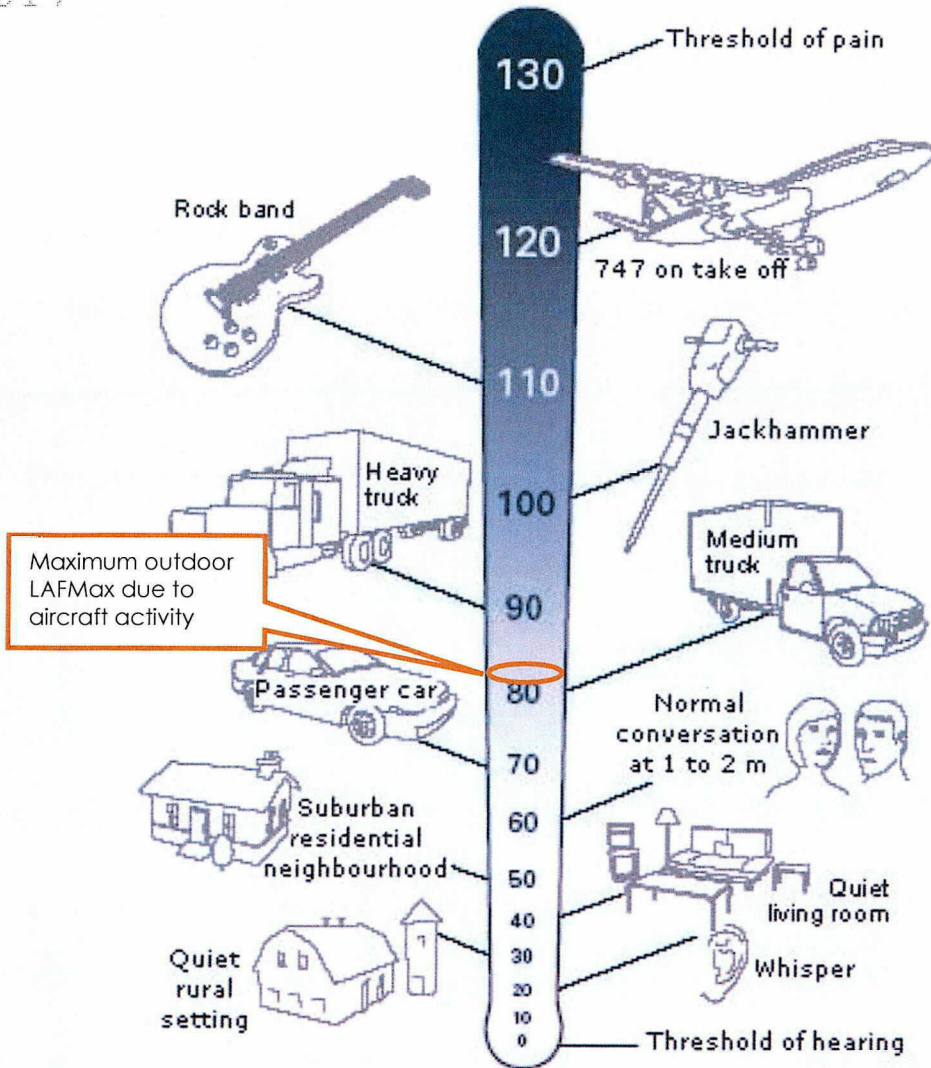


Figure 8 Graphic depicting noise levels associated with everyday activities.

Section B below provides a detailed assessment of aircraft noise effects, including assessing indoor sound levels based on the provision of acoustic insulation due to the design and construction of the building.

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## 5 Applicable Noise Criteria

In assessing potential noise impacts on the environment the following guideline / criteria and Standards apply.

### 5.1 Resource Management Act

Noise is an environmental effect identified in the Resource Management Act as a matter to be included in any assessment of environmental effects. Noise is defined as unwanted sound and can affect the residential amenity of an area. What constitutes a "reasonable level" is not prescribed by the Act. As a guide, noise limits prescribed by the Wellington City District Plan and New Zealand Standards can be used to determine limits of acceptability.

The environmental effects of land use activities, including industrial activities, are controlled through the provisions of the Resource Management Act 1991 [the RMA], which embraces the sustainable management of natural, and physical resources. The environment involves people and communities and their ability to provide for their social and cultural well-being as well as for their health and safety. Section 16 of the RMA places a general duty on all occupiers to adopt the best practicable option [BPO] to ensure noise emitted from any site does not exceed a reasonable level. What constitutes a "reasonable level" is not prescribed by the RMA. Noise limits prescribed in the Wellington City District Plan are used to determine limits of acceptability.

### 5.2 Wellington City District Plan

The site is zoned **Business 1** under the Operative Wellington City District Plan. Surrounding sites are zoned a mixture of both **Business 1** and **Airport Precinct** under the Operative Wellington City District Plan. The closest Residential sites, zoned **Outer Residential** under the Operative Wellington City District Plan are a block to the west of the site. **Figure 9** below illustrates a District Planning Map.

