MARSHALL DAY Acoustics

REZONING OF 80-120 PACIFIC HIGHWAY DOYALSON (DOYALSON WYEE RSL CLUB) ACOUSTIC ASSESSMENT

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EXECUTIVE SUMMARY

The purpose of this report is to present the results and findings of an investigation into the acoustic impacts associated with the proposed re-zoning of land at 80-120 Pacific Highway Doyalson, associated with the Doyalson Wyee RSL Club (the Club).

This Planning Proposal is an Addendum to the Planning Proposal submitted for 100-120 Pacific Highway in December 2018.

This report examines the acoustic impacts associated with the proposed rezoning and land uses, both on the site as well as adjacent land uses. A proposed masterplan has been referenced for the purposes of this rezoning application in order to demonstrate the feasibility of achieving compliance for one potential redevelopment scheme of the site. We note that further acoustic assessment would be required of any proposed developments at DA stage.

The existing Club is a tenant on lands at 80-90 Pacific Highway. The Club owns adjacent freehold properties at various locations in within the boundaries of 80-90, 100, 110 and 120 Pacific Highway**.**

The current zoning permits a limited range of land uses, including rural and recreational uses. The Planning Proposal seeks to deliver a broader range of retail, recreation, community and residential uses. The Planning Proposal seeks to change the zoning from RU6 Transition to RE2 Private Recreation with an additional permitted use schedule that includes the land uses contained in the concept plan.

The acoustic constraints on the site relate to:

1. noise impacts on the development from traffic using the Pacific Highway
2. noise emission from the development to adjacent sensitive receivers including existing residential receivers in Wentworth Avenue
3. noise impacts from the development onto other sensitive receivers within the development

Noise impacts from new commercial and recreational uses would likely require few controls to address impacts to existing residential areas but would need to be managed to any new sensitive uses on the site (such as seniors living or tourist accommodation).

Modelling of the current masterplan has demonstrated that required noise controls are practically achievable for the proposed uses.

Similarly, the noise impacts on any new commercial developments on the site, from the Pacific Highway, will be able to be managed with building layouts and architectural upgrades.

High noise level outdoor activity such as a go kart facility would require careful noise mitigation. This may involve the selection of low noise (e.g. electric) karts with adjustable noise settings, suitable placement of the track on site, management controls (such as operating hours or number of concurrent karts in use) or physical controls such as barriers, mounds or buildings. The noise emissions are likely to be manageable due to the physical distance separation from residential receivers. A detailed assessment of any proposed high noise intensity activity such as go karts would be required when a development application is made.

The use of the site for short stay accommodation, such as a motel or resort, would need to consider mitigation of noise from other new uses on the site (e.g. licenced premises, commercial and recreational uses) as well as noise from the Highway. The required treatment of the building will need to be balanced with the requirements to treat other noise sources within the development (i.e. if noise from the Club is reduced the acoustic controls required for the motel façade will be reduced). These impacts could be practically mitigated with available technology, primarily the incorporation of architectural upgrades (e.g. acoustic glazing) into the design and construction of the buildings.

The use of the site for a seniors living development would need to consider and mitigate noise from other new (commercial) developments on the site. The form of this mitigation would need to be considered during

the design of each phase. Noise impacts on a seniors living development from road traffic would also need to be considered during detailed design.

The use of the site for permanent (or semi-permanent) residential development (such as a mobile home estate) would need to consider and mitigate noise from other new (commercial) developments on the site. The form of this mitigation would need to be considered during the design of each phase.

Noise impacts on residential development from the Pacific Highway may be above 65dB $L_{Aeq(15hr)}$ at the residents closest the road. This will require some form of acoustic mitigation in order to provide internal amenity. External amenity is not directly protected in the noise policies applicable to the site, however provision of private open space with a reasonable level of acoustic amenity is recommended.

Whilst the future traffic noise levels would require mitigation for residential use the noise levels are typical for residential lands adjoining arterial roads and feasible noise control options are available. The mitigation may include a combination of the following:

- Noise mounding or barrier to the Pacific Highway frontage to residential uses
- Architectural upgrades to dwellings, such as acoustic rated glazing or alternative ventilation systems (to allow windows to stay closed to exclude noise whilst still providing fresh air to residents)
- Lot layouts that orientate the buildings so that the first row of buildings provide shielding to their rear private open space, while providing acoustic façade upgrades to achieve internal amenity.
- Dwelling layouts which orientate noise sensitive areas, such as bedrooms, away from the road noise source, while locating less sensitive uses, such as garages and bathrooms, towards the noise.

Screening, such as acoustic fencing, may also be required to shield noise from any new internal roads on the site to new or existing residences. This would need to be assessed during the development application for any subdivision and would depend on variables including the projected traffic volumes.

There is potential for the proposed through traffic on the eastern portion of Wentworth Avenue to generate noise impact to the adjacent existing residential lots. Quantification of the impact will require detailed information on the expected traffic flows along Wentworth Avenue. This would be compared with suggested limits with the EPA Road Traffic Noise Policy.

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1.0 INTRODUCTION & SCOPE

The purpose of this report is to present the results and findings of an investigation into the acoustic impacts associated with the proposed re-zoning of land at 80-120 Pacific Highway Doyalson, associated with the Doyalson Wyee RSL Club (the Club).

This report examines the acoustic impacts associated with the proposed rezoning and land uses, both on the site as well as adjacent land uses. A proposed masterplan has been referenced for the purposes of this rezoning application in order to demonstrate the feasibility of achieving compliance for one potential redevelopment scheme of the site. We note that further acoustic assessment would be required of any proposed developments at DA stage.

Possible noise control approaches for future developments are discussed throughout this report, however any future development will need to be assessed in more detail at a development application stage.

This report is based on measurements, calculations and site visits carried out by Marshall Day Acoustics, in addition to:

- Subdivision Plan – Indicative Concept Plan provided by Urbis – 21 June 2019
- Projected traffic report provided by TTPP: 'Doyalson-Wyee RSL Structure Plan Transport Impact Assessment 17395, dated 15 October 2018
- Survey / terrain data provided by VERIS in February 2018

2.0 SITE DESCRIPTION & PROPOSED RE-ZONING USES

The existing Club is a tenant on lands at 80-90 Pacific Highway. The Club is wishes to relocate to its freehold land at 100-120 Pacific Highway. The relevant lots are shown in Figure 1.

This Planning Proposal has been prepared on behalf of Doyalson Wyee RSL Club (Club Ltd) to amend the Wyong Local Environmental Plan 2013 (WLEP 2013) for 80-120 Pacific Highway, Doyalson. This Planning Proposal is an Addendum to the Planning Proposal submitted for 100-120 Pacific Highway in December 2018.

The Club Ltd is seeking to diversify its offer to meet the needs of a growing local community and to enhance its unique landscape setting to create a new leisure and experience – the Australian Resort.

Therefore, this Planning Proposal seeks to facilitate the future redevelopment of the site for an integrated retail, recreation, community and residential precinct, centred around Doyalson Wyee RSL Club.

The current zoning permits a limited range of land uses, including rural and recreational uses. The Planning Proposal seeks to deliver a broader range of retail, recreation, community and residential uses. The Planning Proposal seeks to change the zoning from RU6 Transition to RE2 Private Recreation with an additional permitted use schedule that includes the following land uses contained in the concept plan.

An Indicative Concept Plan (Concept Plan) has been developed to support the Planning Proposal (Figure 4). The Concept Plan includes the following land uses:

- RSL Club;
- Wellness and fitness centre;
- Indoor and outdoor recreational facilities;
- Tourism and accommodation;

- Restaurants and cafes;
- Medical centre;
- Childcare centres;
- Seniors Living ;
- Residential; and
- Landscaping, open space and lakefront accessibility

