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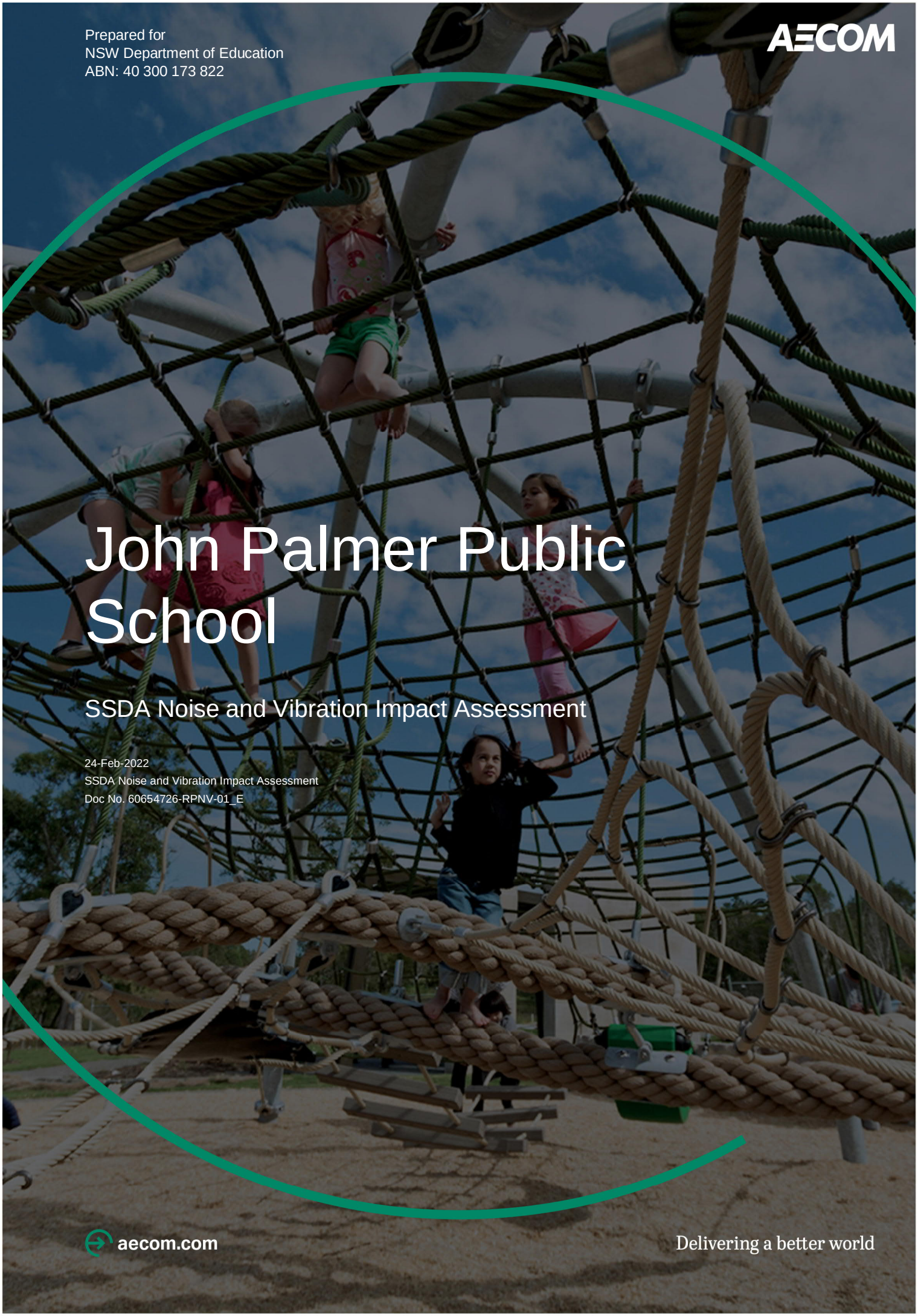

John Palmer Public School

SSDA Noise and Vibration Impact Assessment

24-Feb-2022
SSDA Noise and Vibration Impact Assessment
Doc No. 60654726-RPNV-01_E

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John Palmer Public School

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Client: NSW Department of Education

ABN: 40 300 173 822

Prepared by

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Reviewed by Gayle Greer

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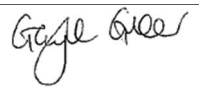
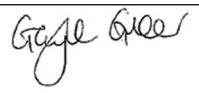
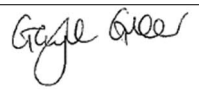
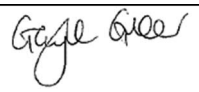
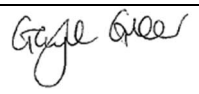
Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	10-Sep-2021	Draft	Gayle Greer Technical Director - Acoustics	
B	08-Oct-2021	Draft	Gayle Greer Technical Director - Acoustics	
C	12-Oct-2021	Revised draft	Gayle Greer Technical Director - Acoustics	
D	13-Oct-2021	Final	Gayle Greer Technical Director - Acoustics	
E	24-Feb-2022	Updated to address DPIE RfI	Gayle Greer Technical Director - Acoustics	

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1.0 Introduction

1.1 Background

AECOM Australia Pty Ltd (AECOM) has been engaged by School Infrastructure NSW to provide acoustic consultancy services for the proposed John Palmer Public School (JPPS) Upgrade located at 85 The Ponds Boulevard, The Ponds.

This Noise and Vibration Impact Assessment (NVIA) has been prepared on behalf of School Infrastructure NSW and presents the assessment of operational and construction noise and vibration for project. The assessment has been prepared in support of an Environmental Impact Statement (EIS), which has been prepared to assess the environmental impacts associated with the project.

This report addresses the relevant Secretary's Environmental Requirements (SEARS) issued 20 July 2021, specifically the following:

Noise and Vibration

Provide a noise and vibration impact assessment that:

- *includes a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation and construction.*
- *details the proposed construction hours and provide details of, and justification for, instances where it is expected that works would be carried out outside standard construction hours.*
- *includes a quantitative assessment of the main sources of operational noise, including consideration of any public-address system, school bell, mechanical services (e.g. air conditioning plant), use of any school hall for concerts etc. (both during and outside school hours) and any out of hours community use of school facilities.*
- *outlines measures to minimise and mitigate the potential noise impacts on nearby sensitive receivers.*
- *considers sources of external noise intrusion in proximity to the site (including, road rail and aviation operations) and identifies building performance requirements for the proposed development to achieve appropriate internal amenity standards.*
- *demonstrates that the assessment has been prepared in accordance with polices and guidelines relevant to the context of the site and the nature of the proposed development.*

Relevant Policies and guidelines:

- *NSW Noise Policy for Industry 2017 (NSW Environment Protection Authority)*
- *Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009)*
- *Assessing Vibration: A Technical Guideline 2006 (Department of Environment and Conservation, 2006)*
- *Development Near Rail Corridors and Busy Roads – Interim Guideline (Department of Planning, 2008)*
- *Australian Standard 2363:1999 Acoustics – Measurement of noise from helicopter operations.*

Operational noise management levels and vibration criteria have been established using:

- *Noise Policy for Industry* (NPfI), Environment Protection Authority (EPA), 2017
- *State Environmental Planning Policy (SEPP) (Infrastructure*), 2007
- *Development Near Rail Corridors and Busy Roads – interim guideline*, Department of Planning, 2008
- *Assessing Vibration: A Technical Guideline* (AVATG), Department of Environment and Conservation (DEC), 2006

- *NSW Road Noise Policy* (RNP), Department of Environment, Climate Change and Water (DECCW), 2011
- *Australian Standard AS 2021:2015 Acoustics – Aircraft noise intrusion – Building siting and construction*

Construction noise management levels and vibration criteria have been established using:

- *Interim Construction Noise Guideline* (ICNG), Department of Environment and Climate Change (DECC), 2009
- *Assessing Vibration: A Technical Guideline* (AVATG), Department of Environment and Conservation (DEC), 2006
- *NSW Road Noise Policy* (RNP), Department of Environment, Climate Change and Water (DECCW), 2011.

