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Mr Dhiren Singh
49 Huntley Drive
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Our Reference 150584-01L-DD

For the attention of Mr Dhiren Singh

Aircraft Noise Assessment
Residential Dwelling Development
Lot 238, 26 Medinah Avenue, Luddenham

1.0 INTRODUCTION

Acoustic Consulting Engineers Pty Ltd was commissioned by Mr Dhiren Singh to conduct an assessment of potential aircraft noise intrusion for the proposed residential dwelling development at Lot 238, 26 Medinah Avenue, Luddenham.

The subject site could be exposed to aircraft noise from the proposed Second Sydney Airport and Penrith City Council requires the residential dwelling be designed to provide the aircraft noise reduction (ANR) requirements of the Australian Standard AS2021-2000 "*Acoustics - Aircraft Noise Intrusion – Building Siting and Construction*".

This report presents an assessment and recommendations to control potential aircraft noise intrusion into the proposed residential dwelling development.

The findings from the noise assessment and recommendation are site specific and have been prepared for the particular investigation described in this report. The report should not be used in any other context or for any other purposes.

2.0 BUILDING SITE ACCEPTABILITY

Figure 12C.1 (*refer to the figure below*) of Penrith City Council DCP2014 Volume 1 provides the ANEF Contours for the Proposed Second Sydney Airport. This figure may be used to determine site acceptability for the future residential dwelling developments.

However, *Figure 12C.1* of Penrith City Council DCP2014 does not provide the locations of the aerodrome runways, necessary to predict aircraft noise levels in accordance with the requirements of AS2021-2000.

The "*Environmental Impact Statement for the Proposed Second Sydney Airport at Badgerys Creek*", prepared in 1999 by PPK Environment and Infrastructure is used to determine the location of the aerodrome runways for the prediction of aircraft noise levels in accordance with the requirements of AS2021-2000.

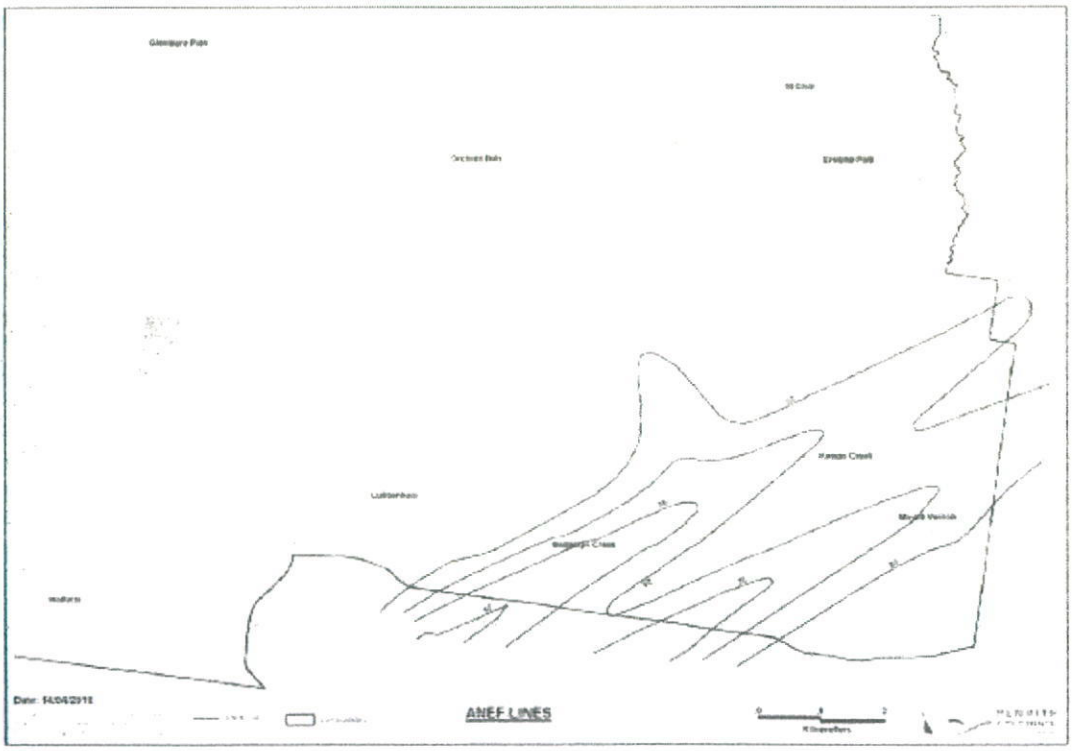
Figure 1 shows locations of Runway Options for the proposed Second Sydney Airport. The ANEF Contours for the Proposed Second Sydney Airport *Figure 12C.1* of Penrith City Council DCP2014 are based on Runway Option A of the "*Environmental Impact Statement for the Proposed Second Sydney Airport at Badgerys Creek*". Accordingly, the distance coordinates for Runway Option A are used for the prediction of aircraft noise levels.

