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Portside Building 20

Noise Impact Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic evaluation of noise impacts associated with the proposed Building 20 of the Portside development, Hamilton. Noise impacts addressed in this document include the following:

- Noise associated with the cruise ship terminal to the South.
- Noise associated with aircraft flyovers; and
- Traffic noise associated with Kingsford Smith Drive to the North.

Noise impacts have been assessed against the following:

- Brisbane City Council Noise Impact Planning Scheme Policy (NIAPSP) and associated Noise Methodologies Guidelines.
- Queensland Development Code – Mandatory Part 4.4.
- Australian Standard AS 2021-2000 *"Aircraft Noise Intrusion - Building Siting and Construction"*.

This document also establishes noise emission objectives to govern mechanical plant servicing the development.

2 SITE DESCRIPTION

Portside Building 20 is a residential development to be located along the Brisbane River as part of the Portside development. The building will include:

- 24 × 1 Bed units (level 1 -3)
- Retail on the ground level
- Basement level car park

Traffic to the area is fed from Kingsford Smith Drive along the local streets Harbour Road, Remora Road and Hercules Street.



LEGEND

Proposed Site	
Portside Development	
Citimark Development	
Developments by Mirvac and Devine	

Figure 1: Portside Site Survey

3 TRANSPORTATION NOISE INTRUSION

3.1 BASIS OF METHODOLOGY

An investigation of noise intrusion into the proposed development has been carried out for the following reasons, namely:

1. High levels of external noise sources heard within habitable spaces may be disruptive to general day to day activities such as speech communication, listening to the television/stereo, or sleeping. Therefore, such noise needs to be reduced to a level where it is not intrusive upon normal activities.
2. The regulation of external noise sources is seen as an indication of the quality and market position of a development.

As part of this assessment, an investigation into traffic noise has been conducted to ascertain the potential level of noise impact on the future occupants of the building.

3.2 TRANSPORTATION NOISE SOURCES

Transportation noise addressed in this assessment includes the following:

- Traffic noise from Kingsford Smith Drive;
- Aircraft noise associated with the Brisbane Airport; and
- Cruise ship noise associated with the terminal to the South of the site.

Due to the distance between the development and Kingsford Smith Drive, traffic noise impacts are expected to be minimal compared to the cruise ship terminal and aircraft flyovers. Notwithstanding this, traffic noise impacting the façade has been included for clarity.

3.3 TRANSPORTATION NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15 minute measurement interval is utilized. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10} , L_{90} and L_{eq} .

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (*which is commonly referred to as the background noise level*) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

4 TRAFFIC NOISE INTRUSION

Traffic noise levels potentially impacting the site will be assessed against the Queensland Development Code – Mandatory Part 4.4 *'Buildings in a Transport Noise Corridor'*.

4.1 QUEENSLAND DEVELOPMENT CODE

Noise criteria for residential buildings in a transport noise corridor are covered under the Queensland Development Code – MP 4.4 *'Buildings in a Transport Noise Corridor'*. The MP 4.4 policy outlines indicative treatments for residential dwellings in proximity to transport corridors with the implementation of specific noise categories.

Table 1 - Noise Category Levels (Table 1, Schedule 3 – MP 4.4)

Noise Category	Level of transport noise (LA10, 18hour) for State-controlled roads and designated local government roads
Category 4	≥ 73 dB(A)
Category 3	68 – 72dB(A)
Category 2	63 – 67dB(A)
Category 1	58 – 62dB(A)
Category 0	≤ 57 dB(A)

* Measured at 1m from the façade of the proposed or existing building.

Where noise levels exceed the 'Category 0' noise level of 57dB(A) L_{10} 18 hour, acoustic treatments should be determined to comply with the weighted sound reduction (R_w) values in Schedule 1 of the QDC-MP4.4, as set out below.