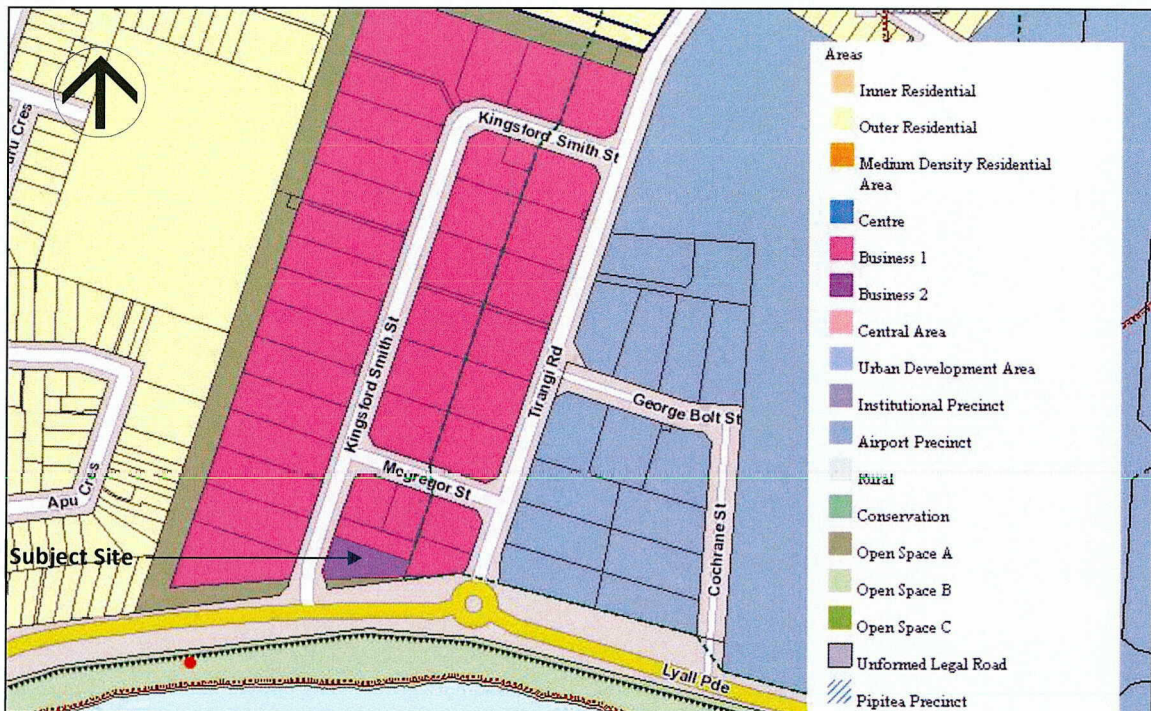


Figure 9: District Plan Zone Map. Reference Wellington City Council. Sourced May 2017

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### 5.3 District Plan Noise Limits Business 1 Areas – Noise Emitted From Site

#### Noise [Emitted and Received within Business 1 Areas]

##### **Rule 34.6.1.1.1**

Noise emission levels from activities in Business 1 Areas when measured at or within the boundary of any site or at the outside wall of any building on any site other than the site from which the noise is emitted in Business 1 Areas shall not exceed the following limits:

- At all times 60dB  $L_{Aeq(15\ min)}$
- At all times 85dB  $L_{AFmax}$

#### Noise [emitted within Business Areas received in other Areas]

##### **Rule 34.6.1.1.6**

Noise emission levels from activities in Business Areas when measured at or within the boundary of any residential site, in Centres, Residential and Rural Areas shall not exceed the following limits:

##### Outer Residential Area:

Monday to Sunday	7am to 7pm	50dB $L_{Aeq(15\ min)}$
Monday to Sunday	7pm to 10pm	45dB $L_{Aeq(15\ min)}$
Monday to Sunday	10pm to 7am	40dB $L_{Aeq(15\ min)}$
Monday to Sunday	10pm to 7am	65dB $L_{AFmax}$

#### **34.6.1.2 Fixed Plant Noise**

##### **Rule 34.6.1.2.1**

Noise emission levels in Business 1 Areas from fixed plant when measured at or within the boundary of any site, or at the outside wall of any building on any site, other than the building or site from which the noise is emitted on shall not exceed the following limits:

At all times 55dB  $L_{Aeq(15\ min)}$

- Monday to Sunday 10pm to 7am 80dB  $L_{AFmax}$

##### **Rule 34.6.1.2.4**

Noise emission levels from fixed plant in Business Areas must comply with standard 34.6.1.1.6.

##### **Rule 34.6.1.2.5**

The noise limits set in standard 34.6.1.2.1 shall not apply to fixed plant that is used solely for emergency purposes. Examples of such equipment are standby generator sets that are used to supply electricity only at times of electrical supply failure, or for plant used only during life threatening situations such as smoke fans or sprinkler pumps. This fixed plant is exempt from the noise limits provided that it:

- (i) Only operates for maintenance between 8.00am and 5.00pm weekdays, and
- (ii) Can comply with standard 34.6.1.1.1 and 34.6.1.1.5, or
- (iii) Is an electricity generator sets that can only be used on an emergency basis and is not used to generate power for the national grid.

## 5.4 District Plan – Acoustic Insulation Against Outdoor Sound

#### 34.6.2.10 Noise Insulation and Ventilation – Business Areas

##### **Rule 34.6.2.10.1**

Except for port noise and airport noise zone, any habitable room in a building used by a noise sensitive activity within Centres shall be protected from noise arising from outside the building by ensuring the external sound insulation level achieves the following minimum performance standard:  $D_{nT,w} + C_{tr} > 30\ dB$

Compliance with this performance standard shall be achieved by ensuring habitable rooms are designed and constructed in a manner that:

- accords with an acoustic design certificate signed by a suitably qualified acoustic engineer stating the design as proposed will achieve compliance with the above performance standard, or

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accords with the schedule of typical building construction set out below: (the schedule describes the minimum requirements necessary to achieve an external sound insulation level of  $D_{nT,w} + C_{tr} > 30$  dB)

#### 34.6.2.10.2 Ventilation

Where habitable rooms with openable windows are proposed, a positive supplementary source of fresh air ducted from outside is required at the time of fitout. The supplementary source of air is to achieve a minimum of 7.5 litres per second per person.

#### 34.6.2.12 Noise Insulation and Ventilation: Airnoise Boundary

##### Rule 34.6.2.12.1

Any new habitable room within the Airnoise boundary depicted on Map 35 must be designed and constructed to achieve an internal level of  $L_{dn}$  40dB with doors and windows closed. The certification of an approved acoustical engineer will be accepted as evidence that the design meets the insulation standard.

##### Rule 34.6.2.12.2

Any new habitable room within the Airnoise boundary depicted on Map 35 that is proposed to have openable windows must be provided with, at the time of fit out, a positive supplementary source of fresh air ducted from the outside. The supplementary source of air is to achieve a minimum of 7.5 litres per second per person.

