



ACOUSTIC REPORT FOR DEVELOPMENT APPLICATION

Wilton Public School Upgrade

11 Greenbridge Drive, Wilton NSW 2571

PREPARED FOR SINSW

C/- MBB Group, Mr Paul Collister L14, 49-51 York Street Sydney 2000

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Acoustic Design Specification

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Northrop Consulting Engineers Pty Ltd

ACN 064 775 088 | ABN 81 094 433 100

Level 11, 345 George Street, Sydney NSW 2000

02 9241 4188 | sydney@northrop.com.au | www.northrop.com.au

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1. Executive summary

Northrop Consulting Engineers Pty Ltd (Northrop) Acoustics have been engaged by SINSW to provide an acoustic report for development application for the proposed upgrade of Wilton Public school located at 11 Greenbridge Drive, Wilton, NSW. The school upgrade will involve addition of Block J (Stage 1), increasing number of children and staff. The extension of the carpark will be contained within a separate Review of Environmental Factors, however it will be considered in this DA report as the increase in total capacity of the school has an impact.

A noise survey including noise monitoring was conducted on site to measure the ambient and traffic noise. Based on ambient noise measurement the noise criteria were established. An assessment was conducted to assess noise emission levels from the operation of the school upgrade and the impact upon the surroundings. Where exceedances occurred, recommendations were given for compliance with the criteria.

Noise emissions from the school upgrade and changes are expected to mostly comply with the acoustic requirement of Wollondilly Council and relevant Australian standards and guidelines.



2. Referenced documents

This assessment has been prepared considering the following documentation:

Table 1: Referenced documents - project documents

Document	Document #	Date	Issued by
Proposed site building plan	MBB Group	05/02/2 020	MBB Group

Table 2: Referenced documents - consent authority and other references

Document title	Abbreviation	Year	Issued by
NSW Noise Policy for Industry	NPI	2017	NSW Environmental Protection Authority
Noise guide for local government	Noise Guide	2013	NSW Environmental Protection Authority
State Environmental Planning Policy (Educational Establishments and Child Care Facilities)	SEPP	2017	NSW Government
NSW Road Noise Policy	RNP	2011	EPA NSW



3. Site description

The Site is bound by Greenbridge Drive to the south, Woodward Road to the east, Charlton Street to the north and Kenniff Street to the west. The site location is shown in Figure 1.

Figure 1 also shows the locations of the long-term noise monitors, and the locations of the operator attended measurements.



Figure 1: Aerial view of site with nearest affected recievers and measurement locations



4. Project appreciation

The school is already operational and will be going through un upgrade. For the upgrade few options have been proposed and the most favourable option 7B is considered. The following is a list of changes for the upgrade.

- Addition of Block J, stage 1 to the plan. (stage 2 will not be constructed until 2026 and is not part of this DA application).
- Improve outdoor passive and active play spaces including upgrade of COLA
- Upgrade of the Special programs and addition of new OSHC
- Increase in number of students from the current 543 to 750. This will be a gradual increase over a few years.
- 17 new teaching spaces will be created
- Addition of new mechanical equipment

The main outdoor areaurrently thre n is to the north of the building comprising of the new game court, playgrounds, COLA and landscaping.

The carpark will have an extension to the north of its current location. The carpark is accessed through Kenniff Street and will be used by the staff and long-stay visitors.

The Drop off / Pick up point is in front of the school in an exclusive inner lane in Greenbridge Drive. The Drop off / pick up point will stay at the same location.

The proposed plan for the upgrade is shown in Figure 2.



Figure 2: Plan for school upgrade and addition of Block J



5. Environmental noise criteria

5.1 State Environmental Planning Policy

The NSW State Environmental Planning Policy SEPP (Educational Establishments and Child Care Facilities) 2017 for the purposes of determining the impacts of an educational establishment upon surrounding residences have set the following conditions for compliance:

A new building or (if the development is an alteration or addition to an existing building for the purpose of changing its use) an existing building that is to be used for the purpose of a school or school-based child care must be designed so as not to emit noise exceeding an L_{Aeq} of 5 dB(A) above background noise when measured at any lot boundary.

5.2 Wollondilly Council

Section 3.10 of part 5 Wollondilly Council DCP 2016 is on Educational Establishments. The section provides general controls for establishments such as schools but does not provide any criteria or details on noise control of schools. At the time of this report there was no acoustic requirement for the schools in the published DCPs, we therefore use the requirements in relevant Australian standards and guidelines.