Table 2 – Minimum Acoustic Constructions (Schedule 1 – MP 4.4)

Noise Category	Minimum transport noise reduction dB(A) required for habitable rooms	Component of building's external envelope	Minimum Rw required for each component
4	40	Glazing	43
		External Walls	52
		Roof	45
		Floors	51
		Entry doors	35
3	35	Glazing	38 (where total area of glazing for a habitable room is greater 1.8m ²)
			35 (where total area of glazing for a habitable room is less than 1.8m ²)
		External Walls	47
		Roof	41
		Floors	45
		Entry doors	33

Table 3 – Minimum Acoustic Constructions (Schedule 1 – MP 4.4)

Noise Category	Minimum transport noise reduction dB(A) required for habitable rooms	Component of building's external envelope	Minimum Rw required for each component
2	30	Glazing	35 (where total area of glazing for a habitable room is greater 1.8m ²)
		External Walls	32 (where total area of glazing for a habitable room is less than 1.8m ²)
		Roof	41
		Floors	38
		Entry doors	45
1	25	Glazing	27 (where total area of glazing for a habitable room is greater 1.8m ²)
		External Walls	24 (where total area of glazing for a habitable room is less than 1.8m ²)
		Roof	35
		Floors	35
		Entry doors	28
0	No additional acoustic treatment required	standard building assessment provisions apply	

4.2 TRAFFIC NOISE MEASUREMENTS

Traffic noise levels were established from on-site measurements conducted by Acoustic Logic Consultancy.

4.2.1 Measurement Equipment

Noise measurements were obtained using a Norsonics 118 precision sound level analyser, set to A-weighted fast response. The precision sound level analyser was calibrated before and after the measurements using a Norsonics 1443 precision sound level calibrator. No significant drift was recorded.

4.2.2 Location of Measurements

Noise measurements were conducted along Kingsford Smith Drive in front of the Hamilton Harbour development. Traffic was free flowing during this period with high concentrations of heavy traffic which will be used as a worst case for this assessment.

4.2.3 Traffic Noise Levels

Measured traffic noise levels along Kingsford Smith Drive are presented in Table 2 below. This noise level will be used as a basis for this assessment in comparison with the ultimate traffic flows for the road. Traffic noise levels have been corrected for façade reflection associated with the hoarding along the Hamilton Harbour site.

Table 4 – Kingsford Smith Drive Traffic Noise Levels

Location	Time	Traffic Noise Level
3m from KSD	6am – 8am	76dB(A) L_{eq} 1hour

4.3 ULTIMATE TRAFFIC VOLUMES

The ultimate traffic volumes projected for Kingsford Smith Drive have been adopted from traffic counts conducted in 2008. Projected volumes have been determined from the SKM Connell Wagner Airport Link feasibility study.

Table 5 – Ultimate Traffic Volumes

Traffic Volumes	AADT	% Heavy Vehicles
2008	64,906	11
Projected 2022	77,200	11

These traffic volumes have been incorporated into the Calculation of Road Traffic Noise model which has been used to predict noise levels to the development.

4.4 CORTN PARAMETERS

The following parameters have been incorporated in the CoRTN model. These parameters have been used and incorporated into the SoundPlan™ noise modelling software in conjunction with measured worst case noise levels.

Table 6 – CoRTN 2022 Model

Parameter	2008 Traffic Volume (KSD)	Ultimate Traffic Volume AADT (KSD)	Ultimate Traffic Volume 18 hour (KSD)
Traffic Volume	64,906	77,200	71800
Percentage of Heavy Vehicles	11%	11%	11%
Estimated Traffic Speed	60km/h	60 km/h	60km/h

The CORTN modelling software is based around the 18hour time descriptor which typically represents 93% of traffic flows during the 24-hour period.

A set of offset parameters for correlating noise descriptors has previously been published¹ and is based on extensive study of sites in southeast Queensland. The results of these offset parameters are presented in Table 7 below and have been used for the purpose of this assessment.

Table 7 - Descriptor Offset Parameter

Descriptor / Parameter	L ₁₀ 18 Hour Vs. Offset Parameter dB(A)
L ₁₀ 18 hour	0.0
L _{Aeq} 24 hour	+3.6
L _{Aeq} 1 hour night	+3.4
L _{Aeq} 1 hour day	-0.4
L _{Aeq} 1 hour	-0.4
Average L _{AMAX} night	-0.2
L ₁₀ 12 hour	-1.5

The model has been calibrated using the offset parameters against the measured noise levels during the peak hour period.