#### 34.6.2.10 Noise Insulation and Ventilation – Business Areas

34.6.2.10.1 Except for port noise and airport noise zone, any habitable room in a building used by a noise sensitive activity within Centres shall be protected from noise arising from outside the building by ensuring the external sound insulation level achieves the following minimum performance standard:

$$D_{nT,w} + C_{tr} > 30 \text{ dB}$$

Compliance with this performance standard shall be achieved by ensuring habitable rooms are designed and constructed in a manner that:

- accords with an acoustic design certificate signed by a suitably qualified acoustic engineer stating the design as proposed will achieve compliance with the above performance standard, or
- accords with the schedule of typical building construction set out below: (the schedule describes the minimum requirements necessary to achieve an external sound insulation level of  $D_{nT,w} + C_{tr} > 30$  dB)

#### 34.6.2.10.2 Ventilation

Where habitable rooms with openable windows are proposed, a positive supplementary source of fresh air ducted from outside is required at the time of fitout. The supplementary source of air is to achieve a minimum of 7.5 litres per second per person.

## 5.5 New Zealand Environmental Noise Standards

The Wellington City District Plan states that unless specifically authorised by a Rule or Standard elsewhere in the Plan, noise shall be measured in accordance with **New Zealand Standard 6801:2008 Acoustics - Measurement of Environmental Sound** and assessed in accordance with **New Zealand Standard 6802:2008 Acoustics - Environmental Noise**. In the case of aircraft noise, the relevant NZ Standard is NZS6805:1992 *Airport Noise Management & Land Use Planning*.

## 5.6 Construction Noise

The relevant standards to assess temporary construction noise is compliance with the construction noise standard **NZS6803:1999 Acoustics Construction Noise**. The project will involve the demolition of the existing buildings and construction of the 7 level mixed use building which will comprising of basement level parking retail spaces and residential units which comprise of both single and dual key units, a swimming pool and gym facilities. The main noise sources associated with the proposed construction activities include the following:

- Construction equipment and plant, from demolition, etc;
- Construction equipment and plant, namely earthworking machinery, concrete trucks, etc;
- Welding, grinding and hammering.
- Vehicle noise associated with delivery trucks and small utility vehicles;



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- *Hand tools and 'bench' tools; and*
- *People noise, noise from sub trades.*

Based on the information available for all other activities and proposed size and scale of the development including the separation distances involved, the layout of the site, the nature of the proposed construction works, construction methods and hours of operation, cumulative construction noise levels are not predicted to exceed noise limits set out within New Zealand Standard *NZS 6803:1999 Acoustics Construction Noise* at any time when conducted during daytime hours as defined in *NZS6803:1999 Acoustics Construction Noise* being 0730 to 6.00pm Monday to Saturday.

We are of the view that for a project of this scale, length and intensity that a Construction Noise Management Plan should be prepared by the selected contractor and form part of the sites wider Construction Management Planning methods to control noise from the lead contractor and all sub contractors on site during the build. We note that with a Construction Noise Management Plan prepared by a suitable experienced and qualified acoustic consultant the overall assessment here is the cumulative noise effects are predicted not to exceed construction noise limits set out within either NZ Standard *NZS6803:1999 Acoustics Construction Noise* when a specific construction noise assessment and management plan is prepared by the Contractor.

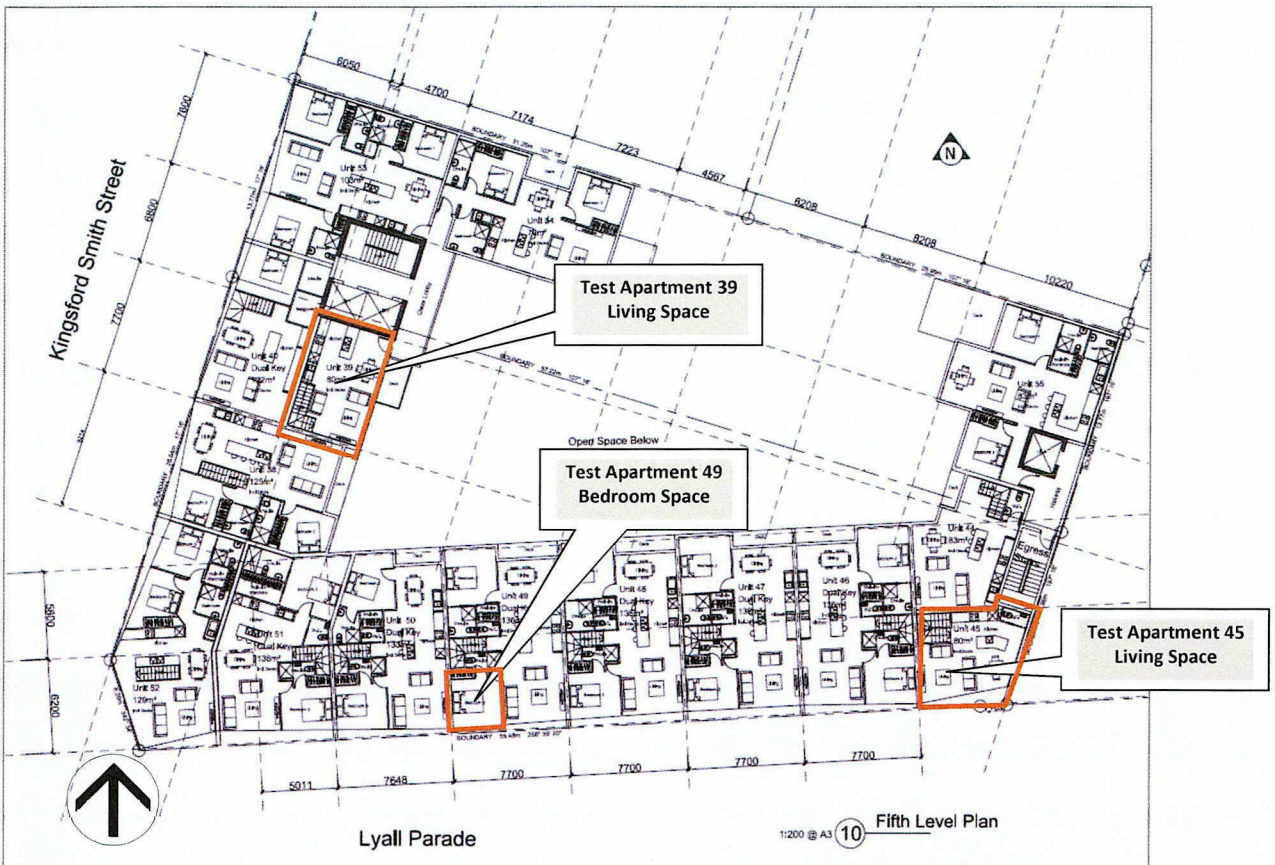
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## Section B – Acoustic Insulation Assessment

