Penola Catholic College Stage 2

Planning Stage Acoustic Report

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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing at typical levels of environmental noise. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Adjustments	Adjustments may be applied to effective noise levels noise sources to account for annoying noise character, duration and/or measurement position.
Aggravated noise	Noise defined by the Environment Protection Regulations to exceed the noise limits established under the Noise Protocol by more than 15 dB, or to exceed a noise level of 75 dB L_{Aeq} during the day period, 70 dB L_{Aeq} during the evening period or 65 dB L_{Aeq} during the night period.
Ambient noise	The overall environmental noise level at a given location caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, insects, animals and the like. It is typically described by the L_{Aeq} metric.
ANEF	Australian Noise Exposure Forecast as defined in AS/NZS 2021. A single number index for predicting the cumulative exposure to aircraft noise in communities near aerodromes during a specified time period (normally one year).
ANR	Aircraft Noise Reduction as defined in AS/NZS 2021. For design purposes, the arithmetic difference between the aircraft noise level at a site and the indoor design level.
Alternative assessment location	An alternative location used to quantify the noise from a commercial, industrial or trade premises at a noise sensitive area. An alternative location may be used where it is difficult to measure the noise at the noise sensitive area itself.
Background Level	The Background Level determined in accordance with the Noise Protocol, for different times of day.
Background noise	The underlying noise level at a given location, measured in the absence of a noise source under investigation and any other short-term noise sources such as intermittent traffic, industry, lawnmowers, insect, animals and the like. It is typically described using the L_{A90} metric.
C-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing at high levels of noise. Unlike the A-weighting, the C-weighting does not apply large negative weightings to low frequency noise levels, so it is commonly used for the assessment of low frequency noise.
Day period	Monday to Saturday (except public holidays), from 7 am to 6 pm as defined in the Environment Protection Regulations.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of loudness.
dB(A)	Units of the A-weighted sound level.
Duration adjustment A_{dur}	If noise emissions from the commercial, industrial or trade premises do not occur continuously over the whole 30-minute period, a duration adjustment is applied to represent the level of noise over the 30-minute period.
Effective noise level	The level of noise, expressed as an $L_{Aeq,30min}$, emitted from the commercial, industrial or trade premises after relevant adjustments have been applied.

Environment Protection Regulations	The Victorian *Environment Protection Regulations* are subordinate legislation to the *Environment Protection Act 2017*. They give force to noise limits for commercial, industrial and trade premises.
EPA Victoria	Environment Protection Authority Victoria.
ERS	Environment Reference Standard
Evening period	Monday to Saturday, from 6 pm to 10 pm; and Sunday and public holidays, from 7 am to 10 pm, as defined in the Environment Protection Regulations.
Extraneous noise	Extraneous noise refers to any noise that is not part of the noise emissions from a noise source and is not relevant to the typical background noise. Extraneous noise includes noise from aircraft, local traffic, construction works, insects, bird chirping, people talking, rustling leaves, and the effect of wind on the microphone diaphragm.
Frequency (Hz)	The number of times a sound pressure wave oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
GED	General Environmental Duty – As defined by Section 25(1) of the *Environment Protection Act 2017*, it requires that any person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.
Impulse adjustment A_{imp}	When noise is impulsive in character than an adjustment of +2 dB for just detectable impulse character of the noise, adjustment of +5 dB for prominent impulse character of the noise.
Intermittency adjustment A_{int}	An intermittency adjustment is applied to situations where noise from a commercial, industrial or trade premises increases noticeably in level on multiple occasions during a 30-minute period.
L_{A90}	A-weighted sound pressure level, measured using the Fast time-weighting, that is exceeded for 90% of the time interval considered. The L_{A90} metric is often used to quantify the background noise level in an environment.
L_{Aeq}	The equivalent continuous A-weighted sound pressure level. It is the value of the A-weighted sound pressure level of a continuous steady sound that has the same acoustic energy as a given time-varying A- weighted sound pressure level when determined over the same measurement time interval. The L_{Aeq} metric is used to quantify the effective noise level from a premises.
L_{Smax}	The maximum instantaneous noise level with a slow time weighting.
Low frequency noise	Noise that occurs at frequencies of below 200 Hz. Examples of low frequency noise include truck engine noise and bass music noise.
Noise Limit	The maximum effective noise level allowed in a noise sensitive area, as determined in accordance with the Noise Protocol.
Night period	Between 10 pm and 7 am of the following day as defined in the Environment Protection Regulations.
Noise Protocol	Environmental Protection Authority 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*. The current version is published by EPA Victoria on its website.