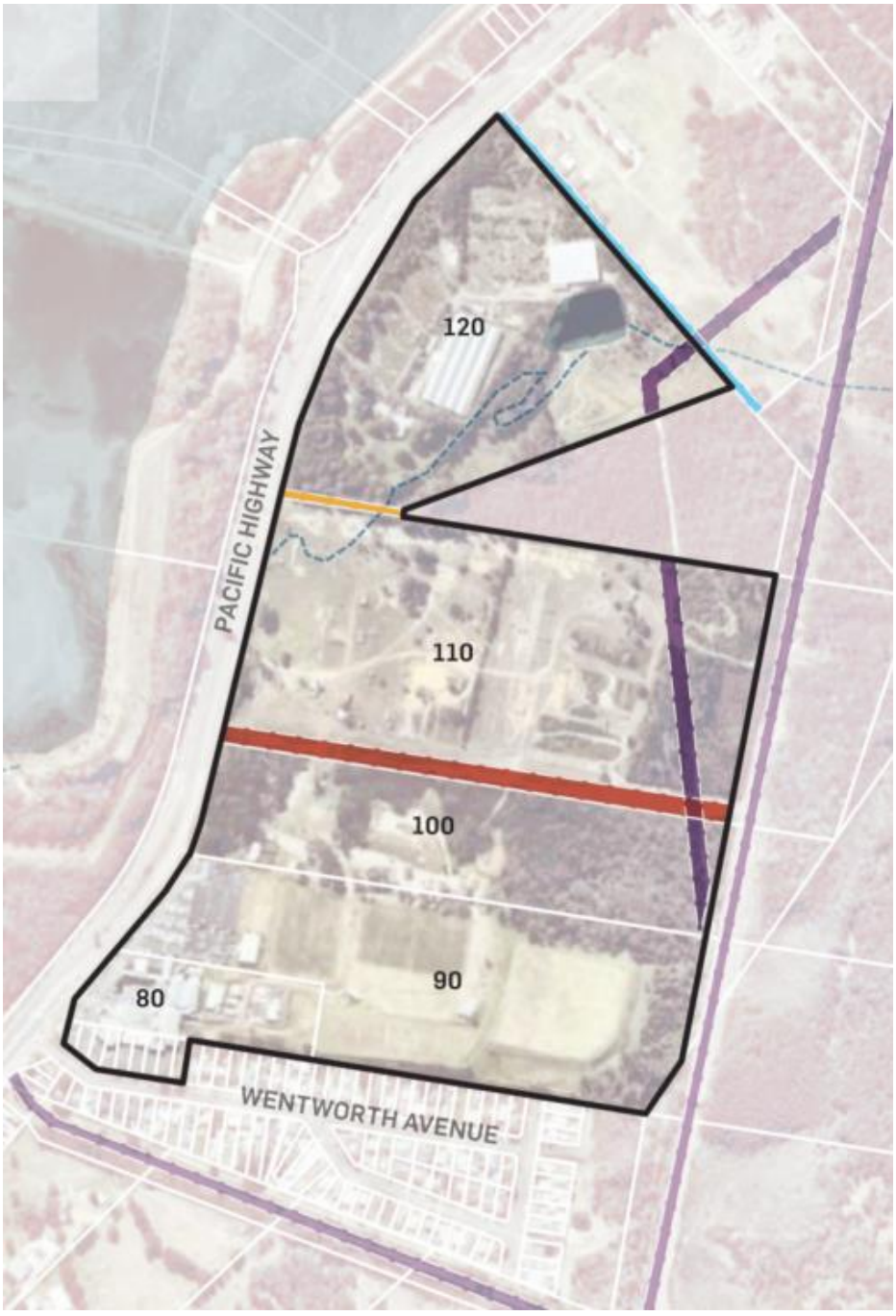


Figure 1: Site location and lot boundaries (Urbis)

The only significant external noise source in the immediate vicinity of the development is the Pacific Highway, adjacent the western site boundary.

2.1 Subject Site – Existing Club

The existing Club is located at 80-90 Pacific Highway and incorporates a range of facilities, including:

- food and beverage outlets, including outdoor courtyards
- gaming facilities
- function rooms
- an auditorium, hosting events including live music
- a commercial gym
- parking at grade on the north, west and southern side of the main Club building
- a loading dock on the southern side of the main Club building

A commercial outdoor recreation area, identified as Raw Challenge, is operated on existing Club lands, currently on 110 Pacific Highway.

Residential receivers are located to the south and east of the Club, along Wentworth Avenue. The residential receivers are low density, generally one or two-story free-standing dwellings. The nearest residence to the east of the Club (directly adjoining the site boundary) is 47 Wentworth Avenue. The nearest residences to the south are 40-56 Wentworth Avenue, which are directly opposite the Club frontage to Wentworth Avenue.

The existing Club building and proximity to residential receivers is shown in Figure 2 and Figure 3.

Figure 2: Existing Club building location and residential receivers (Image Courtesy NearMaps)

Figure 3: Existing Club, Residential Receivers & Proposed Site Location (Image Courtesy NearMaps)

2.2 Planning Proposal Site

The following land uses are proposed to be permitted under the rezoning of 80-120 Pacific Highway:

- RSL Club
- Wellness and fitness centre
- Indoor and outdoor recreational facilities
- Tourism and accommodation
- Restaurants and cafes
- Medical centre
- Childcare centre
- Seniors living development

- Landscaping, open space and lakefront accessibility
- Motel
- Residential dwellings

A proposed masterplan has been referenced for the purposes of this rezoning application. We note that further acoustic assessment would be required of any proposed developments at DA stage. The masterplan (prepared by Urbis) is included and reference in this report as Figure 4. The uses proposed under the masterplan include:

Precinct 1

RSL Club:

- Entertainment & gaming areas, including outdoor facilities
- Food and beverage outlets
- Function Room(s)
- Hairdresser & drycleaner
- Kids internal recreation

Motel/Hotel:

- Stage 1 Hotel – 102 Rooms & Ancillary
- Stage 2 Hotel – 72 Villa Style & Ancillary
- Resort style with up to 200 rooms

Health & Wellness Precinct (Stage 1 & 2):

- Gym / fitness centre
- Spa
- Swimming pool complex
- Physio

Car Parking – Lots 1, 2 & 3 & Verge Car Parking

- 781 Spaces

Precinct 2

Fast Services:

- Four fast food outlets with drive thru
- Service Station
- Car Wash

Car Parking – Lots 4, 5 & 6

- 155 Spaces

Precinct 3

Medical Centre – 2 storey

Childcare centre(s):

- Up to 360 places

Car Parking – Lot 7

- 128 Spaces

Precinct 4

- Recreational warehouse & arrivals centre
- Raw challenge course
- Go-kart track – (Electric Karts)
- Paintball

Car Parking – Lot 8

- 180 Spaces

Precinct 5

Seniors Living Development

Car Parking – as required throughout the Seniors Living Development

Residential and MHE lots

The proposed residential and Seniors living lots are planned on lots 80-110 with lot totals shown on the Urbis masterplan as follows:

Lot 80-110	Residential Lots (No.)	Seniors Living Lots (No.)
Total	141	220

Figure 4: Proposed Masterplan

3.0 EXISTING ACOUSTIC ENVIRONMENT

The existing acoustic environment on site was quantified via both attended and unattended measurements as detailed below. Survey work has been carried out in sufficient detail for the rezoning assessment but additional measurements may be required for future development applications.

3.1 Ambient environment

Unattended noise monitoring location has been used to establish background noise levels for residential receivers in Wentworth Avenue.

An ARL-316 noise logger, serial no. 16-707-018 was installed near the rear (northern) boundary of 23 Wentworth Avenue, in the land adjacent the sporting fields. The logger was on site for the period 06 February 2018 to 16 February 2018 with background noise levels measured continuously and logged in 15-minute intervals. The logger background noise data was then analysed and edited, removing data sets affected by poor weather conditions and data exclusion guidelines set out in the EPA's Noise Policy for Industry (NPfI).

The calibration of the unit was checked prior to and following the measurement period using a Rion NC-74 Sound Level Calibrator and exhibited no significant deviation.

In the NPfI, the background noise level is termed the Rating Background Level (RBL). We have determined the RBL and L_{Aeq} noise levels for the relevant periods in accordance with the procedures detailed in the NPfI.

The survey results for the entire measurement period are summarised in Appendix B. A summary of the logging measurements is shown in Table 1 below.

Table 1: NPfI time periods and measured background noise levels for Wentworth Avenue receivers

Time Period and Description	RBL L_{A90} dB	$L_{Aeq(period)}$ dB
Daytime (0700*-1800hrs)	35	52
Evening (1800-2200hrs)	36	51
Night (2200-0700*hrs)	37	52

*0800 on Sundays and public holidays

The logger location was selected to be far enough east of the Club so as to not have any significant contribution for existing activities at the Club. This location is also well removed from significant traffic noise associated with the Pacific Highway. As such the residential receivers nearer the existing Club and the Highway are likely to have higher background noise levels.

4.0 CRITERIA

The purpose of this assessment is not to set final design criteria for noise impacts, either from or to the development, but rather to carry out a high-level overview of likely acoustic impacts. The criteria below should therefore not be applied to any development applications and are for guidance in the rezoning assessment only.

For example, the criteria for the existing residential area are derived based on a noise logger installed adjacent 23 Wentworth Avenue, some 200m from the existing Club building and over 300m from the Pacific Highway. This location was selected to be free of influence from the existing Club operations. Residences closer to the Club and the Highway will be subject to higher background noise levels and would therefore have a higher (less stringent) noise criteria.

4.1 Impacts from the development on existing residences

Impacts from the rezoned land to existing residences in Wentworth Avenue have been assessed based on the current masterplan. In the absence of any specific acoustic policy from Wyong Shire Council the assessment criteria are as set out below. Derivation of the specific criteria are set out in Appendix C.

4.1.1 Liquor & Gaming NSW Standard Noise Conditions

The standard noise conditions from Liquor & Gaming (L&G) would apply to noise from licenced premises within the development, primarily for noise from music and patrons. Other sources within licenced premises such as car parks and mechanical plant would normally be assessed under the NPfI, as set out below.

The L&G criteria applicable to the site would broadly apply the following limits at existing receivers. The criteria would be assessed in octave bands but are presented as overall A-weighted figures below for clarity.

Table 2: Liquor & Gaming Criteria (to be assessed in octave bands)

Time period	Criteria L_{A10} dB	Note
7am-12am	40	
12am-7am	35	Must also be inaudible within any habitable room in a dwelling

4.1.2 NSW EPA Noise Policy for Industry (NPfI)

The NPfI would likely be applicable to most noise generated by the development including from:

- All car parks and vehicle movements on site (including loading docks)
- Mechanical plant
- Noise generated by non-licenced premises, including Health & Wellness, Motel, Fast Services, Go Karts & Recreational Commerce.

Table 3: NPfI criteria

Time Period and Description	**$L_{Aeq(15min)}$ dB**
Daytime (0700*-1800hrs)	40
Evening (1800-2200hrs)	40
Night (2200-0700*hrs)	40

*0800 on Sundays and public holidays

The NPfI criteria would need to be assessed for annoying characteristics such as tonality, low-frequency noise or intermittency and adjusted in accordance with the policy.

4.1.3 AAAC Guideline for Child Care Acoustic Assessment

The Association of Australasian Acoustical Consultants (AAAC) Guideline for Child Care Acoustic Assessment may be applied for assessment of the proposed child care centres. In practice the derived criteria from this policy are likely to be very close to the criteria derived under the NPfI.

4.1.4 EPA NSW Road Noise Policy (RNP)

Noise generated from development on the rezoned land due to additional traffic on surrounding public roads would be assessed against the EPA NSW Road Noise Policy.

In practice the high levels of existing traffic on the Pacific Highway mean that any additional traffic from the development is unlikely to result in any noise issues on this road.

Access to the site is proposed via the Pacific Highway, with some additional internal circulation along Wentworth Avenue, adjacent existing residential properties. This may result in additional traffic flow along Wentworth Avenue therefore introducing the possibility of additional noise impacts to the existing residential properties. Such noise impacts are assessed in accordance with the EPA Road Noise Policy (RNP) as summarised in Table 4 below.

Table 4: RNP external criteria

Generating Road	Criteria Day (7am-10pm)	Criteria Night (10pm-7am)
Pacific Highway	60dB $L_{Aeq(15hr)}$	55dB $L_{Aeq(9hr)}$
Wentworth Avenue	55dB $L_{Aeq(1hr)}$	50dB $L_{Aeq(1hr)}$

4.2 Impacts from the development onto new sensitive uses within the site

All above criteria in Section 4.1 would also generally apply to sensitive uses within the development, for example the tourist accommodation and seniors living development.

An exception to this may be where the receiver (e.g. motel) is under the same ownership as the noise generating activity (e.g. the Club building).

4.3 Impacts on the development from road traffic noise

4.3.1 SEPP (infrastructure) 2007 & DPE Interim Guidelines

For new residential uses within the site the State Environmental Planning Policy (Infrastructure) 2007 may apply. Whilst the SEPP requirements are mandatory only for roads with a daily traffic flow above 40,000 they are "best practice advice" for roads with daily flows of 20,000-40,000 vehicles. The Department of Planning & Environment (DPE) document *Development Near Rail Corridors & Busy Roads - Interim Guideline* sets out a framework for application of the SEPP criteria.

Table 5: SEPP / DPE Interim Guideline traffic noise criteria

Receiver	Criteria (dB)
Residential - sleeping area (bedroom)	35dB $L_{Aeq(9hr)Night}$
Residential – other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40dB $L_{Aeq(15hr)\ Day}$ or $L_{Aeq(9hr)\ Night}$ (at any time)
Educational including childcare	40dB $L_{Aeq(15hr)\ Day}$
Hospitals – Wards**	35dB $L_{Aeq(15hr)\ Day}$ or $L_{Aeq(9hr)\ Night}$
Hospitals – other sensitive areas**	45dB $L_{Aeq(15hr)\ Day}$ or $L_{Aeq(9hr)\ Night}$

Note*: The Interim Guideline refers to a Day period of 7am-10pm and a Night period of 10pm-7am

Note**: As this does not directly relate to medical centres, we have provided guideline from AS 2107:2016 in Section 4.3

The residential criteria in Table 5 applies for all forms of residential buildings including seniors living.

4.3.2 Australian Standard 2107:2016

Australian Standard AS2107:2016 provides recommended design sound levels for different areas of occupancy. This is a non-mandatory standard but has been used in this assessment to provide guidance on the likely quantum of noise control which will be required for new development on the site. A detailed table of levels from AS2107 is provided in Appendix C.6. For this assessment the targets summarised in

Table 6 have been used for determining conceptual façade treatments for internal spaces.

Table 6: AS2107 design targets for internal spaces L_{Aeq} dB

Receiver	Target	Applicable Period
Residential	35	Night
Medical	40-45	Day
Commercial	45	Day

4.3.3 AAAC Guideline for Child Care Acoustic Assessment

The Association of Australasian Acoustical Consultants (AAAC) Guideline for Child Care Acoustic Assessment may be applied to the proposed child care centres. Criteria for impacts on the centre(s) from road traffic or industry (which would apply to noise from other parts of the Club development) are set out in Table 7.

Table 7: AAAC Childcare Noise Criteria Summary

Area	Criteria – $L_{Aeq(1hr)}$ dB
Indoor play or sleeping areas	40
Outdoor play or activity areas	55

5.0 MODELLING RESULTS

5.1 Modelling assumptions

For the purposes of predicting noise from future development, the details of which are unknown, a series of assumptions regarding noise emission have been required. These are summarised in Table 8.

An environmental noise model for the site has been developed by MDA using SoundPLAN 7.4, a commercially available computer modelling package. For this project, our noise model was calculated using the following methodologies within SoundPlan:

- Predication of outdoor sound levels has used ISO 9613-2 Acoustics - Attenuation of sound during propagation outdoors
- Traffic noise levels across the site have been predicted using the Calculation of Road Traffic Noise (CoRTN) methodology.
- Carpark activities have been modelled with Bavarian Parking Area Noise study 2007 (Bayerisches Landesamt fur Umwelt) methodology. The study incorporates various selectable acoustic parameters including K_{PA}. Values for K_{PA} have been taken from the study and incorporated into the modelling.

Table 8: Noise modelling assumptions

Source	Assumptions
Pacific Highway	2036 traffic flow of 33,321 AADT; 4% Heavy Vehicles; 80km/h speed limit; 0dB surface correction. Calculated using CoRTN with -3dB adjustment from $L_{10(18hr)}$ to $L_{eq(15hr)}$ and -8dB adjustment from $L_{10(18hr)}$ to $L_{eq(9hr)}$.
Wentworth Avenue	The assessment noise generated by the any traffic increased flow along Wentworth Road will be carried out during detailed design and DA Stage.
RSL Club	2 groups of rooftop plant with L_{WA} of 93dB each group. Other sources such as music and patrons have not been modelled for future scenarios as breakout is highly dependent on built form and layout. Impacts are however discussed.
Car parks (excl. Fast services)	Bavarian Parking Area Noise (Bayerisches Landesamt fur Umwelt 2007) prediction model used. Model variables used; asphaltic lanes, K_{PA} = 3. Vehicle turnover of 1250 vehicle movements per hour between 7am-1am. 625 movements per hour 1am-7am. Note that 1 movement is a car either arriving or departing.
Fast services car park and drive thru	Bavarian model used with K_{PA} = 4. Vehicle turnover: 7am-6pm 420 movements/hr; 6pm-10pm 330 movements/hr; 10pm-7am 180 movements/hr. Rooftop plant with combined total of L_{WA} of 93dB
Health & Wellness	Internal level of up to 80dB L_{Aeq} from internal activity, such as gym classes. Glass façade with R_w 33 performance, e.g. single glazed façade. Rooftop plant with combined total of L_{WA} of 93dB
Childcare	100 children playing outside simultaneously with L_{wA} based on 87dB per 10 children (i.e. total L_{WA} of 97dB).
Go Karts	10 electric hire go karts have been assumed to be driving around the track simultaneously as a worst case scenario. A maximum sound power level of L_{WA} 89dB per kart has been assumed based on electric go karts. A 3 metre acoustic mound has been included on the northern side of the go kart track

5.2 Noise Modelling Results

Noise modelling results for proposed site plans and re-zoning are set out below based on the current masterplan proposal.

Figure 5 shows projected 2036 traffic noise impacts on the development from the Pacific Highway and Local Road 2.

Figure 6 shows projected noise emission from the development, based on the assumptions set out in Section 5.1.

Figure 5: Option H - Road traffic noise contours

Figure 6: Option H - Development noise emissions

6.0 DISCUSSION & RECOMMENDATIONS

A number of potential land uses are proposed to be allowed under the rezoning. Acoustic implications of the main proposed uses are discussed below. Particular reference is made to the current masterplan as a means to demonstrate one potential development path by which acoustic compliance can be achieved.

6.1.1 Commercial development

Commercial development on 100-110 Pacific Highway could include new (relocated) licenced premises, a medical centre, health and wellness facilities, childcare facilities and fast services (petrol, retail, fast food etc). Noise impacts generated by these uses would likely require few controls to address impacts to existing residential area located on Wentworth Avenue due to the separation and distance from the site. However, noise impacts would need to be managed to existing residential receivers to the north and any new sensitive uses on the site.

As any development would be entirely new noise controls could be readily incorporated during the design and construction process. Noise from associated carparks would need to be managed, particularly to sensitive uses (such as seniors living and childcare) within the development, however this can be managed with carpark layouts, management, acoustic fencing etc.

Modelling of the current masterplan has demonstrated that noise controls are practically achievable for the proposed uses.

Similarly, the noise impacts on any new commercial developments on the site, from the Pacific Highway, will also be practically achievable with building layouts and architectural upgrades.

6.1.2 Recreational activity

The use of 120 Pacific Highway for recreation businesses could include activities such as paintball, go karts, indoor rock climbing and adventure courses.

For most activities that are not highly noise intensive, such as indoor rock climbing, paintball and adventure courses the size of the site and distance to the nearest sensitive receivers means that required noise controls are likely to be minimal.

Similarly, although noise levels from Highway traffic may be in the order of 65dB $L_{Aeq(15hr)}$ the impacts on the recreational facilities should be easily mitigated in design.

In order to protect the existing residential receiver located at 130 Pacific Highway (to the north of the site) higher noise activity such as an electric go kart facility will require careful noise mitigation. This may be feasible by implementing a scenario comprising:

- Specific low noise (e.g. electric) karts with variable noise level controls
- Limited number of karts simultaneously on the track
- Management of specific operating hours
- Provision of an acoustic mound to around the northern end of the kart track
- Suitable placement of the track on site

A detailed assessment of any proposed high noise intensity activity such as go karts would be required when a development application was made.

6.1.3 Tourist Accommodation

The use of the site for tourist accommodation or similar would need to consider mitigation of noise from other uses on the site (e.g. licenced premises, commercial and recreational uses). The required treatment of the building will need to be balanced with the requirements to treat other noise

sources within the development (i.e. if noise from the Club is reduced the acoustic controls required for the motel façade will be reduced).

The above impacts could be practically mitigated with available technology, primarily the incorporation of architectural upgrades (e.g. acoustic glazing) into the design and construction of the buildings.

6.1.4 Seniors Living Development

Noise impacts on the seniors living development from other new (commercial) developments on the site will require consideration during the design of each phase.

Noise impacts on the seniors living development from the Pacific Highway is unlikely to require mitigation measures due to the distance between the Highway and the seniors living development.

Lot 7 of seniors living development will have direct line of site to the RSL and Tourist Accommodation car parking and will require some form of acoustic mitigation in order to provide internal amenity including allowance for protecting against potential sleep disturbance. External amenity is not directly protected in the noise policies applicable to the site, however provision of private open space with a reasonable level of acoustic amenity is recommended.

The potential noise impacts from commercial car parking noise on the adjacent seniors living development area will likely require mitigation, especially noise levels during the Night-time period with the potential to cause sleep disturbance. The mitigation may include a combination of the following:

- Architectural upgrades to dwellings, such as acoustic rated glazing or alternative ventilation systems (to allow windows to stay closed to exclude noise whilst still providing fresh air to residents)
- Screening, such as acoustic fencing to mitigate noise from car parking activities during the Night-time period with the potential to cause sleep disturbance
- Dwelling layouts which orientate noise sensitive areas, such as bedrooms, away from the noise source, while locating less sensitive uses, such as garages and bathrooms, towards the commercial and car parking noise.

Screening, such as acoustic fencing, may also be required to shield noise from any new internal roads on the site to new seniors living residences. This would need to be assessed during the development application for any subdivision and would depend on variables including the projected traffic volumes and internal road locations.

6.1.5 Residential – long stay

Noise impacts on the residential development from other new (commercial) developments on the site will require consideration during the design of each phase.

Noise impacts on the residential development from the Pacific Highway may be above 65dB $L_{Aeq(15hr)}$ at the residential lots closest the road. This will require the provision of acoustic mitigation in order to provide the necessary acoustic amenity. While external acoustic amenity is not directly protected by the noise policies applicable to the site, the provision of private open space with a reasonable level of acoustic amenity is recommended.

We have been advised by TTPP that it is unlikely for vehicles to access the site via Wentworth Avenue (other than emergency access and emergency vehicles). All site access to the proposed residential area is likely to be via the new Pacific Highway intersection.

Whilst the future traffic noise levels would require mitigation for residential use the existing noise levels are typical for residential lands adjoining arterial roads and feasible noise control options are available. The mitigation may include a combination of the following:

- Noise mounding or barrier to the Pacific Highway frontage of residential lots
- Architectural upgrades to dwellings, such as acoustic rated glazing combined with alternative ventilation systems (to allow windows to stay closed to exclude noise whilst still providing fresh air to residents)
- Lot layouts that orientate the buildings so that the first row of buildings provide shielding to their rear private open space, while providing acoustic façade upgrades to achieve internal amenity.
- Dwelling layouts which orientate noise sensitive areas, such as bedrooms, away from the road noise source, while locating less sensitive uses, such as garages and bathrooms, towards the noise.

Screening, such as acoustic fencing, may also be required to shield noise from any new internal roads on the site to new or existing residences. This would need to be assessed during the development application for any subdivision and would depend on variables including the projected traffic volumes.

6.1.6 Impacts on Proposed Residential use of Land on 80-90 Pacific Hwy

Impacts from the proposed development at 80-90 Pacific Highway have been considered. This land is currently zoned as RE2 Private Recreation and is proposed to provide additional residential and seniors living dwellings.

Current Masterplan proposals show a combination of residential and Seniors Living lots, either of which are expected to be more sensitive to noise impacts that currently approved uses.

Noise Impacts from Commercial Development

Noise impacts on this residential development from other new (commercial) developments on the site will require consideration during the design of each phase. A noise mitigation approach has been adopted by positioning the Childcare Centre and Medical Centre buildings between the noise intensive commercial premises (such as fast services, car parking and RSL Club) and 80-90 Pacific Highway to the south to provide acoustic screening to any future uses.

Noise Impact from Pacific Highway

Noise impacts on the residential development from the Pacific Highway may be above 65dB $L_{Aeq(15hr)}$ at the residents closest the road. This will require some form of acoustic mitigation in order to provide internal amenity. External amenity is not directly protected in the noise policies applicable to the site, however provision of private open space with a reasonable level of acoustic amenity is recommended.

Whilst the future traffic noise levels would require mitigation for residential use the noise levels are typical for residential lands adjoining arterial roads and feasible noise control options are available. The mitigation may include a combination of the following:

- Noise mounding or barrier to the Pacific Highway frontage to residential uses
- Architectural upgrades to dwellings, such as acoustic rated glazing or alternative ventilation systems (to allow windows to stay closed to exclude noise whilst still providing fresh air to residents)
- Lot layouts that orientate the buildings so that the first row of buildings provide shielding to their rear private open space, while providing acoustic façade upgrades to achieve internal amenity.

- Dwelling layouts which orientate noise sensitive areas, such as bedrooms, away from the road noise source, while locating less sensitive uses, such as garages and bathrooms, towards the noise.
- Screening, such as acoustic fencing, may also be required to shield noise from any new internal roads on the site to new or existing residences. This would need to be assessed during the development application for any subdivision and would depend on variables including the projected traffic volumes.

Noise Impacts to existing Residential premises from Wentworth Avenue

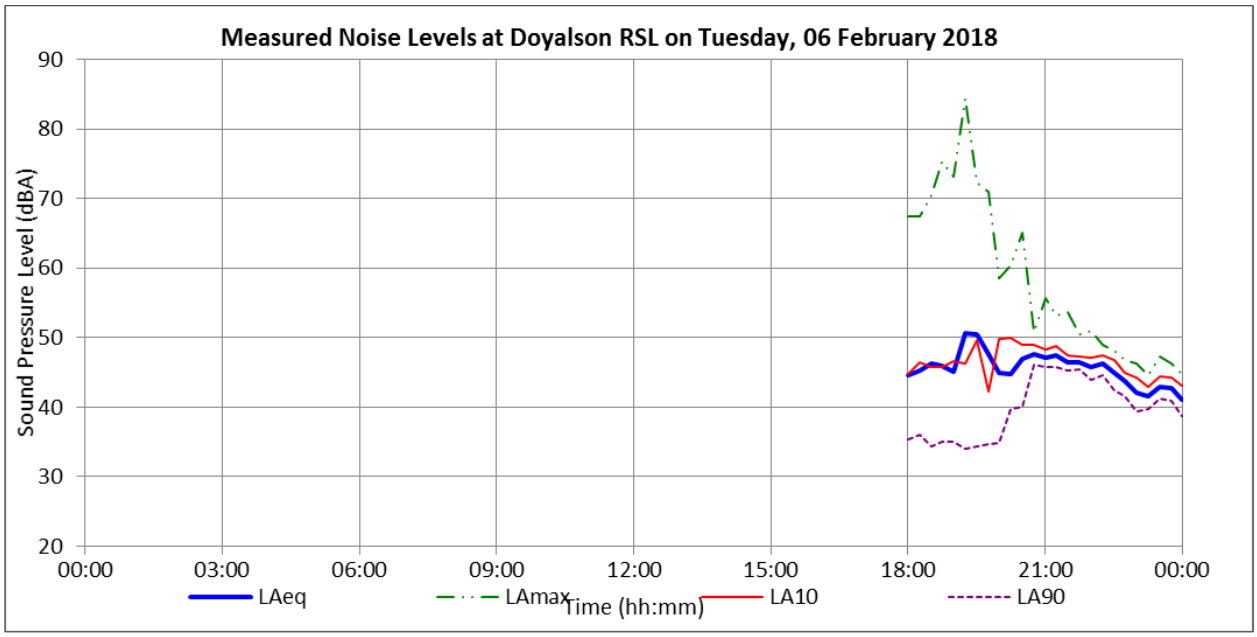
The propose involves internal traffic circulation along Wentworth Avenue, adjacent the existing residential lots. Detailed information regarding future traffic flow along Wentworth Street is not yet available.

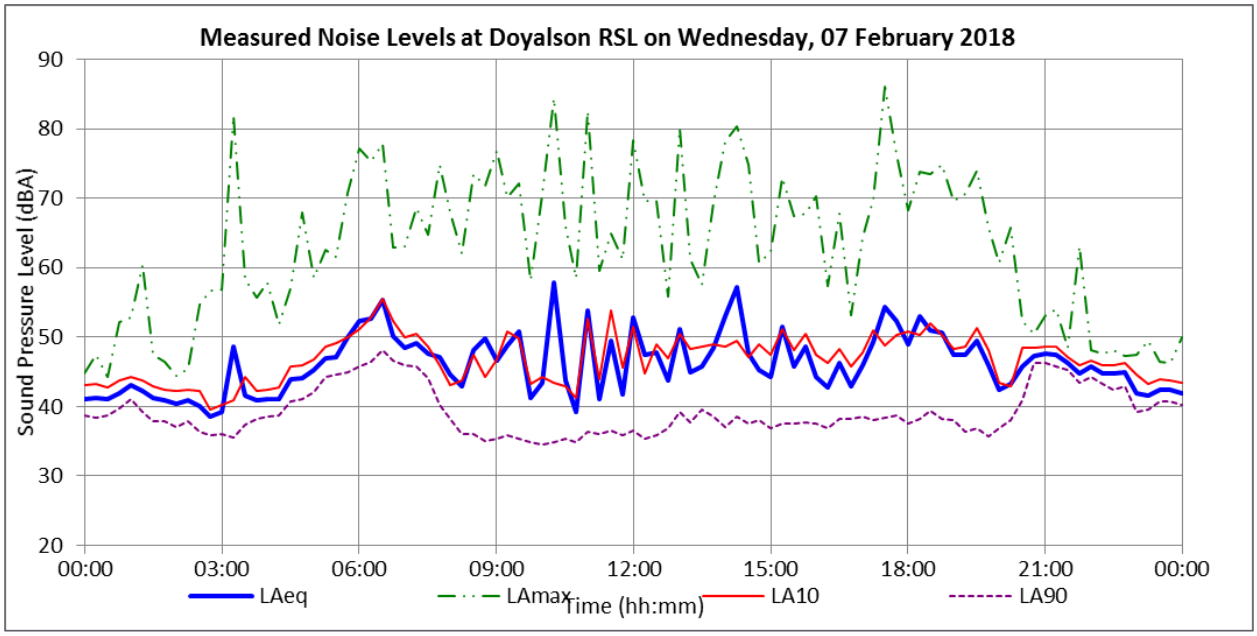
Additional noise levels generation due to traffic on the western section of Wentworth Avenue is likely to be minimal, due to the existing noise impacts from Pacific Highway. Noise impacts are however likely to increase further east along Wentworth Avenue as there is currently little existing traffic flow in this area. It will be necessary to quantify traffic flow in detail in order to make the required comparison with the EPA Road Traffic Noise Policy, this should be conducted during the DA Stage.

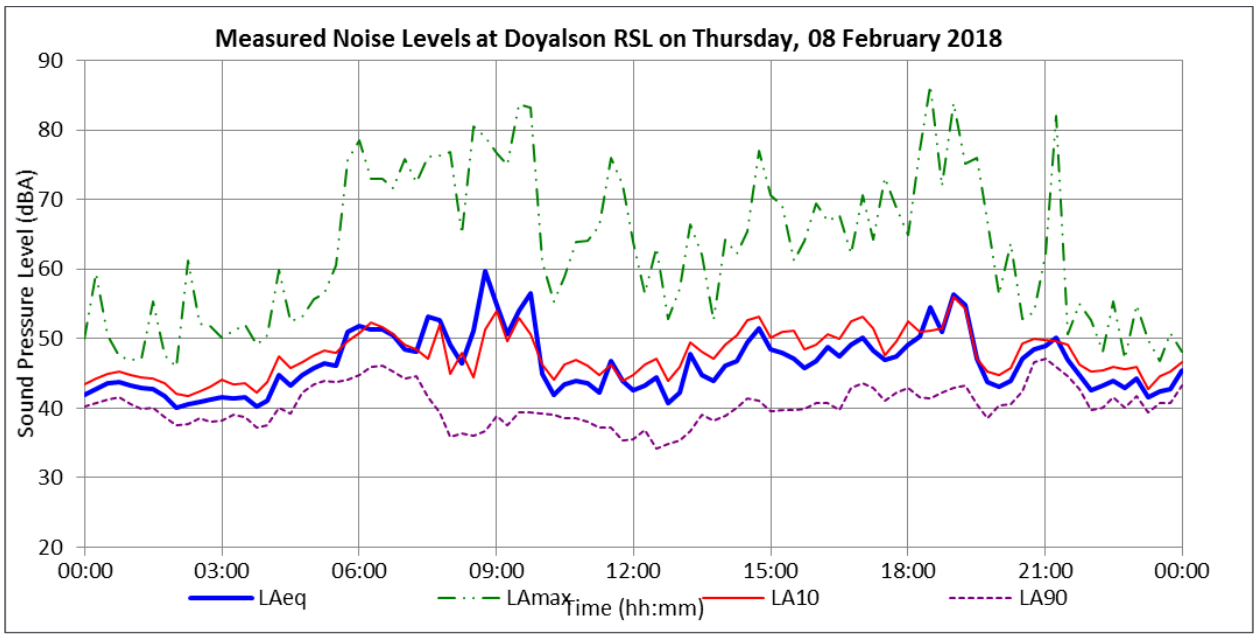
APPENDIX A GLOSSARY OF TERMINOLOGY

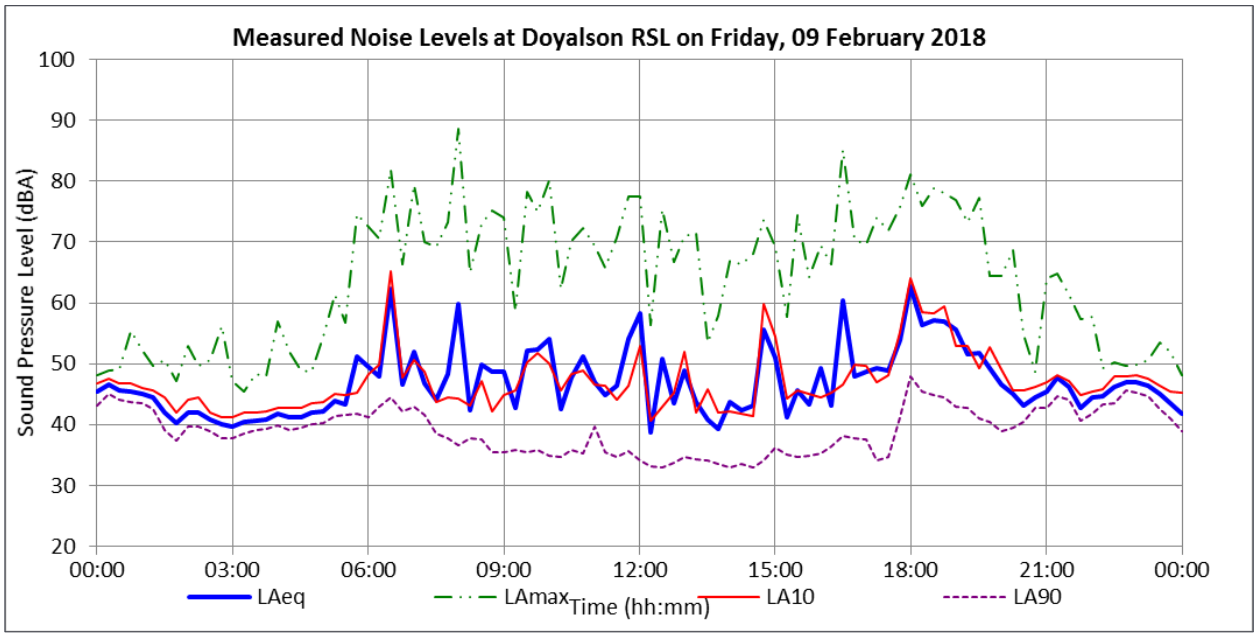
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel The unit of sound level.
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
Hertz (Hz)	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
L_{A90}	The noise level exceeded for 90% of the measurement period, measured in dB. This is commonly referred to as the background noise level.
L_{Aeq}	The equivalent continuous sound level. This is commonly referred to as the average noise level and is measured in dB.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_{A10}	The A-weighted noise level equalled or exceeded for 10% of the measurement period. This is commonly referred to as the average maximum noise level.
L_w (or SWL)	Sound Power Level. The level of total sound power radiated by a sound source.
Octave Band	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
Rating background level (RBL)	The overall single-figure background level representing each assessment period (Day/Evening/Night) over the whole monitoring period (as opposed to over each 24-hr period used for the assessment background level). This level is used for assessment purposes. It is defined as the median value of all the assessment background levels over the monitoring period for the Day/Evening and Night.

APPENDIX B NOISE LOGGING RESULTS






Measured Noise Levels at Doyalson RSL on Thursday, 08 February 2018
Sound Pressure Level (dBA)
90
80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)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Sound Pressure Level (dBA)
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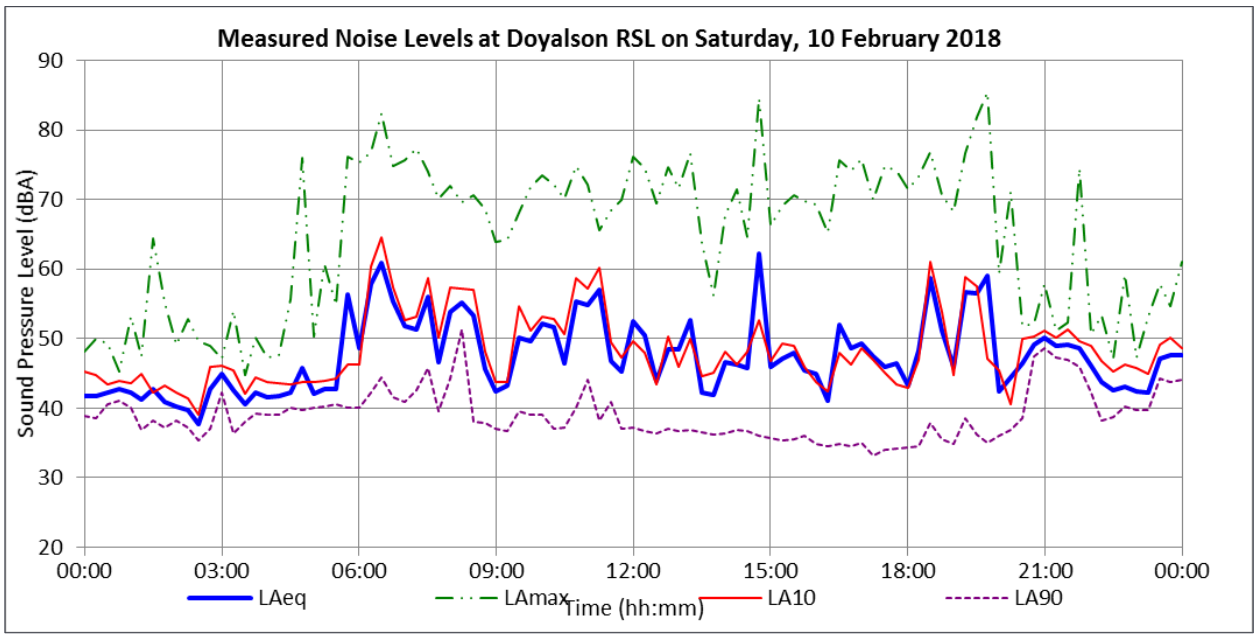
80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at Doyalson RSL on Saturday, 10 February 2018
Sound Pressure Level (dBA)
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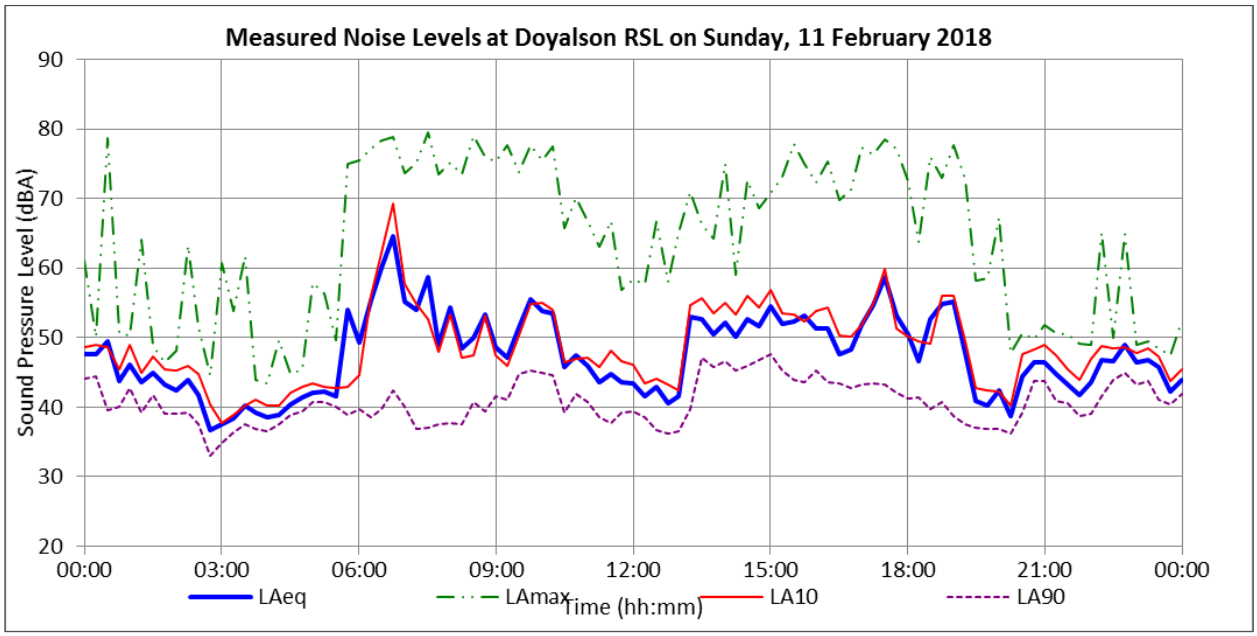
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at Doyalson RSL on Sunday, 11 February 2018
Sound Pressure Level (dBA)
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70
60
50
40
30
20
00:00
03:00
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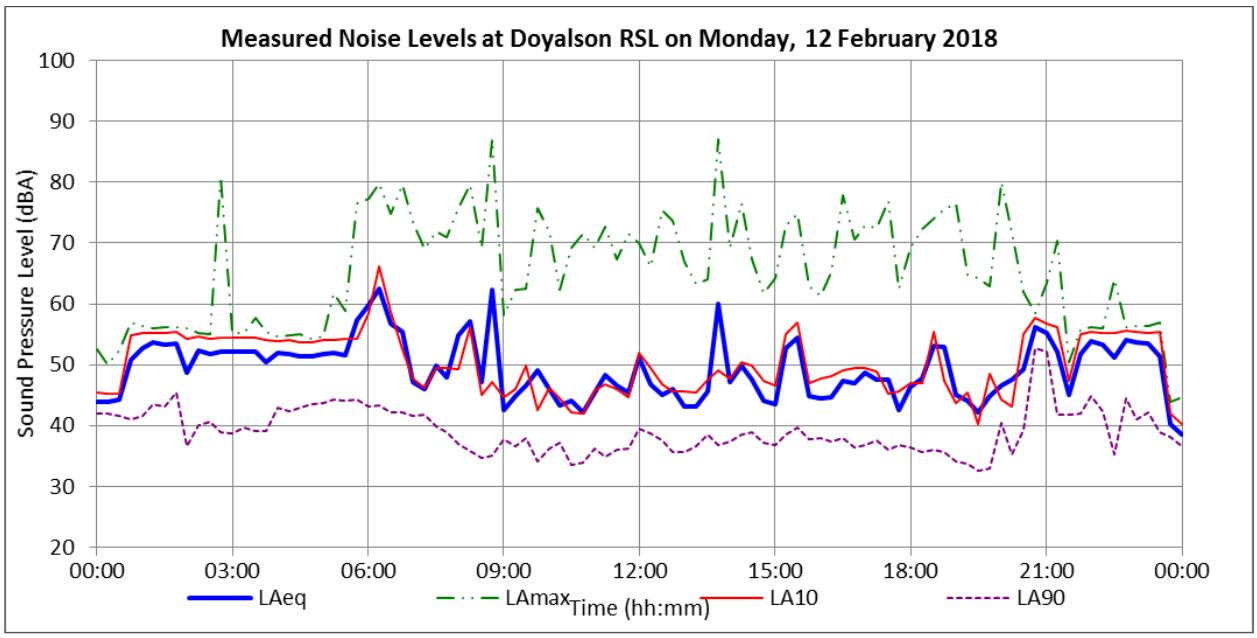
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at Doyalson RSL on Monday, 12 February 2018
Sound Pressure Level (dBA)
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80
70
60
50
40
30
20
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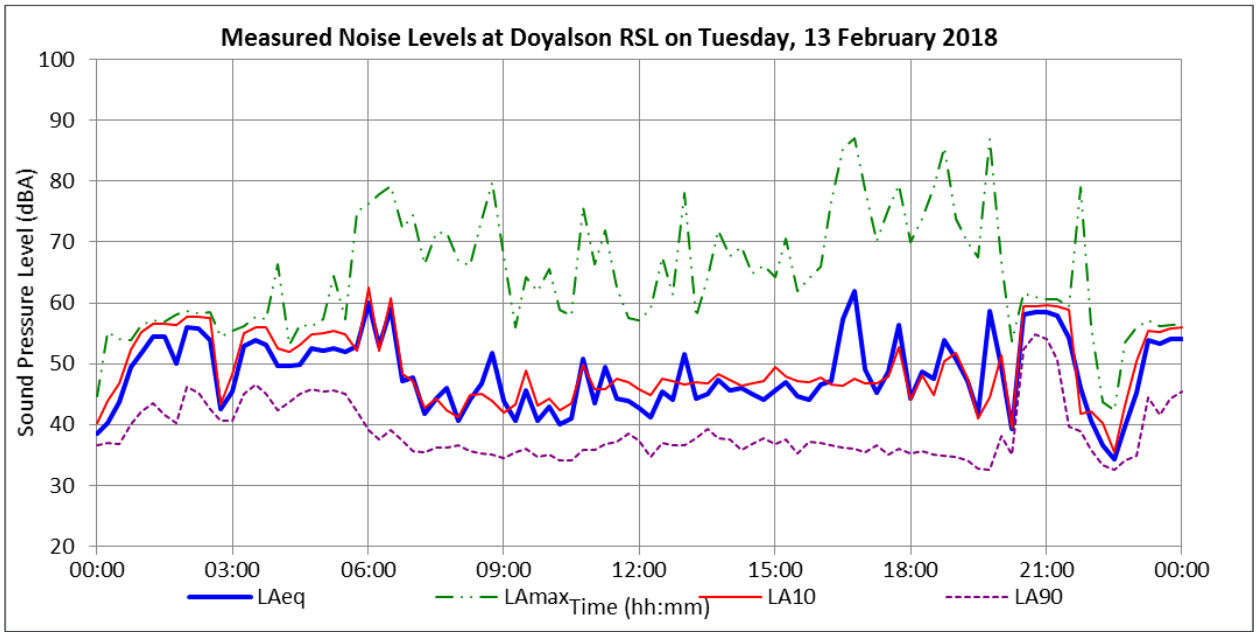
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)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Sound Pressure Level (dBA)
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80
70
60
50
40
30
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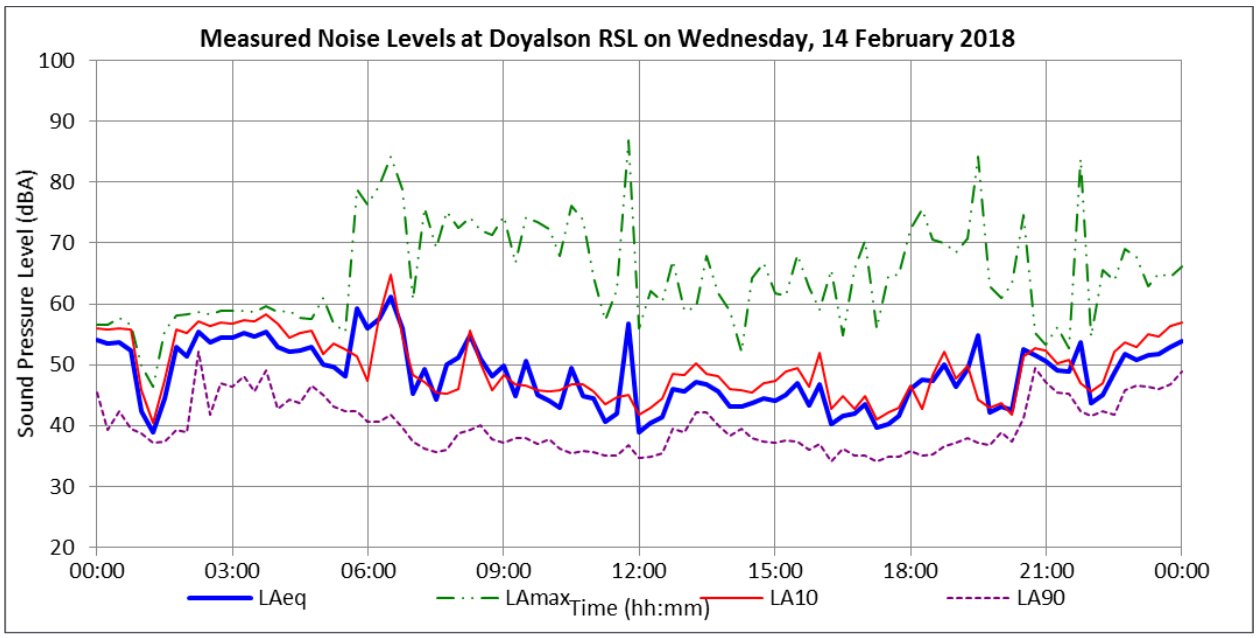
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at Doyalson RSL on Wednesday, 14 February 2018
Sound Pressure Level (dBA)
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70
60
50
40
30
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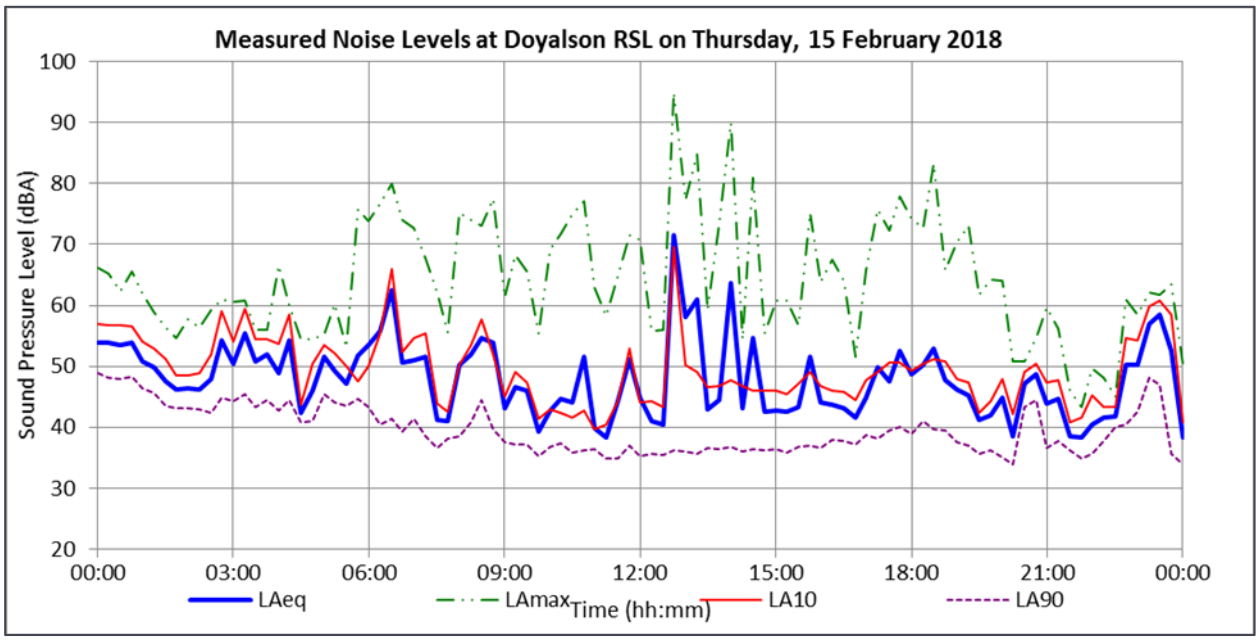
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at Doyalson RSL on Thursday, 15 February 2018
Sound Pressure Level (dBA)
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90
80
70
60
50
40
30
20
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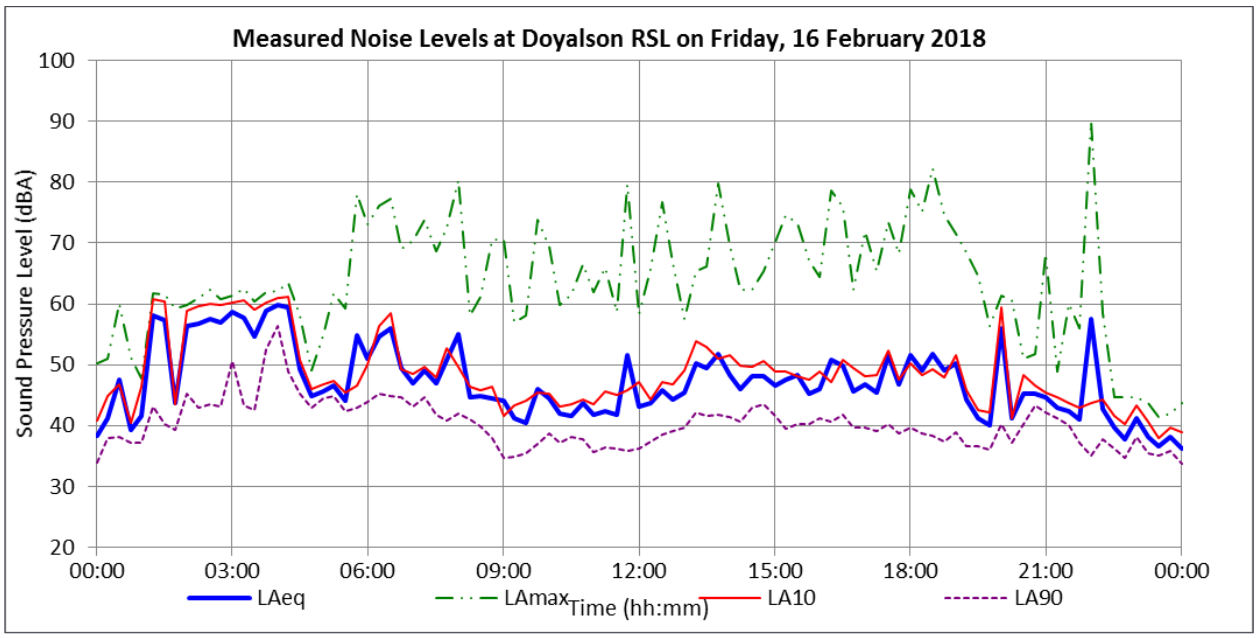
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at Doyalson RSL on Friday, 16 February 2018
Sound Pressure Level (dBA)
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80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
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21:00
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LAeq
LAmax
LA10
LA90
Time (hh:mm)

APPENDIX C DERIVATION OF SITE SPECIFIC CRITERIA

D.1 Noise Policy for Industry

The NPfI is a guideline for assessing noise emissions from industrial facilities and other developments with noise sources that may be considered to be industrial in nature. The NPfI sets out a procedure where an industrial facility can be assessed against a series of noise levels. In the NPfI, these project specific noise levels are derived from an analysis of the ambient noise environment and zoning information.

The ambient noise levels for this project are summarised in Table 9 below. In the NPfI, the background noise level is called the Rating Background Level (RBL).

Table 9: Measured ambient noise levels (NPfI time periods) for Byrne Avenue receivers

Period	Time period	RBL dB L_{A90}	dB L_{Aeq}
Daytime	0700* - 1800hrs	35	52
Evening	1800 - 2200hrs	36	51
Night	2200 - 0700hrs	37	52

*0800 on Sundays and public holidays

Intrusiveness noise criteria

The intrusiveness noise assessment is based on knowledge of the background noise level at the receiver location. The intrusiveness level is the background noise level at the nearest noise sensitive location plus 5dB. The noise emissions from the premises are therefore considered to be intrusive if the A-weighted source noise level ($L_{Aeq, 15mins}$) is greater than the background noise level (L_{A90}) plus 5dB.

The logger location was selected to be far enough east of the Club so as to not have any significant contribution for existing activities at the Club. This location is also well removed from significant traffic noise associated with the Pacific Highway. As such the residential receivers nearer the Club and the Highway are likely to have higher ambient background noise levels.

Based on the data summarised in Table 9, noise limits for Intrusiveness have been calculated in accordance with the NPfI and are presented in Table 10 below.

Table 10: Calculated Intrusiveness Criteria

Period	Rating Background Level, dB L_{A90}	Intrusiveness Criteria (RBL + 5 dB), dB $L_{Aeq, 15\ min}$
Day	35	40
Evening	36	41
Night	37	42

It should be noted that the Intrusiveness levels are only applicable to residential receivers.

Amenity Noise levels

The Amenity Noise Levels are designed to prevent industrial noise continually increasing above an acceptable level. The initial stage in determining the Amenity level is to correct the acceptable noise levels set for the appropriate amenity area with the baseline noise monitoring.

A review of the noise levels measured indicates that the noise environment is typical of an Urban area with mostly traffic related noise sources.

The project amenity noise levels for the development is the recommended amenity noise level minus 5 dB(A).

These levels and the relevant modifications are detailed in **Table 11** below.

Table 11: Amenity Criteria

Receiver	Period	Recommended Amenity Noise Level L_{Aeq} dB	Modified Amenity Noise Level L_{Aeq} dB (period)
Residential	Day	60	55
	Evening	50	45
	Night	45	40

Source: Table 2.2 NSW Noise Policy for Industry

Determination of Project Specific Noise Levels

The final process in determining the operational noise limits for the development, called the project specific noise levels, is to select the more stringent of either the Intrusiveness or Amenity trigger levels (this will also depend on the period of operation of the noise source). It can be seen that for residential receivers the Amenity levels are generally the more stringent for evening and night-time periods (particularly as the noise sources are likely to be mechanically based); compliance with the Amenity levels will also mean compliance with the Intrusive levels. The project specific noise levels are shown in Table 12, and includes a modification to the evening and night-time period levels to standardise the measurement periods.

Table 12: Project specific noise levels

Receiver	Period	Criteria $L_{Aeq(15\ minutes)}$
Residential	Day	40
	Evening	40
	Night	40

The NPfl criteria are applicable at the property boundary of the nearest affected receivers.

D2 Liquor & Gaming NSW

The L&G NSW standard noise conditions are as follows:

> *The L_{A10}* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz–8kHz inclusive) by more than 5dB between 7:00 am and 12:00 midnight at the boundary of any affected residence.*

The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz–8kHz inclusive) between 12:00 midnight and 7:00 am at the boundary of any affected residence.*

Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 7:00 am.

** For the purpose of this condition, the L_{A10} can be taken as the average maximum deflection of the noise emission from the licensed premises. This is a minimum standard. In some instances the Director may specify a time earlier than midnight in respect of the above condition. Interior noise levels which still exceed safe hearing levels are in no way supported or condoned by the Director.*

D.3 AAAC Guideline for Child Care Centre

The AAAC document titled "Guideline for Childcare Centre Acoustic Assessment" provides criteria for assessing noise emissions from childcare centres. The AAAC guidelines suggest the noise emission for the indoor play area, mechanical plant and traffic on the site should not exceed the background noise level by more than 5dB at the assessment location, which is similar to the NPfI Intrusiveness criteria.

For outdoor play areas the AAAC guidelines recommend that a higher noise level, 10dB above the background, is allowed from children playing outside where the duration of this noise source is less than 2 hours per day. However, where the outdoor play at the site may occurs for more than 2 hours per day a more stringent background plus 5dB criteria would apply. The AAAC criteria is summarised below in **Table 13**.

Table 13: AAAC Operational noise criteria summary

Assessment	Receiver	Time of day	Time period	Criteria, dB
Indoor play areas, mechanical plant, carpark	Residential	Day	0700-1800hrs	40 $L_{Aeq,\ 15min}$
Outdoor play areas	Residential	Day	0700-1800hrs	400 $L_{Aeq,\ 15\ mins}$

D.4 NSW Road Noise Policy

The noise level criteria for increased traffic flow as a result of land-use development with the potential to create additional traffic is set by the EPA's NSW *Road Noise Policy (RNP)*. Table 14 presents the traffic noise criteria for this development.

Table 14: Road Traffic Noise Criteria

Type of Development	Criteria	
	Day 0700-2200hrs	Night 2200-0700hrs
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{eq(15hr)}$ 60dBA (external)	$L_{eq(9hr)}$ 55dBA (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{eq(1hr)}$ 55dBA (external)	$L_{eq(1hr)}$ 50dBA (external)

Source: Table3 EPA – RNP

In addition to the above criteria, Section 3.4 of the RNP notes that "*an increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person*" and that "*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 2dB above that of the corresponding 'no build option"*.

D.5 SEPP (infrastructure) 2007 & Department of Planning & Environment Interim Guidelines

For new residential uses within the development the State Environmental Planning Policy (Infrastructure) 2007 may apply. Whilst the SEPP requirements are mandatory only for roads with a daily traffic flow above 40,000 they are "best practice advice" for roads with daily flows of 20,000-40,000 vehicles. The Department of Planning & Environment (DPE) document *Development Near Rail Corridors & Busy Roads - Interim Guideline* sets out a framework for application of the SEPP criteria.

The residential criteria in Table 15 applies for all forms of residential buildings as well as aged care, nursing home facilities and childcare centres.

Table 15: SEPP / DPE Interim Guideline traffic noise criteria

Receiver	Criteria (dB)
Residential - sleeping area (bedroom)	35dB $L_{Aeq(9hr)Night}$ (10pm-7am)
Residential – other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40dB $L_{Aeq(15hr)\ Day}$ or $L_{Aeq(9hr)\ Night}$ (at any time)
Educational including childcare	40dB $L_{Aeq(15hr)\ Day}$
Hospitals – Wards	35dB $L_{Aeq(15hr)\ Day}$ or $L_{Aeq(9hr)\ Night}$
Hospitals – other sensitive areas	45dB $L_{Aeq(15hr)\ Day}$ or $L_{Aeq(9hr)\ Night}$

D.6 AS2107:2016

Australian Standard AS2107:2016 provides recommended design sound levels for different areas of occupancy. This is a non-mandatory standard but has been used in this assessment to provide guidance on the likely quantum of noise control which will be required for new development on the site. The design sound levels presented in AS2017:2016, *Table 1* have been summarised for this specific project in Table 16.

Table 16: Design sound levels for different areas of occupancy in buildings

Type of occupancy / activity	**Design sound level ($L_{Aeq,t}$) range**
Hotels and motels	
Bars and lounges	< 50
Conference areas:	
Without sound reinforcement	
- Up to 50 persons	35 to 40
- 50 to 250 persons	30 to 35
With sound reinforcement	35 to 45

Type of occupancy / activity	Design sound level ($L_{Aeq,t}$) range
Dining rooms	40 to 45
Enclosed carparks	< 65
Foyers and recreation areas	45 to 50
Kitchen, laundry & maintenance areas	< 55
Sleeping areas (night-time)	
- Hotels & motels in inner city areas or entertainment district or near major roads	35 to 40
Washroom & toilets	45 to 55
Houses & apartments near major roads	
Apartment common areas (e.g foyer, lift lobby)	45 to 50
Living areas	35 to 45
Sleeping areas (night-time)	35 to 40
Work areas	35 to 45
Shop buildings	
Department stores – Main floor	< 55
Department stores – Upper floor	< 50
Enclosed Car parks	< 65
Small retail stores (general)	< 50
Shopping malls	<55
Show rooms	< 50
Speciality shops	< 45
Supermarkets	< 55
Sports clubs	
Indoor pools	50 to 60
Indoor sports with coaching	< 45
Indoor sports without coaching	< 50
Leisure centre and gaming	40 to 50
Restaurants & cafeterias	
Cafeterias	40 to 50
Food courts	45 to 55
Coffee shops	40 to 50
Restaurants	40 to 50

Type of occupancy / activity	Design sound level ($L_{Aeq,t}$) range
Sports & club buildings	
Bars	<50
Function areas	40 to 45
Change rooms	< 50
Health buildings for medical centre	
Ward bedrooms	35 to 40
Nurseries, office areas	35 to 45
Emergency areas, control rooms, consulting rooms, dental clinics, dining areas, geriatric rehab, intensive care, laboratories, nurses stations, operating theatres, patient lounges, staff rooms, surgeries rooms	40 to 45
Delivery suits, MRI/CT Scan/X-Ray etc, Pharmacies	45 to 50
Utility rooms	50 to 60
Maintenance workshops	< 60