The council have advised that an allowance of "Background + 10" dB(A) as a noise limit for schools play areas should be applied.

5.3 NSW EPA Noise Policy for Industry (2017)

The NSW Environment Protection Authority (EPA) Noise Policy for Industry (2017) sets out noise criteria to control the noise emission from industrial noise sources. Mechanical, building services and operational noise from the development shall be addressed following the guideline in the NSW EPA Noise Policy for Industry.

The NSW EPA Noise Policy defines the following noise descriptors:

- The Intrusiveness Criterion states that the L_{Aeq, 15 minute} generated from the operation of the development cannot exceed the rating background noise level (RBL) plus 5 dB.
- The Project Amenity Noise Level is the ANL (Table 3) minus 5 dB, plus 3 dB to convert from a period level to a 15 minute level.
- The Project Noise Trigger Level (PNTL) is the more stringent (lowest) value of the intrusiveness and amenity noise levels, which becomes the benchmark for assessing the noise impact from the proposed site upon the surrounding noise-sensitive receivers.

The determination of the criteria is based on the results of the ambient and background noise unattended monitoring, addressing two components:

- Controlling intrusive noise into nearby residences (Intrusiveness Criteria)
- Maintaining noise level amenity for particular land uses (Amenity Criteria)

Once both criteria are established the most stringent for each considered assessment period (day, evening, night) is adopted as the Project Noise Trigger Level (PNTL). The project noise trigger level becomes the benchmark for assessing the noise impact from the proposed site upon the surrounding noise-sensitive receivers for the external noise emissions from the development. The assessment periods are:

- Day: 7am 6pm Monday Saturday, 8am 6pm Sunday
- Evening: 6pm 10pm Monday Sunday



(External)

Night: 10pm – 7am Monday – Saturday, 10pm – 8am Sunday

The applicable parts of Table 2.2: Amenity noise levels from the Noise Policy for Industry which are relevant to the project are presented in Table 3 below:

Receiver	Noise amenity area	Time of day	Recommended amenity noise level – L _{Aeq} dB(A)
Residential	suburban	Day	55
		Evening	45
		Night	40
School classroom - internal	All	Noisiest 1-hour period when in use	35

Table 3: Amenity criteria for external noise levels

5.4 **EPA NSW Road Noise Policy**

Noise from the vehicles associated with the school will be assessed using NSW Road Noise Policy. Table 4 presents the noise assessment criteria for land use developments with potential to create additional traffic on existing local roads.

able 4: Noise levels- Road Noise Policy						
Road	Type of project/Land use	Assessment criteria, dB(A)				
category		Day	Night			
Local roads	Existing residences affected by	L _{Aeq,1hr} 55	L _{Aeq,1hr} 50			

additional traffic on existing local

roads generated by land use

Tak

development

RNP recommends that "Where feasible, existing noise levels should be mitigated to meet the noise criteria. In this regard, the RNP states that for existing roads there is limited potential for noise control as the development is not linked to road improvements. It does however advise that applicable strategies include appropriate location of private access roads, regulating time of use, using clustering, and using barriers and acoustic treatments".

(External)

Section 3.4.1 of the RNP specifies a limit of 2 dB for vehicular noise level increase over existing noise level of local roads for such developments/projects.



6. Site measurements

A noise survey was conducted on site between 13th February and 20th February 2020. Unattended noise monitoring was conducted by using two noise monitors at the following locations:

- 1. On the boundary of Woodward Road on the east (Logger L1).
- 2. On the boundary of Kenniff Street on the west (Logger L2).

6.1 Instrumentation

The survey was conducted with the following instruments:

- ARL noise monitor Type EL-215 Serial number 194637
- ARL noise monitor Type EL-215 Serial number 194662
- NTI Precision Integrating Octave Band Sound Level Meter, Type XL2 conforms to applicable standards of IEC 61672-1:2002-05 CLASS1 & IEC 60651 TYPE1, Serial number A2A-15765-E0

All equipment was calibrated before and after the measurements using a Brüel & Kjær Acoustic Calibrator. No calibration deviations were recorded.

All equipment carry traceable calibration certificates.

6.2 Long-term noise logging

Long-term noise monitoring was conducted between 13th and 20th February 2020 at Logger locations shown in Figure 1. During the monitoring period the weather was good, calm and dry except for a short period in one evening. For that short period where adverse weather condition prevailed, data was disregarded.

Based on monitoring data and requirements of NSW "Noise Policy for Industry", the criteria were established. This is presented in Table 5.

Detailed results of the logger measurements are shown in Appendix C. Meteorological data was retrieved from a Bureau of Meteorology station located within 30km of the site. For those periods where adverse weather conditions prevailed, data was disregarded.



Monitor/Location	Period	RBL background, dB(A)	RBL+5 (Intrusivenes s criteria), dB(A)	ANL, dB(A)	PNTL, dB(A)
L1 Close to east	Day	43	48	53 L _{Aeq,15min} (55–5+3)	48 L _{Aeq,15min}
boundary	Evening	41	46	43 L _{Aeq,15min} (45–5+3)	41 L _{Aeq,15min}
	Night	40	45	38 L _{Aeq,15min} (40–5+3)	40* L _{Aeq,15min}
L2 Close to west	Day	43	48	53 L _{Aeq,15min} (55–5+3)	48 L _{Aeq,15min}
boundary	Evening	41	46	43 L _{Aeq,15min} (45–5+3)	43 L _{Aeq,15min}
	Night	40	45	38 L _{Aeq,15min} (40-5+3)	40* L _{Aeq,15min}

Table 5: Long-term noise monitoring results and criteria

*RBL has been used because RBL exceeds ANL

The L_{A90} rating background noise levels were determined using the methodology as described in the Noise Policy for Industry.

6.3 Attended noise measurements

Noise measurement was conducted on Kenniff Street at 11 am on 20th of February. The daytime ambient noise level including the passing traffic was $L_{Aeq,15 mins}$ 48 dB(A).



7. Acoustic assessment

7.1 Mechanical and building services noise

At this stage, the new mechanical plant and equipment have not been finalised therefore assessment of mechanical noise was not possible. The mechanical consultant should select the equipment such that the aggregate noise level of all mechanical services comply with the PNTL noise level criteria provided in Table 9 above.

The following general recommendations should be observed.

- The equipment should be located away from the noise sensitive receivers.
- There should be no direct line of sight between the noise sources and receivers.
- Enclosures housing of plant and equipment inside the plant room, typically provides 20 to 30 dB(A) reduction.
- Acoustic louvers and acoustically treated intakes and discharges to acoustically treat air intakes into plant rooms using acoustic louvers, lined intakes/discharges and attenuators.
- Barriers use of acoustic barriers or screens to shield sensitive receivers.

7.2 Noise breakout from outdoor areas

The outdoor spaces are shown in Figure 2.

The outdoor area is located to the north of the buildings and will be used for outdoor gatherings or classes, recess and as a play area. The new games court will be located to the west of the outdoor area.

The highest noise emissions will be during morning supervision, recess and lunch times where 750 students gather outside. To assess the noise impact from the outdoor area we have made a noise model and made the following assumptions:

- It was assumed that only a quarter of children i.e. 188 will be playing at any time. The remaining 562 children will be talking, resting or eating.
- Those playing will be on or around the games court area.
- The remaining 562 children on the outdoor area, will be talking in normal voice.
- For every two children talking, one talks at any time.
- It was assumed that the noise source is halfway between a point source and line source.

The school building to the south will provide shielding to the residences across Greenbridge Drive to the south but the residences on the other sides will be exposed to the outdoor play noise.

We have calculated the noise emissions form the outdoor area to the nearest residential building across Kenniff Street to the west. The following Table 6 presents a summary of the results.



Table 6: Noise level emissions from the main	outdoor area
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Noise from 10 children at play SWL, dB(A)	Noise from 188 children at play, SWL, dB(A)	Noise from 188 children at play, SPL @ 1m, dB(A)	Noise from 562 children talking in normal voice (half talking), dB(A)	Total noise SPL at source, dB(A)	Noise at residential receiver, SPL, dB(A)	Criteria RBL+10, dB(A)	Complies (Y/N)
90	103	95	83.5	95	68	53	No

The summary results above indicate that there will be an exceedance of 15 dB(A) at the residential buildings over the east and north boundaries. This exceedance is expected only at morning supervision, recess and lunch times for a maximum 1.75 hours on weekdays.

A possible physical intervention of a high boundary acoustic wall has been discounted due to impact upon neighbours and significantly altering aesthetics of the school at the boundary. Due to the slope of the site the barrier would be required to exceed 3m in height.