The operational and construction noise and vibration impact assessment is presented in this report along with noise and vibration mitigation treatments and strategies. The scope of the assessment includes:

- Operational noise and vibration
  - Major noise emitting plant
  - Traffic noise generation
  - Design of building envelope to attenuate traffic noise intrusion
  - Noise emission from indoor spaces, such as the school hall
  - Noise emission from outdoor spaces, such as outdoor play and sport
  - Recommendations for noise control measures to be incorporated into the architectural and services design strategies
- Construction noise and vibration
  - Noise predictions for construction scenarios
  - Noise impact assessment
  - Recommendations for construction noise control measures to be incorporated into a construction noise management strategy.

1.2 Site description

JPPS is located within the Blacktown Local Government Area (LGA) at 85 The Ponds Boulevard, The Ponds. The site is roughly rectangular in shape, with a total area of 29,830 m^2 and street frontages to Pebble Crescent to the west, Jetty Street to the south and The Ponds Boulevard to the east. The Ponds Shopping Centre adjoins the northern property boundary of the school.
An overview of the Proposal area is located in Figure 1 below.

Land use directly to the north of the site is predominantly commercial, however, is largely surrounded by a suburban environment with residential receivers located directly adjacent to the school.

It is understood that the school is operated by a Public Private Partnership (PPP).

Figure 1 JPPS Site Plan

1.3 Works description

The proposed development seeks to upgrade John Palmer Public School. The upgrade consists of the following alterations and additions:

- Construction of a new three storey building facing The Ponds Boulevarde which will accommodate 29 Permanent Learning Spaces and 1 new staff room;
- Construction of a one storey new library building;
- Relocation of service access to staff car park off The Ponds Boulevarde, including alterations to the existing car park to accommodate service vehicle;

- One-storey extension to and refurbishment of existing School Hall building. The School Hall extension will accommodate ancillary spaces for Out of Hours School Care;
- Building Block D will be re-purposed from an existing library to special program spaces and administration;
- Refurbishment of Building F to provide 1 new support unit;
- Minor additions and internal refurbishments to Building A;
- Removal of all 20 existing demountable classroom buildings once alterations and additions have been completed; and
- Ancillary works to support the alterations and additions including landscaping and service provision.

1.4 Proposed activities

The development is proposed to be used for both school activities and community use as follows:

- School use
  - The classes within the school operate from 8.55 am to 3pm
  - Accommodation of up to 1,012 students
  - Outdoor play for the entire student body for morning tea and lunch
  - Indoor teaching within classrooms, libraries and other school buildings
  - Outdoor teaching and sports
  - School assemblies, concerts and dances within the school hall
- Community and out of school hours care use
  - Accommodation for up to 165 students for out of school hours care
  - Out of school hours care will operate from 6.30 am to 8.30 am and 3 pm and 6.30 pm during the school term and between 7 am and 6.30 pm for vacation care
  - Out of school hours care use is limited to the hall and new extension, Covered Outdoor Learning Area to the north of the hall and Block E.
  - Concerts and dances within the hall
  - Sport on unencumbered play areas.

1.5 Document purpose

This Noise and Vibration Impact Assessment is intended to provide a reference for the policies, guidelines and standards that apply to the treatment and management of operational and construction noise and vibration associated with a large building project.

The Noise and Vibration Impact Assessment also sets out the applicable criteria, standard noise and vibration mitigation measures and monitoring, reporting and complaint management requirements.

1.6 SEARs requirements

Table 1 presents a guide to where the noise and vibration SEARs requirements have been addressed in this report.

Table 1 SEARs requirements

SEARs Requirements		Relevant Section of the Report
12 Noise and Vibration		
Construction Noise	Includes a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation and construction	Section 3.0 Section 5.0 Appendix B
	Details the proposed construction hours and provide details of, and justification for, instances where it is expected that works would be carried out outside standard construction hours	Section 3.0
Operational Noise	Includes a quantitative assessment of the main sources of operational noise, including consideration of any public address system, school bell, mechanical services (eg air conditioning plant), use of any school hall for concerts etc (both during and outside school hours) and any out of hours community use of school facilities	Section 4.0 Section 7.0 Appendix C
	Considers sources of external noise intrusion in proximity to the site (including road, rail and aviation operations) and identifies building performance requirements for the proposed development to achieve appropriate internal amenity standards	Section 4.0 Section 4.0
Construction and Operational Noise	Outline measures to minimise and mitigate the potential noise impacts on nearby sensitive receivers	Section 6.0 Section 7.0
	Demonstrates that the assessment has been prepared in accordance with policies and guidelines relevant to the context of the site and the nature of the proposed development	This document

2.0 Noise Monitoring

2.1 Estimated rating background levels

Due to the COVID-19 lockdown occurring in Sydney in 2021, the amount of road traffic, school activities and pedestrian traffic which would normally contribute to the local noise environment were absent to a large extent. As a result, it was not considered reasonable to conduct noise monitoring in order to establish ambient noise levels, as they would not be considered indicative of 'normal' activity in the area.

As a result, the following methods have been considered in order to establish reasonable background noise levels for the purpose of determining construction and operational noise criteria:

- Recommended minimum background noise levels presented in the EPA's Noise Policy for Industry (see Section 2.1.1)
- Estimated average background noise levels as presented in AS1055.2-1997 *Acoustics – Description and measurement of environmental noise Part 2: Application to specific situations* (see Section 2.1.2)
- Noise and vibration impact assessments completed for any other developments in the vicinity of the schools which may include recent ambient background noise measurements (see Section 2.1.3)

2.1.1 Recommended minimum rating background levels

The EPA's Noise Policy for Industry's (NPfI) presents minimum rating background levels (RBL) for residential receivers in the area based on Table 2.1 of the EPA's Noise Policy for Industry. The relevant RBLs are presented below in Table 2.

Table 2 Recommended minimum rating background levels

Time of day	Minimum assumed rating background noise level, dB(A)
Day 0700 - 1800	35
Evening 1800 – 2200	30
Night 2200 – 0700	30

2.1.2 AS1055.2:1997 Estimated background noise levels

Appendix A of Australian Standard 1055.2-1997 *Acoustics – 'Description and measurement of environmental noise – Part 2: Application to specific situations'* provides estimated Rating Background Level (RBL) values for different areas in Australia. In lieu of noise logging, conservative estimates have been used to establish rating background levels (RBL) for the nearby residential receivers.

As the receivers are all low-density suburban, they are concluded to lie within Noise Area Category R1: "*Areas with negligible transportation"*. The relevant RBLs are presented below in Table 3.

Table 3 Rating background levels

Noise Area Category	Description of Neighbourhood	Average rating background A-weighted sound pressure level, L_{A90} dB(A)		
		Day 0700 - 1800	Evening 1800 - 2200	Night 2200 - 0700
Area R1	Areas with negligible transportation	40	35	30

2.1.3 Other recent ambient background noise measurements

AECOM conducted a review of other nearby recent Development Applications where noise monitoring was conducted. Table 4 below presents noise monitoring conducted from *Riverbank Public School Noise Report for DA* by Wilkinson Murray in 2017.