### 6.1 Methodology

The acoustic assessments set out in this section are based on the plans and specifications provided, and as attached as **Appendix 2** to the AEE report. In addition, Information on the design of the proposed dwelling, materials, window sizes and construction methods were obtained from drawings provided to Malcolm Hunt Associates by Reve Architects including surface areas and room volumes used in the calculations.

In order to reasonably assess indoor aircraft noise levels, we have selected three ‘worse case’ habitable spaces [rooms, these being **Unit 45** [Fifth Floor] Living Space located on the south east corner of the site facing towards the airport. The second test space **Unit 49** [Fifth Floor] a double units located on the Fifth Floor facing Lyall Parade [looking south]. The bedroom [Bedroom 3] has been tested for Unit 49. The final test space was **Unit 39**, again located on the Fifth Floor, this unit faces towards Kingsford Smith Street; however the test space within Unit 39 being the Living space is on the opposite site of the unit [eastern side] and looks out toward the airport. It is noted that all units being located on the Fifth Floor meaning that the units will have their ceiling/roof exposed to aircraft noise and thus are worst case compared the units below. Units with a high level of glazing have also been chosen to represent worst case. **Figure 10** below illustrates the Fifth Floor plan and the three test spaces adopted within this assessment.



**Figure 10:** Acoustic insulation calculations were undertaken for the habitable rooms within each top floor apartment indicated. Reference; Base plan Revel Architecture.

The method of investigation involved determining both the internal sound environment due to future aircraft noise does not exceed **40 dBA L<sub>dn</sub>** [with doors and windows closed] as well as calculating the expected external sound insulation level in terms of the **D<sub>nt,w</sub> + C<sub>tr</sub>** rating. The District Plan requires new habitable rooms within Business 1 Areas to achieve an external sound insulation level of **D<sub>nt,w</sub> + C<sub>tr</sub> > 30 dB**.

The subject site is located west of Wellington International Airport and within the air noise boundary as defined on Map 35 of the Operative Wellington City District Plan. The above discussion indicates that the site is expected to receive an external aircraft sound level in the future of **L<sub>dn</sub> 66 dBA**. Calculations have employed a worst case jet aircraft

spectrum of  $L_{dn}$  66 dBA as the outdoor design sound level, with the acoustic performance of the various materials and building elements based on manufacturer's data, or the equivalent estimated performance based on the superficial mass of the product.

Table 4 below illustrates the incident sound spectrum for jet aircraft used for the site normalised to  $L_{dn}$  65 dBA:

Oct. Band Freq [Hz]	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Incident Jet Spectrum	66 dB	70 dB	69 dB	66 dB	63 dB	63 dB	54 dB

Table4: Incident outdoor aircraft sound level spectrum [Jet Aircraft].

## 6.2 Indoor Aircraft Noise Calculations

The first step is quantification of the acoustic design target. Table 5 below establishes the acoustic design target by comparing the expected future outdoor aircraft sound level ( $L_{dn}$  66 dBA) against the indoor target of  $L_{dn}$  40 dBA, leaving a reduction of 26 dBA to be achieved by the external building envelope in order to achieve the District Plan indoor performance standard.

	Incident Sound Level JET Aircraft sound spectrum $L_{dn}$ dBA	Required Minimum Internal Sound Criteria $L_{dn}$ dBA	Minimum TOTAL Façade Reduction Required $L_{dn}$ dBA
$L_{dn}$	66 dBA [ $L_{dn}$ ]	40 dBA [ $L_{dn}$ ]	26 dBA [ $L_{dn}$ ]

Table 5: expected outdoor aircraft sound level [ $L_{dn}$  dBA] also indicating the indoor performance standard and the reduction required to be achieved by the external building elements.

The next step involves quantifying the sound reduction index (Rw) of each of the elements found within the external building envelope of the habitable room(s) under investigation. Each building element [wall types, roof, windows, etc] set out above in Section 3.0 have been assigned an Rw rating based on published data sheets and manufacturers specifications. Specialised acoustic computer modelling software [INSUL] assists the process of predicting indoor sound levels based on the amount of sound insulation provided among the relevant exterior building elements based on the procedures set out in ISO 12354-3:2000 *Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound.*

Based on the generic results obtained from the INSUL programme and published test reports, the following reduction values have been adopted for each of the following external components of the building;

	Calculated Reduction Due To Individual Elements
Walls	49 dB
Roof and Ceiling	49 dB
Windows	29 dB
Non-direct [including floor]	30 dB

Table 6: Calculated reduction of elements [ $L_{dn}$  dBA].

Each of the exterior building envelope elements of the selected rooms has been evaluated in terms of its acoustic performance, based on manufacturer information, the acoustic prediction database and room habitable dimensions and details set out within the plans attached to the AEE report as Appendix 2.

Calculating the internal sound levels requires information on the relative surface area of each of the external building elements, for each room being assessed. The area coefficients for the areas of roof, walls and windows are set out as follows in **Table 7**.