Noise sensitive area	Defined by the Environment Protection Regulations as the part of the land within the boundary of a parcel of land that is: within 10 m of the outside of external walls of dwellings (including a residential care facility but not including a caretaker's house), residential building or noise sensitive residential use, or within 10 m of the outside of external walls of any dormitory, ward, bedroom or living room of a caretaker's house, hospital, hotel, residential hotel, motel, specialist disability accommodation, corrective institution, tourist establishment, retirement village or residential village, or within 10 m of the outside of external walls of a classroom or any room in which learning occurs during the operating hours of a child care centre, kindergarten, primary school or secondary school.
Tonal adjustment A_{tone}	When noise is tonal in nature then an adjustment is applied depending on the prominence of the tonality. Examples of tonal noise may include reversing beepers or transformer hum.
Unreasonable noise	Noise that is unreasonable due to its character as defined under the Environment Protection Act or because it is prescribed to be unreasonable, for example because it exceeds a noise limit set forth under the Environment Protection Regulations.
Zone Level	The Zone Level determined on the basis of land zoning around a noise sensitive area in a rural area in accordance with the Noise Protocol.
Zoning Level	The Zone Level determined on the basis of land zoning around a noise sensitive area in an urban area in accordance with the Noise Protocol.

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1 Introduction

This report outlines the relevant noise assessment conducted for the proposed new buildings at Penola Catholic School in Broadmeadows. The new buildings will accommodate:

- A Year 10 Learning Centre with a combination of 6 new Learning Studios, breakout areas for student learning, staff workroom, toilets, and associated links to the existing building. An adjacent Social Heart for the campus with a canteen, and landscaped shelter and enclosure to appeal to students and staff as a focal point for social interaction and informal learning on campus; and

The site is subject to the Melbourne Airport Environs Overlay Schedule 2 (MAEO2) and the development must be constructed so as to comply with any noise attenuation measures required by Section 3 of Australian Standard AS 2021-2015, Acoustics - Aircraft Noise Intrusion - Building Siting and Construction, issued by Standards Australia Limited. The site is not located within an area affected by aircraft noise (ANEF zone defined in AS 2021). However, it is noted that the potential impact of aircraft noise in the site will be assessed in accordance with AS 2021 as it is recommended for all schools that are located near an airport.

Potential aircraft noise intrusion into the rooms have been assessed in accordance with AS 2021. Acoustic design requirements to achieve compliance with the provisions of AS 2021 relating to aircraft noise are provided in the following report. Environmental noise emissions from external plant has been reviewed against the Environmental Protection Authority (EPA) Victoria Publication 1826: *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol).

2 Project description

The proposed site for the development is located at Penola Catholic School at 29 Gibson Street Broadmeadows and is shown in Figure 1. The site is located in a General Residential Zone with the nearest noise sensitive receivers are located on Gibson Street.

Figure 1 Site layout

3 Legislation, policy and guidelines

3.1 Environment Protection Act 2017

General Environmental Duty

The *Environment Protection Act 2017* (the Act) sets out environmental obligations and protections for Victorians. The cornerstone of the Act is the General Environmental Duty (GED), which states:

> A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

In the context of the Act, 'reasonably practicable' measures mean putting in controls to eliminate the risk of harm to human health and the environment so far as reasonably practicable. If eliminating the risk of harm is not reasonably practicable, then the risk of harm must be reduced so far as reasonably practicable. A number of matters must be considered in deciding what is reasonably practicable in the circumstances:

- the likelihood of those risks eventuating
- the degree of harm that would result if those risks eventuated
- what the person concerned knows, or ought reasonably to know, about the harm or risks of harm and any ways of eliminating or reducing those risks
- the availability and suitability of ways to eliminate or reduce those risks
- the cost of eliminating or reducing those risks.

