Appin and North Appin Precincts
Acoustic Assessment

Prepared for:

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EXECUTIVE SUMMARY

An acoustic assessment has been undertaken into the potential for noise emanating from various existing and proposed significant noises sources to impact on parts of the Appin and North Precincts, within the Greater Macarthur Growth Area's land release area, that is proposed for rezoning for residential purposes.

Appropriate noise criteria were developed based on procedures in the applicable Australian Standards and Government guidelines and policies.

The assessment considered theoretical noise emissions from a number of existing industrial noise sources and also from existing and proposed roads in the area.

Noise control options and noise management techniques were advised, as required, to enable compliance with the relevant noise criteria at future residential, and other, receivers.

The assessment concluded that the proposed development may be supported provided the appropriate noise attenuation measures are incorporated at key existing noise generating sites and proposed infrastructure deliverables for the project.

1.0 THE APPIN PROJECT

Greater Sydney's population is projected to grow to approximately 6.1 million by 2041 – over a million more people than currently live in the region.

The NSW Government has identified Growth Areas as major development areas that will assist in accommodating this growth. The Greater Macarthur Growth Area (**GMGA**) is one such growth area and is a logical extension of the urban form of south-west Sydney. The GMGA is divided into precincts. The Appin Precinct and North Appin Precinct are the southernmost land release precincts of the GMGA. The goal is to deliver 21,000+ dwellings.

The land is to be rezoned and released for development to achieve this goal. A submission has been prepared by Walker Corporation Pty Limited and Walker Group Holdings Pty Limited (the **Proponent**) to rezone 1,378 hectares of land (**the site**) within the Appin Precinct from *RU2 Rural Landscape* to the following zones:

Urban Development Zone
Zone 1 Urban Development (UD)

Special Purposes Zone
Zone SP2 Infrastructure (SP2)

Conservation Zone
Zone C2 Environmental Conservation (C2)

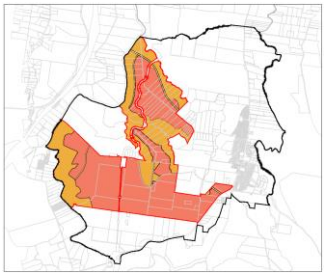
The zonings are shown on the Appin (Part) Precinct Plan (**the precinct plan**). 'The precinct plan' will be incorporated into the *State Environmental Planning Policy (Precincts – Western Parkland City) 2021* and contain the provisions (clauses and maps) that will apply to 'the site.' 'The precinct plan' envisages the delivery of 12,000+ new homes.

A structure plan has been prepared for the site and is shown on the Appin (Part) Precinct Structure Plan (**the structure plan**). It identifies staging and the first stage to be developed – Release Area 1. Release Area 1 is anticipated to deliver 3,500+ dwellings.

The submission is aligned with strategic land use planning, State and local government policies and infrastructure delivery. The development potential is tempered by a landscape-based approach that protects the environment and landscape values, shaping the character of new communities. A series of residential neighbourhoods are to be delivered within the landscape corridors of the Nepean and Cataract Rivers, supported by local amenities, transit corridors and community infrastructure.

The submission includes a hierarchy of plans. The plans and their purpose are summarised in Table 1.

Table 1: Title and Purpose Plans

(1) APPIN & NORTH APPIN PRECINCTS INDICATIVE PLAN	(2) APPIN (PART) PRECINCT PLAN (*THE PRECINCT PLAN*)	(3) APPIN (PART) PRECINCT STRUCTURE PLAN (*THE STRUCTURE PLAN*)
Broader context & for information purposes only. It has no statutory weight. It identifies: • *Higher-order transport network* • *Centres hierarchy* • *School sites* • *Conservation areas* • *Residential areas* • *Cultural sites and connections*	*It shows the land proposed to be rezoned (the site) and incorporated into a new schedule in the Western Parkland City SEPP 2021.* *The precinct plan contains the development provisions (clauses and maps) applicable to the site and is used in assessing development applications.*	*Structure plan for the site, showing staging of release areas.* *It illustrates land use components including (but not limited to):* • *Low and medium-density residential* • *Retail and employment centres* • *School* • *Open space* • *Drainage network/basins* • *Transport network*
 **(21,000+ dwellings)**	 **(12,000+ dwellings)**	 **(12,000+ dwellings)** **(Inc. Release Area 1 - 3,500+ dwellings)**

2.0 INTRODUCTION

Spectrum Acoustics Pty Ltd has been engaged by the Proponent to prepare an acoustical assessment to support the Appin and North Appin Precincts Indicative Plan.

The Appin and North Appin Precincts are the southernmost land release areas of the Greater Macarthur Growth Area (**GMGA**) – refer to Figure 1 and Table 2 for key features of the precincts.

The Appin and North Appin Precincts immediately neighbour the suburbs of Gilead to the north, Wilton to the south and Douglas Park to the west. Dharawal National Park, a large protected national park, is located to the east. The precincts are predominately bound by waterways, with Mallaty Creek to the north, George's River to the east, Nepean River to the west and Cataract River to the south.

have been engaged by the Proponent to prepare an acoustical assessment to support an Indicative Structure Plan for the Appin and North Precincts.