Figures 2 and *3* show the location of the subject site relative to Runway Option A.

The proposed residential development site is located in within the 20-25 ANEC contour of the proposed Second Sydney Airport at Badgerys Creek under Option A and would be most affected by Runway 05L-23R.

Figure 4 shows the location of the residential dwelling development site with respect to Option A and the surrounding.

Figure C12.1: Land affected by ANEF contours for the proposed Second Sydney Airport



The "*Environmental Impact Statement for the Proposed Second Sydney Airport at Badgerys Creek*", prepared in 1999 by PPK Environment and Infrastructure and Penrith City Council DCP2010 are used to determine site acceptability, aircraft noise levels and

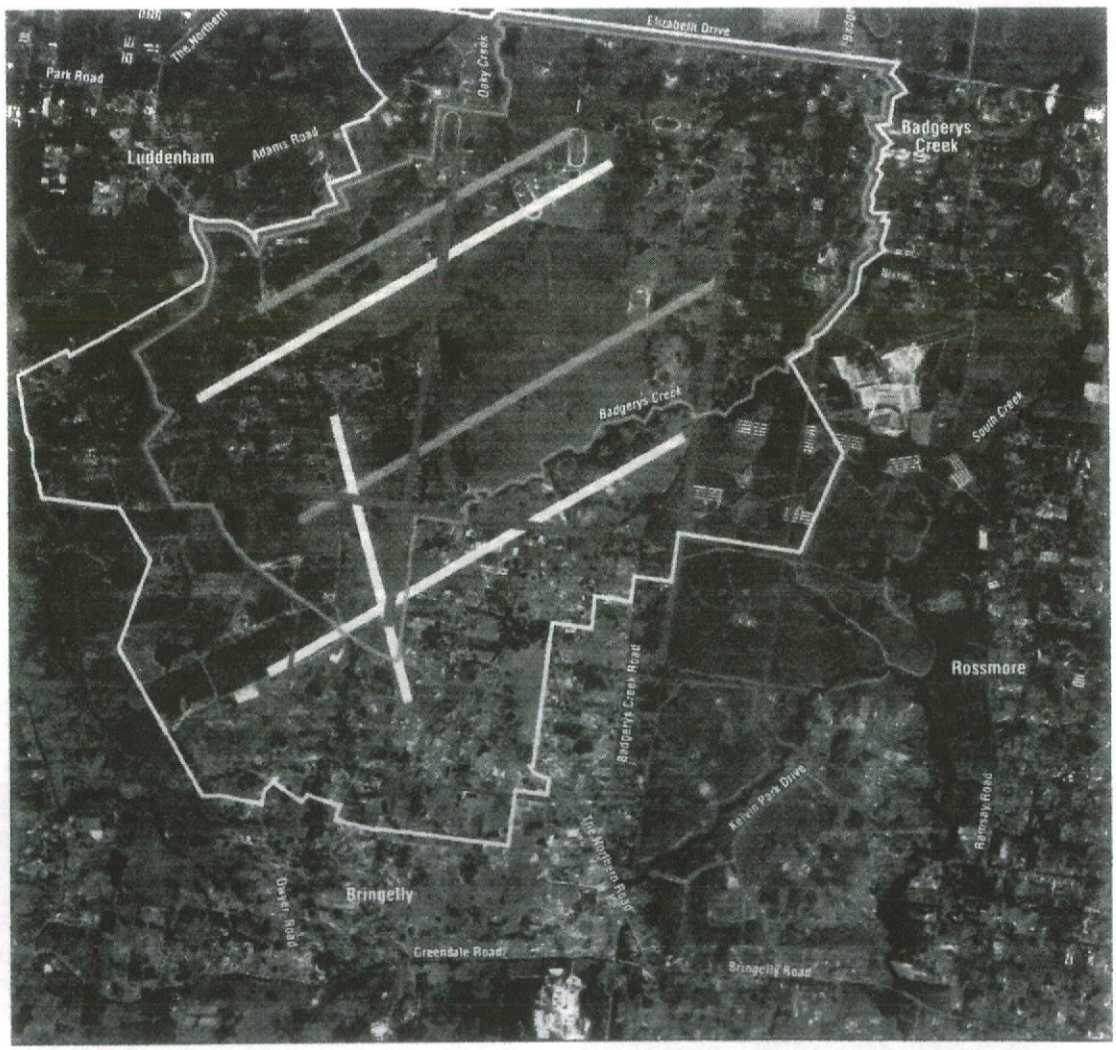
attenuation required for the residential dwelling development in accordance with the requirements of AS2021-2000.