Test Space	Area Co-Efficient Roof and Ceiling	Area Co-Efficient Window Glazing	Area Co-Efficient External Wall [Fifth Floor]	Area Co-Efficient Non Direct
Unit 45 Living Room	0.34	0.15	0.15	0.36
Unit 49 - Bedroom	0.27	0.18	0.0**	0.55
Unit 39 - Living	0.25	0.23	0.0**	0.52

**Table 7:** Calculated areas co-efficient. As a worst case façade treated as full glass façade.

The calculated indoor aircraft sound level for each habitable room is provided in **Table 8**:

	Incident Sound Level  $L_{dn}$ dBA	Sound Level Loss [Outdoor to Indoor All Building Elements]  $L_{dn}$ dBA	Expected Indoor Sound Level  $L_{dn}$ dBA	Comply with $L_{dn}$ 40 dB? [All Windows and Doors Closed]
Unit 45 Living Room	66 dBA [ $L_{dn}$ ]	31 dBA [ $L_{dn}$ ]	35 dBA [ $L_{dn}$ ]	Yes
Unit 49 - Bedroom	66 dBA [ $L_{dn}$ ]	36 dBA [ $L_{dn}$ ]	30 dBA [ $L_{dn}$ ]	Yes
Unit 39 - Living	66 dBA [ $L_{dn}$ ]	38 dBA [ $L_{dn}$ ]	28 dBA [ $L_{dn}$ ]	Yes

**Table 8:** Calculated indoor sound level [ $L_{dn}$  dBA].

As above, in order to comply with the requirements of the District Plan, the calculated indoor sound level should not exceed 40 dBA in the room [with doors and windows closed].

### 6.3 Calculation Of External Sound Insulation Level

Although not technically required under the District Plan, the assessment of compliance with the acoustic insulation performance standard for new habitable rooms with the Business 1 Zones of  $D_{Tntw} + C_{tr} > 30$  dB has been carried out based on the procedures set out within ISO 717-1:2013 *Acoustics -- Rating of sound insulation in buildings and of building elements -- Part 1: Airborne sound insulation*.

As above, each building elements described above in **Section 3.0** have been assigned an  $R_w$  rating based on published data sheets, and the acoustic computer modelling software INSUL. The following summary in **Table 9** shows the calculated  $D_{Tntw} + C_{tr}$  provided for each of the habitable spaces assessed [as described above in **Section 3.0**].

	Calculated $D_{Tntw} + C_{tr}$ Rating	Comply With $D_{Tntw} + C_{tr} > 30$ dB ?
Unit 45 Living Room	$D_{Tntw} + C_{tr}$ 38	Yes
Unit 49 - Bedroom	$D_{Tntw} + C_{tr}$ 40	Yes
Unit 39 - Living	$D_{Tntw} + C_{tr}$ 44	Yes

**Table 9:** Expected  $D_{nT,w} + C_{tr}$  levels for tested habitable space.

The above results indicate the required level of 30 dB reduction is exceeded by between 8 to 14 dB. On this basis the expected indoor sound environment within the proposed apartments is expected to be entirely compatible with quality living environment.

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### 6.4 Indoor Aircraft Noise levels

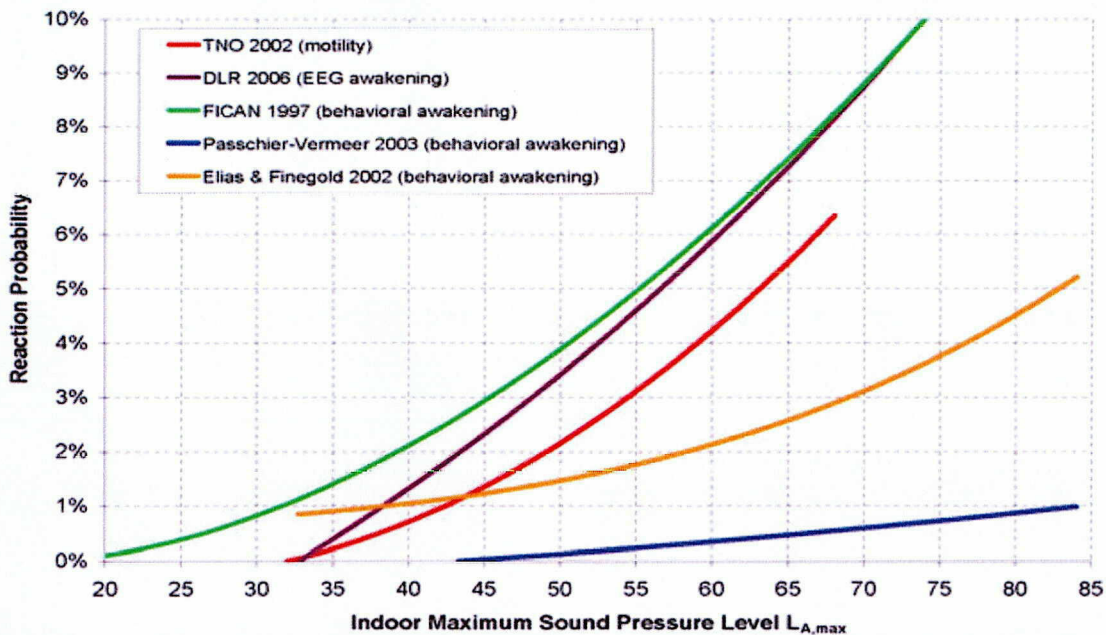
Taking the calculated reduction level for the three tested rooms, we estimate the indoor LAFMax sound levels due to B777-200 departures and landings (corrected for reduced acoustic screening for habitable rooms located on Level 5) as follows;

	B777-200 Depart	B777-200 Arrival
Unit 45 Living Room	LAFMax 45.6 dB	LAFMax 46.7 dB
Unit 49 - Bedroom	LAFMax 43.6 dB	LAFMax 44.7 dB
Unit 39 - Living	LAFMax 39.6 dB	LAFMax 40.7 dB

These indoor LAFMax indoor aircraft sound levels (doors and windows closed) are well below criteria guiding on acceptable indoor LAFMax noise levels. Guidance on acceptable levels of indoor aircraft noise under AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* does not stipulate any specific guidance but refers to AS 2021:2000 *Acoustics – Aircraft Noise Intrusion – Building siting and construction* and NZS 6805:1992 *Airport Noise Management and Land Use Planning*. NZS6805:1992 contains now relevant recommendations around acceptable indoor aircraft noise levels. AS 2021:2000 Acoustics recommends is that the LAFmax inside the bedroom should not exceed 50 dBA.