¹ Brown, R., "An Assessment of the Relationship between the L_{10(18 hour)} Noise Level Parameter and other Road Traffic Noise Level Parameters", Proc. Australian Acoustical Society Annual Conference, Gold Coast, 2004.

Table 8 – CoRTN Calibration

Noise Level	Noise Level L_{10} 18-hour	Noise Level L_{eq} 1-hour
CoRTN 2008 @ 3m from curb	76	77
Measured Noise Level @ 3m from curb	-	76

Predicted noise levels using the CoRTN model fall within +/- 1dB(A) of the measured noise levels during a worst 1 hour period and a such will be used for the basis for this assessment.

4.5 PREDICTED TRAFFIC NOISE LEVELS

Traffic noise levels at the worst affected residential façade have been calculated using the SoundPlan™ noise modelling software. The worst case external noise level is 61dB(A) L_{eq} . This level will be used as a basis in comparing the ultimate required noise reduction across the façade in comparison with port and aircraft noise sources.

5 PORT ACTIVITIES NOISE ASSESSMENT

Portside Wharf caters for commercial cruise liners which dock at the facility. The potential for noise impact on Building 20 has been assessed for general operation of the port against the requirements of BCC.

5.1 NOISE CRITERIA

Noise impacts from the port operation have been assessed against the requirements of the BCC NIAPSP. Internal noise levels within apartments as part of the development are to comply with Australian and New Zealand Standard AS/NZS 2107:2000 "Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors". These design sound levels are presented in the Table below.

Table 9 – Recommended Design Sound Levels

Occupancy/Activity	Recommended Design Sound Level dB(A) L_{aeq}	
	Satisfactory	Maximum
Living Areas	35	45
Sleeping Areas	30	40
Work Areas	35	45

5.2 PORT NOISE ASSESSMENT

Noises associated with the port have been assessed against noise levels previously measured by this office and used on Portside Building 1, 3 & 7. Noise levels used as a basis for this assessment include the following:

Table 10 – Port Sound Noise Levels

Activity	Distance from Source Noise	Noise Level L_{eq} (15 Min) dB(A)	Noise Level L_1 dB(A)
Berthed Ship (Generators and the like)	25m	68	70
Forklift	10m	72	76
Crain	10m	76	79
Container Loader	10m	74	81

5.3 PORT NOISE LEVELS

The predicted noise levels from the operation of the port have been implemented in the SoundPlan™ noise modelling software. The worst case external noise level is 49dB(A) L_{eq} . This level will be used as a basis in comparing the ultimate required noise reduction across the façade in comparison with traffic and aircraft noise sources.

6 AIRCRAFT NOISE

6.1 AIRCRAFT NOISE CRITERIA

The acceptability of aircraft noise exposure is assessed using Australian Standard AS 2021-2000 "Aircraft Noise Intrusion - Building Siting and Construction". The standard sets criteria for allowable levels of aircraft noise exposure depending on the proposed land use for the site being assessed.

The acceptability of a site in terms of aircraft noise exposure is assessed using the Australian Noise Exposure Forecast System (ANEF). Three basic parameters influence perception of aircraft noise: the frequency of aircraft movement's overhead, the noise level and duration of individual aircraft movements, and the time of the day in which they occur. ANEF was developed to provide a rating system that reflects actual human response to these factors so that the noise exposure of a particular location can be readily assessed.

The Portside Wharf development is located adjacent to the ANEF 20 contour of the Brisbane Airport Ultimate Capacity ANEF chart which incorporates the proposed New Parallel Runway (NPR). This makes the site "conditionally acceptable" for use as a residential development subject to compliance with the flyover internal noise levels recommended in AS2021:2000.

AS2021:2000 states that a full evaluation of internal noise levels should be carried out for locations with an aircraft noise exposure close to or exceeding ANEF 20. This full evaluation requires an examination of likely levels of internal noise from aircraft flyovers.