Table 4 Rating background levels – Riverbank Public School

Time of day	Rating background noise level, dB(A)
Day 0700 - 1800	41
Evening 1800 – 2200	37
Night 2200 – 0700	30

2.1.4 Summary of background noise level estimates

From a review of these three methods, it is deemed that the recommended minimum rating background levels identified in the NPfI would be too conservative for the surrounding noise environment for the site. These minimum RBLs would be more typical of a rural environment. It can be seen from Table 4 that measured noise levels at Riverbank Public School are similar to the estimated RBLs taken from AS1055.2-1997. Measured noise levels in Table 4 are 1 dB(A) higher in the daytime and 2 dB(A) higher in the evening compared to AS1055.2-1997. Therefore, RBLs taken from AS1055.2-1997 have been selected as an appropriately conservative measure.

2.2 Measurement of environmental noise from The Ponds Shopping Centre

The Ponds Shopping Centre (TPSC) is owned by ISPT Limited and is located at 91 The Ponds Boulevarde, The Ponds. TPSC is located to the north of the northern boundary of John Palmer Public School. An existing concrete wall is located on the boundary between TPSC and JPPS. The wall ranges from 1.5 to 3.5 m in the area of the proposed new school buildings. The major environmental noise sources at TPSC include external mechanical plant, light vehicles entering the underground car park, fork-lift and truck activity in the loading dock and truck movements within the site. A The location of TPSC and JPPS are shown below in Figure 2.

Figure 2 Location of JPPS and The Ponds Shopping Centre

To determine the existing noise levels from The Ponds Shopping Centre at the proposed new buildings, noise monitoring was conducted at the approximate location of the proposed new building closest to The Ponds Shopping Centre.

The noise logger was placed at the Location M1 shown in Figure 2 between Thursday 16 December and Wednesday 22 December 2021, after the COVID-19 lockdown had ended. The noise monitor was placed at approximately 4 metres above ground level, to determine noise levels which would occur at the higher levels of the proposed building. An attended measurement was also conducted between 1.45 pm and 2.00 pm on 22 December 2021, at M2 in Figure 2 at approximately 1.5 metres above the ground for a 15 minute period.

The unattended measured $L_{Aeq,9hr}$ noise level at location M1 was 58 dB(A) during the daytime over the five day measurement period. The $L_{Aeq,1hr}$ noise level ranged between 54 dB(A) and 61 dB(A) during the measurement period.

The attended measured $L_{Aeq,15min}$ noise level at location M2 was 54 dB(A) during the measurement period. The noise level at M2 included noise from road traffic on The Ponds Boulevard, vehicles entering and exiting the TPSC car park, three trucks and activities in the loading dock and vacation care children in the outdoor play area.

3.0 Construction Noise and Vibration Criteria

Construction of the proposed development has the potential to temporarily contribute to the existing external noise environment. Noise is expected to be generated by construction works as well as construction traffic movements. This section presents construction noise and vibration management levels in order to address the impacts.

3.1 Construction noise management levels

The ICNG is a NSW Government document that identifies ways to manage impacts of construction noise on residences and other noise sensitive land uses. It is the principal guideline for the assessment and management of construction noise in NSW and is used to establish construction noise management levels (NML).

As the proposed works are expected to continue for a period of more than three weeks and are within relatively close proximity to noise sensitive receivers, a quantitative assessment, based on 'reasonable' worst case construction scenarios, has been carried out for these works. Noise levels resulting from construction activities are predicted at nearby noise sensitive receivers using environmental noise modelling software and compared to the noise management levels, derived in accordance with the ICNG. The background noise levels described above in Section 2.1.4 have also been used to determine construction noise management levels.

Where an exceedance of the NMLs is predicted, the ICNG advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as provide contact details to facilitate feedback from affected residents during construction.

The ICNG also states that during recommended standard construction hours where construction noise levels reach 75 dB(A) at residences, residential receivers can be considered as 'highly noise affected' and the proponent may be required to consider restricting hours of very noisy works (such as rock breaking or road cutting) to provide respite periods. In this assessment, receivers are considered as 'highly noise affected' where noise levels are 75 dB(A) or above, regardless of the time of day. Respite periods could be a negotiated outcome with highly noise affected receivers, taking into account times identified by the community when they are less sensitive to noise, or considering whether the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

The ICNG defines what is considered to be feasible and reasonable as follows:

Feasible

> *A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.*

Reasonable

> *Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.*

The construction noise management levels (NMLs) for the residential and other sensitive land uses in proximity to the site are detailed below.

3.1.1 Residential receivers

Guidance for setting construction noise management levels for residential receivers are summarised in Table 5.

Table 5 Construction noise management levels – residential receivers

Time of day	NML, $L_{Aeq,15min}$, dB(A)[1]	How to apply
Recommended standard hours[2]: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 (ICNG).

Notes:

1. *Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.*

2. *As noted, standard construction hours are Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm*

The above guidance has been utilised to define NMLs applicable to residences adjacent to the development. The project specific NMLs are summarised in Table 6.

Table 6 Construction noise management levels – Residential receivers

Receiver type	Recommended standard hours RBL	Recommended standard hours noise management levels L_{Aeq} dB(A)	Highly noise affected level L_{Aeq} dB(A)
Residential	40	50	75

3.1.2 Other sensitive land uses and commercial receiver noise management levels

Noise management levels for non-residential receivers located adjacent to the site have been determined using the recommended levels in the ICNG for other sensitive land uses and commercial buildings. The NMLs are presented in Table 7.

Table 7 Noise at sensitive land uses (other than residences) and commercial buildings

Land use	External noise levels, $L_{Aeq,15min}$ (Applies when properties are in use)
Educational institutions	65 dB(A)[1]
Active recreation areas	65 dB(A)

Notes:

1. Assumes an external to internal noise level reduction through a closed window of 20 dB(A)

3.2 Vibration criteria

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

The relevant standards and guidelines for the assessment of construction vibration are summarised in Table 8.

Table 8 Standards/guidelines used for assessing construction vibration

Item	Standard/guideline
Structural damage	Heritage structures – German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (DIN 4150) Non-heritage structures – Evaluation and Measurement for Vibration in Buildings Part 2, (British Standard (BS) 7385:Part 2-1993) (BS 7385)
Human comfort (tactile vibration)	Assessing Vibration: A Technical Guideline (AVATG)[1]

Notes:

1. *This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. However, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.*

3.2.1 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration.

DIN 4150 and BS 7385-2 provide recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in Table 9 and Table 10. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage. Structural damage criteria for heritage items have been taken from DIN 4150, whilst criteria for commercial/residential items have been taken from BS 7385.

Table 9 Structural damage safe limits (DIN 4150) for building vibration (Vibration peak particle velocity)

Group	Type of structure	At foundation – Less than 10 Hz	At foundation – 10 Hz to 50 Hz	At foundation – 50 Hz to 100 Hz[1]	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Notes:

1. *At frequencies above 100 Hz, the values given in this column may be used as minimum values*

Table 10 BS 7385-2: Transient vibration guide values for cosmetic damage

Group	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

3.2.2 Human comfort

The assessment of intermittent vibration outlined in the NSW EPA guideline A*ssessing Vibration: A Technical Guideline* (AVTG) is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 11. The VDV criteria are based on the likelihood that a person would comment adversely on the level of vibration over the entire assessment period.

Table 11 Preferred and maximum vibration dose values for intermittent vibration (m/s$^{1.75}$)

Location	Daytime (7am – 10pm)		Night-time (10pm – 7am)	
	Preferred	Maximum	Preferred	Maximum
Critical areas[1]	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops[2]	0.8	1.6	0.8	1.6

Notes:

1. *Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. Places where sensitive equipment is stored or delicate tasks are undertaken require more stringent criteria than the residential criteria specified above*
2. *Examples include automotive repair shops, manufacturing or recycling facilities. This includes places where manufacturing, recycling or repair activities are undertaken but do not require sensitive or delicate tasks.*

4.0 Operation Noise and Vibration Criteria

4.1 Noise Policy for Industry – Operational Noise Trigger Levels

Under the NSW Protection of the Environment (Operations) Act 1997, the Environment Protection Authority (EPA) document Noise Policy for Industry (NPfI) provides guidance in relation to acceptable noise trigger levels for industrial noise emissions.