The World Health Organisation (WHO) recommendations for community noise levels [World Health Organisation 1999] included a table listing guidelines for a number of specific environments. This aspirational target of LAFmax inside bedrooms of 45 dBA. This can be compared with the more practical recommendation above of Australian Standard 2021 value of 50 dBA to give general guidance on an acceptable single event level of indoor aircraft noise. It is noted the Corrigan Decision<sup>2</sup> referred to achieving LAFMax of 55 dB indoors.

International research on the effects of aviation noise have signalled that a range of objective physiological, biochemical and behavioural measures have been studied in relation to sleep effects of indoor aircraft noise. The following graph indicates the relatively low probability of movement or awakening associated with indoor aircraft noise measured at levels of LAFMax 45 to 50 dB.



**Figure 11** Results of international studies of sleep disturbance factors, as a function of indoor aircraft noise measured LAFMax (dB). Ref. Passchier-Vermeer, W., Vos, H., Steenbekkers, J., van der Ploeg, F., Groothuis and Oudshoorn, K. (2002) *Sleep disturbance and aircraft noise exposure: Exposure-effect relationships*. TNO Inro Report No. 2002.027, 1-245

<sup>2</sup> WIALv WCC and Corrigan Commercial Ltd, before the Environment Court at Wellington 6-8 April 2005. Decision No. W 55/2005

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As noted in Table D the worst case expected internal sound pressure level Ldn is 35 dBA assuming Ldn 66 dBA outdoors. In regards to the expected minimum performance standard of  $D_{Tntw} + C_{tra}$  as noted in Table E, under a worst case scenario an insulation level achieving at least  $D_{Tntw} + C_{tr} > 48$  is predicted.

Thus overall, our assessment has found the internal aircraft sound level will not be likely to exceed Ldn 40 dBA indoors within habitable spaces [with windows and doors closed]. Predicted indoor aircraft noise levels assuming Ldn 66 dBA outdoors range from Ldn 35 dBA to Ldn 28 dBA.

Regarding the Business 1 insulation standards, the above results easily achieve the minimum acoustic insulation design level of  $D_{Tntw} + C_{tr} > 30$ . In fact the external building envelope delivered values between 38 to 44 dB.

In summary the calculations of the proposed building's insulation against aircraft noise indicate that due to the materials and construction techniques being adopted, a minimum standard of 40 dBA [ $L_{dn}$ ] can be achieved [with windows and doors closed] and  $D_{nTw} + C_{tr} > 30$ .

## Section C – Environmental Noise Assessment

A detailed description of the activity and building is provided in the Application. We provide the following information as part of our noise assessment.

### 7.1 Aircraft Noise Issues

The site has been found to receive relatively low levels of aircraft noise. Even in the long term future the aircraft noise levels at the site will (in theory) only reach Ldn 66 dBA. LAFMax (outdoor) aircraft noise levels have been measured for both jet aircraft arrivals and departures on both runways at Wellington International Airport. The largest jet aircraft using the airport measure (when corrected for reduced screening at Level 5) at levels at or below LAFMax 85 dB. This level is no higher than the LAFMax limit of 85 dB (Rule 34.6.1.1.1) which applies 24 hours per day to noise emitted from any Business 1 zone site, when received within sites within this zone.

For the reasons explained, the loudness of the aircraft events will be no louder than the maximum levels emitted by land use activities on neighbouring sites. These levels are likely to be no noisier than the loudest vehicles passing the site for the habitable units facing Lyall Bay Parade and Kingsford Smith Street. On this basis, the users of the proposed outdoor decks will experience some noise from a range of sources but this would not preclude their use for rest and relaxation when weather conditions allow.

The above analysis of single event aircraft noise confirm the suitability of the site for noise sensitive activities. As per the Corrigan decision, positive amenity engendered on the site through the proposed development outweighs the negatives associated with living within the airnoise boundary.

When assessing applications for new buildings with habitable rooms establishing within the Air Noise Boundary the district plan states Council will consider a number of matters. These matters are assessed below, with information provided in response to each issue.

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<ul style="list-style-type: none"> <li>• whether the likely exposure to noise will lead to an unreasonable level of health or amenity for occupiers of the building</li> </ul>	<p>The site of the proposed development has lowest aircraft noise levels found anywhere within the Airnoise Boundary. The loudest outdoor LAFMax aircraft noise events are received on this site are received at levels <u>less than</u> LAFMax 85 dBA which is the permitted activity noise standard applying <u>24 hours per day</u> to noise from <u>any site</u> in the Business 1 zone (Rule 34.6.1.1.1). Above calculations show occupiers will be well protected indoors due to high standards of acoustic insulation proposed.</p>
<ul style="list-style-type: none"> <li>• whether the habitable rooms are located, orientated or designed in such a way which would make insulation to the required standards unnecessary</li> </ul>	<p>The site of the proposed development has lowest aircraft noise levels found within the Airnoise Boundary. Habitable rooms generally face away from airport or flight tracks.</p>
<ul style="list-style-type: none"> <li>• whether the development is likely to lead to potential conflict with and cause adverse effects, including reverse sensitivity effects, on port and airport activities</li> </ul>	<p>Low outdoor aircraft noise effects coupled with good acoustic insulation results in quality indoor living environments. Outdoor courtyard partially acoustically screened from aircraft/airport. Thus, minimal effects on occupants and use of no-complaint covenants will result in nil reverse sensitivity effects for WIAL.</p>
<ul style="list-style-type: none"> <li>• whether the building is a listed heritage building and the extent to which it is practicable to insulate to the required standard without compromising the heritage significance and fabric of the building</li> </ul>	<p>No heritage issues arise.</p>
<ul style="list-style-type: none"> <li>• whether the appropriate noise attenuation and/or management measures can be provided to protect the health or wellbeing of future users</li> </ul>	<p>As above, design includes well insulated habitable spaces as well as central courtyard partially screened from aircraft noise.</p>
<ul style="list-style-type: none"> <li>• the extent to which the site or building is affected by port noise or airport noise, any special characteristics of the site or building which influence the level of port or airport related noise received, and any mitigation proposals included in the application which will reduce the adverse effects of noise on the activity or building.</li> </ul>	<p>As above, the site of the proposed development has lowest aircraft noise levels found anywhere within the Airnoise Boundary. Loudest outdoor LAFMax jet aircraft noise events are received on this site at levels less than LAFMax 85 dBA which is the permitted activity noise standard 24 hours per day applying to noise from any site in the Business 1 zone (Rule 34.6.1.1.1). Proposed use of no-complaint covenants will result in nil reverse sensitivity effects for WIAL.</p>