AS2021:2000 stipulates the internal noise levels listed in the Table below for residential buildings. These levels will be used to assess aircraft noise intrusion into the residential levels of the development.

Table 11 – Aircraft Noise Level Criteria

Building Use	Building Type and Activity	Indoor Design Sound Level from Aircraft Flyover, dB(A) L_{max}
Residential	Sleeping areas	50
	Other habitable spaces	55
Retail	Shops, supermarkets, showrooms	75

6.2 AIRCRAFT FLYOVER NOISE LEVELS

Noise intrusion into the residential development was assessed using flyover noise levels established using Australian Standard AS2021-2000 for noise associated with aircraft using the Brisbane Airport.

Aircraft noise levels have been assessed based on the loudest typical noise level of 83dB(A) L_{AMAX} associated with Boeing 747-400 aircraft taking off from the New Parallel Runway as part of the Brisbane Airport Master Plan.

Table 12 – External Aircraft Noise Levels

Source of Noise	Noise Level dB(A) L_{AMAX}	Internal Criteria dB(A) L_{AMAX}	Required Reduction dB(A)
Aircraft	83	Bedrooms 50	33
		Other habitable spaces 55	28
		Retail 75	8

7 REQUIRED NOISE REDUCTION

The noise levels used for this assessment will be evaluated for the worst case scenario representing the maximum noise reduction required. The predicted noise levels presented above are illustrated below with respect to the maximum reduction required.

Table 13 – Residential Maximum External Noise Sources (Bedrooms)

Source of Noise	Noise Level dB(A)	Internal Criteria dB(A) L_{Aeq}	Internal Criteria dB(A) L_{AMAX}	Required Reduction dB(A)
Traffic	61	To satisfy minimum R_w requirements of QDC MP 4.4	-	21
Aircraft	83	-	50	33
Port Noise	49	40	-	9

On this basis, aircraft noise intrusion will be the primary source of noise impacting future residents as part of the development and as such have been used for this assessment.

Note that internal compliance with the aircraft noise criteria will result in compliance with all other noise sources including the minimum R_w requirements of the Queensland Development Code.

8 EVALUATION OF AIRCRAFT NOISE INTRUSION

Aircraft noise intrusion into the proposed Building 20 of the Portside development was assessed using the noise levels established from aircraft flyovers presented in Section 7 which represents the worst typical noise level affecting residential dwellings.

Calculations were undertaken taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

In all cases, the selected glazing types reduce internal noise levels to within the internal noise criteria detailed in Sections 4-6 for the various space types.

8.1 RECOMMENDED CONSTRUCTIONS

These constructions are recommended to comply with the aircraft noise objectives stated in Table 11.

8.1.1 Glazed Windows and Doors

The recommended glazing assemblies are presented in Table 14 in order to satisfy the project acoustic objectives presented in Table 11. Thicker glazing may be required for structural, safety or other purposes. Where required to use thicker glazing than that scheduled, this will also be acoustically acceptable.

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

Table 14 – Minimum Glazing Requirements

Units	Space	Minimum Glazing Thickness
All Units	Bedrooms	10.38mm / 12mm airgap / 6.38mm
	Living / Kitchen	10.38 mm laminated

In addition to complying with the minimum scheduled glazing thickness, the STC rating of the glazing fitted into operable frames and fixed into the building opening should not be lower than the values listed in Table 15 for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of operable frames and the frame will need to be sealed into the building opening using a flexible 100% polyurethane sealant equal to Selleys Proseries Fireblock.