The Secretary's Environmental Assessment Requirements (SEARs) indicates that the EPA's NPfI should be used to assess noise emission from this development.

The NPfI provides noise levels for assessing the potential impact of noise from industry and includes a framework for considering feasible and reasonable noise mitigation measures. The NPfI applies to all noise emission from permanent operations fixed facilities for the project. The assessment procedure for industrial noise sources has two components that must be considered:

- Controlling intrusiveness noise impacts in the short term for residences; and
- Maintaining noise level amenity for residences and other land uses.

4.1.1 Intrusiveness noise impacts

The NPfI states that the intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (L_{Aeq} level), measured over a 15 minute period, does not exceed the background noise level measured by more than 5 dB. The Rating Background Levels (RBLs) and resultant project intrusiveness noise levels are presented in Table 12.

Table 12 NPfI recommended $L_{Aeq,15\ minute}$ intrusiveness noise levels from industrial noise sources

Location	Period[4]	RBL (L_{A90}), dB(A)	Intrusiveness noise level (RBL + 5), ($L_{Aeq\ 15\ minutes}$), dB(A)
Residential Receivers	Day	40	45
	Evening	35	40
	Night	30	35

Notes:

1. *Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.*

   Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays.

   Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

As per the NPfI, intrusiveness noise levels are only applied to residential receivers. For other receivers, only the amenity levels apply.

4.1.2 Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from all industrial noise sources in an area should not normally exceed the recommended amenity noise levels specified in Table 2.2 of the NPfI. As per the definitions of receiver types within the NPfI, residences are classified as being in a suburban area.

Table 13 NPfI recommended L_{Aeq} amenity noise levels from industrial sources

Type of receiver	Noise amenity area	Time of day	Recommended noise level ($L_{Aeq, period}$), dB(A)
Residential	Suburban	Day	55
		Evening	45
		Night	40
School Classroom – Internal	All	Noisiest 1-hour period when in use	35[1]
Active recreation area	All	When in use	55
Commercial Premises	All	When in Use	65

Notes:

1. *In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable L_{Aeq} noise level may be increased to 40 dB L_{Aeq1hr}.*

The amenity level applicable to the project is equal to the recommended level minus 5 dB(A). This takes into account the cumulative impacts from other industrial noise sources in the area.

As per the NPfI, the project amenity level is converted to a 15 minute period by adding 3 dB.

4.1.3 Project noise trigger levels

Table 14 presents the applicable project noise trigger levels.

Table 14 NPfI project noise trigger levels

Type of receiver	Time of day	Intrusiveness noise level (RBL+5) ($L_{Aeq, 15 minutes}$), dB(A)	Project amenity level ($L_{Aeq, 15 minutes}$), dB(A)	Project noise trigger level ($L_{Aeq\ 15 minutes}$), dB(A)
Residential Receivers	Day	45	53	45
	Evening	40	43	40
	Night	35	38	35
School Classroom – Internal	Noisiest 1-hour period when in use	-	38[1]	38[1]
Active recreation area	When in use	-	53	53
Commercial Premises	When in Use	-	63	63

Notes:

1. *Amenity noise level has been adjusted due to existing industrial noise levels at the project site in accordance with Section 2.4 of the Noise Policy for Industry.*

Adjustments to the level of noise predicted at the assessment location may be applied in accordance with Fact Sheet C of the NPfI to account for the subjective effects of specific noise characteristics including tonality, low frequency content, intermittency, impulsiveness and duration.

4.1.4 Sleep disturbance trigger levels

The NPfI requires the potential for sleep disturbance to be assessed by considering maximum noise level events during the night-time period.

Where night-time noise levels from the proposed development at a residential location exceed the following screening levels, a detailed maximum noise level event assessment should be undertaken:

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

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

Based on the measured background noise levels during the night, the sleep disturbance trigger levels for the noise sensitive residential receivers are presented in Table 15.

Table 15 Night-time sleep disturbance trigger levels

Type of receiver	Measured night period RBL ($L_{Aeq,\ 15\ minute}$), dB(A)	Sleep disturbance screening trigger levels	
		$L_{Aeq,\ 15\ minutes,\ dB(A)}$	$L_{AFmax,\ dB(A)}$
Residential	30	40	52

4.2 Noise from road traffic generation – Road Noise Policy

Land use developments with the potential to create additional traffic on surrounding roads should be assessed using the EPA's Road Noise Policy (RNP). The external noise criteria are applied at 1 metre from the affected external building façade.

Table 16 Road traffic noise assessment criteria for existing residences affected by additional traffic

Period	Parameter	Criterion
The Ponds Boulevard (Collector)		
Day (7am – 10pm)	$L_{Aeq\ (15hr)}$	60 dB(A)
Night (10pm – 7am)	$L_{Aeq\ (9hr)}$	55 dB(A)
Jetty Street and Pebble Crescent (Local roads)		
Day (7am – 10pm)	$L_{Aeq\ (1hr)}$	55 dB(A)
Night (10pm – 7am)	$L_{Aeq\ (1hr)}$	50 dB(A)

In cases where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

To assess noise impacts from additional traffic generated by the project, an initial screening test is undertaken to determine if existing road traffic noise levels would increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers.

4.3 Noise intrusion

4.3.1 Development Near Rail Corridors and Busy Roads – Interim Guideline

The NSW Department of Planning document Development Near Rail Corridors and Busy Roads – Interim Guideline, presents noise criteria for sensitive receivers. Criteria relevant to the JPPS development are outlined in Table 17.

Table 17 Traffic noise intrusion – Development Near Rail Corridors and Busy Roads – Interim Guideline

Type of occupancy	Noise criteria, dB(A)
Educational Institutions	40

4.3.2 Educational Facilities Standards and Guidelines

The Educational Facilities Standards and Guidelines (EFSG) Design Guide 11 (DG11) sets out internal noise level criteria for school buildings. Table 18 presents the internal noise criteria extracted from Table 11.06.1 of the EFSG that have been nominated for the school. The criteria are expressed in terms of an A-weighted Equivalent Continuous Sound Pressure Level (L_{Aeq}), which generally represents the average decibel level. The internal noise levels are inclusive of external noise intrusion and building services noise from plant serving the building.

Table 18 Internal noise level criteria summary

Area	EFSG Internal Noise Level, (L_{Aeq}), dB(A)
Teaching spaces/single classroom – Primary schools	35

It is noted from Table 13 that the Noise Policy for Industry also sets an internal noise level criterion of L_{Aeq} 35 dB(A) for classrooms.

5.0 Construction Noise and Vibration Assessment

5.1 Construction noise

This construction noise and vibration assessment is based on typical construction scenarios for this type of development.

5.1.1 Construction hours

Construction activities at the JPPS site are proposed to be limited to the recommended standard hours as defined by the ICNG as follows:

- Monday to Friday: 7 am to 6 pm
- Saturday: 8 am to 1 pm
- Sunday and Public Holidays: No works

5.1.2 Construction phases and sources

The equipment and associated sound powers for the proposed JPPS development works are shown in Table 19. The assessment has been based on a worst-case scenario of all equipment operating concurrently.