The above noise impact is for the worst case scenario as it considers a large number of children at play (188 - 1 quarter of total students) and considers the nearest residential receivers. We are of the opinion that the impact should be absorbed or well received by the neighbours because:

- 1. The school is beneficial for Wilton and surrounding area in terms of services it provides to the families, employment, etc, therefore in a way the neighbours should be reciprocal and accept some inconvenience.
- 2. The school was constructed in 2011 before the arrival of the residential neighbours. There have been no noise complaints since school opening in 2011.
- 3. The outdoor play noise is only for short periods of time during the day. Not a continuous noise.
- 4. The above noise impact or exceedance is for the proposed number of children which is 750. Currently the number of children is 543, and population of the school will grow to 750 over a few years therefore the above noise impact will be gradual hence less noticeable by the adjacent properties.

It is noted that there is an exceedance over the criteria from the current school operations – the long term noise monitor data show worst case noise levels of 63 - 65 dB(A) during recess and lunch times. The expected noise increase is approximately 3dB(A) over the existing worst case value.

The normal times of use are as follows:

- Morning playground supervision: 9:00am 9:30am
- Recess: 11:30am 12:00pm
- Lunch: 1:30pm 2:15pm

The worst case noise levels which will only occur during class, recess and lunch times, are for a maximum of 1.75 hours daily, and will occur at day times where the residents would typically be out. The following managerial controls are recommended to reduce the noise impact to the nearest affected receivers:

- Children are to be supervised at all times
- No outdoor play permitted past 6pm



- Keep neighbours informed of any events or activities happening outside of regular morning supervision, recess and lunch times. Neighbours shall be informed of the nature of the event or activity and expected start and finish times
- Provide neighbours with a direct line of contact to the school for resolution of any issues. A direct line of contact to the school is publicly available to the neighbours via the Wilton PS website and the School Infrastructure website, with contact phone number and email address.
- Installing acoustically absorptive finish to the soffit of the new Covered Outdoor Learning Area (COLA) near the games court to reduce noise reflected from the COLA soffit towards the residences. The minimum absorption coefficient to be NRC 0.8.

7.3 Noise from PA System & School Bells

It is recommended that Public Address (PA) system loudspeakers and electronic school bells for the new buildings are installed facing away and/or shielded from the neighbouring residences and are calibrated and set (with a power limiter) such that the Project Noise Tigger Level criteria at the nearest affected residence L_{Aeq,15min} 48 dBA are not exceeded during their operation.

7.4 Noise breakout from the buildings:

Noise breakout from the buildings were considered in the assessment. The main noise emissions sources are as follows:

7.4.1 Noise emissions from Homebase Buildings

Stage 1 of the upgrade will comprise of Homebase buildings on the east near Woodward Road and these are the nearest buildings to the boundaries.

The activities in the homebase building will be limited to low noise activities such as teaching. The nearest homebase buildings to the residential boundary are Homebase 11 and Homebase 7 which will be used as classrooms. A typical noise level inside a small- medium size classroom will be L_{Aeq} 60 dB(A). The solid walls and standard glass windows R_w 25 of these buildings will provide enough attenuation to reduce the noise levels to levels below 48 dB(A) at the residential boundary of Woodward Road. If the windows/doors are left open, considering the loss through an open door, directivity and distance, the resulting noise at the boundary will still comply with the 48 dB(A) criteria.

7.4.2 Noise from the main hall (communal space)

The hall is multi-purpose and can be used for the following:

- School presentations
- School performances, music, concerts
- Sport training and games

The hall may be used for school activities in the evenings or over the weekend for which the hours of use will be extended to 9 pm.

To assess noise breakout from the hall we have considered a sports game which is one of the noisier activities in the hall. Noise from a sports game in a similar hall was previously measured at 88 dB(A) within the reverberant space of a hall. Noise breakout through the glass doors and windows on the south and east were calculated to the residential receiver across Greenbridge Drive 45 m away. Calculations were performed based on acoustic performance of standard glass window and frame R_w 25. The attenuation effect of building envelope, distance and directivity were considered. Table 7 presents a summary of calculation results.



Noise at source, SPL, reverberant	Noise outside the hall, SPL	SPL at receiver	Criteria	Complies (Y/N)
88	63	46	48 (day) 46 (evening)	Y

Table 7: Noise emissions from the hall

The above results indicate that with the windows closed, noise breakout from the hall will not have any impact upon the nearest residences across Greenbridge Drive, day or evening.