## 7.2 Building Structure

As noted above the project will be a 7 level building constructed of solid materials. The above acoustic insulation calculations show the building is capable of achieving a good standard of acoustic insulation. Many of the habitable rooms will face away from the airport and flight tracks. Habitable rooms facing Kingsford Smith Street will receive as much sound from vehicles passing the site than from aircraft operating at the distant airport. The proposed outdoor courtyard will not experience noise from visible aircraft movements. Instead, the courtyard, being partially screened, will receive outdoor aircraft noise events at levels around 10 dB reduced below the direct (unscreened) levels.

In terms of noise generated on-site from sources such as people socializing and retail-related activity, these effects will generally be minor. The building will act to reduce sound transmitted internally, and being of a solid, modern design and construction will be more than adequate to contain worst case indoor sound sources associated with the range of possible commercial activities likely to establish on the ground level. This includes any cafes and restaurants which are commonly situated on ground floor commercial sites with (insulated) residential uses established at the first floor level. Additional control over noise from these sources can be exerted via rules of the Body Corporate and through lease agreements.

It is concluded that the building, being of modern design and construction, will be more than adequate to contain worst case indoor sound sources associated with the proposed activity [even with windows open for fresh air and ventilation].

### 13062017 **7.3 Plant Noise**

A modern, fashionable apartment complex with apartments, swimming pool, retail and other services requires mechanical plant in relation to ventilation extract, swimming pool water treatment, etc..

The project is only at Consent Stage. Final design or plant and services has not been completed in detailed. It is acknowledged mitigation of plant noise will rely on the specification, location and design of modern, low noise equipment. This will ensure noise from these sources is suitably avoided or directed away from noise sensitive sites. There are no reasons to signify noise from mechanical services would not comply at all times with the District Plan permitted activity noise limits for fixed plant which are set at levels below those applying to other land use activities and will ensure this type of noise does not predominate in the area.

### **7.4 Service Noise**

In addition to plant there will also be service areas. The service area is located within the building on the ground floor, will receive deliveries from couriers or other providers. Being internal to the building means only low levels of noise would be detectable within any other commercial site, or within any of the proposed apartments. Any service noise such as delivery from couriers or removal of waste will be on a low level scale and confined to the internal parts of the ground floor and basement of the proposed building.

### **7.5 Vehicle Noise**

Parking will be located in the basement and Ground Floor Levels and thus also located within the building. Generally the activity of residents or retail clients arriving or leaving site is a low noise activity with patients walking to or from their vehicles and leaving or exiting the building. Noise generated from vehicle activity on site needs to meet the noise limits and has been included with the calculations and assessment. We consider the site is well laid out and designed in a noise-aware manner keeping the vehicles away from the site boundaries where possible or providing suitable noise mitigation where necessary. The Applicants Traffic Engineer has provided the following estimated for traffic: 55 apartments [Assume worst-case residential trip generation 7-8 vehicle movements/day, of which 10% in peak period [Traffic Engineer this is expected worst case] thus peak hour =  $55 * 7.5 * 10\% = 41$  movements and thus in peak 15 mins = 10 vehicle movements.

In general, car parks are not inherently noisy. Our observations are that drivers will be required to operate vehicles slowly on-site due to constraints of the site and for safety reasons. As such noise from vehicles on-site is assessed as being likely to be low within adjoining sites, particularly in terms of the existing high day time ambient sound climate. On this basis noise generated from vehicle activity on-site has very little potential to travel off-site and affect residential sites in the context of the proposed site layout and design as proposed.

Overall, the assessment is that noise produced into the surrounding environment from on-site vehicle movements will generally add no more to the day or night time ambient noise environment than that already produced from vehicles on surrounding roads or other land based activities in the area and will fully comply with the applicable noise rules.

### **7.6 Retail Noise**

Retail activity is to be provided for on the Ground Floor and will possibly emit low levels of noise emission. We understand that the retail component will be based on shopping experiences, similar to the range of retail shops currently found within the area, including possible cafés or restaurants located within proposed retail spaces. Should any of the retail spaces be used for a cafe or restaurant, this would generate some sound associated with customers and equipment, however such uses would be able to fully comply with District Plan permitted noise activity standards, with the sounds produced being able to fully assimilated into the existing environment.

The solid structure of the building will eliminate the transmission of sound within the structure to affect residential apartments above. Effective management of noise from the retail sites is also a factor to consider. Due to the need to consider effects on apartments above, there are arguably greater incentives for retail managers and operators to avoid unreasonable or excessive noise than would be the case for a standalone facility, if such a use were to occur adjacent to the proposed development.



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Overall it is concluded that the proposed development is suited to controlling noise from both retail activities and residential activities taking place with the building. All relevant District Plan noise requirements can be achieved. The building itself is acoustically more than adequate to contain indoor sound sources associated with commercial uses without causing adverse effects to occupants elsewhere in the proposed building.

## 7.7 Construction Noise

Temporary construction noise is assessed above in **Section 4.7**. As recommended above the cumulative noise effects are predicted not to exceed construction noise limits set out within either NZ Standard *NZS 6803:1999 Acoustics Construction Noise*. When a specific construction noise assessment and management plan is prepared by the Contractor. Thus the recommendation here is that as part of the Contractors Construction Management Plan a review is section of the plan or a standalone plan is prepared by the selected contractor illustrating how the contractor and all sub contractors will ensure they mitigate noise so as to comply at all times with the requirements of *NZS 6803:1999 Acoustics Construction Noise*.