Table 19 Construction phases and equipment

Phase	Equipment/activity	Percentage time on	'A' Weighted SWL dB(A)
Site Preparation and Excavation	Smooth Drum Roller	100%	105
	Plate Compactor	100%	108
	Front End Loader	100%	108
	Posi-Track Loader	100%	104
	5 Tonne Excavator	100%	94
	10 Tonne Excavator	100%	94
	Rigid Truck	100%	98
	Articulated Truck	100%	98
	Overall	**-**	**113**
JPPS Construction	Posi Track Loader	100%	104
	50 Tonne Mobile Crane	100%	104
	Concrete Boom and Pump	100%	106
	Concrete Agitator Delivery Truck	100%	105
	Asphalt Paving Machine	100%	106
	Rigid Truck	100%	98
	Articulated Truck	100%	98
	300 Tonne All-Terrains Crane	100%	106
	Overall	-	**113**
Demountable Removal	Articulated Truck	100%	98
	Rigid Truck	100%	98
	50 Tonne Mobile Crane	100%	104
	Hand tools	100%	94
	Overall	**-**	**106**

Construction is scheduled to be undertaken during recommended standard hours only. As such the impacts of construction activities on sleep disturbance do not need to be assessed. Sound power levels were obtained from published datasets in Australian Standard AS 2436:2010 *Guide to noise and vibration control on construction, demolition and maintenance sites*, British Standard BS5228: Part 1 2009 *Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise* and AECOM's database.

5.1.3 Modelling and conditions

Modelling of the proposed construction scenario has been performed using SoundPLAN 8.0. Standard weather conditions were applied. The following parameters were used in the modelling:

- Standard meteorological conditions – Pasquill-Gillford stability category D with source to receiver wind speed up to 0.5 m/s at 10 metres above ground level.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to localised fixed building structures would also vary as the construction equipment moves around the site.

5.1.4 Results

Construction noise contours are presented in Appendix B. The construction NMLs are predicted to be exceeded at number receivers. The predicted noise level at the worst affected residential receiver in each adjacent street and the nearest commercial and community receiver are presented in Table 20.

Table 20 Construction noise NML exceedances

Location		NML, dB(A)	Maximum predicted construction noise level, dB(A)	Maximum predicted exceedance, dB(A)
Site Preparation and Excavation				
Residential properties	The Ponds Boulevard	50	75	25
	Jetty Street	50	57	7
	Pebble Crescent	50	58	8
The Ponds Shopping Centre		65	58	-
The Ponds Community Hub		65	51	-
JPPS Construction				
Residential properties	The Ponds Boulevard	50	75	25
	Jetty Street	50	57	7
	Pebble Crescent	50	58	8
The Ponds Shopping Centre		65	58	-
The Ponds Community Hub		65	51	-
Demountable Removal				
Residential properties	The Ponds Boulevard	50	53	3
	Jetty Street	50	64	14
	Pebble Crescent	50	69	19
The Ponds Shopping Centre		65	45	-
The Ponds Community Hub		65	47	-

It should be noted that the most affected residences are located along The Ponds Boulevard for with worst case construction scenarios. No receivers are anticipated to be highly noise affected (i.e. exceed an $L_{Aeq,15min}$ of 75 dB(A)). Reasonable and feasible construction mitigation measures are provided in Section 6.0.

5.2 Construction vibration

Vibration-intensive works may include the use of the following items of equipment:

- Plate compactor

The minimum working distances of these items of equipment to nearby receivers are shown in Table 21 which is based on recommendations of the TfNSW *Construction Noise and Vibration Strategy* (CNVS) and AECOM's previous project experience. If these minimum working distances are complied with no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage. Based on the indicative construction activities assessed for the proposed development, works are unlikely to occur within the minimum working distances.

Table 21 Recommended minimum working distances for vibration intensive plant

Plant	Rating/description	Minimum working distance	
		Cosmetic damage	Human response
Plate Compactor	Handheld	1 m nominal	Avoid contact with structure

5.3 Construction traffic

The construction work would be undertaken in stages and would require a number of trucks, to deliver materials including concrete to the site. During early stages of construction workers may be able to park on site, during later stages they would park away from the site and either walk or use public transport to get to the site.

Based on the peak number of truck movements per day that typically occur at similar development, we have assumed that the peak number of trucks visiting the site per day would be 20 trucks resulting in 40 vehicle movements. The trucks visiting the site will gain access from Pebble Crescent. Based 40 heavy vehicle movements per day, the predicted level of noise from construction traffic is <55 dB(A) at the nearest affected residences at Pebble Crescent. This level of noise meets the RNP criteria presented in Section4.2.

Construction traffic noise management mitigations measures such as scheduling vehicle movements to avoid idling trucks on Pebble Crescent should be included in the construction noise and vibration management plan as discussed in Section 6.0.

6.0 Construction Noise and Vibration Mitigation

Given that NMLs are likely to be exceeded, reasonable and feasible noise mitigation measures and work practices would need to be considered. Where receivers are predicted to be 'noise affected' the ICNG states that all feasible and reasonable works practices should be applied to meet the NMLs. It is recommended that a construction noise and vibration management plan (CNVMP) be prepared.

Details of noise and vibration mitigation measures and management practices which should be considered for each CNVMP are detailed below.

The CNVMP should include the following:

- Identification of nearby residences and other sensitive land uses
- Description of approved hours of work
- Description and identification of all construction activities, including work areas, equipment and duration
- Description of what work practices (generic and specific) would be applied to minimise noise and vibration
- A complaint handling process
- Noise and vibration monitoring procedures
- Overview of community consultation required for identified high impact works.

Noise and vibration mitigation measures which should be considered in the CNVMP are detailed in Table 22.

Table 22 Recommended noise mitigation measures

Action required	Safeguard details
Management measures	
Implement community consultation measures	Notification (letterbox drop or equivalent), website, Project Infoline, Construction Response Line, email distribution list and community and stakeholder meetings to be undertaken by the Contractor.
Site inductions	All employees, school/facilities manager, contractors and subcontractors are to receive an environmental induction.
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Monitoring	A noise monitoring program should be considered.
Attended vibration measurements	If vibration intensive works are likely within minimum working distances attended vibration measurements are recommended at the commencement of vibration generating activities to determine site specific minimum working distances. Vibration intensive work should not proceed within the minimum working distances unless a permanent vibration monitoring system is installed approximately a metre from the building footprint, to warn operators (via flashing light, audible alarm, SMS etc.) when vibration levels are approaching the peak particle velocity objective.
Source controls	
Construction hours and scheduling	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. Consideration should be given to avoiding examination periods.
Equipment selection and maintenance	Use quieter and less vibration emitting construction methods where feasible and reasonable. Equipment would be regularly inspected and maintained to ensure it is in good working order.
Maximum noise levels	The noise levels of plant and equipment must have operating sound power or sound pressure levels that would meet the predicted noise levels.
Rental plant and equipment	Noise emissions should be considered as part of the selection process.
Use and siting of plant	Avoid simultaneous operation of noisy plant within discernible range of a sensitive receiver. The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Plant and vehicles to be turned off when not in use. Noise-emitting plant to be directed away from sensitive receivers.

Action required	Safeguard details
Plan works site and activities to minimise noise and vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Co-ordinate with key site locations and storage areas.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) should be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work, subject to work health and safety requirements.
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.
Construction related traffic	Schedule and route vehicle movements away from sensitive receivers and during less sensitive times. Avoid trucks idling on Pebble Crescent. Limit the speed of vehicles and avoid the use of engine compression brakes. Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.
Silencers on Mobile Plant	Where possible reduce noise from mobile plant through additional fittings including: • Residential grade mufflers • Damped hammers such as “City” Model Rammer Hammers • Air parking brake engagement is silenced
Path controls	
Shield stationary noise sources such as pumps, compressors, fans etc.	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.
Shield sensitive receivers from noisy activities	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.

6.1 Complaints handling procedure

A complaint handling procedure should be developed and documented within each CNVMP. The following section outlines items to be considered for inclusion in the procedure.