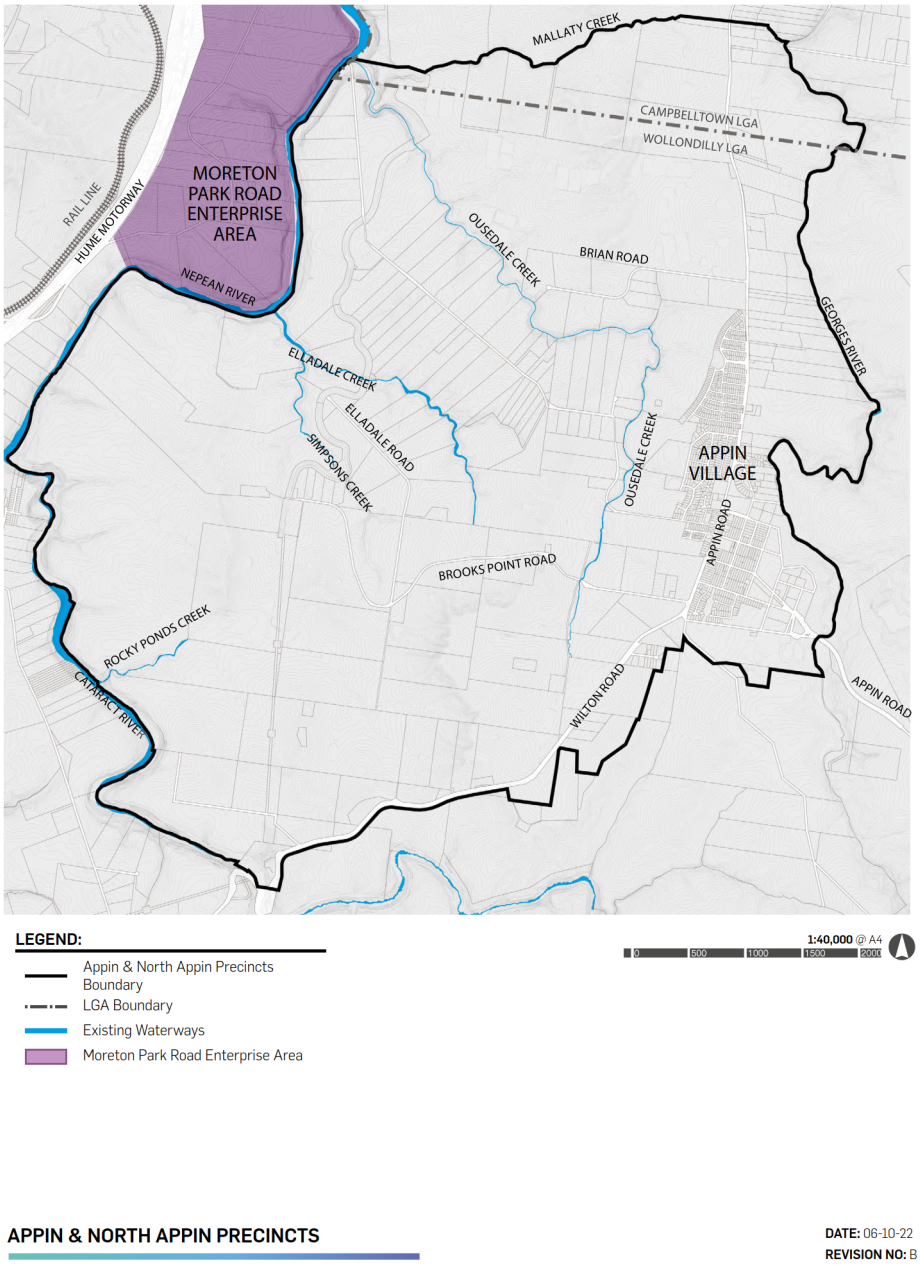


Figure 1: Boundary of Appin and North Appin Precincts

Table 2: Appin and North Appin Precincts – summary of key attributes

	Location	Key Attributes	
Appin and North Appin Precincts		**Area**	3,826 ha
		LGA	Part Wollondilly Part Campbelltown
		Proposed Dwellings	21,000+
		Proposed Population	65,000+

Table 2: Summary of Appin and North Appin Precincts key attributes

This report summarises the potential for noise emanating from various existing and proposed significant noises sources to impact on parts of the Appin and North Appin Precincts that are proposed for rezoning for residential purposes.

The objectives of the report are:

- To determine appropriate noise criteria for different noise sources and various land uses,
- Utilise historic noise level data supplemented with “typical” noise levels for similar situations to theoretically determine potential noise impacts,
- Provide advice on noise control methods and management techniques to minimise noise impacts and achieve compliance with the applicable criteria.

The outcome of this report has been to determine indicative zones of affectation where there is a potential for noise to impact on proposed residential developments and, where required to provide options to achieve an adequate acoustic amenity for future residents.

The assessment has indicated that a combination of relatively common architectural treatments and noise control such as construction of noise barriers, can be employed to achieve an adequate acoustic amenity at future residences.

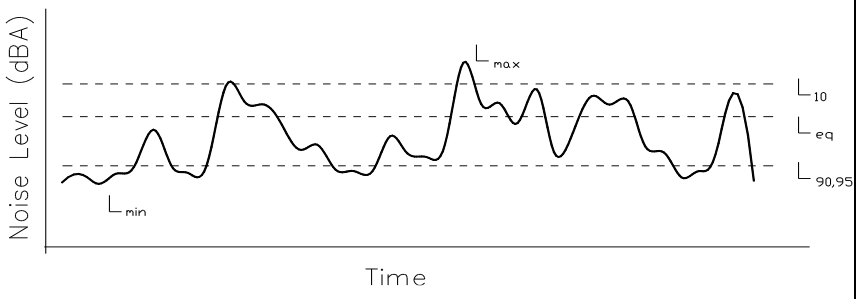
Detailed and specific acoustic assessment will be required for the key existing and proposed noise generating sources identified in this report.

From an acoustic point of view, the proposed development may be supported provided the appropriate noise attenuation measures are incorporated in proposed infrastructure deliverables for the project.

3.0 DESCRIPTION OF TERMS

Table 3 contains the definitions of commonly used acoustical terms and is presented as an aid to understanding this report.

Table 3: Definition of acoustical terms

Term	Definition
dB(A)	The quantitative measure of sound heard by the human ear, measured by the A-Scale Weighting Network of a sound level meter expressed in decibels (dB).
SPL	Sound Pressure Level. The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard.
STL	Sound Transmission Loss. The ability of a partition to attenuate sound, in dB.
Lw	Sound Power Level radiated by a noise source per unit time re 1pW.
Leq	Equivalent Continuous Noise Level - taking into account the fluctuations of noise over time. The time-varying level is computed to give an equivalent dB(A) level that is equal to the energy content and time period.
L1	Average Peak Noise Level - the level exceeded for 1% of the monitoring period.
L10	Average Maximum Noise Level - the level exceeded for 10% of the monitoring period.
L90	Average Minimum Noise Level - the level exceeded for 90% of the monitoring period and recognised as the Background Noise Level. In this instance, the L90 percentile level is representative of the noise level generated by the surrounds of the residential area.
	

4.0 NOISE ASSESSMENT CRITERIA

The area proposed for rezoning covers a large part of the Appin and North Appin Precincts. There are several known existing and proposed significant noises sources in the area which are shown in **Figure 2**, and detailed below;

- Appin Motocross Track,
- Appin Power Station,
- South 32 Ventilation Shaft,
- Proposed Outer Sydney Orbital Phase 2,
- Existing Hume Highway,
- Existing Wilton Road, and
- Existing Appin Road.

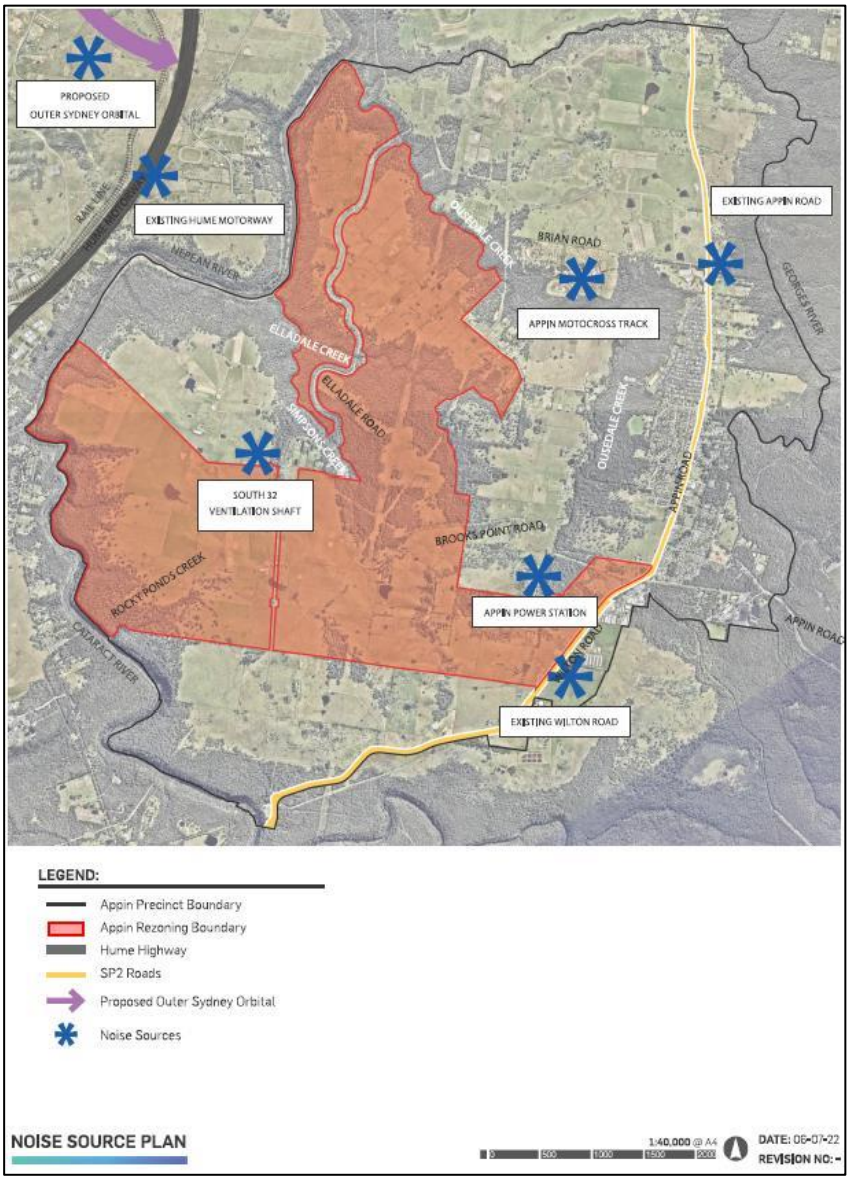


Figure 2: Noise Sources

Each of these noise sources will be considered separately. The applicable noise criteria will be presented and the potential for adverse

impacts discussed along with possible noise control measures and areas where more in depth assessment will be required.