EPA Victoria Publication 1856: *Reasonably practicable* explains that, when dealing with a common risk or harm, it is possible to demonstrate that the risk has been reduced so far as reasonably practicable if well-established effective practices or controls have been adopted to eliminate or manage risk. Where well-established practices or controls do not exist, then it is necessary to show that effective controls have been assessed and adopted.

Unreasonable noise

The Act also prohibits the emission of unreasonable noise and aggravated noise. The Act provides a definition for 'Unreasonable noise' in two parts. Section 3(1)(a) states that noise that is unreasonable having regard to the following:

- its volume, intensity or duration
- its character
- the time, place and other circumstances in which it is emitted
- how often it is emitted
- any prescribed factor.

Section 3(1)(b) states that noise is unreasonable noise if it is prescribed to be so. Under the *Environment Protection Regulations*, noise that exceeds the noise limits established in accordance with EPA Victoria Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol) is prescribed to be unreasonable noise.

Unreasonable noise occurs if noise meets the requirements of Section 3(1)(a) and/or Section 3(1)(b) of the Act.

3.2 Environment Protection Regulations

The *Environment Protection Regulations* (the Regulations) are subordinate legislation that support the Act and prescribe noise limits for commercial, industrial and trade premises. Under the Regulations, the assessment of noise from commercial, industrial and trade premises at noise sensitive areas must be carried out in accordance with the

Noise Protocol, both in terms of establishing noise limits as noise sensitive areas and in terms of the measurement of noise from the subject premises.

Noise sensitive areas are defined in the Regulations as:

- The area within 10 m of the external walls of dwellings (including residential care facilities but excluding caretaker's houses), residential buildings and noise sensitive residential uses.
- The area within 10 m outside the external walls of any dormitories, wards, bedrooms and living rooms of caretaker's houses, hospitals, hotels, motels, residential hotels specialist disability accommodation, corrective institutions, tourist establishments, retirement villages and residential villages.
- The area within 10 m outside the external walls of classrooms or other rooms in which learning occurs at childcare centres, kindergartens, primary schools and secondary schools.
- Within the boundary of tourist establishments, campgrounds and caravan parks that are located in rural areas.

Under the Regulations, the assessment of noise from commercial, industrial and trade premises at NSAs must be carried out in accordance with EPA Victoria Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol), both in terms of establishing noise limits as noise sensitive areas and in terms of the measurement of noise from the subject premises.

The Regulations specify time periods for assessment as presented in Table 1.

Table 1 Time periods defined in Regulations

Period	Time
Day	7 am to 6 pm Monday to Saturday
Evening	6 pm to 10 pm Monday to Saturday 7 am to 10 pm Sundays and Public Holidays
Night	10 pm to 7 am Everyday

The Regulations prescribe 'unreasonable noise' and 'aggravated noise' as follows:

- Unreasonable noise from commercial, industrial and trade is noise that exceeds the applicable noise limits from the Noise Protocol.
- Aggravated noise thresholds for commercial, industrial and trade premises are:
  - 75 dB $L_{Aeq,30m}$ or more than 15 dB above the Noise Protocol noise limit during the day
  - 70 dB $L_{Aeq,30m}$ or more than 15 dB above the Noise Protocol noise limit during the evening
  - 65 dB $L_{Aeq,30m}$ or more than 15 dB above the Noise Protocol noise limit during the night.