If complaints are received, an Environmental Incident Report Form should be completed to record details of the occurrence and actions taken. Where applicable, completed forms should detail the following:

- the date and time of the complaint
- the method by which the complaint was made
- any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect
- the nature of the complaint
- description of noise source that is the subject of complaint, duration of event
- location of complainant during time of incident, and general area in which the noise source was located
- identification of project related noise activities and locations that could have or are known to have contributed to the incident
- if known, identification of non-project related noise emission activities and location at time of incident
- meteorological conditions at the time of the incident
- the action taken in relation to the complaint
- any follow-up contact with the complainant
- if no action was taken, the reason why no action was taken.

All records are to be kept in a legible form, or in a form that can readily be reduced to a legible form and kept for at least 4 years after the complaint or event to which they relate took place.

The Site Environmental Officer should make available a report on complaints received to the relevant Government Agencies upon request. A response should be provided to the complainant within 24 hours. Corrective actions may involve supplementary monitoring to identify any non-compliances, and/or may involve modification of construction techniques to avoid any recurrence or minimise impacts.

A noise monitoring program should be implemented as a result of construction noise and vibration complaints.

7.0 Operational Noise and Vibration Assessment

The operational noise assessment, including assessment of noise emission and noise intrusion, is detailed in this section of the report with regard to the established criteria presented in Section 4.0. The acoustic assessment is based on the architectural drawing set issued by PTW Architects detailed below:

- AECOM-JohnPalmerPS-2021-09-25-27-13-07-59-490 Issue 24/09/2021

7.1 Assessment receivers

The locations of the nearby sensitive receivers are shown in Figure 3. The sensitive receiver locations along with the land use classification are presented in Table 23.

Table 23 Assessment receiver locations

Receiver	Address	Land use classification
R1	98 The Ponds Boulevard, The Ponds	Residential
R2	90 The Ponds Boulevard, The Ponds	Residential
R3	80 The Ponds Boulevard, The Ponds	Residential
R4	25 Pebble Crescent, The Ponds	Residential
R5	17 Pebble Crescent, The Ponds	Residential
R6	5 Pebble Crescent, The Ponds	Residential
C1	Riverbank Drive, The Ponds	Commercial
AR1	45 Riverbank Drive, The Ponds	Active recreation

Figure 3 Assessment receiver locations

7.2 Building services noise emission assessment

7.2.1 Equipment selections and noise levels

Details of indicative proposed major plant items and their associated sound power levels are provided below in Table 24.

Table 24 Major plant items and associated sound power levels, dB

Location	Plant item	Octave band centre frequency, Hz							Overall, dB(A)
		125	250	500	1k	2k	4k	8k	
Building N North	REYQ16TAY1 (4 units)	83	82	81	77	70	66	61	82
	REYQ20TAY1 (2 units)	85	85	85	81	76	72	67	86
Building N South	REYQ8TAY1 (1 unit)	76	77	76	73	66	63	58	77
	REYQ10TAY1 (1 unit)	80	77	77	73	68	63	58	78
Building D	REYQ18TAY1 (2 units)	83	82	82	78	72	68	63	83
	REYQ20TAY1 (1 unit)	85	85	85	81	76	72	67	86
Building B	REYQ16TAY1 (1 unit)	83	82	81	77	70	66	61	82
	RXYQ14AYM (1 unit)	62	60	58	53	48	44	38	59
	RXYMQ3AV4A (1 unit)	68	69	68	65	58	55	50	69
Eastern Boundary	1000 kVA Transformer	67	61	60	62	50	34	-	64

The location of the outdoor mechanical plant can be seen in in Appendix C.

For the purposes of this noise and vibration impact assessment, the following scenarios have been considered for noise emission from the mechanical condenser units:

- Day (7am to 6pm): All condenser units and eastern boundary transformer operating simultaneously
- Evening (6pm to 10 pm): Condenser units serving Building B and eastern boundary transformer operating simultaneously
- Night (10 to 7am): Eastern boundary transformer operating.

7.2.2 Acoustic treatments

The following acoustic treatments would be incorporated into the JPPS design:

- Internally lined ductwork comprising minimum 0.5 metres straight duct to be applied to each outdoor condenser unit discharge. Internal lining to be minimum 50 mm thick.
- Noise barriers of 2 m height surrounding outdoor condenser units servicing Building N North and Building N South. Where solid noise barriers are not possible due to air flow requirements, the barrier may be formed by acoustic louvres with an insertion loss equivalent to that shown in Table 25.

Table 25 Acoustic Louvre Insertion loss

Description	Octave band centre frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
300 mm acoustic louvres	7	9	11	16	19	23	24	21

7.2.3 Predicted operation noise levels

Incorporation of the above treatments results in building services meeting the applicable project trigger noise levels presented in Section 4.0 for noise sensitive receivers. The predicted noise levels from these three scenarios has been presented in Table 26 below.

Table 26 Building services noise emission

Receiver	Project noise trigger level ($L_{Aeq\ 15\ minutes}$), dB(A)	Predicted noise level ($L_{Aeq\ 15\ minutes}$), dB(A)
Daytime scenario		
R1	45	42
R2	45	32
R3	45	<30
R4	45	<30
R5	45	<30
R6	45	<30
C1	63	40
AR1	53	<30
Evening scenario		
R1	40	<30
R2	40	<30
R3	40	<30
R4	40	<30
R5	40	<30
R6	40	<30
C1	-	<30
AR1	-	<30
Night-time scenario		
R1	35	<30
R2	35	<30
R3	35	<30
R4	35	<30
R5	35	<30
R6	35	<30
C1	-	<30
AR1	-	<30

Operational noise contours for building services noise emission are presented in Appendix C

7.3 Out of School Hours Care Outdoor area usage noise emission assessment

Outdoor areas of the proposed school grounds would be utilised for the purposes of Out of School Hours Care (OSHC).

Below presents the assessed scenario that is considered representative of the worst-case for the above activity is as follows:

- Out of School Hours Care
  - 165 students located in the asphalt and COLA
  - Other OSHC (over and above 165) located within the school buildings such as the hall and library
  - $L_{Aeq,15min}$ 10 children: 87 dB(A)
  - Occurs during the daytime (6.30am to 6pm) period only

The predicted noise levels from the worst case scenario of all OSHC students located outdoor has been presented in Table 27 below.

Table 27 Out of hours school care

Receiver	Project noise trigger level ($L_{Aeq\ 15\ minutes}$), dB(A)	Predicted noise level ($L_{Aeq\ 15\ minutes}$), dB(A)
Out of school hours care scenario		
R1	45	<30
R2	45	34
R3	45	<30
R4	45	37
R5	45	35
R6	45	<30
C1	63	<30
AR1	53	30

The OSHC activities may occur during the daytime shoulder period from 6.30 am. The background noise levels during the shoulder period are typically consistent with daytime noise levels. The OSHC are therefore assessed against the daytime criteria.

It is predicted that the Out of Hours School Care scenario would comply with the relevant NPfI criteria at residences, therefore, no further consideration to outdoor area usage is required.

OSHC Operational noise contours for outdoor area use noise emission are presented in Appendix C.

7.3.1 School use of outdoor areas

It is noted, that the NPfI is not applicable to noise emission from the use of outdoor play areas and sports fields and therefore compliance with these criteria is not mandatory.

The proposed new buildings and refurbishments will increase the capacity of the school from 943 students to 1,012 students. This will result in a predicted increase of less than 1 dB(A) from existing capacity to the proposed new capacity. This increase in noise level is imperceptible and is therefore considered acceptable.

In consideration of the above, it is unlikely that the use of outdoor areas will cause significant disturbance to nearby noise sensitive receivers.

7.4 Indoor area usage noise emission assessment

The use of the existing hall for both school and community activities has the potential to generate significant noise levels at nearby sensitive receivers.

New openings are proposed on the western façade of the existing hall building envelope. Existing tilt doors on the northern façade are proposed to be replicated on the western façade.