Figure 1 shows locations of Runway Options for the proposed Second Sydney Airport. *Section C12 "Noise and Vibration"* of Penrith City Council DCP2010 requires aircraft noise to be assessed under Runway Option A.

Figures 2 and *3* show the location of the subject site relative to Runway Option A. *Figure 4* shows the location of the residential dwelling development site with respect to Option A and the surrounding.

The proposed residential development site is located in within the 20-25 ANEC contour of the proposed Second Sydney Airport at Badgerys Creek under Option A and would be most affected by Runway 05L-23R.

Figure 1 Second Sydney Airport Runway Options, Badgerys Creek



Aerial Photograph of Sites of Badgerys Creek Airport Options

Figure 2 *Site Location*

Figure 3 *Site Location Relative to Runway Option A*

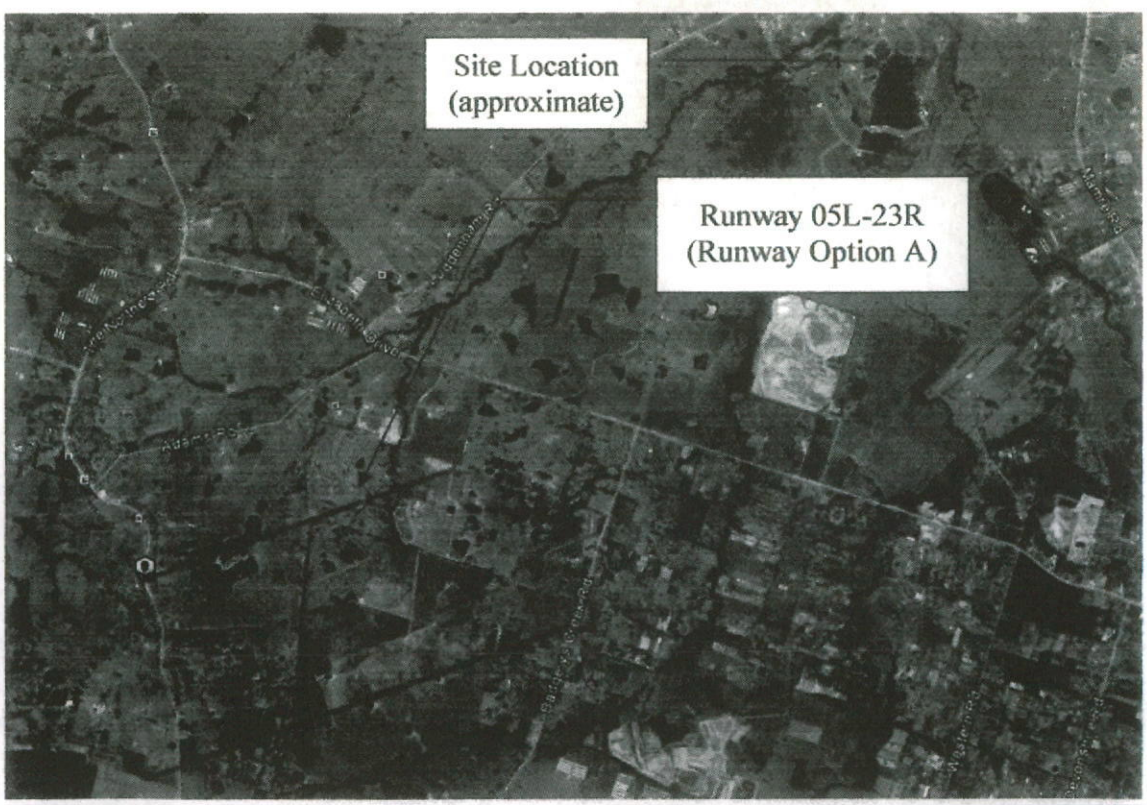


Figure 4 *Site Location relative to Runway Option A*

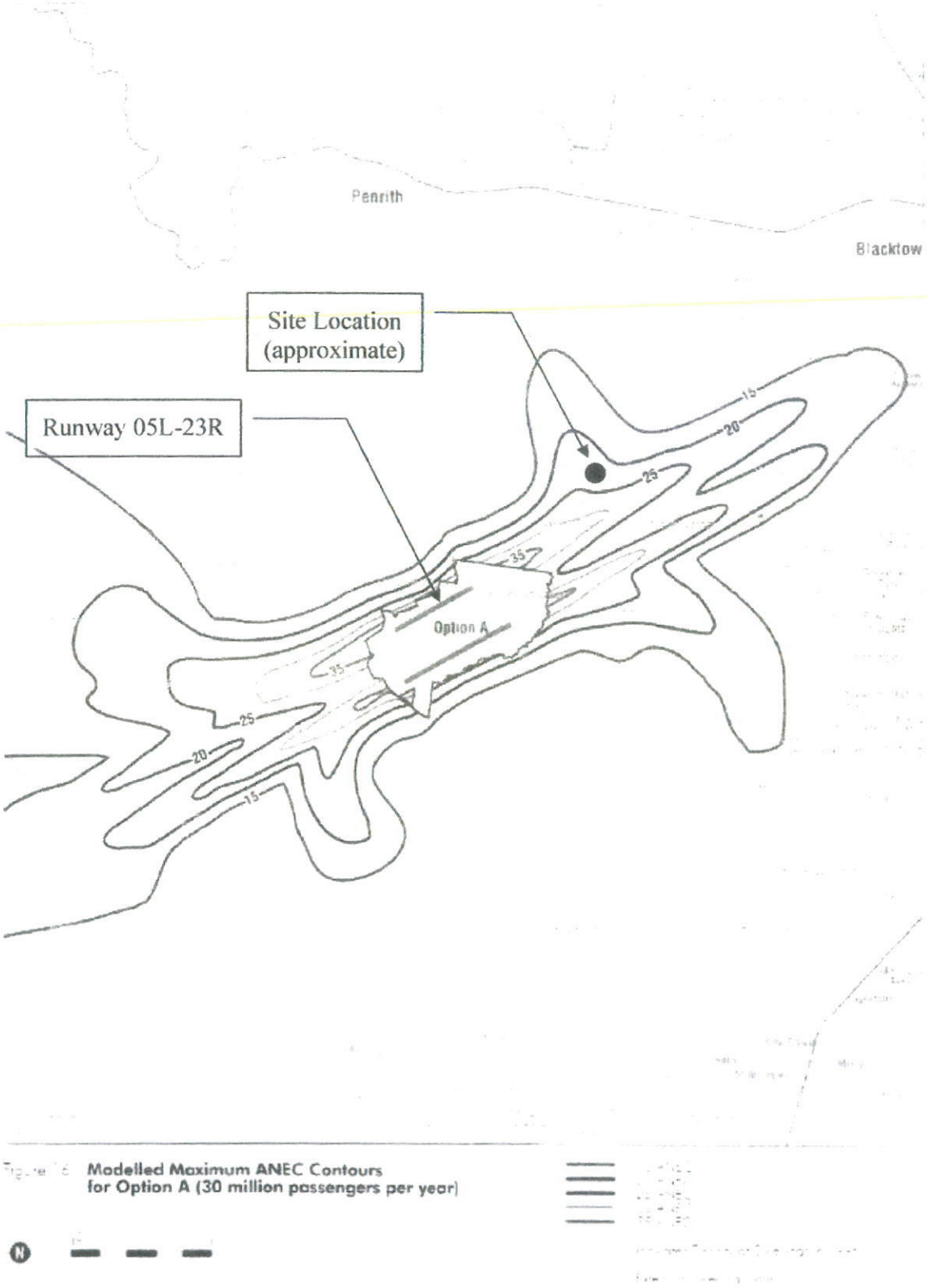
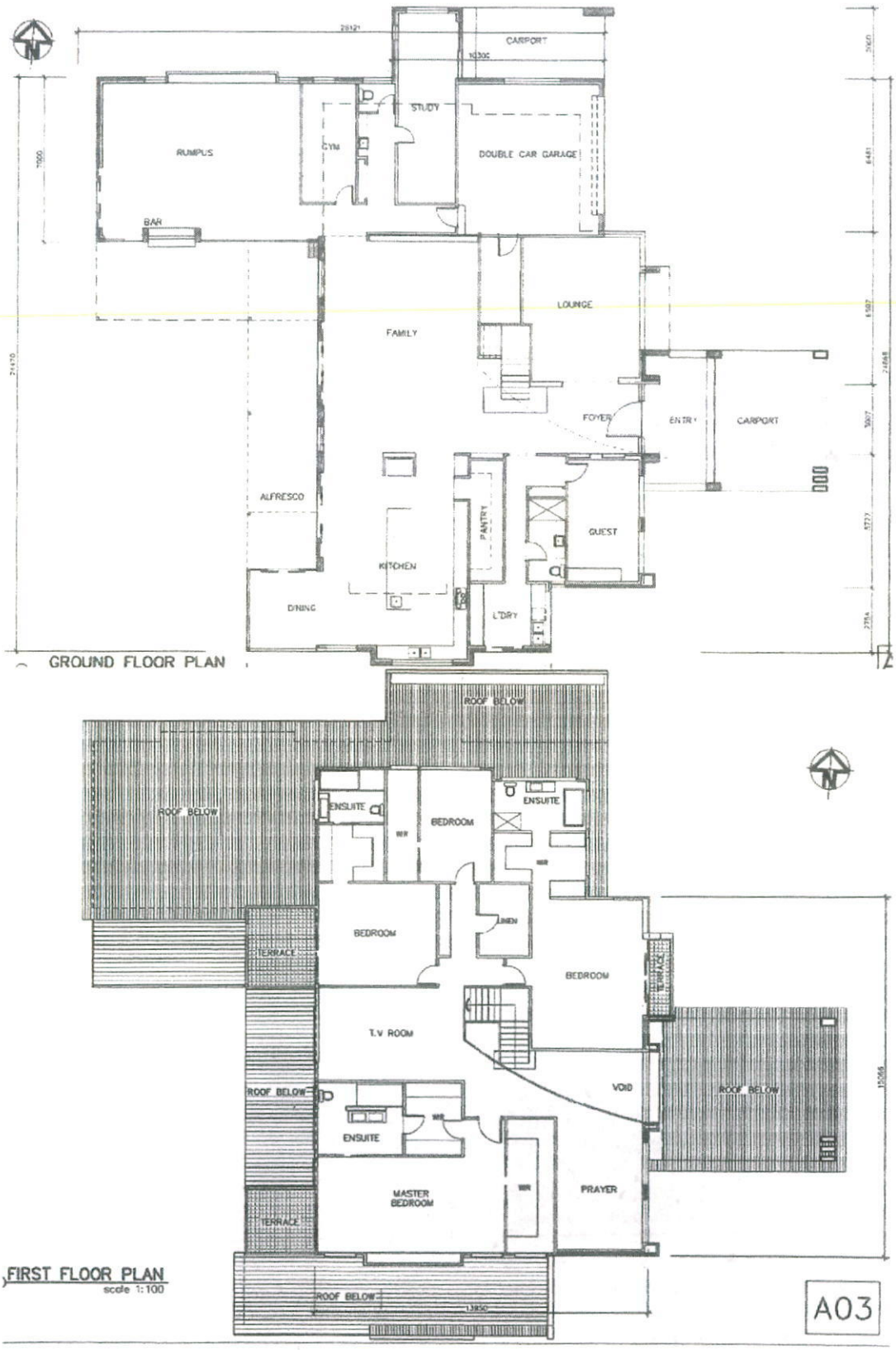