It should be noted that school upgrade in stage 1 does not increase the hall capacity or the noise levels. The above summary calculations have been added to show that the hall, whether existing or after the upgrade complies with the noise criteria.

7.5 Noise impact from vehicular movements

Noise impact from vehicular movements have been considered as follows:

7.5.1 Noise emissions from the carpark

Drawings indicate that the carpark extension will add 20 parking spaces to the existing 27 making a total of 47. The carpark will be used by the staff and long stay visitors.

To use the carpark, members of staff drive into the carpark through the electrical swing gates, drive to an empty space, park the car and switch the engine off. This whole process will take approximately 1 minute.

Noise emissions from the carpark was calculated to consider any possible noise impacts. The buildings in Kenniff Street comprise commercial buildings on the top, an OSHC building in front of carpark entrance and a residential building at the end of Kenniff Street. The nearest residential building at the end of Kenniff Street fronts this road (namely 14 Charlton Street as the entry door is on Charlton).

Noise levels from a moving car at slow speed was previously measured at L_{Aeq} 50 dB(A) at 2m and was stored in our database. This was corrected for the car numbers, duration and the distance to calculate the overall noise level. To calculate the noise levels, we have split the carpark into two sections. The first one will be the existing carpark, capacity 27 at an average distance of 55m to the residence, the second being the carpark extension, capacity 20 at an average distance of 25 m to the above residence. A summary of calculations and results is presented in Table 8.

SPL, 1 car @2m, dB(A)	SPL, 1 car @2m, dB(A)	Existing carpark		Carpark extension		Total	Criteria,	Complies
		SPL, 27 cars @ 2m, dB(A)	27 cars at receiver, @ 55m, dB(A)	SPL, 20 cars @ 2m, dB(A)	20 cars at receiver, @ 25m, dB(A)	noise at L _{Aeq,15min} receiver, dB(A) dB(A)	L _{Aeq,15min} dB(A)	(17N)
L _{Aeq,1} min 50	L _{Aeq,15} min 38	52	35	51	40	42	48 (Day) 46 (Evening)	Yes

Table 8: Carpark noise emission levels- Noise impact on Kenniff St residential building



The above summary results predict that noise emissions from the car park will comply with criteria at the nearest residential boundary. Other buildings in Kenniff Street are commercial for which the limit/criteria is 65 dB(A), hence all noise levels will comply with the criteria, no mitigation measures will be required.

7.5.2 Noise from generated traffic

We have used the figures of Traffic Report submitted by the traffic consultant. (PTC consulting, Traffic Impact Assessment, issue 5, dated 10-03-2020).

Existing traffic:

Section 6.1 and Table 4 of the traffic report provide the following volumes for existing traffic presented

in Table 9.

Intersection	AM Peak		PM Peak		
	Peak hour	Count	Peak hour	Count	
Site 1. Picton Rd/Pembroke Pde	7:30-8:30	2,257	15:00-16:00	2,092	
Site 2. Pembroke Pde/ Fairway Dr / Spearing St/Greenbridge Dr	8:30-9:30	343	15:00-16:00	423	
Site 3. Beatty St/ Greenbridge Dr	8:30-9:30	111	15:00-16:00	181	

Table 9: Existing traffic volumes

Generated traffic:

Table 5 of section 6.2 of the traffic report provide the following figures for generated traffic, presented in Table 10.

 Table 10:
 Generated traffic volumes

Stage	Capacity	AM peak		PM peak			
		Students	Trips	Roundtrips	Students	Trips	Roundtrips
Existing	450	261.9	138.2	276.4	251.1	138.6	277.2
Stage 1	750	436.5	230.3	460.6	418.5	231.0	462
Net	+300	+174.6	+92.1	+184	+167.4	+92.4	+185

Table 7 of the traffic report provides a summary of trip generations, as presented in Table 11 below.



Type of trip	AM Peak additional trips	PM Peak additional trips	
Students (Roundtrips)	184	185	
Staff (One-way trips)	2	12	
Total	186	197	

Table 11: Generated traffic volumes

The net increase in AM and PM peak figures are very similar therefore we look at noise increase in the AM peak with a net increase in Roundtrips of +184 vehicles in that hour.

The traffic report has assumed that the vehicles will be distributed between few zones A, B, C and Other roads, the distribution rate is between 21 % and 33%.

In all the surrounding roads, Greenbridge Drive will have the highest vehicular noise as we are assuming that no matter which direction or road the vehicles come from , they all congregate in front of the school, parents vehicles go to the Drop off point and the staff will turn to Kenniff Street to go into the carpark. The number of vehicles and the associated noise will be smaller on other surrounding roads or zones as the vehicle numbers split depending on the direction and distance from the school. On Greenbridge Drive the traffic volume will increase from 276.4 to 460.6 with a net increase of +184 vehicles. A summary of calculations for generated traffic noise and the impact on Greenbridge Drive is presented in Table 12.

Road	Existing traffic	Generated traffic	Increase in noise level	Permitted increase in noise level, dB(A)	Complies (Y/N)
Greenbridge Drive	277	461	2.2	2	Ν

Table 12: RNP- Noise levels summary due to generated traffic

The increase in noise levels in Greenbridge Drive from the generated traffic will be 2.2 dB(A) which marginally exceed the limit. The other surrounding roads will have smaller volume and noise levels. The attended noise measurement on Kenniff Street had a value of L_{Aeq} 48 dB(A). This figure is within the 55 dB(A) daytime criteria/limit specified by RNP hence with noise level increases of such level the noise will still be within the limit.

7.5.3 Noise emissions from the Drop off/Pick up point

The drop off point is on Woodbridge Drive in front of the school. It has an exclusive lane close to the kerb allocated to drop offs in the morning and pick ups in the afternoon.

The generated traffic will have a nett increase of 92 vehicle trips in the AM and in the PM peak hour. Assuming that the children arrival is evenly spread within 1 hour prior to start of school, then there will be 23 vehicle trips in the 15 minute assessment period.

To consider the impact we have done a series of calculations. Noise emissions from a passing car at low speed was previously measured at $L_{Aeq, 10 \text{ secs}} 61 \text{ dB}(A)$. The equivalent noise level for 23 vehicles over 15 minutes was calculated to the residential receivers across Greenbridge Drive. A summary of results is presented in Table 13.



1 vehicle, SPL at 10 m, dB(A) (measured)	23 vehicles, SPL at 10 m, dB(A)	SPL for 23 vehicles at 10 m, dB(A)	Resulting noise at receiver, dB(A)	Criteria	Complies (Y/N)
LAeq, 10secs 61	LAeq, 10secs 74	LAeq,15 min 54	L _{Aeq,15} min 48	48 (day)	Yes

Table 13: Noise emissions from Drop off/ Pick up points

The above summary results indicate that accumulated noise from the drop off point for the nett vehicle generated trips, complies with the day time criteria therefore no mitigation measures will be required.

7.6 OSHC noise emissions

Noise emissions from the new OSHC was considered. The activities in OSHC is mainly looking after children, helping with homework and holding teaching classes, all within indoor spaces. There will be no outdoor play during out of school hours.

Typically, noise levels within a small to medium teaching space is 60 dB(A). Considering the attenuation from the external walls, standard windows R_w 25, distance and directivity, the resulting noise levels at the nearest residential buildings in Kenniff Street will be well below the 48 dB(A) criteria hence no mitigation measures will be required.



8. Conclusion

This report forms part of the development application submission for the proposed upgrade of Wilton Public School.

A noise survey was conducted on site. Attended noise measurements and unattended noise monitoring were conducted to measure the ambient and traffic noise. The project noise criteria at the nearest affected receivers have been determined from the results using NSW Noise Policy for Industry, the SEPP criteria and relevant Australian standards. An assessment was conducted to establish the noise impacts. Where exceedances occurred, recommendations were given for compliance.

Providing our recommendations are implemented, the proposed upgrade is expected to mostly comply with the acoustic requirements of the Council and relevant Australian standards and guidelines.



Appendix A - Architectural drawings

The following drawings produced by Lahznimmo Architects was provided by the client and was used in the assessment:

Drawing number	Revision	Title
A-DA-1102	P2	Proposed site plan



Appendix B – Noise monitoring results















































Appendix C – Glossary of acoustic terms

The details are of the noise logging measurements are shown below. The measurements are in accordance with the NSW EPA Noise Policy for Industry (2017).

To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are plotted in the graphs below, are here defined.

- L_{Amax} The Maximum Noise Level (L_{Amax}) over a sample period is the maximum level, measured on fast response, during the sample period.
- L_{A10} The noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.
- L_{Aeq} The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.
- L_{A90} The noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level or RBL.
- L_{Amin} The Minimum Noise Level (L_{Amin}) over a sample period is the minimum level, measured on fast response, during the sample period.