Noise emissions from each of the industrial and commercial noise sources (motocross track, power station and ventilation shafts) would, typically, be assessed against noise criteria determined in accordance with the Noise Policy for Industry (NPfI). These noise criteria are generally applicable externally to a receiver.

Noise emissions from traffic on public roads in NSW are assessed against specific traffic noise criteria.

4.1 Noise Policy for Industry

The NPfI provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997.

In setting noise goals for an industrial development, the NPfI considers both Amenity and Intrusiveness criteria. The former is set to limit continuing increase in noise from industry, whilst the latter is set to minimise the intrusive impact of a particular noise source.

Amenity criteria are dependent upon the nature of the receiver area and the existing level of industrial noise. The current project is for the rezoning of land to develop residential areas. Future residential receivers in these areas would be considered “suburban” as per the definitions in the NPfI.

The Project Amenity Noise Level for an industrial development is equal to the recommended amenity noise level (from Table 2.2 in the NPfI) minus 2 dB(A).

The intrusiveness criteria are based on the Rating Background Level (RBL) for the time period, plus 5 dB(A). The RBL (L90) is defined as the overall single figure background level representing each assessment period.

The Project Noise Trigger Levels (that are effectively the noise criteria for the operation of an industry or commercial premises) are the lower of the applicable Intrusiveness or Amenity criteria for each of the acoustic Day, Evening or Night time periods.

The noise criteria in the NPfI are applicable externally to a residence. That is, to a standard theoretical receiver at 1.5m high located at the most affected point within 30m of a residence (for typical residential situations this is the property boundary).

4.2 Road Traffic Noise

In NSW noise emanating from traffic travelling on public roads is assessed using specific noise criteria detailed in the Office of Environment and Heritage (OEH) NSW Road Noise Policy (RNP), as adopted by the Transport for NSW (TfNSW).

The RNP details various noise criteria for different road developments and uses. The criteria differ depending on whether a road is existing or new and also whether a noise sensitive receptor is existing or proposed.

The various criteria for existing residences, taken from the RNP, are shown in **Table 4**.

Table 4: Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ (15\ hour)}$ 55 (external)	$L_{Aeq,\ (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing freeway/arterial/sub- arterial roads 3. Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)
Local roads	4. Existing residences affected by noise from **new** local road corridors 5. Existing residences affected by noise from **redevelopment** of existing local roads 6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq,\ (1\ hour)}$ 55 (external)	$L_{Aeq,\ (1\ hour)}$ 50 (external)

The criteria applicable to noise from off-road and on-road bus transitways are detailed below. The RNP states that noise criteria for bus transitways aim to assist future public transport proposals and ensure that any adverse amenity effects that might be associated with increased public transport use are properly assessed and minimised to the greatest extent possible.

Transitway type	Assessment criteria – dB(A)		Additional considerations
	Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)	
Off-road transitway	L_{Aeq}, (15 hour) 60 (external)	L_{Aeq}, (9 hour) 50 (external)	The total noise level from the transitway is to be assessed against the criteria.
On-road transitway	The noise assessment criteria in **Table 4** apply as appropriate to the existing road classification, e.g. freeway/arterial/sub-arterial or local road classification.		The total combined noise level from the road including the transitway and other traffic is to be assessed against the criteria.

The RNP details that, in some cases, there will be existing land uses that may be particularly sensitive to noise (e.g., hospitals and schools) where more stringent standards are expected, and there are other land uses where different criteria than those specified for residential land use are more appropriate.

For existing schools, child care facilities, hospitals, places of worship and recreation, specific criteria have been set so the characteristic activities for each of these land uses will not be unduly disturbed.

The applicable criteria are shown in **Table 5**.

Table 5: Road traffic noise assessment criteria for non-residential land uses affected by proposed road projects and traffic generating developments

Existing sensitive land use	Assessment criteria – dB(A)		Additional considerations
	Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)	
1. School classrooms	L_{Aeq}, (1 hour) 40 (internal) when in use	–	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000).
2. Hospital wards	L_{Aeq}, (1 hour) 35 (internal)	L_{Aeq}, (1 hour) 35 (internal)	
3. Places of worship	L_{Aeq}, (1 hour) 40 (internal)	L_{Aeq}, (1 hour) 40 (internal)	The criteria are internal, i.e. the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what in these areas may be affected by road traffic noise. For example, if there is a church car park between a church and the road, compliance with the internal criteria inside the church may be sufficient. If, however, there are areas between the church and the road where outdoor services may take place such as weddings and funerals, external criteria for these areas are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (see point 5) may be applied.

Table 5: (continued)

4. Open space (active use)[1]	L_{Aeq}, (15 hour) 60 (external) when in use	–	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g. school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.
5. Open space (passive use)[1]	L_{Aeq}, (15 hour) 55 (external) when in use	–	
6. Isolated residences in commercial or industrial zones	–	–	For isolated residences in industrial or commercial zones, the external ambient noise levels can be higher than those in residential areas. Internal noise levels in such residences are likely to be more appropriate in assessing any road traffic noise impacts, and the proponent should determine suitable internal noise level targets, taking guidance from Australian Standard 2107:2000 (Standards Australia 2000).
7. Mixed use development	–	–	Each component of use in a mixed use development should be considered separately. For example, in a mixed use development containing residences and a childcare facility, the residential component should be assessed against the appropriate criteria for residences in **Table 3**, and the childcare component should be assessed against point 8 below.
8. Childcare facilities	Sleeping rooms L_{Aeq}, (1 hour) 35 (internal) Indoor play areas L_{Aeq}, (1 hour) 40 (internal)	–	Multi-purpose spaces, e.g. shared indoor play/sleeping rooms should meet the lower of the respective criteria. Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility.
	Outdoor play areas L_{Aeq}, (1 hour) 55 (external)		
9. Aged care facilities	–	–	Residential land use noise assessment criteria should be applied to these facilities (see **Table 43**).

1. The noise level is to be assessed at the time(s) and location(s) regularly attended by people using the space. In this regard, 'regular' attendance at a location means at least once a week.

In relation to new residential developments, however, the RNP advises that land use developers must meet the internal noise goals in the Infrastructure SEPP (Department of Planning NSW, 2007).

The acceptable internal noise levels (based on World Health Organisation guidelines) have been established for new sensitive developments along major road and rail corridors.

The Infrastructure SEPP is aimed at facilitating the effective delivery of infrastructure across NSW. Key objectives of this planning policy were to:

- protect the safety and integrity of key transport infrastructure from adjacent development; and
- ensure that adjacent development achieves an appropriate acoustic amenity by meeting the internal noise criteria specified in the Infrastructure SEPP.

The Infrastructure SEPP states that if the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the relevant L_{Aeq} levels are not exceeded.

The Infrastructure SEPP is supported by the Department of Planning guideline "Development near Rail Corridors and Busy Roads – Interim Guideline" (2008) (Interim Guideline) which gives the following criteria in Section 3.5:

- In any bedroom in the building: **35dB(A),L_{Aeq}** at any time between 10pm – 7am, and
- Anywhere else in the building (other than a garage, kitchen, bathroom or hallway): **40dB(A),L_{Aeq}** at any time.

These criteria originated from the Rail Infrastructure Corporation (RIC) publication "Consideration of Rail Noise and Vibration in the Planning Process" (2003) where it is explicit that the criteria apply with windows and doors closed.