Compliance with the noise limits set forth in the *Environment Protection Regulations* is one aspect of meeting a duty holder's obligations with respect to noise emissions. The noise limits are established to support the GED requirements of minimising risks to human health and the environment. However, compliance with the limits does not remove the overarching requirement to take steps to minimise risks so far as reasonably practicable in accordance with the GED.

3.3 Noise Protocol

The Noise Protocol prescribes procedures for determining the statutory environmental noise limits that apply at noise sensitive locations, such as residential areas, with respect to noise due to commercial, industrial and trade operations.

The noise limits in the Noise Protocol are dependent on:

- Zoning Levels, which are based on the planning scheme zoning types within 70 m and 200 m radii of the noise sensitive area.

- The time of day i.e., different limits apply at different times of the day, as defined in Table 1.
- The background noise level (L_{A90}) in the noise sensitive area, in the absence of noise due to commercial, industrial or trade operations.

Typically, Zoning Levels are considered along with the background noise levels in the area to establish the applicable noise limits. Background noise levels can be classified as 'Low', 'Neutral' and 'High' relative to the Zoning Levels. In cases where background noise levels are sufficiently low such that they do not influence the Zoning Levels, the background noise level is called 'Neutral'. In 'Neutral' background noise conditions, the applicable noise limit is equal to the zoning levels. 'High' background levels will increase the applicable noise limits above the zoning levels and 'Low' background noise levels, where background noise levels are significantly below the Zoning Levels, reduce the applicable noise limits further below the Zoning Level.

For the purpose of this assessment, no noise measurements were undertaken at site and the background levels have been assessed as "neutral", therefore the noise limiting criteria will be equal to the Zoning Level. We note that this approach is generally conservative for the assessment of environmental noise in metropolitan Melbourne areas and provides protection against the potential for seasonal change in background noise levels over the course of a year.

The noise limits applicable to noise emissions from the development at the nearest noise sensitive areas are presented in Table 2.

Table 2 Noise limits for mechanical plant in $L_{eq,30min}$ dB(A)

Time Period	Time	Zoning Level, L_{eq} dB(A)	Background Classification	Noise Limit $L_{eq,30min}$ dB(A)
Day	7 am to 6 pm Monday to Saturdays	50	Neutral	**50**
Evening	6 pm to 10 pm Monday to Saturdays 7 am to 10 pm Sundays and Public Holidays	44	Neutral	**44**
Night	10 pm to 7 am Everyday	39	Neutral	**39**

It should be noted that, since schools only operate during the Day time period presented in the table above, the mechanical services for this development are only expected to operate during the Day time period.

3.4 Aircraft noise impact

Assessment of the impact of aircraft noise on site is undertaken under Australian Standard (AS) 2021–2015. Under AS 2021, the acceptability of a development site is dependent on the ANEF (Australian Noise Exposure Forecast) zone that it is located in. The relevant zones for different building types are shown in Table 3.

Table 3 Extract from AS 2021 - Building site acceptability based on ANEF zones

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	< 20 ANEF(1)	20 – 25 ANEF	>25 ANEF
Hotel, motel, hostel	< 25 ANEF	25 – 30 ANEF	>30 ANEF
School, university	< 20 ANEF(1)	20 – 25 ANEF	>25 ANEF

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
Hospital, nursing home	< 20 ANEF	20 – 25 ANEF	>25 ANEF
Public building	< 20 ANEF	20 – 30 ANEF	>30 ANEF
Commercial building	< 25 ANEF	25 – 35 ANEF	>35 ANEF
Light industrial	< 30 ANEF	30 – 40 ANEF	>40 ANEF
Other industrial	Acceptable in all ANEF zones		

(1) The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the conditionally acceptable procedure may be followed for building sites outside but near the 20 ANEF contour.

The site of the proposed construction is located outside but near the 20 ANEF contour for the Melbourne Tullamarine Airport. The location of the building site is identified in Figure 2

Based on the requirements of AS 2021 and Table 3, the site is considered acceptable for a school, but will be assessed under the conditionally acceptable procedure, in line with Note 1 of Table 3.