Figure 5 Proposed Floor Plan



3.0 ACOUSTIC DESIGN OBJECTIVES

Table 1 presents a summary of the indoor noise levels, recommended by the Australian Standard AS2021-2000 "*Acoustics - Aircraft Noise Intrusion – Building Siting and Construction*", adopted for the aircraft noise assessment and recommendation.

Table 1 Recommended Indoor $L_{Amax,slow}$ Design Noise Objectives, dB(A)

Use of Area	Recommended Indoor $L_{Amax,slow}$ Design Noise Objective dB(A)
Sleeping areas	50
Other habitable spaces	55
Bathrooms, toilets, laundries	60

4.0 DESCRIPTION OF DEVELOPMENT

Figure 5 shows the floor plan for the proposed residential dwelling development at Lot 238 26, Medinah Crescent, Luddenham which consists of:

- *Ground Floor*: a guest bedroom, a study room, a rumpus, a lounge room, a gym, an open plan kitchen/dining/family room, a laundry and bathrooms/toilets; and
- First Floor: four (3) bedrooms, three (3) ensuites, a TV room and a prayer room

5.0 AIRCRAFT NOISE PREDICTION AND ASSESSMENT

With reference to AS2021:2000, the calculation of maximum aircraft noise levels requires the distance co-ordinates for the building site relative to the aerodrome runways to be established, which includes the:

- perpendicular distance from the development to the extended runway centre-line (DS);
- distance from the closer end of the relevant runway to the intersection of the extended runway centre-line and the perpendicular line passing through the development (DL); and
- distance from the further end of the relevant runway to the intersection of the runway centre-line and the perpendicular line passing through the development (DT).

The relevant distance co-ordinates for the development site at Lot 238, 26 Medinah Avenue, Luddenham used in the calculation are outlined in *Table 2*.

Table 2 ***Distance Co-ordinates of Site Relative to Aerodrome Runway Option A Runway 05L-23R***

Distance Co-ordinate	Distance (m)	
	Straight Flight Path	Curved Flight Path
DT	7,900	8,700
DL	4,900	5,700
DS	2,000	100

Table 3 presents a summary of the predicted maximum aircraft noise levels due to take-off and landing operations from different aircraft types, using the procedures in AS2021:2000.

Predicted maximum noise levels (L_{Amax}) of 78dB(A) from landings of Boeing 737 and Airbus A320 aircraft on the Runway 05L-23R (curved flight path) have been adopted for the assessment of aircraft noise intrusion. Due to the site location relative to Runway 05L-23R, it is considered that curved flight paths from larger aircraft would not be over the proposed development.

The noise levels predicted are in accordance with AS2021:2000 which is based on average maximum levels. Accordingly, a proportion of aircraft noise events may exceed the design maximum noise level.

Table 3 ***Predicted Maximum Aircraft Noise Levels***

Aircraft Type	Predicted Maximum Aircraft Noise Level			
	Straight Flight Path		Curved Flight Path	
	Take-off	Landing	Take-off	Landing
Boeing 747-400	67	61	–	–
Boeing 767	63	57	–	–
Boeing 737, Airbus A320	60	54	74	78
British Aerospace BAe146	54	50	75	75
SAAB 340, Boeing Dash 8, Fokker F50	50	50	63	71
Corporate Jet	56	46	71	71
Light General Aviation Aircraft	53	49	68	70

From the predicted aircraft noise levels (*Table 3*) and recommended indoor design objectives (*Table 1*), *Table 4* presents the aircraft noise reduction (ANR) required with windows/doors in the closed position. If windows or doors are open for ventilation purposes, the ANR of the building would be significantly reduced.

Table 4 ***Indoor Design Objectives and Required Aircraft Noise Reductions***

Use of Area	Indoor Design Objective dB(A)	Required Aircraft Noise Reduction dB(A)
Bedrooms	50	28
Study Room, Lounge Room, Rumpus, Kitchen/Dining/Family Room, Room, TV Room and Prayer Room	55	23
Gym, Laundry, Bathrooms/Toilets, Ensuites	60	18

6.0 RECOMMENDATIONS

To achieve the indoor design noise objectives and aircraft noise reductions recommended in *Table 4*, the following minimum acoustic performances (R_w) for building construction systems/elements are recommended.

Alternative construction methods/materials may be employed provided that the R_w ratings are equal or higher than those recommended in this report.

6.1 External Walls

External wall construction shall consist of:

- one (1) layer of 110mm brickwork;
- one (1) row of 90mm timber studs separated from the brickwork 40mm;
- 75 Gold Batts 1.5 between the timber studs; and
- one (1) layer of 10mm plasterboard

The above wall construction is estimated to achieve a weighted sound reduction index of **R_w59**.

OR

- any external cladding;
- one (1) layer of 7.5mm CSR Cemintel Texture Base Sheet;
- sarking;
- one (1) layer of 13mm CSR Gyprock FyrChek plasterboard;
- one (1) row of 90mm timber studs at 600mm maximum centres;
- 90 Gold Batts 2.7 between the timber studs; and
- one (1) layer of 13mm CSR Gyprock FyrChek plasterboard

The above wall construction is estimated to achieve a weighted sound reduction index of **R_w46**.

6.2 Roof and Ceiling

Roof/ceiling construction shall consist of:

- steel sheet roof minimum 0.42mm with minimum Bradford Anticon 55 insulation over battens;
- ceiling joists or trusses at 600mm maximum centres;
- Rondo Furring Channel;
- one (1) layer of 10mm CSR Gyprock SuperChek or 16mm CSR Gyprock FyrChek plasterboard; and
- 215 Gold Batts 4.0 in the ceiling cavity.

Any mechanical ventilation ductwork/system located in the roof/ceiling system shall be boxed and detailed to ensure the acoustic performance of the roof/ceiling system is not de-rated.

All penetrations in the ceiling shall be appropriately detailed to ensure the acoustic performance of the roof/ceiling is not de-rated.

The above roof/ceiling construction is estimated to have an acoustic performance of $\mathbf{R_W 48}$.

6.3 External Door

External door to the entry shall consist of a minimum of 35-40mm thick solid core door and installed with acoustic rated seals around perimeter of the doors/frames to achieve an acoustic performance of not less than $\mathbf{R_w 30}$.

6.4 Internal Door

Internal door separating the garage and hallway/corridor shall consist of a minimum of 35mm thick solid core door and installed with acoustic rated seals around perimeter of the doors/frames to achieve an acoustic performance of not less than $\mathbf{R_w 28}$.

6.5 Eave

All external eaves shall be lined with one (1) layer of 6mm compressed fibrous cement sheet laid over with R2.0 glass-wool insulation. There shall be no external ventilation openings and cavity vents.

6.6 Façade Glazing

Table 5 presents the recommended glazing acoustic performance for the external window/door systems.

Table 5 Recommended Nominal Glazing Configurations

Room	Recommended Glazing Configuration	Required R_w
Ground Floor		
Guest Bedroom	Upgraded glazed window/door systems (acoustic construction)	32
Study Room, Rumpus, Lounge Room, Kitchen/Dining/Family Room	Upgraded glazed window/door systems (acoustic construction)	29
Gym, Laundry, Bathroom/ Toilet	Standard glazed window/door systems (acoustic construction)	27
First Floor		
Bedrooms	Upgraded glazed window/door systems (acoustic construction)	32
Bedroom Wardrobes	Upgraded glazed window/door systems (acoustic construction)	29
Bedroom Ensuites	Upgraded glazed window/door systems (acoustic construction)	29
TV Room, Prayer Room	Upgraded glazed window/door systems (acoustic construction)	29

The manufacturers/suppliers/installers be consulted and data provided to achieve the recommended R_w ratings in *Table 5*, for the entire window/door systems.

If required, the types of door/window systems shall be changed to achieve the recommended R_w ratings in *Table 5*.

As a guide, typical window/door systems to achieve the weighted sound reductions recommended in *Table 5* are:

- R_w27 Standard glass window/door systems (acoustic construction).
- R_w30 6mm float glass or 6.38mm laminated glass window/door systems (acoustic construction).
- R_w32 6.38-8.38mm laminated glass window/door systems (acoustic construction).

It is recommended that:

- manufacturers/suppliers/installers be consulted for a specific design solution to satisfy the recommended R_w rating in *Table 5*, for the entire window/ door systems (not just the glass).
- in the installation of all doors/windows, the frames be detailed to ensure that they do not de-rate the acoustic performance of the windows/doors.

- in the specification and selection of acoustic rated windows/doors, approved Q-lon acoustic seals or equivalent be fitted to all windows/doors.
- in the installation of all windows/doors, all gaps around/between the frame and facade openings be sealed air-tight with silicon or similar non-hardening mastic prior to fitting any weather strips.
- all open extrusions forming perimeter frames to aluminium windows/doors be detailed to ensure that the frames do not de-rate the acoustic performance of the windows/doors.
- test data of the acoustic performance for acoustically rated window/door systems be certified by the manufacturers/suppliers/installers.

6.6 Acoustic Detailing

The acoustic performance of the building relies on the construction methods, product manufacturer specifications and acoustic detailing and workmanship commensurate with appropriate acoustic design standards which are not within Acoustic Consulting Engineers' control.

The following are recommended to control flanking sound due to leakage path:

- All joints and interfaces between elements of construction shall be detailed to reduce flanking (leaking) noise through "tight" jointing and sealing/ caulking with non-hardening mastic materials.
- All ceiling penetrations shall incorporate appropriate detailing to ensure that the ceiling systems are not acoustically de-rated.
- All interface joints between the ceilings and external walls shall be continuous and sealed airtight and set prior to the installation of cornices.
- There shall be no penetrations in the external walls that could de-rate the acoustic performance of the building.
- Mechanical ventilation shall be constructed and detailed to ensure that the mechanical ventilation ductwork/system does not de-rate the acoustic performances of the roof/ceiling and/or external wall systems.

7.0 CONCLUSIONS

Our calculations, assessment and recommendations are based on:

- the requirement of Penrith City Council DCP2010;
- the procedures of AS2021:2000 "*Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*";
- windows and doors in the closed position for the purpose of controlling aircraft noise;

- habitable rooms being carpeted, soft furnished and windows fitted with drapes to reduce reverberation effects within the rooms.

This assessment and its conclusions are based on the understanding that the methods employed in the construction of the building will be commensurate with acoustic design standards and that this office has no control over the final building construction.

The recommendations in this document relate to aircraft noise considerations only. Any other requirements such as structural adequacy, etc., should be addressed by others.

We trust the information in this letter is satisfactory. Please do not hesitate to contact our office should further information or clarification be required.

Yours sincerely,

Dan Dang
Principal Acoustic Engineer
Acoustic Consulting Engineers Pty Ltd