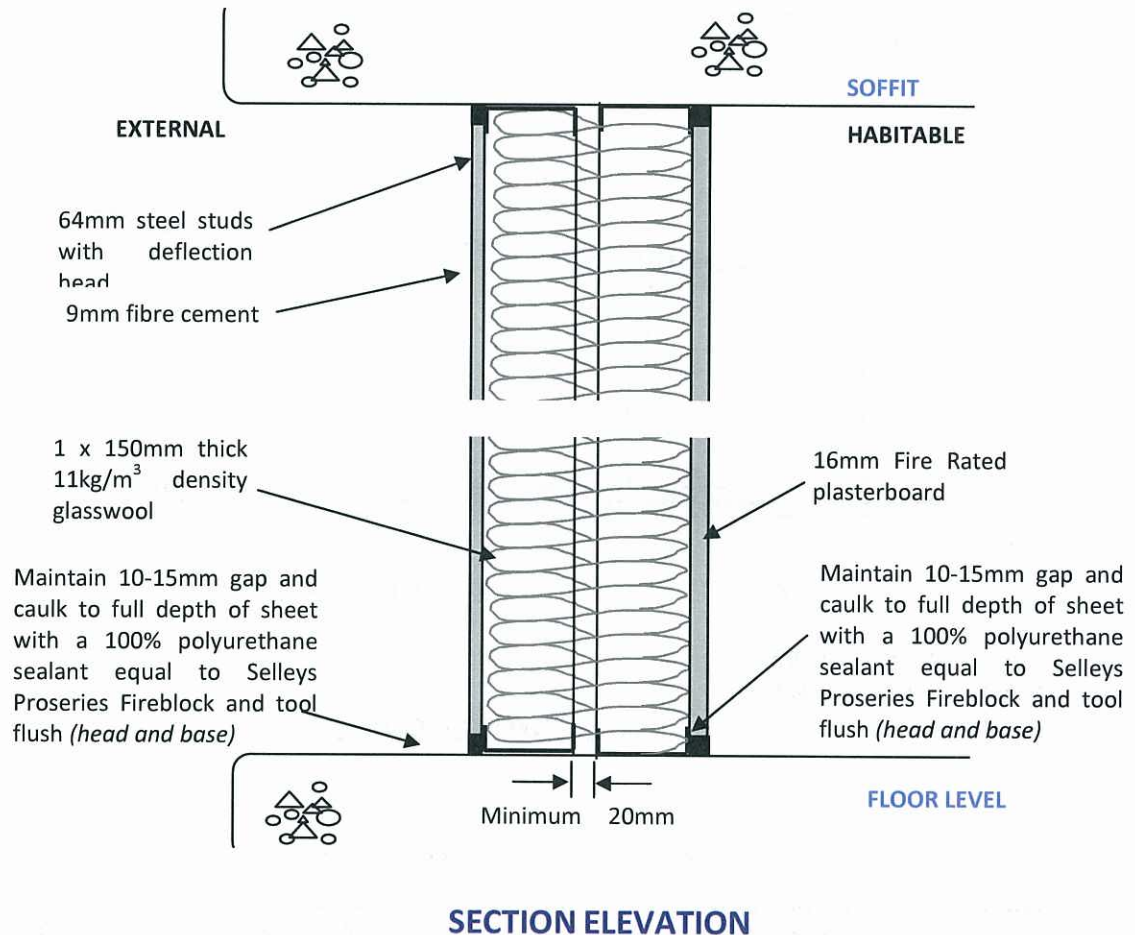
Where acoustic seals are nominated, these seals shall be equal to Schlegel Q-Lon manufacture. **It is noted that mohair or mohair/plastic fin combination seals are not acceptable.**

Table 15 – Minimum STC of Installed Glazing

Glazing Assembly	Acoustic Seals	Minimum STC Of Installed Glazing
10.38mm Laminated	Yes	35
10.38mm / 12mm air gap / 6.38mm	Yes	40

8.1.2 External Wall Construction

All light weight external walls are to be constructed as per the following detail.



Note: The proposed wall construction should be reviewed during the detailed design phase to ensure that the construction meets requirements for other disciplines (ie Structural, thermal etc). Deviations to the wall construction should be confirmed with the acoustic engineer to ensure that the acoustic integrity of the system is maintained.

