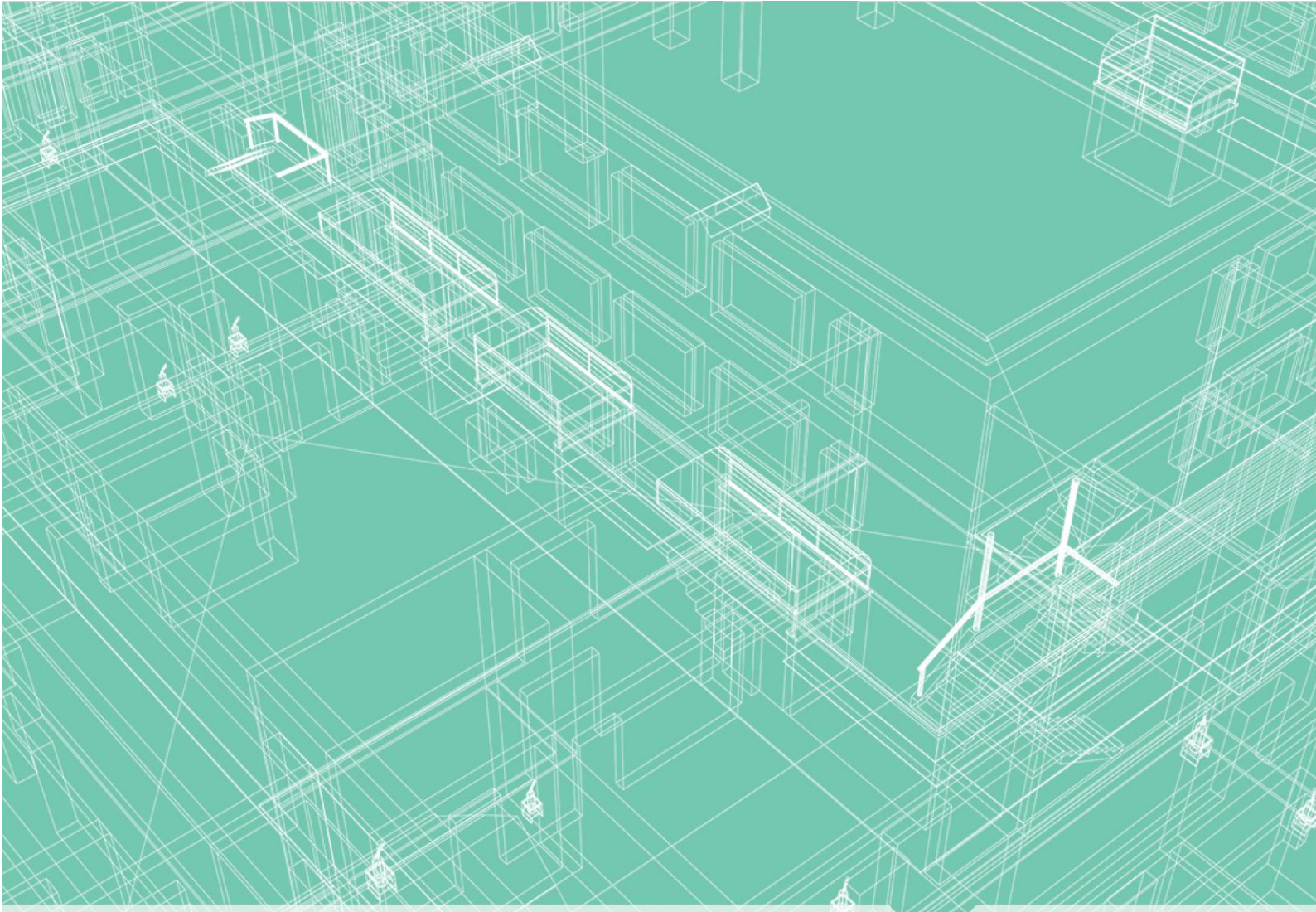

NOISE IMPACT ASSESSMENT FOR DEVELOPMENT APPLICATION

JINDABYNE POLICE STATION

JHA

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DOCUMENT CONTROL SHEET

Project Number	190479
Project Name	Jindabyne Police Station
Description	Noise Impact Assessment for Development Application
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Revision History

Issued To	Revision and Date						
Group GSA	REV	A	B	C			
	DATE	22/01/2021	28/01/2021	19/03/2021			
	REV						
	DATE						
	REV						
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CONTENTS

1 INTRODUCTION

JHA Consulting Engineers has been engaged to provide acoustic services for a proposed development of a NSW Police Station in Jindabyne, NSW. The proposal involves demolition of existing buildings on site plus construction of two new two-storey buildings, ancillary storage and a carport.

An acoustic assessment has been undertaken and it is detailed in this report along with the findings and recommendations. This report has been prepared as part of the Development Application to be submitted to the Snowy Monaro Regional Council.

The objectives of this acoustic assessment are:

- Identify noise sensitive receivers that will potentially be affected by the operation of the proposed development.
- Establish the appropriate noise level and vibration criteria in accordance with the relevant standards, guidelines and legislation for the following noise emissions:
  - External mechanical plant from the development to the surrounding receivers.
  - Traffic generated by the Police Station.
  - Building operations.
- Determine whether the relevant criteria can be achieved based on proposed operations. Where applicable, provide recommendations for any necessary acoustic control measures that will need to be incorporated into the development or use in order to ensure with the assessment criteria.
- Provide recommendations for Construction Noise and Vibration Planning.

This report provides:

- A statement of compliance with the relevant statutory criteria for the use of the proposed development within the vicinity of the nearest potentially affected receivers.
- Recommendations for noise mitigation measures for the proposed development in order to meet the relevant criteria when compliance is not achieved.

The following documentation has been used for the preparation of this report:

- Architectural drawings of the proposed development prepared by Group GSA.

This document and related work has been prepared following JHA Consulting Engineers Quality and Environmental Management Systems, which are based on AS/NZS ISO 9001:2015 and ISO 14001:2015 respectively.

2 DESCRIPTION OF THE PROPOSAL

Jindabyne is a village in south-east NSW near to the Snowy Mountains, located 460 kilometres from Sydney and 180km from Canberra. It belongs to the Local Government Area of Snowy Monaro Regional Council.

The proposed Police Station site is located at 16-18 Thredbo Terrace, being located within the Town Centre. The site is surrounded by a mix of commercial and infrastructure buildings in a sub-urban environment characterised by low to medium levels of activity during the day time. The proposed Police Station will operate 24 hours per day, 7 days per week during winter and from 6.30am to 3.30pm during summer (November to May).