Internal noise levels refer to the noise level at the centre of the habitable room that is most exposed to the traffic noise with openable windows being opened sufficiently to provide adequate ventilation (Refer to the Building Code of Australia (Australian Building Codes Board 2010) for additional information).

5.0 INDUSTRIAL & COMMERCIAL NOISE SOURCES

As indicated above, there are several significant existing industrial and commercial noise sources which have been identified in the proposed

rezoning area. The potential for noise impacts due to emissions from those sources is considered in this section.

5.1 Appin Motocross track

The Appin Motocross Track, otherwise known as the Macarthur Motorcycle Complex (MMC) is shown in **Figure 3** (and also on Figure 2).

The MMC encompasses a number of motocross tracks, a flat track and a trail loop as well as other facilities including motorbike wash bays, club rooms and car parking etc.

Figure 3: Motorcycle Complex Layout

The MMC has operated on the site for over 40 years. The land is owned by the club that operates the facility. The club newsletter indicates that there are currently agreements in place with various government bodies such that anyone purchasing a home in the area, from a developer, is notified of the MMC.

The MMC club newsletter indicates that the facility must comply with local council and state government requirements.

Noise emissions from the operation of a motor sport facility are considered in the NSW EPA's Noise Guide for Local Government (NGLG).

The NGLG provides practical guidance for local council officers in the day-to-day management of local noise problems and in the interpretation of existing policy and legislation. The aim of the NGLG is to help councils assess, manage and regulate noise issues.

The NGLG is advisory in nature, and council officers are encouraged to use it to develop council procedures or policy to deal with noise issues relevant to local circumstances.

Part 2 of the NGLG outlines the noise assessment process, being an examination of the nature and characteristics of a noise and can involve verifying aural factors such as:

- the location of the noise source,
- its audibility at certain locations,
- the time the noise is made and its duration,
- its characteristics; and
- the reported effect it has on people.

This part of the NGLG discusses how an authorised person can judge whether a noise is audible, excessively long in duration, or offensive, as defined by the legislation. It also outlines the techniques for measuring noise where this is desirable or necessary to support decision-making.

The NGLG is underpinned by the NPfI.

Due to the nature of the proposed operations at the site and, in the absence of any noise impact procedures relating specifically to motocross tracks, the NPfI is considered to provide the most appropriate procedure for the assessment of noise from the MMC.

Figure 4 is an extract from the Appin and North Appin Precincts Site Plan which shows the indicative location of the MMC (shown as a star).

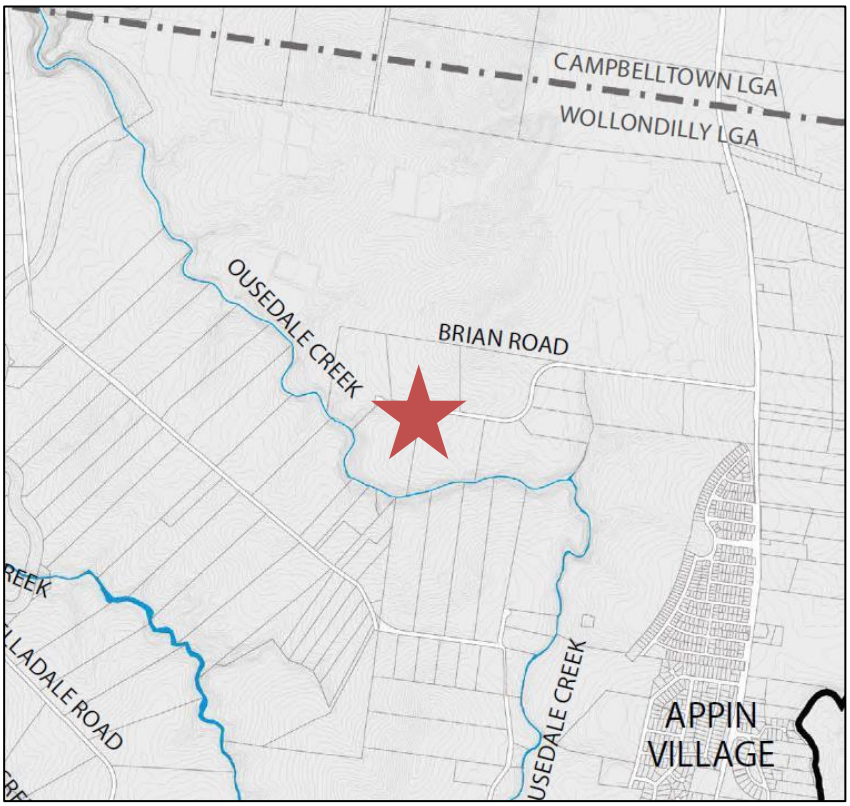


Figure 4: Appin and North Appin Precincts Site Plan – MMC Location

The MMC is to be located in an area zoned as C2 Environmental Conservation Zone (as shown on the Appin and North Precincts Indicative Plan in Table 1 and in **Figure 9**).

The nearest existing residences to the MMC site are in relatively isolated rural/residential areas to the south west off Macquariedale Road, which are around 400m away and includes a vegetation buffer in between. There is also an existing residential subdivision approximately 700m to the east in Appin Valley Estate, also with a vegetation buffer in between.

The closest parts of the proposed residential zones, with frontage to the northern parcel of land, may be less than 100m from the nearest operating parts of the MMC. The Appin and North Appin Precincts Indicative Plan (Table 1) also shows a proposed Transit Corridor (east) and Arterial Road (west) to pass through and near the residential areas.

Both of these will be significant noise generators and will influence the acoustic environment of the areas that they pass through. That is, the presence of these roads will result in an increase in the background noise levels in the areas they pass through. Similarly, the increase in development in the area will also result in an increase in background noise.

The MMC is a multi track facility with several different types of motorbike events being held throughout the year. The track only operates during the day.

Noise emissions from the MMC will vary depending on the location of an event within the complex and the type of motorbikes competing. The received noise at any residences will depend on the number of bikes at any event and the location and orientation of each in relation to the receiver. For some events it will also depend on the location of the bike relative to the ground (i.e., some events have jumps etc. where bikes are off the ground at times).

By way of example, the motocross bikes may have sound power levels (Lw) in the range from 100 to 105 dB(A). For an event where there are 10 such bikes the combined Lw could be as high as 115 dB(A). When averaged over a 15 minute assessment period (as per procedures in the NPfI) this could equate to an Lw in the range of between 100 and 105 dB(A) L_{Aeq} (15 min) for some sections of a track.

At 100m from the tracks this would result in a received noise of between 52 and 57 dB(A) L_{Aeq} (15 min). Noise at these levels would, most likely exceed any day time noise criterion developed in accordance with the NPfI (for future developed areas).

Note that there are no defined noise criteria for the future residential areas in the vicinity of the site and the comments relating to a day time criterion are indicative only and would need confirmation by long term noise monitoring and specific analysis.

At 200m, under the assessed conditions, the noise would be in the range from 46 to 51 dB(A) L_{Aeq} (15 min). This would also, most likely exceed a day time noise criterion (noting the disclaimer above).

Similarly, at 400m the received noise would be 40 to 45 dB(A) L_{Aeq} (15 min), which is at levels that may be considered acceptable during the day. The acceptability of the noise will also depend on the number of times per year the MMC is in operation.

As detailed in Section 4.1, the noise criteria in the NPfI are applicable externally to a residential receiver.

Without any opportunity for the application of noise control at the MMC, noise control may have to be applied in the noise propagation path or at the receivers.

For the current situation, there would be limited opportunity to control noise in the propagation path, through the use of noise barriers and buffer zones etc.

The discussion above indicates that, under the assessed conditions (and in the absence of a site specific noise criterion), a buffer zone of up approximately 400m may be required to achieve compliance with a theoretical day time external noise criterion of, say, 45 dB(A) L_{Aeq} (15 min).