8.1.3 Roof / Ceiling Construction

The light weight roof is to be constructed as per the following detail:

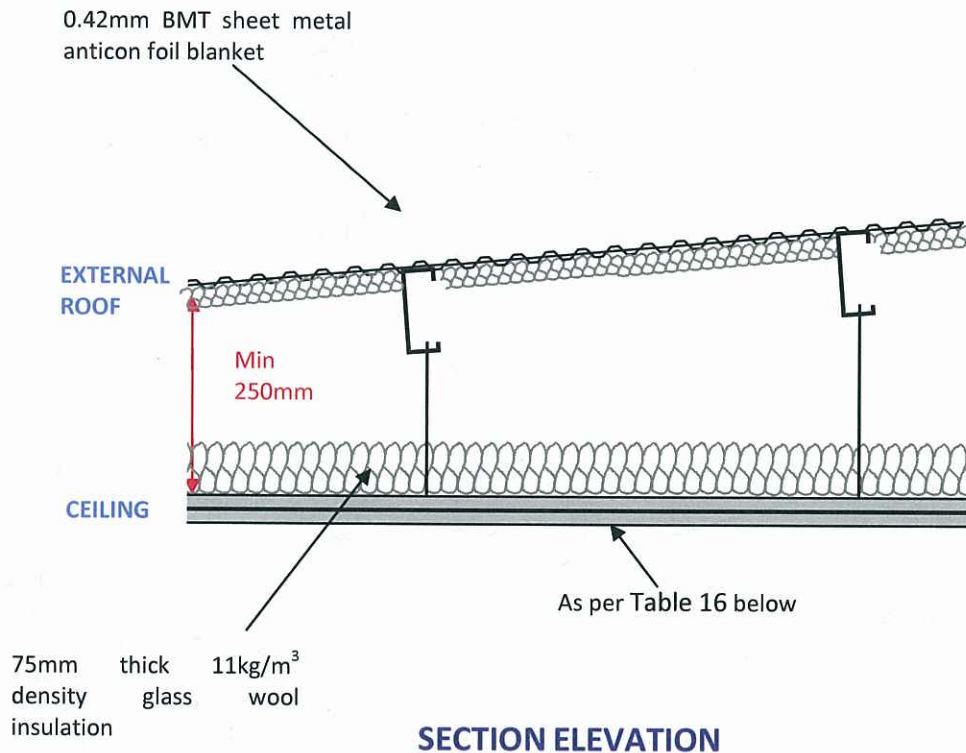


Table 16 – Minimum Ceiling Construction

Spatial Use	Minimum Ceiling Construction
Bedrooms	2 x 16mm plasterboard
Living Area / Kitchen	1 x 16mm plasterboard

Note: The proposed roof/ceiling construction should be reviewed during the detailed design phase to ensure that the construction meets requirements for other disciplines (ie Structural, thermal etc). Deviations to the roof/ceiling construction should be confirmed with the acoustic engineer to ensure that the acoustic integrity of the system is maintained.

8.1.4 Penetrations

Any penetrations in the external façade or roof/ceiling construction should be acoustically treated to maintain the acoustic integrity of the system.

8.2 DISCUSSION

Noise associated with the Portside Wharf carpark and internal traffic to the precinct along Main Street will not result in noise levels which will exceed the aircraft noise requirement. Notwithstanding, further investigation should be conducted by Brookfield Multiplex to ensure that drainage grates to the carpark are solidly fixed and acoustically treated to ensure that structure borne noise does not impact on Building 20.

Noise from the loading dock servicing the Portside Wharf development will not have an acoustic impact on the development due to its location on the Eastern side of Building 8.

9 NOISE EMISSIONS

Noise emissions from the proposed Building 20 will be primarily associated with mechanical plant servicing the development.

Mechanical selections are not yet made available however ALC would recommend an acoustic evaluation of plant is conducted prior to construction to ensure that noise emissions from the operation of plant comply with the requirements of the BCC NIAPSP and Noise Methodologies Guidelines.

10 CONCLUSION

This report presents the acoustic assessment of aircraft noise impacts associated with the proposed Building 20 of the Portside development located at Hamilton.

ALC confirm that internal noise levels will comply with the specified criteria on the proviso that the acoustic constructions presented in Section 8 of this report are adopted.

Noise emissions associated with mechanical plant should be addressed prior to occupation to ensure that noise levels comply with BCC noise emission criteria.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,



Acoustic Logic Consultancy Pty Ltd
James Small