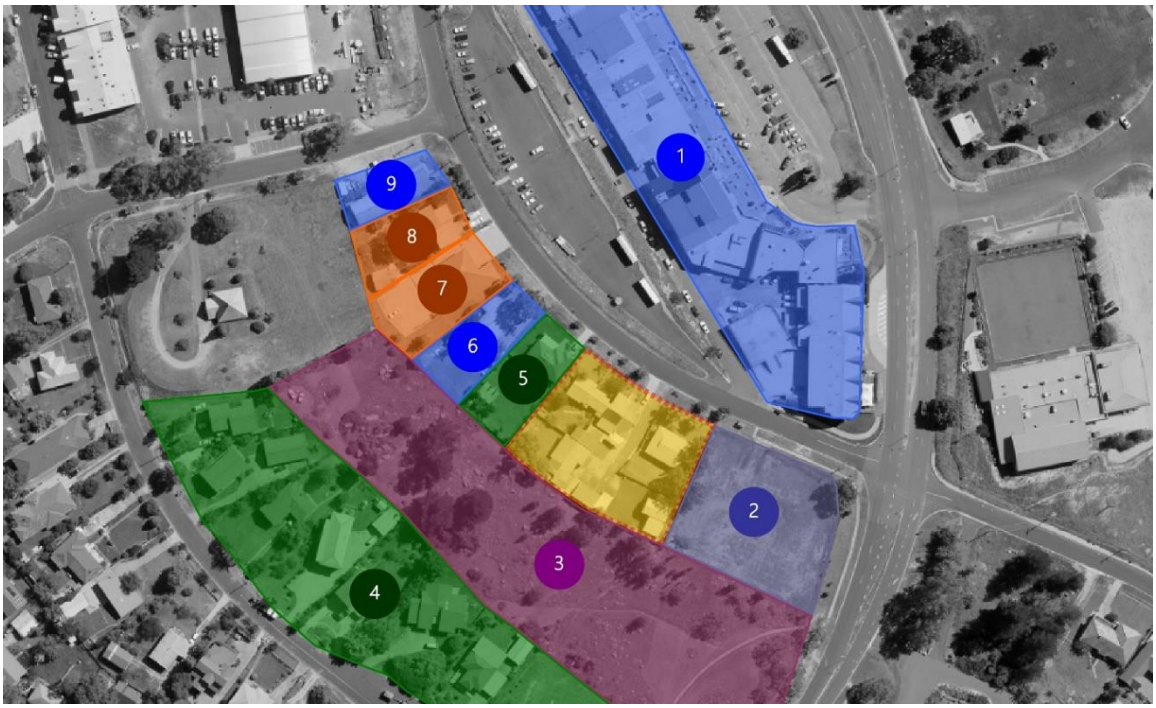

Figure 1: Aerial view of site showing the location of the site and surrounding receivers.

A summary of the nearest sensitive receivers surrounding the site location is shown in Table 1, including the approximate distances from the boundary site.

ID	*Sensitive Receiver*	*Receiver Type*	*Distance (m)*
1	Commercial Noise Catchment	Commercial	35
2	Vacant Lot	---	<5
3	Park	---	<5
4	Residential Noise Catchment at Gippsland St	Residential	50
5	14 Thredbo Terrace	Residential	<5
6	12 Thredbo Terrace	Commercial	20
7	NSW Fire and Rescue Station	Infrastructure	50
8	NSW Ambulance Station	Infrastructure	70
9	6 Thredbo Terrace	Commercial	85

Table 1: Nearest sensitive receivers surrounding the site location plus distances.

It is noted that if noise impacts associated with the proposed development are controlled at the nearest noise sensitive receivers, then compliance with the recommended noise criteria at all noise sensitive receivers will be achieved.

Five buildings are currently on the site, being the police station, two accommodation buildings, garage building and boat & ski-doo storage. Buildings will be demolished in two stages and proposed buildings are a new police station, a new accommodation building, a covered storage plus a new carport. Figure 2 shows the existing and proposed site plans.

Figure 2: Plan of existing site (left) and proposed site (right).

The proposed buildings comprise the following:

- General areas including offices, change rooms, training / meeting rooms, storage areas, custodial area, group areas, local command area, etc.
- Plantroom areas.
- Bedrooms.
- Communal areas including Dining and Kitchen Area, Lounge Area and Communal Laundry.

Figure 3 shows diagrams of the proposed accommodation layouts for Ground Floor and Level 1. Figure 4 shows diagrams of the proposed police station layouts for Ground Floor and Level 1.

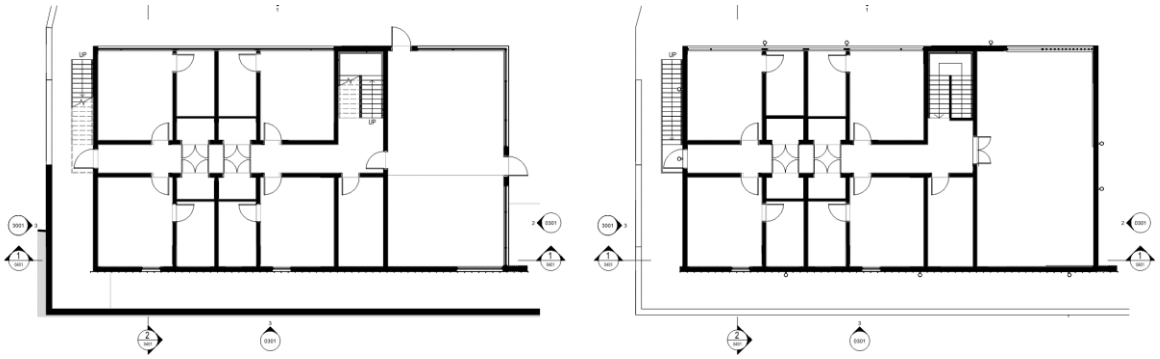

Figure 3: Proposed police accommodation layouts for Ground Floor (left) and Level 1 (right).

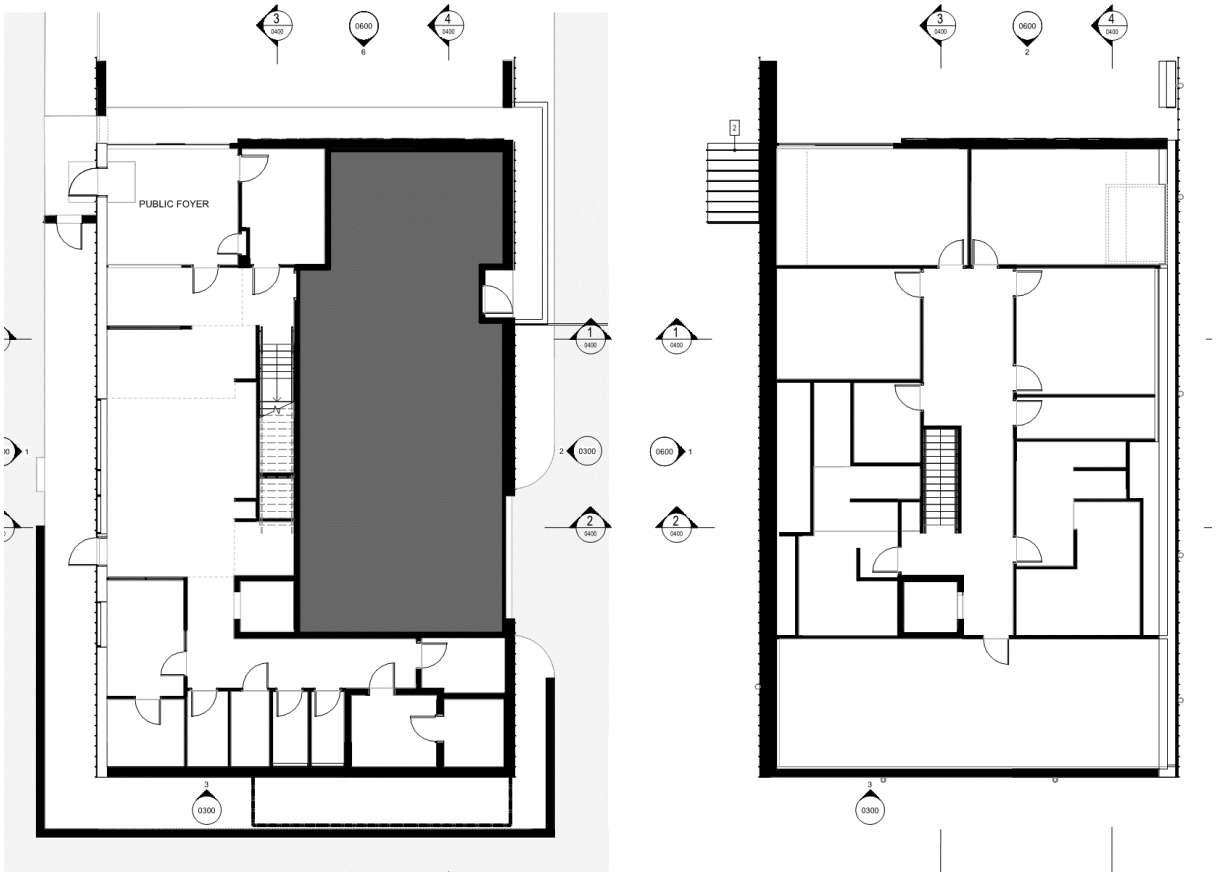

Figure 4: Proposed police station layouts for Ground Floor (left) and Level 1 (right).

3 RELEVANT NOISE STANDARDS AND GUIDELINES

3.1 STANDARDS AND GUIDELINES

The following standards and guidelines are considered relevant to the project and have been referenced in developing the project noise level criteria.

Regulatory Framework:

- Environmental Planning and Assessment (EP&A) Act 1979.
- Protection of the Environmental Operations (POEO) Act 1997.
- NSW DECCW Noise Guide for Local Government (NGLG) 2013.

Planning:

- Snowy River Local Environment Plan 2013.
- Snowy River Development Control Plan 2013.
- Australian Standard AS 1055.3:1997 *'Acoustics – Description and measurement of environmental noise. Part 3: Acquisition of data pertinent to land use'*.

Operational Noise:

- NSW EPA Noise Policy for Industry (NPI) 2017.
- NSW DECCW Road Noise Policy (RNP) 2011.
- NSW Police Building Code.

Construction Noise and Vibration:

- NSW DECCW Interim Construction Noise Guideline (ICNG) 2009.
- NSW DEC 'Assessing Vibration: A Technical Guideline' 2006.
- Australian Standard AS 2436:2010 *'Acoustics – Guide to Noise Control on Construction, Maintenance & Demolition Sites'*.

3.2 REGULATORY FRAMEWORK

3.2.1 ENVIRONMENTAL PLANNING AND ASSESSMENT (EP&A) ACT 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) provides the regulatory framework for the protection of the environment in NSW. The EP&A Act is relevantly about planning matters and ensuring that "environmental impact" associated with the proposed development is properly considered and reasonable before granting development consent to develop.

The assessment of "environmental impact" relies upon the identification of acceptable noise criteria which may be defined in a Development Control Plan, or derived from principles using guidelines like NSW EPA Noise Policy for Industry (NPI 2017) or Noise Guide for Local Government (NGLG 2013).

3.2.2 PROTECTION OF THE ENVIRONMENTAL OPERATIONS (POEO) ACT 1997

The Protection of the Environment Operations (POEO) Act 1997 has the objective to protect, restore and enhance the quality of the NSW environment. Abatement of noise pollution is underpinned by the definition of "offensive noise" as follows:

"...

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

..."

3.3 SNOWY MONARO REGIONAL COUNCIL LEGISLATION

Relevant Planning Documents of Snowy Monaro Regional Council Legislation have been reviewed for any noise requirement or criteria.

The Snowy River Local Environmental Plan (SR-LEP 2013) sets the Land Zoning as shown in Figure 5 as per information extracted from the SR-LEP map 7050_COM_LZN_003AA_020_20170427. The site is categorized as Local Centre (B2) adjacent to General Residential (R1), Low Density Residential (R2) and Public Recreation (RE1).

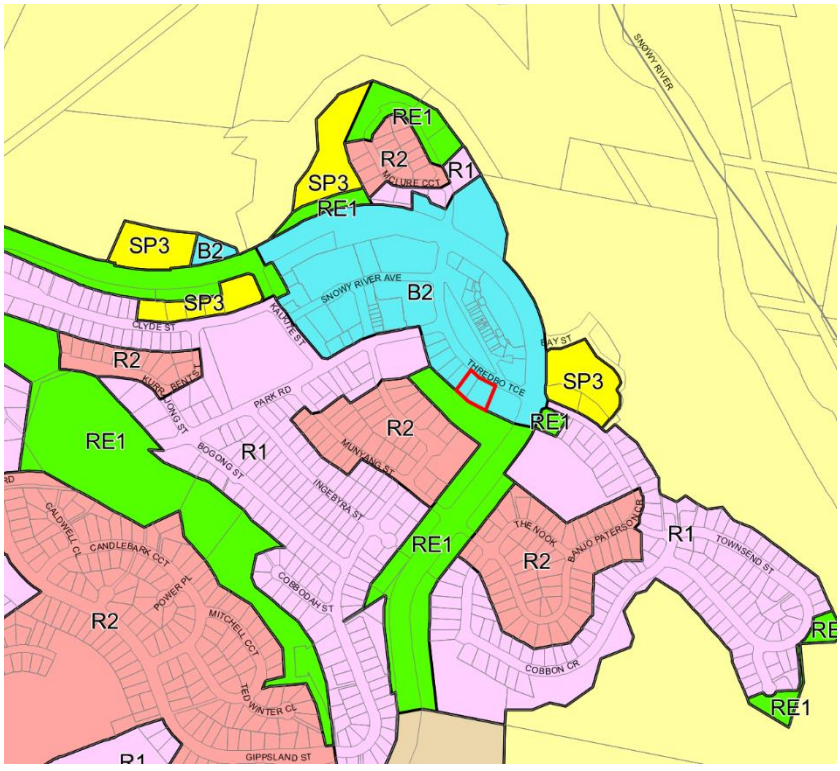

Figure 5: Land Zoning of the site (red outline) and surroundings.

Snowy River Development Control Plan (SR-DCP 2013) has been reviewed for any relevant noise requirements or criteria for the proposed development. There are no specific noise level criteria, but rather sections of the SR-DCP provide general planning strategies.

3.4 AUSTRALIAN STANDARD AS1055.3:1997

JHA Engineers has not been engaged to undertake a noise survey for this project. In absence of a noise survey, the recommended background noise from AS 1055.3:1997 have been used as the basis for the noise assessment. Australian Standard AS 1055.3:1997 provides a guide of estimated average background noise levels for different areas containing residences. Table 2 shows the estimated background noise levels for the site area.

Description of the neighbourhood	*Average Background A-weighted noise level ($L_{A90,T}$)*					
	Monday to Saturday			*Sundays and public holidays*		
	07.00 – 18.00	*18.00 – 22.00*	*22.00 – 07.00*	*09.00 – 18.00*	*18.00 – 22.00*	*22.00 – 09.00*
Areas with medium density transportation or some commerce or industry (R3)	50	45	40	50	45	40

Table 2: Average background noise levels as per AS 1055.3:1997.

3.5 NSW EPA NOISE POLICY FOR INDUSTRY

The NSW EPA Noise Policy for Industry (NPI) 2017 assesses noise from industrial noise sources - scheduled under the POEO. Mechanical noise from the development shall be addressed following the recommendations in the NSW NPI.

The assessment is carried out based on the existing ambient and background noise levels addressing the following:

- Intrusiveness Criteria, to control intrusive noise into nearby sensitive receivers.
- Amenity Criteria, to maintain the noise level amenity for particular land uses.

These criteria are established for each assessment period (day, evening and night) and the more stringent sets the Project Noise Trigger Level (PNTL's).

3.5.1 INTRUSIVENESS CRITERIA

The NSW NPI defines the intrusiveness criteria as follows:

"The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15 minute period, does not exceed the background noise level by more than 5dB when beyond a minimum threshold."

Based on the intrusiveness criteria definition and the estimated background noise levels, Table 3 shows the intrusiveness criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Estimated Rating Background Level (L_{A90}), dB(A)*	*Intrusiveness Criteria, $L_{Aeq,15min}$ dB(A)*
Residential (R1 / R2)	Day	50	55
	Evening	45	50
	Night	40	45

Table 3: Determination of the intrusiveness criteria for noise sensitive receivers.

3.5.2 AMENITY CRITERIA

The NSW NPI states the following to define the amenity criteria:

"To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance."

Based on the amenity criteria definition and the land zoning, Table 3 shows the amenity criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Recommended Amenity Noise Level (L_{Aeq}), dB(A)*	*Amenity Criteria, $L_{Aeq,15min}$ dB(A)*
General Residential (R1) / Local Centre (B2)	Day	60	58 (60-5+3)
	Evening	50	48 (50-5+3)
	Night	45	43 (45-5+3)
Low Density Residential (R2)	Day	55	48 (50-5+3)
	Night	45	43 (45-5+3)
	Evening	40	38 (40-5+3)
Commercial	When in use	65	63 (65-5+3)

Table 4: Determination of the amenity criteria for noise sensitive receivers.

3.5.3 PROJECT NOISE TRIGGER LEVELS

The PNTL's are shown in Table 5 and have been obtained in accordance with the requirements of the NSW NPI. These shall be assessed to the most affected point on or within the noise sensitive receiver boundary.

Indicative Noise Amenity Area	*Period*	*Intrusiveness Criterion, $L_{Aeq,15min}$ dB(A)*	*Amenity Criterion, $L_{Aeq,15min}$ dB(A)*
General Residential (R1) / Local Centre (B2)	Day	55	58
	Evening	50	48
	Night	45	43
Low Density Residential (R2)	Day	55	48
	Night	50	43
	Evening	45	38
Commercial	When in use	---	63

Table 5: Determination of PNTL's (grey highlight) for noise sensitive receivers.

3.6 TRAFFIC NOISE GENERATED

Road traffic noise impact is assessed in accordance with the NSW OEH Road Noise Policy (RNP) 2011. The NSW RNP establishes criteria for traffic noise from:

- Existing roads.
- New road projects.
- Road development projects.
- New traffic generated by developments.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2.0dB above the existing noise levels. An increase of up to 2.0dB represents a minor impact that is considered barely perceptible to the average person.

3.7 SLEEP DISTURBANCE

The potential of sleep disturbance from short-duration noise events from the proposed development – police car departures – during the night-time period needs to be considered. Sleep disturbance occurs through changes in sleep state and awakenings. For continuous traffic flow, L_{Aeq} appears to be acceptably correlated with sleep disturbance.

However, for intermittent traffic flow, which often occurs at night-time ($L_{AFmax} – L_{Aeq}$) or ($L_{AFmax} – L_{A90}$) are better correlated with sleep disturbance.

NSW EPA NPI recommends the following criteria:

"Where the subject development night-time noise levels at a residential location exceed:

- *$L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or*
- *L_{AFmax} 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater,*

A detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period."

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW RNP as follows:

- Maximum internal noise levels below 50–55dB(A) are unlikely to cause awakening reactions.
- One or two noise events per night, with maximum internal noise levels of 65–70dB(A), are not likely to affect health and wellbeing significantly.

Other factors that may be important in assessing the extent of impacts on sleep include:

- How often high noise events will occur.
- The distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development.
- Whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods).

- Current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

Table 6 summarises the noise level criteria for sleep disturbance based on the NSW EPA NPI recommendations and highlight the stringer criteria to apply.

	Sleep Arousal Noise Criteria
Condition 1	$L_{Aeq,15min}$ 40dB(A) || RBL + 5 = **45dB(A)**
Condition 2	L_{AFmax} 52dB(A) || RBL + 15 = **55dB(A)**

Table 6: Sleep Arousal noise criteria.

These values apply shall be achieved external to the bedroom window of the noise residential sensitive receivers, as opposed to the receiver boundary – which is applied for most other criteria.

3.8 NSW POLICE BUILDING CODE

Section 4.12 of the NSW Police Building Code provides acoustic criteria for internal noise levels, reverberation times plus sound insulation performances that should be achieved within the Police Station spaces. However, operational noise level criteria and design guidelines to minimise noise emissions are not provided.

3.9 CONSTRUCTION NOISE AND VIBRATION

3.9.1 NOISE CRITERIA

The noise criteria in this section are for guidance only and do not form part of any legal obligation on the part of the project proponent. However, compliance with these criteria is considered best practice.

The ICNG suggest construction noise management levels that may minimise the likelihood of annoyance being caused to noise sensitive residential receivers depending on the duration of works. The Noise Management Levels (NMLs) for long-term duration works are as follows:

- Within recommended standard hours.

  The $L_{Aeq,15min}$ level measured at the most exposed boundary of any affected residential receiver when the construction site is in operation must not exceed the background noise level by more than 10dB(A). This noise level represents the point above which there may be some community reaction to noise.

  However, in the case of a highly noise affected area, the construction noise level ($L_{Aeq,15min}$) at the most exposed boundary of any affected residential receiver when the construction site is in operation should not exceed 75dB(A). This level represents the point above which there may be strong community reaction to noise.

- Outside recommended standard hours.

  The $L_{Aeq,15min}$ level measured at the most exposed boundary of any affected residential receiver when the construction site is in operation must not exceed the background level by more than 5dB(A). It is noted that a strong justification is required for works outside the recommended standard hours.

ICNG suggests construction noise management levels for other sensitive land uses surrounding construction sites as follows:

- Retail outlets: $L_{Aeq,15min}$ 70dB(A) (external).

In order to establish the airborne construction noise criteria, noise levels from AS 1055.3:1997 have been used to estimate background noise levels for the noise sensitive receivers– refer to Section 3.4. Table 7 below summarises the airborne construction noise criteria for most affected noise sensitive receivers surrounding the development site.

Sensitive Receiver		*Noise Management Level, $L_{Aeq,15min}$ dB(A)*	
		Within Standard Hours	*Outside Standard Hours*
Residential (R1 / R2)	Noise affected / External	60	55
	Highly noise affected / External	75	N/A
Commercial	External	70	70

Table 7: ICNG construction airborne noise criteria (NMLs) for noise sensitive receivers surrounding the site.

The ICNG recommends internal ground-borne noise maximum levels at residences affected by nearby construction activities. Ground-borne noise is noise generated by vibration transmitted through the ground into a structure and can be more noticeable than airborne noise for some sensitive receivers. The ground-borne noise levels presented below from the ICNG are for residential receivers during evening and night-time periods only, as the objective is to protect the amenity and sleep of people when they are at home.

- Evening: $L_{Aeq,15min}$ 40dB(A) (internal).
- Night: $L_{Aeq,15min}$ 35dB(A) (internal).

The internal noise levels are assessed at the centre of the most affected habitable room.

3.9.2 VIBRATION CRITERIA

The Department of Environment and Climate Change (DECC) developed the document *'Assessing Vibration: A Technical Guideline'* in February 2006 to assist in preventing people from exposure to excessive vibration levels within buildings. It is based on the guidelines contained in BS 6472.1:2008 *'Guide to evaluation of human exposure to vibration in buildings – Vibration sources other than blasting'*.

The guideline does not however address vibration induced damage to structures or structure-borne noise effects.

Vibration criteria for continuous and impulsive vibration are presented in Table 8, in terms of vibration velocity levels. When assessing intermittent vibration comprising a number of events, it is recommended that the Vibration Dose Value (VDV) is used. Table 9 shows the acceptable VDV values for intermittent vibration.

Place	Time	r.m.s. velocity, mm/s [dB ref 10^{-9}mm/s]			
		Continuous Vibration		Impulsive Vibration	
		Preferred	Maximum	Preferred	Maximum
Residences	Day-time	0.20 [106 dB]	0.40 [112 dB]	6.00 [136 dB]	12.00 [142 dB]
	Night-time	0.14 [103 dB]	0.28 [109 dB]	2.00 [126 dB]	4.00 [132 dB]
Offices, schools	When in use	0.40 [112 dB]	0.80 [118 dB]	13.00 [142 dB]	26.00 [148 dB]

Table 8: Continuous and impulsive vibration criteria applicable to the site. *Note: Day-time is 07:00 to 22:00 and night-time is 22:00 to 07:00.*

Place	Time	Vibration Dose Values, $m/s^{1.75}$	
		Preferred	Maximum
Residences	Day-time	0.20	0.40
	Night-time	0.13	0.26
Offices, schools	When in use	0.40	0.80

Table 9: Intermittent vibration criteria applicable to the site.

Ground vibration from construction activities can damage surrounding buildings or structures. For unoccupied buildings, or during periods where the buildings are unoccupied, the vibration criteria for building damage suggested by German Standard DIN 4150.3:1993 *'Structural Vibration – Effects of Vibration on Structures'* and British Standard BS 7385.2:1993 *'Evaluation and Measurement for Vibration in Buildings'* are to be adopted. Guideline values from DIN 4150.3:1993 and BS 7385.2:1993 are presented in Table 10 and Table 11 respectively.

Structural type	r.m.s. velocity, mm/s			
	Foundation			Plane of floor uppermost full storey
	Less than 10Hz	10 to 50Hz	50 to 100Hz	Frequency mixture
Dwellings or similar	5	5 to 15	15 to 20	15
Particularly sensitive	3	3 to 8	8 to 10	8

Table 10: DIN 4150.3:1993 Guideline values of vibration velocity for evaluating the effects of short-term vibration.