## 7.8 Summary of Environmental Noise Emissions

In terms of potential noise effects and off site noise emissions the site is located adjacent a host of commercial and other non-residential sites as well as a Wellington International Airport. There are no immediately noise sensitive sites that are zoned residential, however it is noted that there is an accommodations site to the east zoned Business under the District Plan. In terms of potentially off site noise emission this assessment has focused on these residentially zoned sites as well as the adjacent non-residentially zones sites i.e. commercial, industrial and recreational. We have conducted acoustic assessment have been carried out in order to assess future worst case operational noise effects expected at or within the common adjacent site boundaries. Our assessment finds some noise emissions from the a site will occur, however the acoustic effect of this noise will be less than minor in the context of the existing environment. . It is important to note the level of sound emission is expected to be below the existing ambient sound levels for the area. . As above, these ambient sounds are those generated by passing traffic and sounds from other type activities in the area, which includes a host of both commercial and industrial activities and some residentially based recreational and residential activities located further afield.

**The overall assessment is that worst case cumulative noise emissions will be able to fully comply with all required District Plan noise standards.**

## 8 Summary and Recommendations

**Malcolm Hunt Associates** have assessed noise aspects for a proposed apartment and commercial development complex to be located on a site at 57 to 59 Kingsford Smith Street, Wellington. This acoustic assessment has assessed aircraft noise effects as well as environmental noise emissions from the site and from activities potentially taking place on nearby and adjoining Business 1 zoned sites. The report concludes that the building has a high level of sound insulation [being proposed to be constructed of concrete and hi spec doubling glazing] which will be effective in reducing indoor noise levels for occupiers located indoors.

*The assessment findings are summarised as follows;*

### 8.1 Noise Received On-Site

#### Aircraft Noise

As the development is sited within the air noise boundary of Wellington International Airport there are potential adverse effects on the airport of establishing further residential sites within this boundary that need to be considered.

Even though the Airport operates a night time curfew that minimises night time noise impact in the local area, the results of measurements individual aircraft noise events at the development site (as above, for landings and departures of the loudest wide body jet aircraft using the Airport) have been found to be not significant when doors

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and windows are closed. Such single events registering outdoors at levels below the district plan permitted activity standard of LAFMax 85 dB which applies 24 hours per day.

There will be 55 apartments providing residential accommodation for around 100 new residents based on 1.8 occupants per apartment, on average. We understand there are currently between 650 and 700 dwellings located within the Airnoise Boundary at Wellington Airport. Assuming 1.8 occupants per dwelling, this would mean the Kingsford Smith Apartments would cause an increase in the population living within the Airnoise Boundary by less than 10%, assuming full occupancy of all proposed apartments.

Concerning annoyance to aircraft noise, the widely quoted Schultz synthesis<sup>3</sup> of surveys regarding annoyance to transportation noise found that, on average, around 12% of the population report feeling highly annoyed at times by aircraft noise received at levels of Ldn 65 to 66 dBA. Thus, based on the Schultz surveys, whereas around 200 people living within the Airnoise Boundary may report high annoyance to aircraft noise, granting approval to the proposed mixed use and apartment will cause this number to increase by around 12 people which is a very small change in the theoretically number of persons living within the Airnoise Boundary that are 'highly annoyed' by aircraft noise. This level of change is not considered significant as the numbers of persons within the Airnoise Boundary naturally fluctuates by similar amounts due to removal of dwellings, infill housing and new hotels established within the Airnoise Boundary (such as that currently under construction at the Airport). At the end of the day the operation of the Airport's Noise Management Plan appears to be very capable of dealing with the few aircraft noise complaints arising within the affected community and no long term adverse consequences caused by the Kingsford Smith Street development can be realistically foreseen for the operation of Wellington International Airport.

#### **Noise Effects From Other Business 1 Sites**

There are potential adverse noise effects of establishing the proposed sensitive residential activity within the existing noisy environment and from potential new uses on adjoining and nearby sites including business activities that may operate 24 hrs per day. These noise effects will be controlled to acceptable levels due to habitable rooms being acoustically designed to meet or exceed the minimum Business 1 acoustic insulation design level of  $D_{Tntw} + C_{tr} > 30$ . This relatively high standard will adequately protect the occupants from elevated outdoor noise [whether this is due to aircraft activity or activities on other Business 1 zoned sites]. The provision of ventilation into habitable rooms will enable windows to be kept closed to keep noise out, without suffering thermal discomfort.

#### **Noise Effects of Proposed Retail Activities On Residential Apartments Above**

Noise effects of the use of the proposed ground floor retail tenancies has the potential to acoustically effect occupants of residential apartments above. These 'in house' effects are able to be effectively dealt with via the solid, concrete structure proposed, by lease agreements, body corporate rules and via compliance with District Plan outdoor noise emission limits applying to these retail activities that apply noise limits to both fixed and mobile noise sources on the retail sites. In addition, the proposed acoustic insulation and ventilation will assist by being able to keep windows closed, if need be. Thus, in our view there is minimal potential for in-house noise conflicts to arise between retail activities and residential occupiers of the apartments above.

## **8.2 Noise Emitted From The Site**

An assessment of potential noise emitted from the site to affect other sites in the area [or occupants of the distant Residential Zone] has found that that worst case, cumulative noise from the proposed residential and commercial sites will result in noise effects that will not be unreasonable as they will be able to fully comply with District Plan permitted activity noise standards when measured in accordance with New Zealand Standard NZS6801:2008 *Acoustics - Measurement of Environmental Sound* and assessed in accordance with New Zealand Standard NZS6802:2008 *Acoustics - Environmental Noise* at any point within any residentially zoned site or any adjacent Business site.

The overall findings of this report is that the proposed development can comply with the relevant noise emission standards as set out in the Wellington City District Plan and that for the reasons provided, developing the site in the manner proposed will not be likely to generate adverse noise effects within the site itself or within the wider area

<sup>3</sup> Schultz (1978) "Synthesis of social surveys on noise annoyance". J. Acoustic.Soc. Am., 64, 2, 377-405

13062017 including reverse sensitivity effects on existing and proposed Business 1 activities and on the operation of the nearby Wellington International Airport.

**Malcolm Hunt Associates**

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