Any proposed residences that may be closer than 400m from the noise source(s) at the MMC could require development consent conditions necessitating individual acoustic assessment and the application of noise control specific to the individual house design.

Such an assessment would be aimed at achieving the internal noise criteria (within a residence) from the Infrastructure SEPP (see Section 4.2) would, typically, be considered acceptable.

As the noise source at the MMC only operates through the day, any assessment of noise levels would have to account for living areas only. The acceptable level would be 40 dB(A) L_{Aeq} in living spaces.

The comments above relate to the continued operation of the MMC within the proposed CPCP area. Any changes to, or ceasing of, activities at the MMC will likely negate the need for the noise mitigation requirements.

5.2 Appin Power Station

Appin Power Station utilises waste coal mine gas to supply generators that produce electricity for supply to the power grid (shown as a star in **Figure 5**).

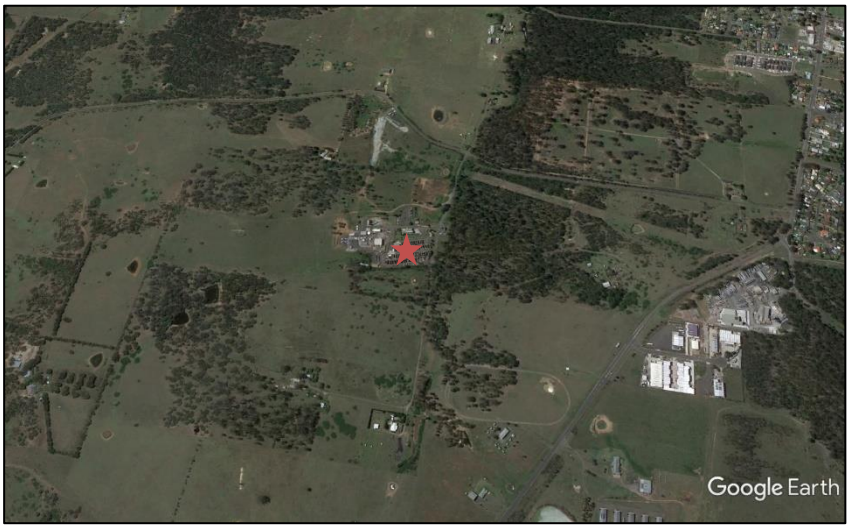


Figure 5: Appin Power Station Location

The power station is associated with activity at the Appin Coal Mine and is located adjacent to some mine facilities including the Number 1 and 2 vent shafts.

Noise emission limits from the power station are detailed in the Appin Mine Noise Management Plan (NMP), dated December 2020. These noise limits have been previously determined through application of the procedures in the NPfI.

The adopted noise criterion at residential locations in the vicinity of the power station is 41 dB(A) L_{Aeq} (15 min) applicable during the day, evening and night time periods.

Figure 5 shows that the power station is located in an area that is currently relatively removed from any residential receivers. The nearest existing receiver is about 450m from the power station.

The mine undertakes noise monitoring at the most potentially affected residential receiver to the south of the site. Noise from the power station and vent fan has been audible and measurable at this location.

Figure 6 shows an extract from the Appin and North Appin Precincts Site Plan with the location of the power station shown indicatively with a star.

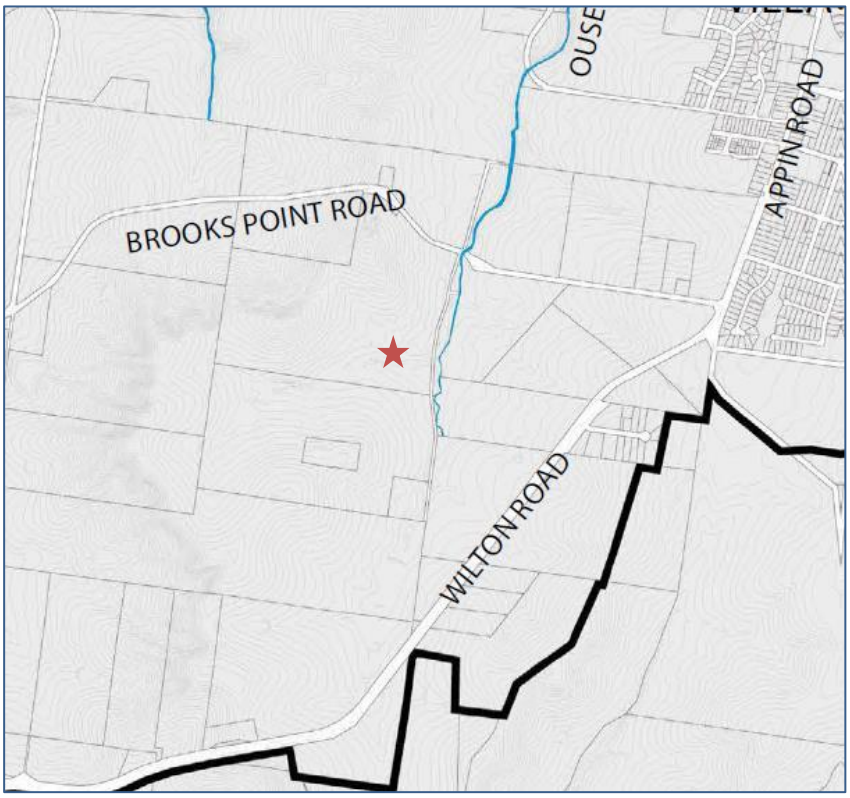


Figure 6: Appin and North Appin Precincts Site Plan – Power Station Location

The Appin and North Appin Precincts Indicative Plan (Table 1 and Figure 9) shows that the nearest proposed residential zones will be approximately 200m from the power station.

Published information from Appin Mine has indicated that some noise mitigation works have been undertaken at the vent shafts in recent years.

Assuming that the power station and mine facilities are currently operating in compliance with the adopted noise criteria, implies that the noise at the receiver approximately 450m from the site is less than 41 dB(A) L_{Aeq} (15 min). It can also be assumed that noise generation from the power station doesn't contain any directional components and, therefore, the noise propagation would be similar in all directions from the site.

Under such circumstances, the noise at receivers that are about 200m from the power station could be up to 47 dB(A) L_{Aeq} (15 min). This would be 6 dB(A) over the adopted day, evening and night time noise criteria for the site.

The power station and associated mine infrastructure comprises a relatively large industrial complex with many individual noise sources distributed throughout the space and at different heights.
Controlling the noise in the propagation path, through the use of noise barriers etc., would require specific analysis. The effectiveness of a noise barrier increases with proximity to either the noise source or the receiver.

In the current situation a noise barrier would have to be constructed close to the power station. From an acoustic point of view, a single noise barrier, built around a noises source is, usually, preferable to applying multiple noise control options and many receivers.

In general, a noise barrier that just breaks the line of sight between a source and a receiver will have an insertion loss of about 5 dB(A).

An alternative would be to apply noise control at the residences. As discussed in Section 5.1, there would need to be an acceptance that the requirement would be to achieve an adequate internal noise level (and not compliance with the NPfI). As the noise source may operate 24 hours per day, any assessment of noise levels would have to account for living and sleeping areas.

Any acoustic assessment would also require quantification of the Lw of the power station, and other mine facilities at the site, throughout all times of the day, evening and night and under all operating conditions. Calculation of received noise at all potentially affected receivers would subsequently need to be performed.

5.3 Vent Shaft

The location of the Appin East Number 3 vent shaft is shown as a star in **Figure 7**.

Figure 7: – Appin East No.3 Vent Shaft - Location

Noise emission limits from the power station are detailed in the Appin Mine Noise Management Plan (NMP), dated December 2020. These noise limits have been previously determined through application of the procedures in the NPfI.

The adopted noise criteria at locations in the vicinity of the power station is variable depending on the individual receiver locations. The criteria range from 35 to 41 dB(A) L_{Aeq} (15 min) with the same limits applicable during the day, evening and night time periods.

Figure 7 shows that the vent shaft is located in an area that is currently relatively removed from any residential receivers. The nearest existing receivers is between 350m and 500m from the vent shaft.

Figure 8 shows an extract from the Appin and North Appin Precincts Site Plan with the location of the vent fan shown indicatively with a star.

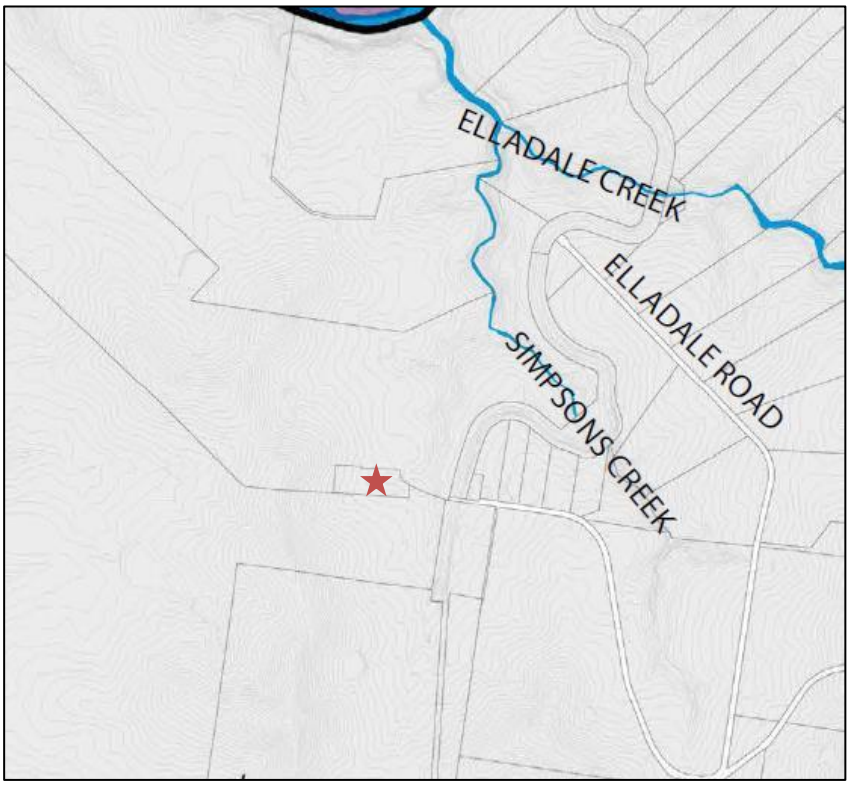


Figure 8: Appin and North Appin Precincts Site Plan – Vent Fan Location

The Appin and North Appin Precincts Indicative Plan for the area shows that the vent shaft is to be located within an area zoned for proposed residential.

Under typical operating conditions, vent fans for this type of application would have an Lw of around 100 dB(A) and would operate continuously 24 hours per day. There are two vents at the location which would give a total Lw for the site of up to 103 dB(A).

The development of future residential areas in close proximity to an unattenuated vent fan would likely be incompatible under most circumstances.

Vent fans can be housed within acoustic enclosures and have acoustic louvres fitted to outlets, but the application of these types of noise control techniques require specific acoustic and engineering analysis to ensure that noise levels can be decreased whilst maintaining the viability of the operation of the vent.

Alternatively, or in conjunction with noise control at the vent fans, residences could be constructed incorporating architectural modifications that result in acceptable internal noise levels with ins various areas of occupation.

That is, accepting that external noise levels may exceed the adopted criteria, but specifying minimum construction types for the façade of a residence that will attenuate the noise and achieve an adequate internal acoustic environment.

Typically, this would involve incorporating judicious design taking into consideration the location of the noise source and layout of the living and sleeping areas with in a residence and the specification of minimum glazing and plasterboard type and thickness, and any other architectural modifications that may be assessed as being required.

This type of noise control application is not uncommon and is often required for residential developments in the vicinity of major roads or other potentially significant noise sources.

6.0 ROAD TRAFFIC NOISE

Figure 9 shows an overview of the Appin and North Appin Precincts Indicative Plan.

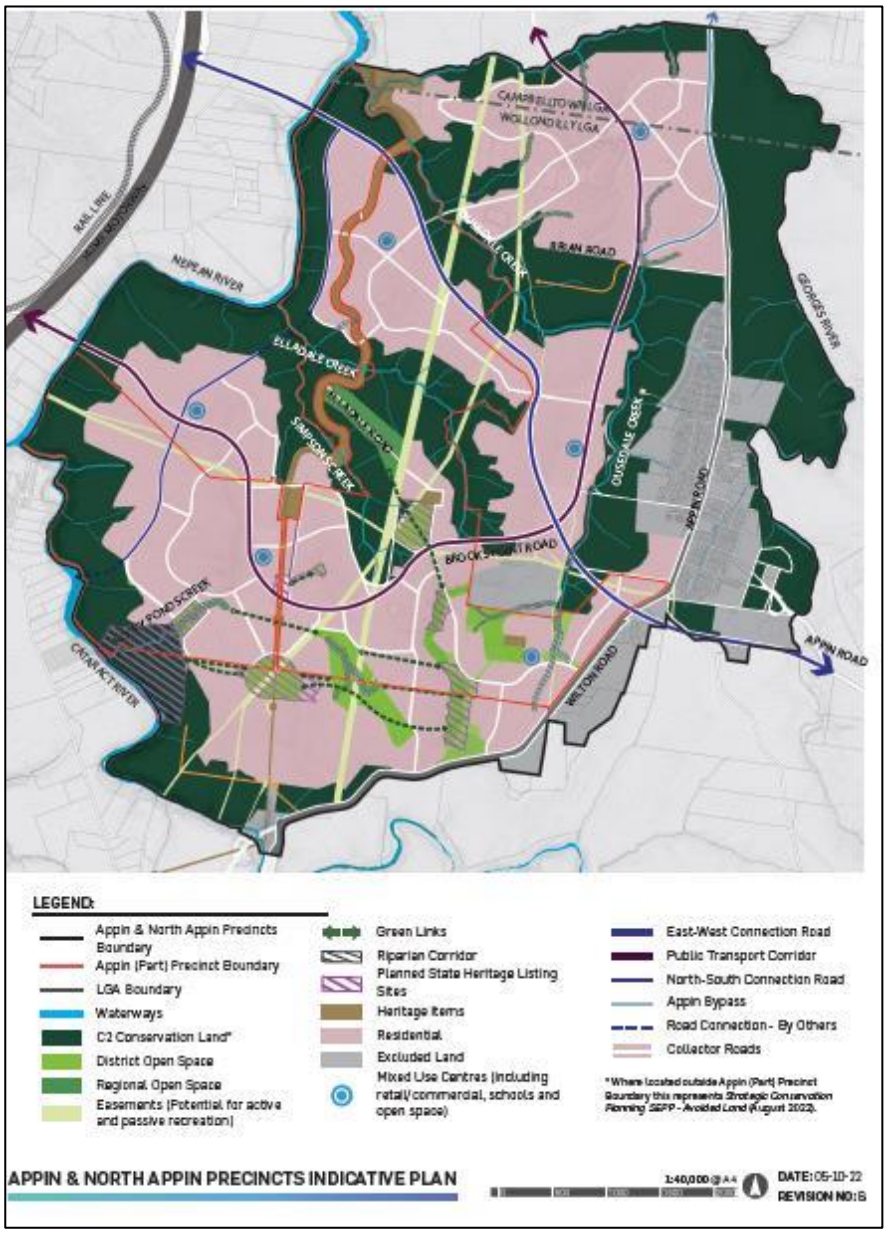


Figure 9: – Appin and North Appin Precincts Indicative Plan

The Appin and North Appin Precincts Indicative plan in Figure 9, shows the location of the various existing and proposed roads (including the proposed East-West Connection, which will link the Hume Highway to Appin), and the proposed Public Transport Corridor.

6.1 Future Predicted Noise Levels

In considering potential traffic noise impacts on a residential development, it is typical for TfNSW to assess the traffic noise levels projected for 10 years from the timing of the development. This is referred to as the “Future Predicted” noise level.

As the current assessment is for a proposed rezoning there is no defined timing for any potential development.

Existing traffic volumes on Appin Road and Wilton Road will increase significantly due to the increased occupation of the Appin Precinct and the Greater Macarthur Growth Area.

Similarly, the traffic volumes on the Hume Highway will likely increase, but the relative increase will be much less than that for the other roads (due mainly to the high volumes of traffic currently on that road). The Structure Plan shows that the nearest proposed residential areas to the Hume Highway will be a minimum of about 900m away.

The Interim Guideline outlines some standard noise control treatments which are separated into six categories depending on factors such as traffic speed, number of vehicles and distance from the road (assuming a direct line of sight to the road). The Interim Guideline also has some screen tests that can be used to determine whether an acoustic assessment is necessary and, if so, provide a general indication of the applicable noise control category. Screen test 1(b) from the guideline is reproduced below.

The speed limit on Appin Road in the study area is 60 kph, through the existing built up areas. On Wilton Road, in the study area the limit is 100kph. The Hume Highway in this vicinity has a speed limit of 110 kph.

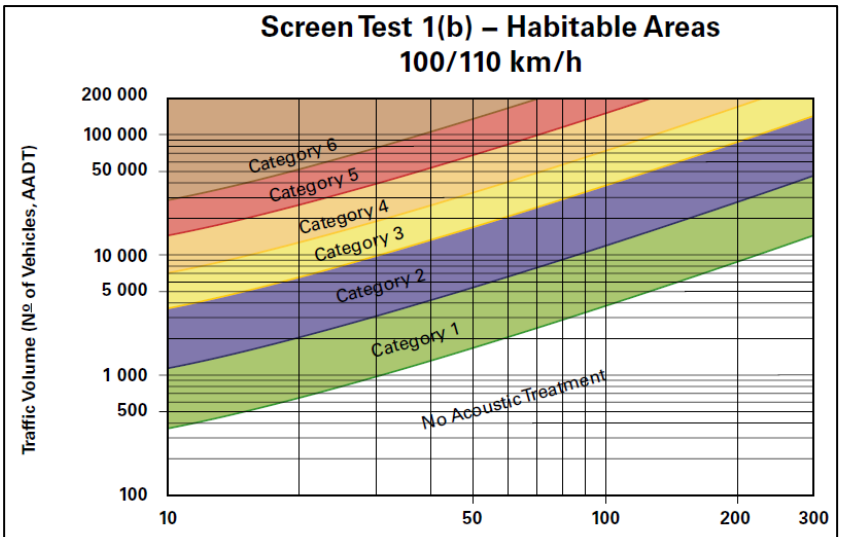


Figure 3.3(b): Screen tests for habitable areas of single/dual occupancy dwellings (if any exposed façade is direct line-of-sight)

The screen test 1(b) shows that the construction of any proposed residential receivers that are at a distance of 900m from the Hume Highway will not have any specific acoustic requirements.

Similarly, the Outer Sydney Orbital Phase 2 road west of the Hume Highway is located over 1000m from the closest parts of any proposed residential areas and, therefore, such residences would not require any specific acoustic treatment.

The environmental assessment for any major road such as the Outer Sydney Orbital would, necessarily, be accompanied by an extensive assessment of all acoustic factors and in include noise control elements which would be included, by the State Government, in the construction to achieve compliance with all road noise criteria.

The future traffic noise on other proposed roads will depend on the amount of development that has been completed at any time. To accurately determine any potential noise impacts in the proposed residential areas, the future predicted traffic noise levels will require to be computer modelled based on predicted traffic volumes as determined in applicable traffic studies. There are several accepted traffic noise modelling packages that can be used to predict the noise.

The noise models can be used to produce noise contours depicting zones of affectation.

Detailed assessment of the potential for noise impacts should be included in the concept design phase of road development to ensure that adequate noise mitigation measures are included that will be acceptable, and of maximum benefit, to the community. This may involve combinations of noise control within the road corridor (e.g., acoustic barriers, buffers zones, speed limits and pavement types etc.) and specification of minimum architectural treatments at residences or other buildings.

The Infrastructure SEPP recognises that judicious land use planning, architectural design, building orientation and good internal layout can achieve acceptable acoustic amenity near busy transport corridors.

The Interim Guideline supports the Infrastructure SEPP and guides development along motorways, tollways, freeways, transitways and other ‘busy’ roads.

As detailed in Section 4.2, for new residential developments, internal noise levels of 35 dB(A) have been set for bedrooms during the night-time period and 40 dB(A) for other habitable rooms.

While application of the Infrastructure SEPP requirements is mandatory only for residential developments near specific highly trafficked roads as listed in the guidelines, the design advice offered in the Infrastructure SEPP may be useful when designing such a development near other high traffic roads.

For new sensitive land use developments around existing busy roads in NSW, such as educational institutions, child care facilities, places of worship and hospitals, both suggested internal acoustic performance requirements and design principles are as shown in Table 5.

The acoustic design advice in the guideline may be considered when designing such a development near any type of road.

In certain circumstances, the Infrastructure SEPP imposes a requirement on councils to consider these guidelines before determining development applications for noise sensitive developments.

In general, when considering the subdivision of land located near busy roads, potential noise impacts should be taken into account at the master planning/concept planning stage. At that stage there is more opportunity to address noise and vibration through setbacks, building orientation, layout, building height controls, noise barriers or acoustic treatments at individual residences.

In some cases, it might be appropriate to design open spaces adjacent to the busy road corridor to setback residential uses to reduce noise exposure. These open space areas could also include appropriate bunding, or noise barriers, to buffer adverse noise impacts and provide for cycle or pedestrian paths along the road to improve accessibility.

It is noted that any bunding or noise barriers should be located within the road authority's corridor to ensure that materials and methodology of construction are consistent, including being all built at the same time.

In this manner the road authority can manage areas of damage in a consistent manner that does not affect the community from both a noise and visual perspective, including any timing of repairs.

6.2 Noise Control

Figure 10 is a reproduction of Figure B2 from the Interim Guideline showing a typical situation of a dwelling adjacent to a busy road. Acoustic consultants often use the Interim Guideline (and Figure B2 specifically) in recommending architectural modifications to achieve the recommended noise levels.

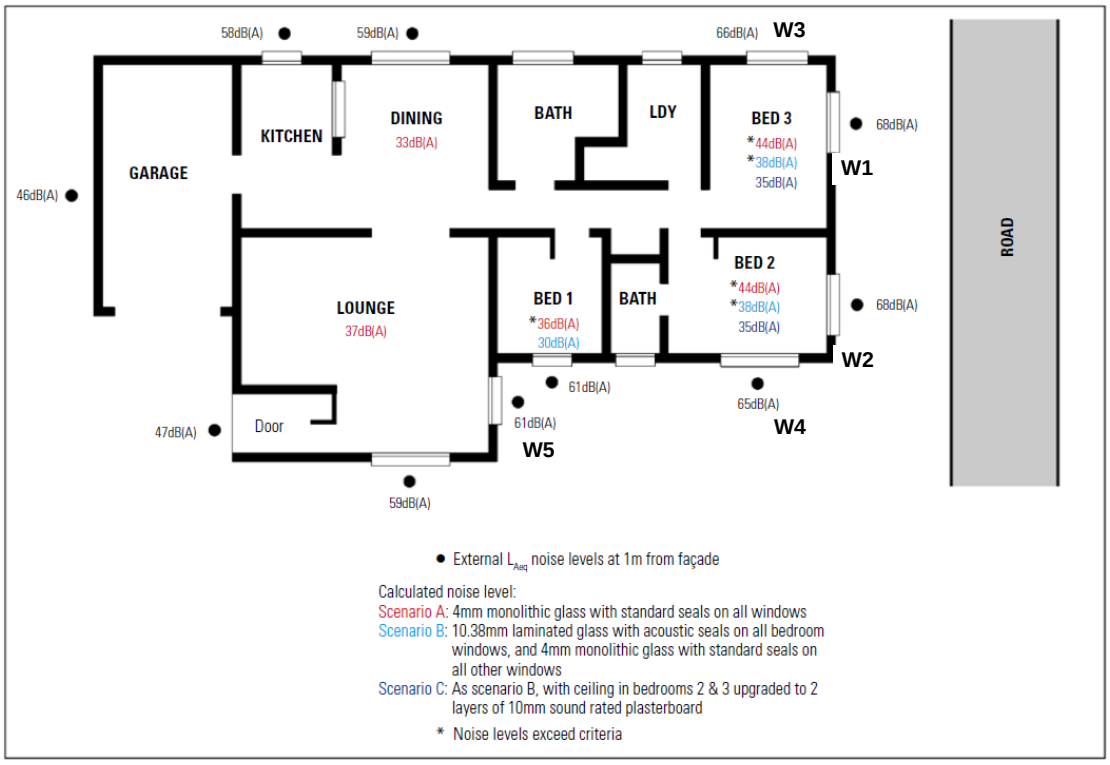


Figure 10: Traffic noise reduction for various construction types.

Figure 10 shows a traffic noise level of 68 dB(A) at windows W1 and W2 directly facing the road. Windows W3 and W4 are on facades perpendicular to the road, thereby being shielded from 50% of the traffic noise by the building structure, and noise levels are 2-3 dB below the traffic noise level at W1 and W2. Window W5 is approximately twice the distance from the road as W4 and experiences an external traffic noise level 4 dB below the level at W4.

Figure 10 also gives the traffic noise attenuation for three construction scenarios labelled A, B and C. The following specifications for these construction scenarios are reproduced from the Interim Guideline.

The specification for walls includes insulation in the wall cavity, however brick veneer achieves Rw >45 without insulation, which will not reduce the overall noise insulation of the room as a whole, since windows are the acoustically weakest elements.

Specification A

Windows	standard 4mm monolithic glass with standard weather seals on all windows	(Rw 25)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	tiled roof and standard plasterboard ceiling with insulation	(Rw 43)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Specification B

Windows	10.38mm laminated glass with acoustic seals on all bedroom windows, standard 4mm monolithic glass with standard seals on all other windows	(Rw 35)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	tiled roof and standard plasterboard ceiling with insulation	(Rw 43)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Specification C

Windows	10.38mm laminated glass with acoustic seals on all bedroom windows, standard 4mm monolithic glass with standard seals on all other windows	(Rw 35)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	as per Specification B, except the single layer of standard plasterboard ceiling is replaced with a double-layer of 10mm sound-rated plasterboard ceiling	(Rw 52)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Table 6 summarises the traffic noise reduction provided by each construction scenario for the cases in Figure 10 where a room contains either one or two windows.

Table 6: Traffic noise reduction (dB) (from Figure B2 of the Interim Guideline)

Construction scenario	Noise reduction (2 windows)	Noise reduction (1 window)
Scenario A	23	25
Scenario B	29	31
Scenario C	32	34 (estimated)

The acoustic treatment of a residence is dependent on several factors relating to such things as room size and orientation, the size and location of windows or other openings and shielding from other structures. Detailed acoustic treatment options would require specific analysis at the design stage of each residence.

By way of typical example, a house near a busy road could be exposed to traffic noise of 68 dB(A) during the day and 62 dB(A) at night. Assuming no other noise reduction this means that the facade of the house may need to attenuate up to 28 dB(A) for living spaces and 27 dB(A) for bedrooms. Such a residence would, typically, require minimum construction scenario B as described above.

6.3 Building Treatments

In general, the Interim Guideline indicates that where a new residential development is planned to occur near a busy road appropriate building design, layout and construction techniques should be applied to minimise noise intrusion and provide suitable internal noise levels for sleeping and other uses.

The following sections provide some general information in relation to incorporating sound acoustic practises in house design.

6.3.1 Walls

Masonry walls typically have better noise insulation properties than other elements in the building envelope. Generally, walls are not a significant noise transmission path. Attention should, therefore, be given to the windows, doors, roof and ventilation openings as these elements will not insulate as well as the walls.

Walls of lightweight construction (e.g., weatherboard, compressed fibrous cement sheeting, timber slats, timber sheeting etc.) provide less noise insulation than masonry walls to low frequency noise. On noisy sites lightweight cladding should be avoided unless specifically designed to provide adequate insulation.

Whether the walls are masonry or of light-weight construction, the wall's insulation capacity will be weakened if it contains ventilators, doors or windows of a lesser insulation capacity. To improve insulation response, ventilators can be treated with sound-absorbing material or located on walls which are not directly exposed to the external noise.

6.3.2 Windows

In acoustic terms windows are one of the weakest parts of a facade. An open or acoustically weak window will severely negate the effect of an acoustically strong facade.

Whenever windows are incorporated in a building design their effect on acoustic performance of the building facade should be considered. Reducing the numbers of windows and/or appropriately positioning them away from the road can be beneficial.

Proper sealing is crucial to the success of noise reduction of windows. To prevent sound leaks, windows should be caulked (with a flexible sealant such as mastic or silicone) thoroughly from the inside, and outside between the wall opening and the window frame. Usually the best option is use one of the many commercially available double glazed or laminated windows with acoustic seals.

Laminated glass is usually cheaper and easier to install than double glazing and is relatively effective in reducing moderate to high levels of traffic noise as indicated previously in this report. Double-glazing: is cost-effective when a very high level of noise attenuation is required. When using double-glazing, the wider the air space between the panes the higher the insulation.

Other factors influencing the acoustic performance of windows include:

- Window seals: ensure windows are fitted with high quality acoustic seals and close windows to reduce internal noises levels.
- Reduction in window size, recognising that reducing the proportion of window to wall size from 50% to 25% reduces noise by only 3 decibels.
- Increase the glass thickness: the thicker the glass the more noise resistance it provides. However, glass thickness is only practical up to a point before the costs exceed the acoustic benefits of increasing glass thickness.
- The presence of absorbent materials on the window reveals will improve noise insulation.
- Window frames and their installation in wall openings must be air tight and operable. Windows must incorporate acoustic seals for optimal noise insulation.

The Interim Guideline also indicates that external areas at residences should be shielded from high levels of noise.

Whilst it may not be possible to acoustically shield the entire yard of a house it is usually relatively simple to shield smaller active recreation areas such as courtyards. Such courtyard areas can be located to be acoustically shielded by the building elements of the house or garage or can be otherwise shielded by the construction of solid fencing or walls. To act as an acoustic barrier any fencing or walls must be solid to the intended height (to be determined by individual assessment) with no gaps for the passage of sound.

7.0 - CONCLUSION

An acoustic assessment has been undertaken into the potential for various noise sources to impact on an area proposed for rezoning within the Appin and North Appin Precincts of the Greater Macarthur Growth Area.

The assessment has identified several existing and proposed noise sources and the typical noise levels from them. Based on this general noise control options have been detailed.

The assessment has indicated that a combination of relatively common architectural treatments and noise control such as construction of noise

barriers, can be employed to achieve an adequate acoustic amenity at future residences.

In conclusion, from an acoustic point of view, the proposed development may be supported provided the appropriate noise attenuation measures are incorporated at key existing noise generating sites and proposed infrastructure deliverables for the project.

Detailed and specific acoustic assessment will be required for the areas shown on Figure 2 and discussed in Section 5 of this report.