7.4.1 Hall operation scenarios

The hall would be utilised for a wide range of activities. These have been split into two categories for the purposes of the acoustic impact assessment:

- Category 1: High noise level activities
  - Activities involving live and/or amplified music
  - Maximum internal reverberant noise level of 85 dB(A)
  - School concerts, school dances/discos, community use
- Category 2: Low noise level activities
  - Maximum reverberant noise level of 75 dB(A)
  - Indoor sports, OSHC, school assemblies.

The following assumptions have been about the large hangar doors for the above activities are presented in Table 28.

Table 28 Hall noise door status

Activity	Time	Control measures
Category 1	Day	Northern and western hangar door closed Northern and western double doors closed
	Evening	Northern and western hangar door closed Northern and western double doors closed
Category 2	Day	Northern and western hangar door open Northern and western double doors open
	Evening	Northern and western hangar door closed Northern and western double doors closed

Notes:

1. It is not envisaged that the hall would be utilised during the night

It is noted that the NPfI is not strictly applicable to noise emission from the use of the school hall and therefore compliance with these criteria is not mandatory. The NPfI criteria however has been used in this case as a benchmark to determine whether use of the hall is likely to cause disturbance to nearby sensitive receivers.

The predicted noise levels from hall Category 1 has been presented in Table 29 below.

Table 29 Hall noise emission

Receiver	Project noise trigger level ($L_{Aeq\ 15\ minutes}$), dB(A)	Predicted noise level ($L_{Aeq\ 15\ minutes}$), dB(A)	Project noise trigger level ($L_{Aeq\ 15\ minutes}$), dB(A)	Predicted noise level ($L_{Aeq\ 15\ minutes}$), dB(A)
	Daytime		Evening	
Hall noise emission – Category 1				
R1	45	<30	40	<30
R2	45	44	40	**44**
R3	45	30	40	30
R4	45	39	40	39
R5	45	30	40	30
R6	45	<30	40	<30
C1	63	<30	63	<30
AR1	53	34	53	34
Hall noise emission - Category 2				
R1	45	<30	40	<30
R2	45	42	40	34
R3	45	31	40	<30
R4	45	40	40	<30
R5	45	31	40	<30
R6	45	<30	40	<30
C1	63	<30	63	<30
AR1	53	35	53	<30

It is noted that, the hall building is existing and no changes are proposed to the eastern and north façade. The changes to the western and south façades relate to door locations and open areas.

It can be seen from Table 29, that noise emissions are predicted to meet the criteria at receivers during category 1 in the daytime, however an exceedance is predicted in the evening at R2. It is likely that events with internal noise levels of 85 dB(A) would be infrequent. For the evening period the exceedance is considered marginal given the level of exceedance and the likely frequency of events. It is also noted R2 is located to the east of the existing Hall. The eastern façade and doors are not proposed to change from the existing Hall and therefore it is unlikely that there would be a significant change in impact from the existing use of the Hall at R2.

Noise emissions during category 2 comply with the day and evening criteria and are therefore considered acceptable.

Operational noise contours for hall use with doors open, are presented in Appendix C.

7.5 School bell and public address operation noise emission

Speakers types, locations and orientation for the school bell and/or public address systems have not been determined at this stage of the design. The speaker design must be assessed during the detailed design stage and appropriate acoustic measures incorporated to meet the relevant criteria presented in Section 4.0. The following should be considered in the design of the speaker system to reduce noise emission to nearby receivers:

- Speaker location and direction

- Use of directional speakers
- The use of more speakers, set at lower volume levels, closer to the listeners will reduce noise emission outside of school grounds.

7.6 Cumulative emission from school grounds

The cumulative noise level from noise emission sources assessed above will be higher than the noise emission from any of the individual sources. However, it is unlikely that most noise sources will be in operation simultaneously, for example use of the school hall will occur at different times of the day than outdoor play.

It is noted that the operation of building services would occur during the same periods as one of the outdoor area usage or hall usage scenarios, however, due to the relative locations and orientations of the relative activities and plant, it is not likely that the combined noise emission will result in exceedances of the NPfI criteria additional to those already noted in the Sections above.

7.7 Noise intrusion assessment

7.7.1 Traffic noise intrusion

The Transport and Accessibility Impact Assessment prepared by TTW dated 11 October 2021 for John Palmer Public School presents SCATS data for the intersection of The Ponds Boulevard and Riverbank Drive recorded on Wednesday 16 June 2021.

The SCATS data indicates that up to 971 vehicles passed the school site during the School afternoon peak period of 2.45 pm to 3.45pm.

It is possible that road traffic would result in noise intrusion into the proposed new building within the school. The façade of the building will be designed to attenuate traffic noise intrusion to meet the criteria presented in Section 4.3.

The road traffic noise level at the façade of the proposed new building was predicted using the Calculation of Road Traffic Noise 1988 (CoRTN) algorithms. It is assumed that the number of vehicles during the School afternoon peak period accounts for 20% of the daytime traffic volume on The Ponds Boulevard.

Based on the above assumption, using the CoRTN calculation method, the predicted traffic noise level at the eastern façade of the proposed new building is presented in Table 30.

Table 30 Road traffic noise levels at eastern façade, $L_{Zeq,15hr}$ levels, dB

Location	Octave Band Centre Frequency, Hz							Overall, L_{Aeq} level, dB(A)
	63	125	250	500	1k	2k	4k	
Eastern façade of the proposed new building	66	67	57	54	54	50	46	59

The following minimum acoustic performances for the northern and eastern facing façade are recommended to meet the traffic noise intrusion requirements:

- Glazed elements
  - Minimum R_w 37 acoustic performance
  - Indicative construction: 10.5 mm Hush Vlam glass
  - Sliding doors must be closed to meet traffic noise intrusion requirements
- Ventilation louvres
  - Minimum R_w 33 acoustic performance
  - Indicative construction: 6.38 mm laminated glass

- Opaque elements
  - Minimum R_w 45 acoustic performance
  - Indicative construction:
    - 60 mm thick panelised brick, 28 mm furring channel with 25 mm bulk insulation in cavity and 13 mm plasterboard; OR
    - 9 mm fibre cement sheet, 64 mm steel stud with 50 mm bulk insulation in cavity and 13 mm fire rated plasterboard

7.7.2 Industrial noise intrusion

Building N is most likely to be affected by industrial noise from the adjacent TPSC. Based on the maximum measured L_{Aeq1hr} noise level at location M1 in Section 2.2 of 61 dB(A) and proposed façade construction as presented in Section 7.7.1, the EFSG/NPfI internal noise level criterion of 35 dB(A) would be achieved at all times when the ventilation louvres are closed.

The internal criterion within learning spaces would not be achieved at all times if the ventilation louvres were open. However as per the Green Star Buildings guidelines internal noise levels are to be measured post construction with the windows and openings closed regardless of the ventilation strategy.

The Mechanical/ESD design is based on the premise that the louvres would be closed at times, due to unfavourable weather conditions. During these times ventilation would be provided in accordance with the Building Code of Australia/National Construction Code (BCA/NCC) 2019 by the mechanical services design as already detailed in the Mechanical Services Specification (AECOM 60654726-ME-SP-01 dated 22 September 2021) and drawings. This meets the requirements of the NPfI.

Cross flow ventilation is only to be utilised at the Teachers discretion when weather and acoustic conditions are favourable.

7.8 Traffic generation noise assessment

As discussed in 7.3.1, the capacity of the school will increase from 943 students to 1,012 students. According to the Transport and Accessibility Impact Assessment prepared by TTW, dated 11 October 2021, the proposal will increase drop-off and pick-up from 566 to 607 vehicles and staff vehicles from 55 to 58.