Structural type	Peak particle velocity, mm/s	
	4 to 15Hz	15Hz and above
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s @ 4Hz increasing to 20mm/s @ 15Hz	20mm/s @ 15Hz increasing to 50mm/s @ 40Hz and above

Table 11: BS 7385.2:1993 Guideline values of vibration velocity for evaluating cosmetic damage.

4 NOISE EMISSIONS ASSESSMENT

Noise break-out from the proposed development has the potential to impact on existing noise sensitive receivers. For the purpose of this noise impact assessment, the noise sources are assumed as follows:

- External mechanical plant to the surrounding receivers.
- Traffic generated by the proposed development.
- Building operations.

Each of these noise sources has been considered in the noise impact assessment. The acoustic assessment has considered the following:

- Noise levels have been considered as continuous over assessment time period to provide the worst-case scenario.
- Lowest background noise levels at the nearest noise sensitive receiver have been used to provide a worst-case scenario.
- Distance attenuation, building reflections and directivity.

4.1 EXTERNAL MECHANICAL PLANT

Noise from proposed development mechanical plant rooms should be controlled to ensure external noise emissions are not intrusive and do not impact on the amenity of the noise sensitive receivers.

Mechanical plant will operate continuously during all day time periods. At this stage, final mechanical plant selections have not been made; therefore, it is not possible to undertake a detailed assessment of the mechanical plant noise emissions. However, a preliminary assessment has been carried out for the external mechanical plant.

Considering the distance from the proposed locations of the external mechanical plants in both buildings to the nearest noise sensitive receiver (residential receiver 14 Thredbo Terrace), at this stage, maximum allowable cumulative noise emissions from the external mechanical plant have been predicted to be limited to the following noise levels at 1 metre from the plant boundary:

- Police Station Building: $L_{Aeq,15min}$ 74dB(A).
- Accommodation Building: $L_{Aeq,15min}$ 70dB(A).

Noise controls will need to be incorporated with the design of the mechanical plant rooms to ensure that the cumulative noise levels from plant to the nearest noise sensitive receivers meets the NSW NPI noise level criteria – refer to Table 5.

Usual design noise controls that may need to be implemented will typically include, but are not limited to:

- Strategic location and selection of mechanical plant to ensure the cumulative noise levels at the receiver boundaries is met.
- Selection of appropriate quiet plant.
- Acoustic noise control measures to be put in place to minimise noise impacts such as:
  - In-duct attenuation.
  - Noise enclosures as required.
  - Sound absorptive panels.
  - Acoustic louvres as required.
  - Noise barriers as required.

Acoustic assessment of all mechanical plant shall continue during the detailed design phase of the project in order to confirm any noise control measures to achieve the relevant noise criteria at the nearest noise sensitive receivers.

4.2 VEHICLES NOISE EMISSIONS

The potential noise sources associated with the proposed vehicles operations will be:

- Noise generated by vehicles movements.
- Police cars dispatched for emergencies during night-time.
- Noise generated by police car sirens.

It is expected that generally vehicle movements will be moving slowly and the number of vehicles movement will be low. Therefore, it has been assumed that worst-case scenario will be with a police car departing the Police Station during an emergency incident in night-time period.

As per architectural drawings, exit path of vehicles is proposed to be via Thredbo Terrace. Therefore, noise sensitive receivers on Thredbo Terrace are the most likely to be impacted for police car movements during night-time.

4.2.1 TRAFFIC NOISE DUE TO THE PROPOSAL

A similar number of vehicle movements – as per number of car-park spaces – it is expected, which indicates that there will be no significant increase in road traffic flows as a result of the development.

As noted in Section 3.6, when considering land use development and the impact on sensitive land uses, the NSW RNP states that an increase up to 2.0dB in relation to existing noise levels is anticipated to be insignificant.

Therefore, traffic noise associated with the development is expected to meet the NSW RNP recommendations.

4.2.2 POLICE CAR MOVEMENTS DURING NIGHT-TIME

For the noise assessment purpose, departing police cars noise impact from the Police Station are likely to generate the following noise level range.

Noise Source	*Maximum Sound Power Level dB(A), ref 1pW*
Police car accelerating	91-96

Table 12: Noise level range for police car departures from the Police Station.

The sleep arousal noise assessment has considered the following assumptions:

- The Police Station will operate 24 hours a day 7 days per week during winter, being the worst-case scenario. Therefore, there will be police car movements at any time period.
- Noise levels have been considered as continuous over a 15-minute assessment period to provide the worst-case scenario.
- Police car noise level are based on the highest value of the maximum sound power level range for a worst-case scenario.
- Noise predictions are based on distance attenuation, ground reflection, building reflections / shielding and directivity.
- Noise level criteria is based on the lowest assumed background noise level in order to provide a worst-case scenario.

Results of sleep disturbance noise assessment are shown in Table 13 and Table 14.

Calculation	*Overall A-weighted noise level, in dB(A)*
L_{Aeq} of police car accelerating at 1 m	82
Distance (16 m) attenuation, dB	-24
One 30 second event over 15 minutes operation correction, dB	-14
$L_{Aeq,15min}$ resulting at noise sensitive receiver façade	**44**
Sleep Arousal Nigh-time Criteria residential receiver / Complies?	**45** / Yes

Table 13: Sleep arousal noise assessment at residential receiver from police car departure during night-time. Condition 1.

Calculation	*Overall A-weighted noise level, in dB(A)*
L_{Amax} of police car accelerating at 1 m	88
Distance (16 m) attenuation, dB	-24
L_{Amax} resulting at residential receiver façade	**64**
Sleep Arousal Nigh-time Criteria residential receiver / Complies?	**55** / No

Table 14: Sleep arousal noise assessment at residential receiver from police car departure during night-time. Condition 2.

Based on the above, the predicted $L_{Aeq,15\ min}$ noise level at the nearest noise sensitive receiver façade is expected to meet the Condition 1 NPI Sleep Arousal Criteria.

The predicted L_{Amax} noise level at the nearest residential receiver façade exceeds the Condition 2 NPI Sleep Arousal Criteria by 9dB(A). However, guidelines that contain additional advice relating to potential sleep disturbance impacts have been considered, including NSW RNP. The RNP provides a review of research into sleep disturbance. From the research to date, the RNP concludes that:

- One or two events per night, with maximum internal noise levels of 65dB(A) to 70dB(A), are not likely to affect health and wellbeing significantly.
- Maximum internal noise levels below 50dB(A) to 55dB(A) are unlikely to awaken people from sleep. It is generally accepted that internal noise levels in a dwelling with the windows open (likely during warm nights) are 10dB lower than external noise levels – being opened sufficiently to provide adequate ventilation. Based on this, these noise levels are equivalent to external maximum noise levels of 60dB(A) to 65dB(A).

Based on the above, internal noise levels are at a level that according to NSW RNP are unlikely to cause awakening reactions.

4.2.3 POLICE CAR SIRENS

Regarding the use of police car sirens on site – when police cars depart to attend incidents – it is not specifically addressed in relevant regulations.

As per NSW Police Force '*Safe Driving Policy*', police car sirens shall be used as a warning only when responding to an emergency call or pursuing a suspected offender. The NSW Police Handbook advises the

use of discretion in certain circumstances regarding the use of sirens such as in "traffic jams and near hospitals, churches, theatres and other public places where people are likely to assemble".

Whilst it is acknowledged that this aspect of the ongoing Police Station operation may give rise to noise impacts, for safety reasons it is not appropriate to impose a mitigation measure limiting the use of sirens in a manner that would conflict with the NSW Police Force Handbook and '*Safe Driving Policy*'.

4.3 NOISE EMISSIONS FROM BUILDING ACTIVITY

Other noise sources associated with the building activity could have a noise impact at the nearest noise sensitive receivers. In order to limiting the noise nuisance, following strategies should be considered:

- Waste / recycling disposal should be limited to the least sensitive periods (i.e. day time period) where possible.
- Written submissions regarding noise complaints as a result of police operations may be forwarded to the Local Area Commander and dealt with appropriately on a case by case basis.

5 NOISE INTRUSION

5.1 INTERNAL DESIGN NOISE LEVELS

The total noise level within the spaces will be a result of the combination of external noise and noise from the building services.

Noise generated by building services, particularly the air-conditioning and ventilation systems, needs to be considered to ensure that the internal noise levels for each space of the Police Station meet the ambient noise levels as per NSW Police Force Building Code.

In order to achieve these internal noise levels for each space, noise control treatments will need to be incorporated into the mechanical systems as required.

5.2 TRAFFIC NOISE INTRUSION

Traffic noise from surrounding roads will be the key noise source affecting the proposed development. Based on the likely traffic noise levels on the development site, we consider that traffic noise break-in will not be an issue if a typical façade design is proposed for the new police station building façade.

The acoustic performance of the façade is to be addressed further throughout detailed design.

6 CONSTRUCTION NOISE AND VIBRATION PLANNING

Currently the project is at an early design stage and a detailed construction program is not yet full defined. This section of the Construction Noise and Vibration Planning (CNVP) provides general recommendations only and provides applicable criteria together with best noise and vibration control practices to be observed during the construction of the proposed development.

This preliminary advice in relation to construction noise and vibration management shall form the basis for the Contractor's Construction Noise and Vibration Management Plan (CNVMP).

Any noise from demolition and construction activities to be carried out on site must not result in *'offensive noise'* to any noise sensitive receiver. To this end, the Contractor employed to undertake the demolition and / or construction works is responsible for ensuring that any site noise and, in particular, any complaints shall be monitored, investigated, managed and controlled.

6.1 RELEVANT CODES AND STANDARDS FOR CONSTRUCTION NOISE AND VIBRATION CRITERIA

Section 3.9 of this report contains the relevant legislation, codes and standards plus construction noise and vibration criteria for this project.

6.2 CONSTRUCTION NOISE AND VIBRATION PLANNING

At this stage, there is no information regarding construction plant / equipment plus work activities / duration. However, a preliminary construction noise and vibration assessment has been carried out in order to identify the likely potential impact of various generic construction plant / equipment on sensitive receivers surrounding the site. The Contractor will be responsible for preparing a Works Plan and Schedule which include all relevant noise and vibration information.

The key noise sources on site during demolition and construction stages of the Police Station will be from heavy plant / equipment such as excavators, bulldozers, hand held pneumatic tools, grinders, etc. It is anticipated that the key construction activities to occur are as follows:

- Site establishment.
- Demolition, excavation, foundation and piling.
- Structure, façade and fit-out works.
- Landscaping.

A detailed noise assessment shall be carried out for the Construction Noise and Vibration Management Plan when details for the construction plant / equipment plus activities / duration will be known.

The NSW RMS *'Construction Noise and Vibration Guideline'* provides safe working distances for vibration intensive plant and are quoted for both 'cosmetic' damage (in accordance with BS 7385.2:1993) and human comfort (in accordance with DEC's *'Assessing Vibration: A Technical Guideline'*). The recommended safe working distances for typical construction plant are provided in Table 15.

Plant Item	*Description*	*Cosmetic Damage*	*Human Response*
Small Hydraulic Hammer	5-12 tonne	2m	7m
Medium Hydraulic Hammer	12-18 tonne	7m	23m
Large Hydraulic Hammer	18-34 tonne	22m	73m
Vibratory Pile Driver	Sheet piles	2-20m	20m
Pile Boring	<800mm	2m	N/A
Jackhammer	Hand held	1m	Avoid Contact with Structure

Table 15: Recommended minimum working distances for vibration intensive plant from sensitive receivers

If Contractor has concerns for the disruptions at nearest sensitive receivers due to vibration intensive plant use, it is recommended that prior to the commencement of the works, to undertake a preliminary vibration survey on each key vibration generating activity / equipment.

The preliminary vibration survey and assessment will determine whether the vibration levels might exceed the relevant criteria then vibration mitigation and management measures will need to be put in place to ensure vibration impacts are minimised as far possible.

6.3 CONTROL ELEMENTS

In order to meet the noise and vibration requirements of the site, the Contractor will be required to engage a qualified acoustic consultant to assist in the compilation of a CNVMP, and undertake noise and vibration monitoring for the duration of the project.

6.3.1 GENERAL CONTROL ELEMENTS

As a general rule, minimising noise and vibration should be applied as universal work practice at any time of day, but especially for any construction works to be undertaken at critical times outside normal daytime/weekday periods.

It is noted that the reduction of noise and vibration at the source and the control of the transmission path between the construction site and the receiver(s) are the preferred options for noise minimisation. Providing treatments at the affected receivers should only be considered as a last resort.

Construction noise and vibration shall be managed by implementing the strategies listed below:

- *Plant and equipment*. In terms of both, cost and results, controlling noise and vibration at the sources is one of the most effective methods of minimising the impacts from any work site activities. Work practices that will reduce noise and vibration at the source include:
  - Employing quieter techniques for all high noise activities such as rock breaking, concrete sawing, and using power and pneumatic tools.
  - Use quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks.
  - Selecting plant and equipment with low vibration generation characteristics.
  - Operate plant in a quietest and most effective manner.
  - Where appropriate, limit the operating noise of equipment.

- Regularly inspecting and maintain plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively.
- Where appropriate, obtain acoustic test certificates for equipment.

- *On site noise management.* Practices that will reduce noise from the site include:
  - Maximising the distance between noise activities and noise sensitive receivers. Strategically locate equipment and plant.
  - Undertaking noisy fabrication work off-site where possible.
  - Avoid the use of reversing beeping alarms or provide for alternative systems, such as broadband reversing alarms, particularly during night or out-of-hours works.
  - Maintaining any pre-existing barriers or walls on a demolition or excavation site as long as possible to provide optimum sound propagation control.
  - Constructing barriers that are part of the project design early in the project to afford mitigation against site noise.
  - Using temporary site building and material stockpiles as noise barriers. These can often be created using site earthworks and may be included as a part of final landscape design.
  - Installing purpose built noise barriers, acoustic sheds and enclosures.
- *Work scheduling.* Scheduling work during periods when people are least affected is an important way of reducing adverse impacts. The following scheduling aspects may reduce impacts:
  - Provide respite periods, including restricting very noisy activities to daytime, restricting the number of nights that after-hours work is conducted near residences, or by determining any specific requirements, particularly those needed for noise sensitive receivers.
  - Scheduling activities to minimise impacts by undertaking all possible work during hours that will least adversely affect sensitive receivers and by avoiding conflicts with other scheduled events.
  - Scheduling work to coincide with non-sensitive periods.
  - Scheduling noisy activities to coincide with high levels of neighbourhood noise so that noise from the activities is partially masked and not as intrusive.
  - Planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from sensitive receivers.
  - Optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours.
  - Designating, designing and maintaining access routes to the site to minimise impacts.
  - Including contract conditions that include penalties for non-compliance with reasonable instructions by the principal to minimise noise or arrange suitable scheduling.
- *Consultation, notification and complaints handling.*
  - Provide information to neighbours before and during construction.
  - Maintain good communication between the community and Project staff.
  - Have a documented complaints process and keep register of any complaints.
  - Give complaints a fair hearing and provide for a quick response.
  - Implement all feasible and reasonable measures to address the source of complaint. Implementation of all reasonable and feasible mitigation measures for all works will ensure that any

adverse noise impacts to surrounding receivers are minimised when noise goals cannot be met due to safety or space constraints.

6.3.2 ADDITIONAL NOISE AND VIBRATION CONTROL MEASURES

If, during construction, an item of equipment exceeds either the noise criteria at any location or the equipment noise level limits, the following noise control measures, together with construction best practices, shall be considered to minimise the noise impacts on the neighbourhood.

- Schedule noisy activities to occur outside of the most sensitive times of the day for each nominated receiver.
- Consider implementing equipment-specific screening or other noise control measures recommended in Appendix C of AS 2436:2010.
- Limit the number of trucks on site at the commencement of site activities to the minimum required by the loading facilities on site.
- When loading trucks, adopt best practice noise management strategies to avoid materials being dropped from height into dump trucks.
- Avoid unnecessary idling of trucks and equipment.
- Ensure that any miscellaneous equipment (extraction fans, hand tools, etc) not specifically identified in this plan incorporates silencing/shielding equipment as required to meet the noise criteria.

Implementation of all reasonable and feasible mitigation measures for all internal works will ensure that any adverse noise impacts to surrounding residential, commercial and recreational receivers are minimised when noise goals cannot be met due to safety or space constraints.

7 SUMMARY AND CONCLUSIONS

A noise assessment has been carried out for the new NSW Police Force Station in Jindabyne. This report forms part of the documentation package to be submitted to the Snowy Monaro Regional Council as part of the Development Application.

This report establishes relevant noise level criteria, details the acoustic assessment and provides comments and recommendations for the proposed development.

The noise assessment has adopted methodology from relevant guidelines, standards and legislation to assess noise impact. The noise impacts have been predicted at the nearest noise sensitive receiver boundaries, taking in account distance attenuation, building reflections and directivity.

A summary of the noise assessments and their outcomes is listed below:

External Mechanical Plant: At this stage, mechanical plant selections have not been made. Therefore, a detailed noise assessment has not been able to be carried out. However, a preliminary noise assessment has been carried out, based on the location of the mechanical plantrooms. The maximum allowable noise emissions from the proposed development's external mechanical plant shall be limited to 70dB(A) at 1 meter for the accommodation building mechanical plant and 74dB(A) at 1 meter for the station building mechanical plant, in order to meet the NSW NPI noise level criteria for all time periods. Recommendations have been provided to minimise the impact of external noise emissions associated with the mechanical plant of the proposed development to the nearest sensitive receivers.

Vehicles Noise Emissions: Traffic noise impact due to the likely generated vehicle movements of the proposed development is anticipated to be insignificant, as the noise levels will not increase more than 2.0dB at the sensitive noise receivers.

For noise from use of police car sirens, it is recommend that their operation within the development and surroundings shall be addressed in the Management Plan and minimised whenever possible.

A sleep arousal assessment for departing police cars during night-time has been undertaken. Results indicate that the predicted $L_{Aeq,15min}$ noise level will meet the noise level criterion. However, the predicted L_{Amax} noise levels are expected to exceed the established noise level criterion by 9dB(A). Internal noise levels within the bedroom of the affected residential receivers due to police car departures are likely to not cause awakening reactions, neither to have an impact on health and wellbeing of receivers.

Noise Intrusion: The final façade design is not yet resolved. Traffic break-in noise levels are not expected to exceed the established noise criteria within the premises if a typical façade design is proposed. The building façade design has to be solved during the detailed design stage.

Construction Noise and Vibration: Potential construction noise and vibration impacts on the surroundings have been presented in this report and recommendations based on the relevant guidelines are provided. If, during construction works, an item of equipment exceeds the stated airborne noise and / or vibration criteria at any sensitive location, the additional noise / vibration control measures presented in this report, together with construction best practices, shall be considered to minimise noise and vibration impacts on the sensitive receivers.

Based on the information presented in this report, relevant objectives will be satisfied and therefore approval is recommended to be granted.