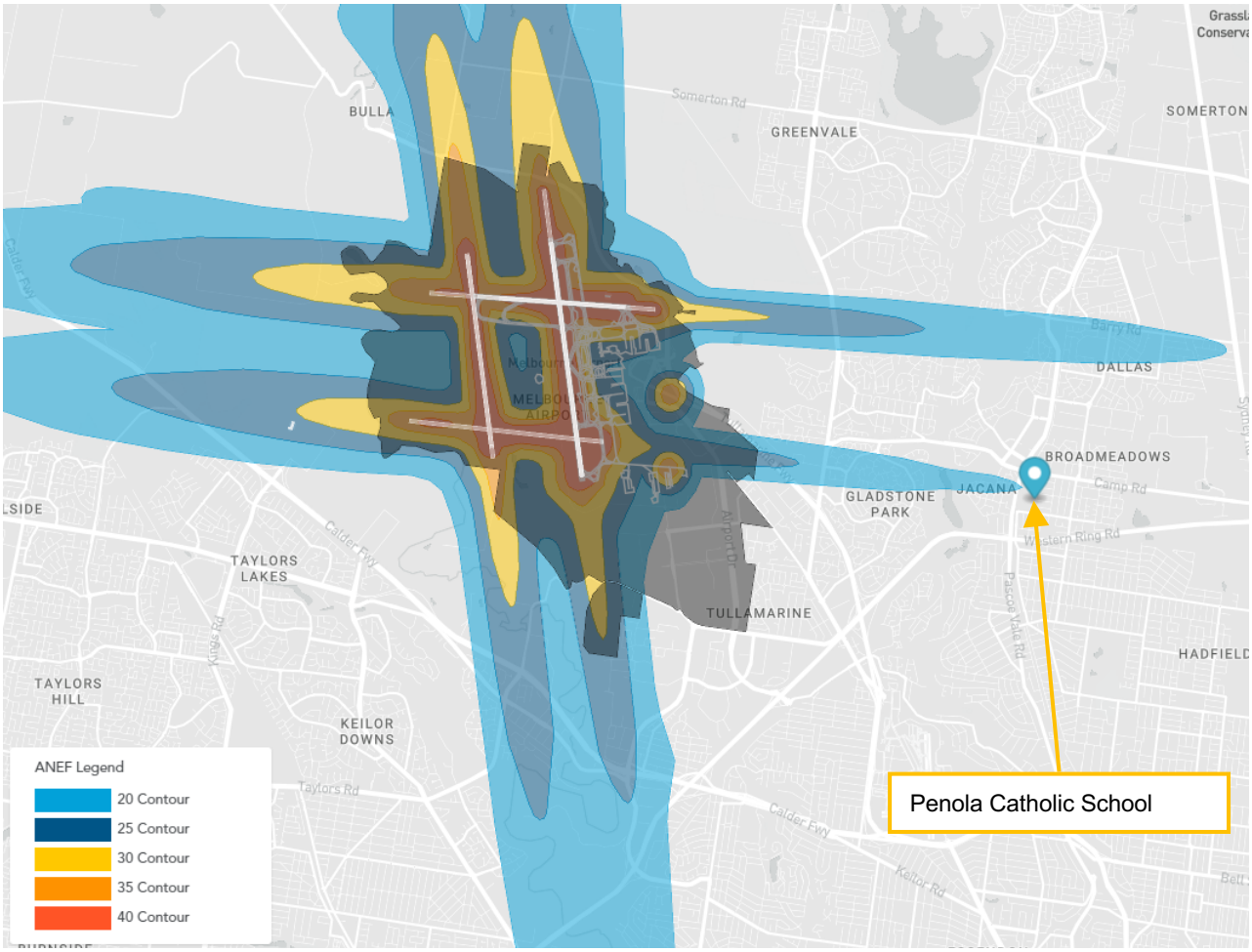

Figure 2 Melbourne Airport Master Plan Four Runways ANEF (extract from Melbourne Airport Flight Path and Noise Tool)

AS 2021 provides indoor design sound levels for the determination of the required aircraft noise reduction. Appropriate design internal noise criteria are outlined in Table 4.

Table 4 AS 2021 indoor design sound levels

Room	Equivalent activity in AS2021	Indoor design sound level, L_{Smax} dB(A)
Language studio, learning studio, breakout/cirulation	Teaching areas, assembly areas(1)	55
Staff work, meeting	Private offices, conference rooms	55
Dining room	Services activities	75

(1) Certain activities in schools may be considered particularly noise sensitive and 50dB(A) may be a more desirable indoor sound level to select for any teaching areas used for such activities. However, the effect of other noise sources should be considered.

4 Noise assessment

4.1 Building plant noise

Mechanical plant items such as condensers are anticipated to be located externally to the school buildings. Noise mitigation measures to control noise emissions from the external plant will include:

- Design and selection of mechanical plant with low noise emissions,
- Locating and orienting the plant to maximise the distance to and minimise direct line of sight to noise-sensitive receivers.
- If necessary, incorporation of solid barriers around the plant or provision of acoustically treated enclosures/louvres.

The above treatments will be specified and incorporated into the design during the detailed design stage to reduce noise emissions so far as reasonably practicable, and to ensure noise emissions are compliant with the applicable noise limits set out in Table 2. The external plant selected for the development should be reviewed when the design and acoustic specifications of units are available.

4.2 Aircraft noise

Aircraft type and noise levels

The aircraft types and noise levels at the site have been determined based on the aircraft operating at Melbourne Airport during 2019, contained within *M3R MDP – Chapter C3: Aircraft Noise Modelling Methodology,* in accordance with AS 2021. The noise levels are presented in Table 5.

Table 5 Aircraft noise levels

Aircraft type	Aircraft noise level, dB(A)		Percentage of movements(1)
	Departures	Arrivals	
Airbus A320	51	53	15
Airbus A321	53	54	5
Airbus A330-200	58	58	4
Airbus A330-300	58	58	4
Airbus A350	56	58	2
Airbus A380	59	58	2
Boeing B737-700	60	56	< 1
Boeing B737-800	59	57	48
Boeing B777-200	58	58	2
Boeing B777-300ER	58	58	4
Boeing B787-8	56	55	2
Boeing B787-9	56	55	2
Bombardier DHC-8 Q400	44	46	3

Aircraft type	Aircraft noise level, dB(A)		Percentage of movements(1)
	Departures	Arrivals	
Saab 340	51	53	4
Other aircraft	-	-	3

(2) The percentage of movements is based on information provided in M3R MDP – Chapter C3: Aircraft Noise Modelling Methodology, expected fleet mix for ultimate capacity total movements.

Facade requirements

The required Aircraft Noise Reduction (ANR) levels for the different spaces of the proposed additions are outlined in Table 6.

Table 6 Required ANR to comply during 100% of flight activity

Room types	ANR, dB(A)
Breakout/circulation	5
Dining room	0
Language studio	5
Learning studio	5
Meeting	5
Staff room	5

Based on the above maximum ANR of 5 dB(A) for any room use, any standard external façade construction will achieve compliance with the AS 2021 criteria. We note that any solid construction will be able to achieve the required ANR for the proposed new and refurbished buildings at Penola Catholic School in Broadmeadows.

5 Conclusion

This report provides an environmental and aircraft noise assessment for the proposed new school buildings at Penola Catholic School in Broadmeadows.

Environmental noise limits for the development have been established in accordance with the requirements of the Environment Protection Regulations 2021. With the incorporation of the noise management measures described within this assessment, noise emissions from the site will be controlled to comply with the noise limits at all noise sensitive receivers. The external plant selected for the development should be reviewed when the design and acoustic specifications of units are available.

There are no specific external façade construction requirements for this development, and compliance with *AS 2021—Acoustics—Aircraft Noise Intrusion—Building Siting and Construction* will be achieved with standard façade constructions.