The increase in traffic to the site as a result of the increase in student and staff numbers is expected to be less than 1 dB, which is considered insignificant. Therefore, the traffic impact on access roads from the project would be acceptable.

7.9 Operational vibration

Items installed as part of JPPS are not expected to produce any significant vibration, therefore no further assessment has been undertaken.

8.0 Conclusion

This report presents the results of a noise and vibration impact assessment of the proposed John Palmer Public School Upgrade.

Operational noise emission from the development has been assessed with consideration to the project noise trigger levels established in accordance with the Noise Policy for Industry and assumptions of the noise levels at the development site. The impact of noise emission from new developments can be widespread when noise issues are not correctly considered, however, this assessment indicates that standard amelioration strategies such as mechanical plant noise limits and barriers would sufficiently treat noise emission to minimise possible acoustic impacts on neighbouring areas.

Noise and vibration intrusion to the development from road traffic has been assessed and provided the noise control measures identified in Section 7.7.1 are implemented, complies with the criteria established in accordance with Development Near Rail Corridors and Busy Roads – Interim Guideline.

As with road traffic noise intrusion, provided the noise control measures identified in Section 7.7.1 are implemented, industrial noise intrusion from TPSC would comply with the EFSG/NPfI criteria. It is noted that at times, ventilation requirements would be provided by the mechanical design, in accordance with the Building Code of Australia/National Construction Code (BCA/NCC) 2019 due to unfavourable weather or acoustic conditions.

Traffic generation as a result of the proposed development is predicted to be minimal and predicted traffic noise increases would comply with the applicable criteria outlined in the NSW Road Noise Policy.

Construction noise has been assessed in accordance with the Interim Construction Noise Guideline. The worst case construction scenarios have been considered. Construction works would be undertaken during standard hours. The level of exceedances of the construction noise management levels are provided in Section 5.1.4. It should be noted that the exceedances presented are the highest on each residential street during the construction phase and would generally be significantly lower for significant periods of time.

Provided the minimum working distances provided in Section 5.2 are complied with no adverse impacts from vibration intensive works are likely. It is recommended that a construction noise and vibration management plan (CNVMP) be prepared. The CNVMP should detail feasible and reasonable noise mitigation measures to be applied to meet the NMLs.

Based upon this assessment documented above, all environmental noise and vibration impacts can be appropriate managed in accordance with the relevant guidelines and standards.

Appendix A

Glossary of Acoustic Terminology

Appendix A Glossary of Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	The total sound emitted by a source.
Sound pressure level	The amount of sound at a specified point.
Decibel [dB]	The measurement unit of sound.
A Weighted decibels [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period.
L_{min}	The minimum sound pressure level measured over the measurement period.
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.

L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for **each day** of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the **entire length** of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 *"Acoustics – Glossary of terms and related symbols"*, the EPA's NSW Noise Policy for Industry and Road Noise Policy.

Appendix B

Construction Noise Contours

Construction Noise Contours - Site Preparation and Excavation

N

0 0.035 0.07 km

AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

55 60 65 70 75

Source:

Construction Noise Contours - JPPS Construction

N

0 0.035 0.07 km

AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

55 60 65 70 75

Source:

Construction Noise Contours - Demountable Removal

N

0 0.035 0.07 km

AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

55 60 65 70 75

Source:

Appendix C

Operational Noise Contours

Mechanical operation - Daytime

N

0 0.02 0.04 km

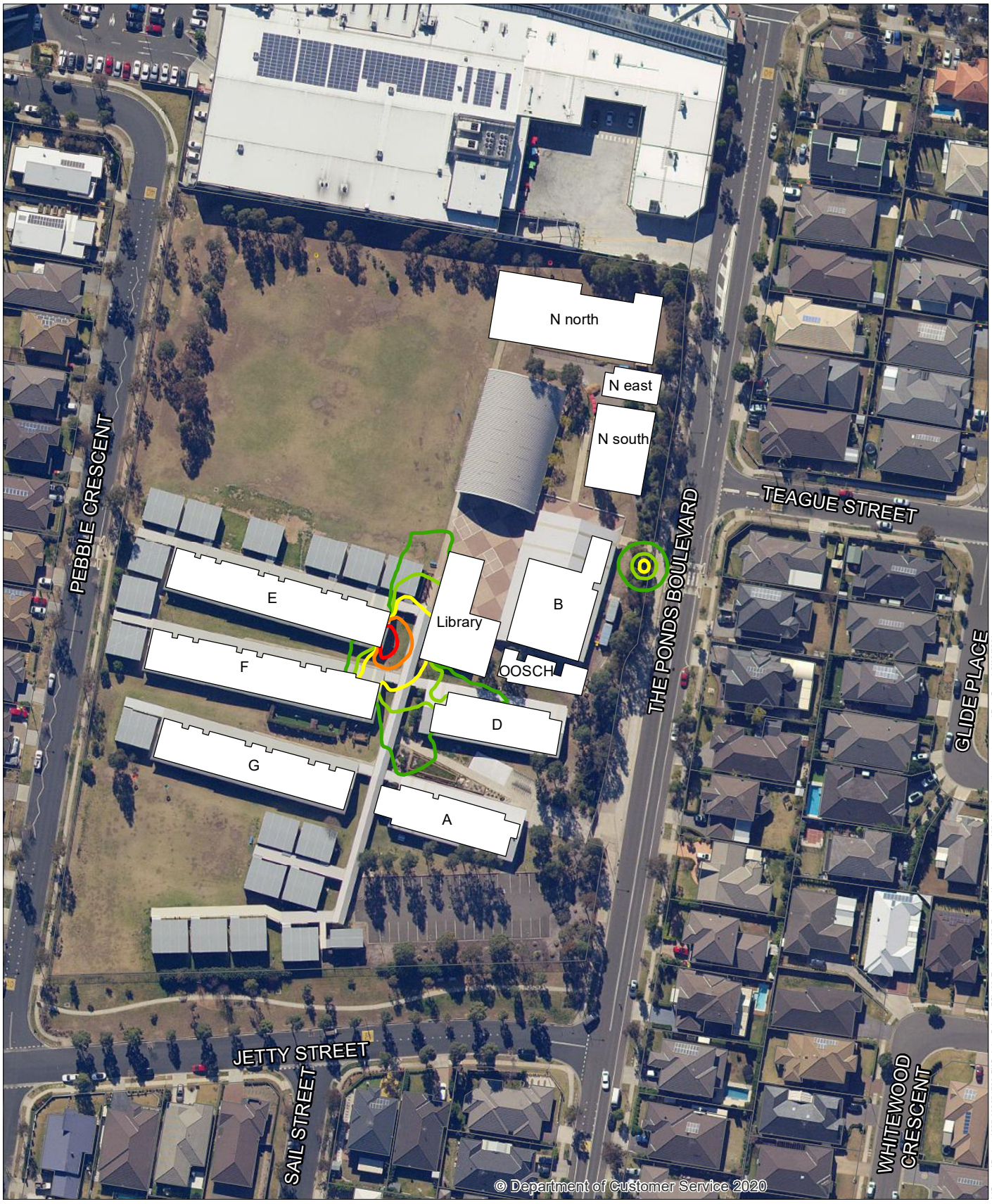
AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

45 50 55 60 65

Source:



Mechanical operation - Evening

N

0 0.02 0.04 km

AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

40 45 50 55 60

Source:

Mechanical operation - Night-time

N

0 0.02 0.04 km

AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

35 40 45 50

Source:

Operation - Out-of-School Hours Care

N 0 0.02 0.04 km

AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

45 50 55 60 65

Source:

Operation - Hall - Category 1 - Doors Closed

N

0 0.02 0.04 km

AECOM

Proposed JPPS Buildings

$L_{Aeq,15min}$, dB(A)

45 50 55 60 65

Source: