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Environmental Noise Assessment

Redevelopment of St Edmunds College
60 Burns Road, Wahroonga, NSW

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1.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by Glendenning Szoboszlay Architects on behalf of St Edmunds College to carry out an acoustic assessment of the proposed redevelopment of their Special Education College at 60 Burns Road, Wahroonga, NSW. This commission involves the following:

Scope of Work:

- Inspect the site and environs
- Measure the background noise levels at critical locations and times
- Establish acceptable noise level criteria
- Quantify noise emissions from the Special Education College taking into consideration the proposed redevelopment
- Calculate the level of noise emission, taking into account building envelope transmission, screen walls and distance attenuation
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Provide recommendations for acoustical treatment (if necessary)
- Prepare an Environmental Noise Assessment Report.

2.0 PROJECT DESCRIPTION & SUMMARY OF FINDINGS

St Edmunds College (*SEC*) propose to redevelop the existing Special Education College at 60 Burns Road, Wahroonga, NSW.

SEC is situated on land zoned *SP2 – Infrastructure* under Ku-ring-gai Local Environmental Plan (LEP) 2015.

SEC comprises of an outdoor play field, two courtyards, general learning areas (GLAs) and classrooms, pool, amenities, resource centre, hospitality class, fitness room, science room, staff areas and administration areas.

SEC caters for up to 132 students (127 currently enrolled) in years 7 to 12 with visual impairments and other special needs such as autism and intellectual disability in the mild to moderate range. There will be no increase to the total number of students enrolled at *SEC* as part of this proposal.

The proposal seeks approval for the following:

- Demolition of some existing structures;
- Retention of key school facilities (i.e. pool, hospitality area, heritage listed building);
- Refurbishment of existing buildings (where required);
- Additions to the rear of the retained existing buildings, including:
  - New hall;
  - New library;
  - Administration areas;
  - Amenities; and
  - Classrooms.
- New car park with associated internal driveway, from Braeside Street; and
- Landscaping.

Mechanical plant, including but not limited to air conditioning condenser units and exhaust fans, will be required to serve the proposed classrooms, hall, amenities, administration and library.

SEC is bounded by Braeside Street to the north, residential premises to the east, Burns Road to the south and residential premises and Wahroonga Avenue to the west. Residential premises are also located on the opposite side of Braeside Street, Burns Road and Wahroonga Avenue to the north, south and west and Wahroonga Public School is located on the opposite side of Burns Road to the south-east, as shown on Figure 1.

The nearest noise sensitive receptors to *SEC*, in various directions, are shown on Figure 1 and as follows in Table 1.

Table 1 Noise Sensitive Receptors

Receptor and Type	Address	Direction from site
R1 – Residential	48 Braeside Street	North
R2 – Residential	41 Braeside Street (front)	East
R2a – Residential	41 Braeside Street (rear)	East
R3 – Residential	64 Burns Road (ground)	East
R3a – Residential	64 Burns Road (first floor)	East
R4 – Residential	62 Burns Road (ground)	South-East
R4a – Residential	62 Burns Road (first floor)	South-East
R5 – Residential	60A Burns Road (ground)	South
R5a – Residential	60A Burns Road (first floor)	South
R6 – Residential	57A Burns Road	South
R7 – Residential	2A Wahroonga Avenue	West
R8 – Residential	3 Wahroonga Avenue	West
R9 – Residential	37 Braeside Street (front)	West
R9a – Residential	37 Braeside Street (back)	West

Each receptor location has been selected to represent the adjacent residential premises, eg R1 is representative of all residential receptors to the north of *SEC*; R6 is representative of all residential receptors to the south of *SEC*; etc.

The existing and ongoing operating hours for the Public School are:

Standard Hours:

- Monday – Friday: 8.00 am – 3.00 pm; including
- Recess: 10.55 am – 11.15 am; and
- Lunch: 12.45 pm – 1.25 pm.

This proposal is to be undertaken in accordance with the NSW Department of Planning and Environment's (DoPE) *State Environmental Planning Policy (SEPP) (Educational Establishments and Child Care Facilities) 2017* and NSW Environment Protection Authority's (EPA) *NSW Road Noise Policy (RNP).*

An acoustic assessment of the noise from the general learning areas (GLAs), mechanical plant, new hall and vehicle movements (on and off site) has been carried out to ensure the noise impact of *SEC*, subsequent to the proposed redevelopment, will not adversely affect the acoustic amenity of the nearby residences.

Calculations show that, provided the recommendations in Section 5 of this report are implemented and adhered to, the level of noise emission, subsequent to the proposed redevelopment, from *SEC* will meet the acoustic requirements in the NSW Department of Planning and Environment's *SEPP (Educational Establishments and Child Care Facilities) 2017* and the NSW Environment Protection Authority's (EPA) *NSW Road Noise Policy.*

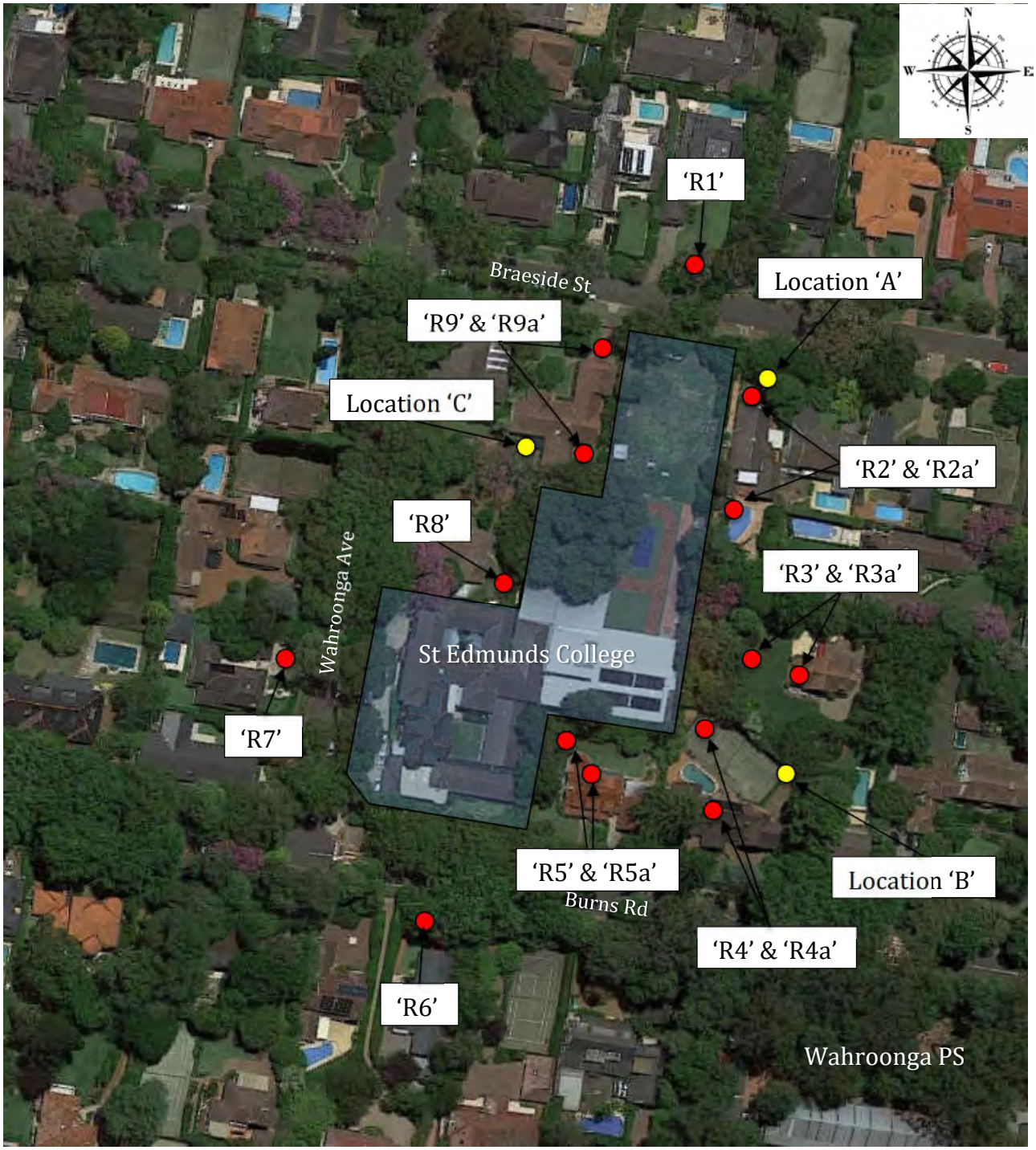


Figure 1 - Location Plan, 60 Burns Road, Wahroonga, NSW.

3.0 ACOUSTIC CRITERIA

3.1 SEPP (Educational Establishments and Child Care Facilities) 2017

The NSW Department of Planning and Environment (DoPE) published the State Environmental Planning Policy (SEPP) (Educational Establishments and Child Care Facilities) 2017 on 1 September 2017. The relevant parts of the SEPP to this proposal have been extracted and are revised below.

Part 4 Schools - specific development controls

35 Schools – development permitted with consent

(2) Development for a purpose specified in clause 39 (1) or 40 (2) (e) may be carried out by any person with development consent on land within the boundaries of an existing school.

(9) A provision of a development control plan that specifies a requirement, standard or control in relation to development of a kind referred to in subclause (1), (2), (3) or (5) is of no effect, regardless of when the development control plan was made.

39 Existing schools – complying development

(1) Development carried out by or on behalf of any person on land within the boundaries of an existing school is complying development if:

(a) it consists of the construction of, or alterations or additions to, any of the following:

(i) a library, an administration building or office premises for the purposes of the school,

(ii) a gym, indoor sporting facility or hall,

(iii) a teaching facility (including lecture theatre), laboratory, trade facility or training facility,

(iv) a cafeteria that is carried out in accordance with AS4674:2004, Design, construction and fit-out of food premises, published by Standards Australia on 11 February 2004,

(v) a kiosk or bookshop for students or staff (or both),

(vi) a hall with associated covered outdoor learning area or kiosk,

(vii) an outdoor learning or play area and associated awning or canopy,

(viii) demolition of a building or structure (unless a State heritage item or local heritage item),

(ix) minor alterations or additions (such as internal fitouts, structural upgrades, or alterations or additions to enable plant or equipment

to be installed, to address work health and safety requirements or to provide access for people with a disability),

(x) restoration, replacement or repair of a damaged building or structure, and

(b) it complies with this clause.

(3) The development standards for complying development under this clause (other than for development referred to in subclause (1) (a) (viii), (ix) or (x)) are set out in Schedule 2.

'Schedule 2 Schools – Complying development' of the SEPP requires the following regarding noise:

'6 Noise

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.'

Also, 'Schedule 4 Schools – design quality principles' of the SEPP requires the following:

'Principle 5. Amenity

Schools should provide pleasant and engaging spaces that are accessible for a wide range of educational, informal and community activities, while also considering the amenity of adjacent development and the local neighbourhood.'

3.2 NSW Environment Protection Authority

3.2.1 NSW Noise Policy for Industry

The NSW Environment Protection Authority (EPA) published the *Noise Policy for Industry* (NPI) in October 2017. The *NPI* is specifically aimed at assessing noise from industrial noise sources listed in Schedule 1 of the Protection of the Environment Operations Act 1997 (POEO, 1997).

The *NPI* provides a useful framework to assess noise emission from non-scheduled premises, whether that premises maintains the amenity of an area.

Section 1.4 of the *NPI* specifies the types of industrial noise sources the policy is designed for, such as mechanical plant and equipment and vehicle movements within the premises and / or on private roads, etc. In addition, Section 1.5 of the *NPI* lists the type of noise sources to which the policy does not apply to, which includes *'noise sources covered by regulation (domestic/neighbourhood uses)'.*

The *NPI* **is not** applicable (Section 1.5 of the NPI - see above) to noise associated with students engaged in active/passive play in the outdoor / indoor areas of an educational establishment. However, the amenity noise levels may be used as a screening test to establish whether further investigation into the likely effects, if any, on the acoustic amenity (as per the *SEPP*) of the local area is warranted.

3.2.1.1 Project Intrusiveness Noise Levels

The EPA states in Section 2.3 of its NSW *NPI* (October 2017) that the intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the rating background noise level by more than 5 dB when beyond a minimum threshold (EPA *NPI*, 2017, Section 2.3).

The Rating Background Level at Logger Location 'A', was 37 dBA during the day (see Table 4). Therefore, the acceptable $L_{eq,\ 15\ minute}$ noise intrusiveness criteria for the residential receptors in these areas is:

- (37 + 5 =) 42 dBA $L_{eq,\ 15\ minute}$ during the day.

The Rating Background Level at Logger Location 'B', was 40 dBA during the day (see Table 4). Therefore, the acceptable $L_{eq,\ 15\ minute}$ noise intrusiveness criteria for the residential receptors in this area is:

- (40 + 5 =) 45 dBA $L_{eq,\ 15\ minute}$ during the day.

The Rating Background Level at Logger Location 'C', was 36 dBA during the day (see Table 4). Therefore, the acceptable $L_{eq,\ 15\ minute}$ noise intrusiveness criteria for the residential receptors in this area is:

- (36 + 5 =) 41 dBA $L_{eq,\ 15\ minute}$ during the day.

3.2.1.2 Project Amenity Noise Levels

Depending on the type of area in which the noise is being made, there is a certain reasonable expectancy for noise amenity. The NSW *NPI* provides a schedule of recommended L_{eq} industrial noise levels that under normal circumstances should not be exceeded. If successive developments occur near a residential area, each one allowing a criterion of background noise level plus 5 dB, the ambient noise level will gradually creep higher.

The recommended L_{eq} noise levels in Table 2 are taken from Section 2.4, Table 2.2 of the NPI.

Table 2 Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day	L_{eq}, dBA, Recommended Amenity Noise Level
Residential	Suburban	Day	55
		Evening	45
		Night	40

The L_{Aeq} is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, the *NPI* assumes that the **$L_{Aeq,15min}$** will be taken to be equal to the **$L_{Aeq,\ period}$ + 3 decibels (dB)** (Section 2.2, NPI).

Compliance with the amenity criteria will limit ambient noise creep. **Section 2.4** of the *NPI* states the following:

*"To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a **project amenity noise level** applies for each new source of industrial noise as follows:*

- ***Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB (A)".***

The existing L_{eq} noise level at Logger Location 'A' was 53 dBA (see Table 4) during the day. Therefore, the acceptable amenity criteria for the residential receptors in this area are:

- (55 – 5 + 3 =) 53 dBA $L_{eq,\ 15\ minute}$ during the day.

The existing L_{eq} noise level at Logger Location 'B' was 53 dBA (see Table 4) during the day. Therefore, the acceptable amenity criteria for the residential receptors in this area are:

- (55 – 5 + 3 =) 53 dBA $L_{eq,\ 15\ minute}$ during the day.

The existing L_{eq} noise level at Logger Location 'C' was 48 dBA (see Table 4) during the day. Therefore, the acceptable amenity criteria for the residential receptors in this area are:

- (55 – 5 + 3 =) 53 dBA $L_{eq,\ 15\ minute}$ during the day.

3.2.2 NSW Road Noise Policy

The NSW Road Noise Policy (RNP), in Section 2.3.1, sets out road traffic noise assessment criteria for residential land uses in Table 3. The information in that table is extracted below in Table 3.

Table 3 Road Traffic Noise Assessment Criterion - Residential

Road Category	Type of project/land use	Assessment Criteria – dB(A) Day (7 am – 10 pm)
Local roads	6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq,\ (1\ hour)}$ 55 (external)

3.3 Measured Ambient Noise Levels

In order to assess the severity of a possible environmental noise problem in a residential area it is necessary to measure the ambient background noise level at the times and locations of worst possible annoyance. The lower the background noise level, the more perceptible the intrusive noise becomes and the more potentially annoying.

Fact Sheet A: Determining existing noise levels, Section A1 of the NPI states the following in relation to determining background noise levels:-

Background noise levels need to be determined before intrusive noise can be assessed. The background noise levels to be measured are those that are present at the time of the noise assessment and without the subject development operating. For the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements. The exception is where the premises has been operating for a significant period of time and is considered a normal part of the acoustic environment; it may be included in the background noise assessment under the following circumstances:

- *the development must have been operating for a period in excess of 10 years in the assessment period/s being considered and is considered a normal part of the acoustic environment; and,*
- *the development must be operating in accordance with noise limits and requirements imposed in a consent or licence and/or be applying best practice.*

Any ambient noise measurements must also take into consideration the noise contribution to the surrounding area from the operation of the nearby Wahroonga Public School, as it forms part of the existing acoustic environment during the school term – noise from the operation of schools is typical / expected in this area.

Section B1.1 'Instrument requirements and siting', paragraph 2 of the *NPI* requires monitoring to take place at a 'site that is truly representative of the noise environment at the residence'.

Section B1.2 'Measurement procedure', point 2, of the *NPI* specifies that monitoring should take place for 'each day of the week the proposed development will be operating and over the proposed operating hours'.

St Edmunds College does not and is not proposed to operate in its typical capacity in the school holidays (i.e. normal classes), therefore monitoring took place during the school term, and excluded the noise emission associated with Edmunds Colleges' outdoor play times (recess and lunch).

The ambient L_{90} background noise level is a statistical measure of the sound pressure level that is exceeded for 90% of the measuring period (typically 15 minutes).

The Rating Background Level (RBL) is defined by the Environment Protection Authority (NSW) as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for day, evening or night periods, measured over a number of days during the proposed days and times of operation.

The places of worst possible annoyance are the nearby residential dwellings. These locations are shown in the Site Plan on Figure 1 as 'R1' to 'R9a'. The times of worst possible annoyance will be during the day when *SEC* is operating.

Ambient noise levels were measured in three location around SEC, Location 'A' and Location 'B' from Wednesday 24 July to Wednesday 31 July, 2019 and Location 'C' from Thursday 17 October to Thursday 24 October 2019. Locations 'A', 'B' and 'C' are shown on Figure 1.

The day time ambient noise levels are presented in the attached Appendix B1 to B3, and also below in Table 4.

Table 4 Ambient Noise Levels – St Edmunds College, Wahroonga, NSW

Noise Measurement Location	Time Period	L_{90} Rating Background Level	Existing L_{eq} Noise Level
Location 'A' – Front yard 41 Braeside Street	Day (7 am to 6 pm)	**37 dBA**	**53 dBA**
Location 'B' – Backyard 62 Burns Road	Day (7 am to 6 pm)	**40 dBA**	**53 dBA**
Location 'C' – Backyard 37 Braeside Street	Day (7 am to 6 pm)	**36 dBA**	**48 dBA**

Meteorological conditions during the testing typically consisted of clear skies. Temperatures ranged from 5 to 19°C from Wednesday 24 July to Wednesday 31 July and 9 to 29°C from Thursday 17 October to Thursday 24 October. Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor areas.

It is noted Location 'A' is located approximately 75 metres, Location 'B' is located approximately 40 metres and, Location 'C' is located approximately 35 metres from the nearest items of existing mechanical plant operating on the St Edmunds College site. During installation of the noise loggers at Locations 'A', 'B' and 'C' mechanical plant originating from SEC could not be heard. Therefore, we are of the opinion the measured L_{90} ambient noise levels at Locations 'A', 'B' and 'C' were not affected by any mechanical plant noise on the *SEC* site.

We also note that considering the distances (> 35 m) from the existing classroom buildings at *SEC* to the logger locations, the measured L_{90} ambient noise levels were not affected by student during indoor classes at *SEC*.

As per the above, we have excluded all noise data that was potentially affected by noise associated with the use of *SEC* (students playing at recess and lunch) from the measured background noise levels in order to calculate our RBLs. As noted above, the measured ambient noise levels were not adversely affected by mechanical plant noise or student noise during indoor classes at *SEC*.

3.4 Project Specific Noise Criteria

Considering there is no specific noise criteria for outdoor activities taking place at an educational establishment, noise emission from outdoor activities will be screened against the amenity noise levels specified in the *NPI*. *Schedule 4, Principle 5 – Amenity* of the *SEPP*, requires that the amenity of adjacent development and the local neighbourhood be considered.

Noise emissions from the use (indoor classes and mechanical plant) of the new school buildings will be assessed against the requirements of *Schedule 2, Part 6 - Noise* of the *SEPP*, the use of the staff and visitor car park assessed against requirements of the *NSW EPA NPI* and on-road traffic noise associated with vehicles arriving / leaving the new car park at *SEC* assessed against requirements of the *NSW EPA RNP*.

3.4.1 Residential Receivers

Residential Receivers – 'R1', 'R2' and 'R9' – Based on measured noise levels at Location 'A'

- **53 dBA**[1] $L_{eq,\ 15\ minute}$ during the day for activities in the outdoor areas; and
- **42 dBA** $L_{eq,\ 15\ minute}$ during the day for all noise associated with the use of the new school buildings and the use of the staff and visitors car park.

Residential Receivers – 'R2a', 'R3', 'R4', 'R5' and 'R6' - Based on measured noise levels at Location 'B'

- **53 dBA**[2] $L_{eq,\ 15\ minute}$ during the day for activities in the outdoor areas; and
- **45 dBA** $L_{eq,\ 15\ minute}$ during the day for all noise associated with the use of the new school buildings and the use of the staff and visitors car park.

Residential Receivers – 'R7', 'R8' and 'R9a' - Based on measured noise levels at Location 'C'

- **53 dBA** $L_{eq,\ 15\ minute}$ during the day for activities in the outdoor areas; and
- **41 dBA** $L_{eq,\ 15\ minute}$ during the day for all noise associated with the use of the new school buildings and the use of the staff and visitors car park.

These criteria apply at the most-affected point on or within the residential property boundary. For upper floors, the noise is assessed outside the nearest window.

3.4.2 On – Road Traffic Noise Criteria

The following criterion will be applied at 1 metre from the most affected façade of 'R1', 'R2' and 'R9', for on – road traffic noise:

- **55 dBA** (external) $L_{eq,\ 1\ hour}$ between 8 am and 3 pm.

[1] ***NOTE**: The existing L_{eq} noise level at Logger 'A' is already equal to this amenity noise level, see Table 4.*
[2] ***NOTE**: The existing L_{eq} noise level at Logger 'B' is equal to this amenity noise level, see Table 4.*

4.0 SCHOOL NOISE EMISSION

The main sources of noise from *SEC*, will be as follows:

- Students in the outdoor areas;
- Students inside the GLAs;
- Mechanical plant;
- Use of the new hall; and
- Use of the staff and visitor car park.

The noise assessment was based on the drawings by Glendenning Szoboszlay Architects for Project Number 1302, dated 6 December 2019, attached as Appendix C.

4.1 Outdoor Areas Noise Emissions

4.1.1 Outdoor Play Field

As mentioned in Section 2.0, there is no proposal to increase to the total number of students enrolled at *SEC* as part of this proposal. Therefore, noise emissions from the outdoor play field are also not expected to increase as the total number of children permitted in the area at any given time will remain the same. In addition, the outdoor play field is not proposed to encroach on any neighbouring property as part of this proposal.

Considering the above, noise emissions from the outdoor play field are considered to be acceptable and will maintain the current acoustic amenity of the local area.

4.1.2 Existing Courtyard (1)

No changes are proposed to the use or construction of the existing Courtyard 1.

Noise emissions from the existing Courtyard 1 are considered to be acceptable and will maintain the current acoustic amenity of the local area.

4.1.3 New Courtyard (2)

Small groups of students may use the new Courtyard 2 at any time during school hours.

In order to model the worst case scenario of noise emission from students in the new Courtyard 2, we have assumed that up to 20 students may use the area at any given time during school hours. We have assumed that up to half of the students may be talking with a normal voice (10) with the other half (10) not talking or listening.

Sound power levels of students were previously measured for other similar projects and are presented below in Table 5. We believe these levels represent the typical $L_{eq,\,15\,minute}$ maximum noise levels of children at play and will be used in this noise assessment.

Table 5 $L_{eq,\ 15\ minute}$ **Sound Power Levels - Students in Courtyard 2**

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
School student talking normally	**63**	53	53	60	63	58	53	52	47
10 x School student talking normally	**73**	63	63	70	73	68	63	62	57

4.2 General Learning Areas Noise Emissions

We have been advised that that the average class size at *SEC* is 11 students.

During normal classroom activities, the main source of noise will be from the teachers and students talking. We have assumed that there may be a maximum of 1/3 of the students talking normally – 3 students. We have also assumed that the teacher in each classroom may be talking loudly. We have also assumed, as a worst-case scenario, that a small band, including drums, electric guitar, electric bass, electric keyboard and an amplified vocal, may be playing in the music rooms during classroom activities.

Calculations assume students are distributed evenly throughout the inside of the GLAs and windows and doors are partially open (10 % of floor area).

Day Design Pty Ltd has previously measured and quantified the Octave Band Centre Frequency sound power level of teachers and students talking at different noise levels. The $L_{eq,\ 15\ minute}$ sound power levels of teachers and students are shown below in Table 6.

Table 6 $L_{eq,\ 15\ minute}$ **Sound Power Levels – Teacher & Students – GLAs**

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
General Learning Areas									
Teacher talking loudly	**80**	59	61	70	77	76	72	65	56
School student talking normally	**63**	53	53	60	63	58	53	52	47
1 teacher and 11 students	**80**	61	63	71	77	76	72	66	57
Small Band in music room	**100**	109	105	104	97	94	84	84	83

4.3 Mechanical Plant Noise Emissions

The architectural drawings show that the air conditioning condenser units will be located in a central roof top plant area on the new building.

The type of exhaust fans have not yet been selected, however the specifications for the HVAC system has been selected and has been provided by the mechanical engineer. The proposed mechanical plant will typically only operate during day time hours, Monday to Friday.

The $L_{eq,\ 15\ minute}$ sound power levels for typical exhaust fans used at school sites and the sound power levels for the specified HVAC system are presented in Table 7.

Table 7 $L_{eq,\ 15\ minute}$ Sound Power Levels - Mechanical Plant

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Toilet exhaust fan	**59**	48	48	56	57	54	53	45	38
Central Roof Top Plant Area – Condenser Units									
Daikin – *REYQ8TY1*	**77**	82	80	80	76	70	64	56	50
Daikin – *REYQ12TY1*	**80**	84	85	79	80	74	72	65	58
Daikin - *REYQ22TY1*	**82**	85	87	82	81	76	73	66	59
Daikin – *REYQ24TY1*	**83**	87	88	82	73	77	75	68	61
Daikin - *REYQ26TY1*	**84**	87	88	84	83	77	74	67	61
Daikin - *REYQ46TY1*	**86**	92	91	89	85	80	75	69	65
Daikin – *RXYMQ3AV4A*	**68**	71	68	68	97	63	58	53	50
Daikin – *RXYMQ4AV4A*	**70**	74	71	71	68	65	61	56	48
Daikin – *RXYMQ8AY1*	**74**	80	78	75	72	69	65	60	53
Daikin – *RZQS100AV1*	**69**	71	68	68	68	64	60	54	46

Once mechanical plant selection has been finalised, a final assessment should be made, prior to the issue of a Construction Certificate / detailed design stage.

4.4 New Hall Usage Noise Emissions

We have assumed the proposed new Hall will have capacity for up to 132 students. From our observations of other sites, we have modelled the noise emission from the Hall as follows:

- Students talking loudly (10%), students talking with a raised voice (20 %), students talking normally (20 %) and the rest are not talking or listening (50 %).
- Calculations assume students are distributed evenly throughout the inside of the Hall and the doors are partially open (10 % of the floor area).
- We have assumed as a worst case scenario the hall may operate at full capacity during recess or lunch time on a rainy day.
- We have assumed that the high level windows on the eastern and northern sides of the hall are of fixed frame construction, with 6.38 mm laminated glass installed within the frames.
- We have assumed the celling / roof system consists of a metal deck roof with standard plasterboard lining beneath, with standard insulation batts installed in the roof / ceiling cavity.
- We have assumed the walls will be constructed with 92 mm steel studs, with 13 mm plasterboard and sheet metal or fibre cement fixed to either side of the studs, with standard insulation batts installed in the cavity.

Based on information in Harris[3] and in our noise level database gathered over many years, we calculate the sound power levels shown below in Tables 8.

Table 8 $L_{eq,\ 15\ minute}$ Sound Power Levels – New Hall – Students

Description	L_{eq} Sound Power Level dBA
One Male Student Talking Loudly	**80**
One Male Student Talking with Raised Voice	**69**
One Male Student Talking Normally	**63**
132 Students	**92**

[3] *Handbook of Acoustical Measurements and Noise Control, Third Edition, Cyril M. Harris, McGraw-Hill Inc, New York, (Page 16.2)*

4.5 Vehicle Noise Emissions

PTC Consultants in their '*Traffic Impact Assessment Report*' for St Edmunds College Wahroonga, dated 5 December 2019, *Section 10 – Operations of the new staff car park,* advise that the new staff car park will be used at peak capacity during the AM and PM peak each day, i.e. peak net traffic generation is 14 vehicle movements. This is equivalent to 4 vehicle trips in a 15 minute period.

The Sound Exposure Level[4] (SEL) sound power level and spectra of vehicle noise is shown below in Table 9 and is based on previous measurements by Day Design.

Table 9 SEL & $L_{A1,\ 1\ minute}$ Sound Power Levels - Vehicles

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
SEL level of car drive by at approximately 10 km/h	**82**	90	87	80	78	77	72	70	64
SEL level of car door slam, ignition and drive away	**91**	104	96	89	87	86	83	81	75

[4] *SEL is the total sound energy of a single noise event condensed into a one second duration.*

4.6 Predicted Noise Level at Receptor Locations

Knowing the sound power level of a noise source (See Tables 5 - 9), the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for distance losses, sound barriers, building envelope transmission, etc. The predicted noise level at the residential receptors from the various noise producing facets of the development are shown below.

Where applicable, calculations include acoustic shielding provided by *SEC* buildings to the residential receptors. Calculations also include acoustic shielding provided by the existing 1.8 metre high boundary fences to the residential receptors 'R9a'.

4.6.1 Courtyard 2

Based on a maximum of 20 students in Courtyard 2 at any one time, the predicted $L_{eq\ 15\ minute}$ noise level is calculated to be as shown below in Table 10. The noise prediction was determined by placing all 20 students into two groups of 10 students in Courtyard 2.

Table 10 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Courtyard 2

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 48 Braeside Street	25	53	Yes
R2 – 41 Braeside Street (front)	24	53	Yes
R2a – 41 Braeside Street (rear)	27	53	Yes
R3 – 64 Burns Road	< 20	53	Yes
R3a – 64 Burns Road	< 20	53	Yes
R4 – 62 Burns Road	< 20	53	Yes
R4a – 62 Burns Road	< 20	53	Yes
R5 – 60A Burns Road	< 20	53	Yes
R5a – 60A Burns Road	< 20	53	Yes
R6 – 57A Burns Road	< 20	53	Yes
R7 – 2A Wahroonga Avenue	26	53	Yes
R8 – 3 Wahroonga Avenue	45	53	Yes
R9 – 37 Braeside Street (front)	< 20	53	Yes
R9a – 37 Braeside Street (back)	26	53	Yes

The predicted level of noise from the students using the Courtyard 2 at the receptor locations 'R1' to 'R9a' complies with the criteria in Section 3.4.1 of this report, and is therefore acceptable.

4.6.2 Cumulative Noise Level – GLAs & Mechanical Plant

The cumulative noise impact from the GLAs and mechanical plant within *SEC* are summarised and shown in Table 11.

Table 11 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – GLAs & Mechanical Plant

Receptor Location	Predicted L_{eq} Noise Level (dBA)	Acceptable L_{eq} Noise Level (dBA)	Compliance
R1 – 48 Braeside Street			
- GLAs	33		
- Mechanical plant	38		
Cumulative Noise Level	39	42	Yes
R2 – 41 Braeside Street (front)			
- GLAs	34		
- Mechanical plant	39		
Cumulative Noise Level	40	42	Yes
R2a – 41 Braeside Street (rear)			
- GLAs	37		
- Mechanical plant	40		
Cumulative Noise Level	42	45	Yes
R3 – 64 Burns Road			
- GLAs	38		
- Mechanical plant	36		
Cumulative Noise Level	40	45	Yes
R3a – 64 Burns Road			
- GLAs	35		
- Mechanical plant	38		
Cumulative Noise Level	40	45	Yes
R4 – 62 Burns Road			
- GLAs	39		
- Mechanical plant	34		
Cumulative Noise Level	40	45	Yes
R4a – 62 Burns Road			
- GLAs	39		
- Mechanical plant	44		
Cumulative Noise Level	45	45	Yes

Table 11 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – GLAs & Mechanical Plant - Continued

Receptor Location	Predicted L_{eq} Noise Level (dBA)	Acceptable L_{eq} Noise Level (dBA)	Compliance
R5 – 60A Burns Road			
- GLAs	50		
- Mechanical plant	45		
Cumulative Noise Level	51	45	**No (+ 6 dB)**
R5a – 60A Burns Road			
- GLAs	43		
- Mechanical plant	45		
Cumulative Noise Level	47	45	**No (+ 2 dB)**
R6 – 57A Burns Road			
- GLAs	34		
- Mechanical plant	48		
Cumulative Noise Level	48	45	**No (+ 3 dB)**
R7 – 2A Wahroonga Avenue			
- GLAs	33		
- Mechanical plant	38		
Cumulative Noise Level	39	41	Yes
R8 – 3 Wahroonga Avenue			
- GLAs	60		
- Mechanical plant	46		
Cumulative Noise Level	60	41	**No (+ 19 dB)**
R9 – 37 Braeside Street (front)			
- GLAs	30		
- Mechanical plant	40		
Cumulative Noise Level	40	42	Yes
R9a – 37 Braeside Street (rear)			
- GLAs	37		
- Mechanical plant	44		
Cumulative Noise Level	44	41	**No (+ 3 dB)**

The predicted cumulative level of noise from the GLAs and mechanical plant at the receptor locations 'R1' to 'R4a' and 'R7' and 'R9', complies with the criteria in Section 3.4.1 of this report, and is therefore acceptable. However, the predicted cumulative level of noise from the GLAs and mechanical plant at the receptor locations 'R5' to 'R6' and 'R8' and 'R9a', exceeds the criteria in Section 3.4.1 of this report and will therefore require noise controls, as recommended in Section 5.0.

4.6.3 New Hall

We have assumed the Hall may be used at full capacity during recess or lunch.

The noise impact from the Hall during recess or lunch time is summarised and shown in Table 12.

Table 12 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Hall

Receptor Location	Predicted L_{eq} Noise Level (dBA)	Acceptable L_{eq} Noise Level (dBA)	Compliance
R1 – 48 Braeside Street			
- Students	33	42	Yes
R2 – 41 Braeside Street (front)			
- Students	35	42	Yes
R2a – 41 Braeside Street (rear)			
- Students	41	45	Yes
R3 – 64 Burns Road			
- Students	34	45	Yes
R3a – 64 Burns Road			
- Students	31	45	Yes
R4 – 62 Burns Road			
- Students	< 20	45	Yes
R4a – 62 Burns Road			
- Students	< 20	45	Yes
R5 – 60A Burns Road			
- Students	< 20	45	Yes
R5a – 60A Burns Road			
- Students	< 20	45	Yes
R6 – 57A Burns Road			
- Students	< 20	45	Yes
R7 – 2A Wahroonga Avenue			
- Students	25	41	Yes
R8 – 3 Wahroonga Avenue			
- Students	41	41	Yes
R9 – 37 Braeside Street (front)			
- Students	30	42	Yes
R9a – 37 Braeside Street (rear)			
- Students	35	41	Yes

The predicted level of noise from the new Hall at the receptor locations 'R1' to 'R9a', complies with the criteria in Section 3.4.1 of this report, and is therefore acceptable.

4.6.4 Use of Staff and Visitor Car Park

The external $L_{eq,\ 15\ minute}$ noise levels at the most affected receptor locations, 'R1', 'R2', 'R2a', 'R9' and 'R9a', from noise associated with the use of the staff and visitor car park throughout the day are calculated to be as shown below in Table 13.

Table 13 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Use of Staff and Visitor Car Park

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 48 Braeside Street	32	42	Yes
R2 – 41 Braeside Street (front)	35	42	Yes
R2a – 41 Braeside Street (rear)	28	45	Yes
R9 – 37 Braeside Street (front)	33	42	Yes
R9a – 37 Braeside Street (back)	22	41	Yes

The predicted external levels of noise from the use of the staff and visitor car park are within the noise criteria in Section 3.4.1, and are therefore acceptable.

4.6.5 On – Road Traffic Noise

The external $L_{eq,\ 15\ hour}$ noise levels at the most affected residential receptor locations, 'R1', 'R2' and 'R9', from noise associated with on – road traffic throughout the day are calculated to be as shown below in Table 14.

Table 14 Predicted $L_{eq,\ 1\ hour}$ Noise Levels – On – Road Traffic

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 48 Braeside Street	36	55	Yes
R2 – 41 Braeside Street (front)	36	55	Yes
R9 – 37 Braeside Street (front)	37	55	Yes

The predicted external levels of noise from on – road traffic are within the noise criteria in Section 3.4.2, and are therefore acceptable.

5.0 NOISE CONTROL RECOMMENDATIONS

5.1 Noise Management Plan

Although this proposal does not comprise any changes to *SEC's* current delivery, garbage pickup or ground maintenance schedule, we recommend the following:

- We recommend that any deliveries, such as food for the canteen, to *SEC* or garbage pickup from *SEC* occur between the hours of 7 am and 6 pm;
- We recommend that any ground maintenance, such as leaf blowing or grass cutting, that may be required on *SEC* grounds occur between the hours of 7 am and 6 pm; and
- We recommend the doors to the music room and multi-purpose room be closed when musical instruments are being used.

5.2 Building Construction

We recommend the following building construction:

- The doors to the music room should be constructed with 10.38 mm thick laminated glass with acoustic seals. The doors should achieve a minimum weighted reduction index of R_w 34;
- The doors to the multi-purpose room should be constructed with 6.38 mm thick laminated glass with acoustic seals. The doors should achieve a minimum weighted reduction index of R_w 30;
- We recommend the external windows to the following GLAs be of fixed frame construction with 6.38 mm thick laminated glass installed. The windows should achieve a minimum weighted reduction index of R_w 30:
  - GLA – 7.1, 7.2, 9.1, 9.2, 5, 6, 8, 9, 10, 11, 12;
  - Art; and
  - Science Lab 1 and 2.

  Note: if fixed frame windows cannot be installed, the external windows to the above listed rooms throughout *SEC* should remain closed during classes.

5.3 Mechanical Plant

5.3.1 General Requirements – Construction Certificate

For typical mechanical plant equipment with sound power levels not exceeding those listed in Table 7, it is reasonable and feasible to acoustically treat the plant area or equipment itself so that noise will not impact the neighbouring properties.

Once mechanical plant selection has been finalised, a detailed acoustic assessment should be made, prior to the issue of a Construction Certificate (or during the detailed design stage). We recommend that the mechanical services engineers select mechanical plant equipment with the lowest sound power levels to reduce the amount of acoustic treatment necessary to achieve the noise criteria at nearby receivers.

We offer to provide detailed noise controls when specifications of the mechanical plant equipment have been finalised.

5.3.2 Plant Area Sound Barrier Walls

We recommend constructing sound barrier walls on all four sides of the central roof top plant area as follows:

- Northern side – 2.4 metres high; and
- Eastern, southern and western sides – 2.1 metres high.

The screen may be constructed from 9 mm fibre cement sheet on both sides (alternatively 0.42 mm corrugated sheet metal on the external side and 9 mm fibre cement sheet on the internal side) of a 90 mm steel post wall without holes or gaps. Bulk insulation, consisting of 75 mm glasswool (min. density 32 kg / m^3) with water resistant woven fiberglass facing, such as CSR Bradford Supertel faced with Ultraphon, should be placed between the posts.

Alternatively, a proprietary system such as Con-form Group's *'Acoustic +'* sound barrier wall may be installed.

6.0 PREDICTED NOISE LEVELS - AFTER NOISE CONTROLS

Once the noise controls recommended in Section 5 have been incorporated into the building design, the cumulative noise impact at 'R5', 'R5a', 'R6', 'R8' and 'R9a' from the GLAs and mechanical plant within *SEC* are summarised and shown in Table 15.

Table 15 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – GLAs & Mechanical Plant – After Noise Controls

Receptor Location	Predicted L_{eq} Noise Level (dBA)	Acceptable L_{eq} Noise Level (dBA)	Compliance
R5 – 60A Burns Road			
- GLAs	20		
- Mechanical plant	41		
Cumulative Noise Level	41	45	Yes
R5a – 60A Burns Road			
- GLAs	16		
- Mechanical plant	42		
Cumulative Noise Level	42	45	Yes
R6 – 57A Burns Road			
- GLAs	34		
- Mechanical plant	39		
Cumulative Noise Level	40	45	Yes
R8 – 3 Wahroonga Avenue			
- GLAs	29		
- Mechanical plant	41		
Cumulative Noise Level	41	41	Yes
R9a – 37 Braeside Street (rear)			
- GLAs	17		
- Mechanical plant	41		
Cumulative Noise Level	41	41	Yes

Once the noise controls in Section 5 have been incorporated into the buildings design, the predicted cumulative level of noise from the GLAs and mechanical plant at the receptor locations 'R5' to 'R6' and 'R8' and 'R9a', complies with the criteria in Section 3.4.1 of this report, and is therefore acceptable.

7.0 NOISE IMPACT STATEMENT

Day Design Pty Ltd was engaged by Glendenning Szoboszlay Architects on behalf of St Edmunds College to carry out an acoustic assessment of the proposed redevelopment of their Special Education College at 60 Burns Road, Wahroonga, NSW.

Calculations show that provided the recommendation in Section 5 of this report are implemented and adhered to, the level of noise emitted from St Edmunds College at 60 Burns Road, Wahroonga, NSW, subsequent to the proposed redevelopment, will meet the acoustic requirements in the NSW Department of Planning and Environment's *SEPP (Educational Establishments and Child Care Facilities) 2017* and NSW Environment Protection Authority's (EPA) *NSW Road Noise Policy,* as detailed in Section 3 of this report, and be considered acceptable.

In addition, the amenity of adjacent development and the local neighbourhood will be respected and upheld.

Adam Shearer, BCT (Audio), MDesSc (Audio and Acoustics), MAAS
Senior Acoustical Consultant
for and on behalf of Day Design Pty Ltd

AAAC MEMBERSHIP

Day Design Pty Ltd is a member company of the Association of Australasian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

APPENDICES

- Appendix A – Noise Survey Instrumentation
- Appendix B1 – Ambient Noise Survey – Front yard, 41 Braeside Street
- Appendix B2 – Ambient Noise Survey – Backyard, 62 Burns Road
- Appendix B3 – Ambient Noise Survey – Backyard, 37 Braeside Street
- Appendix C – Proposed Site Layout

APPENDIX A – NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis were made with instrumentation as follows in Table A:

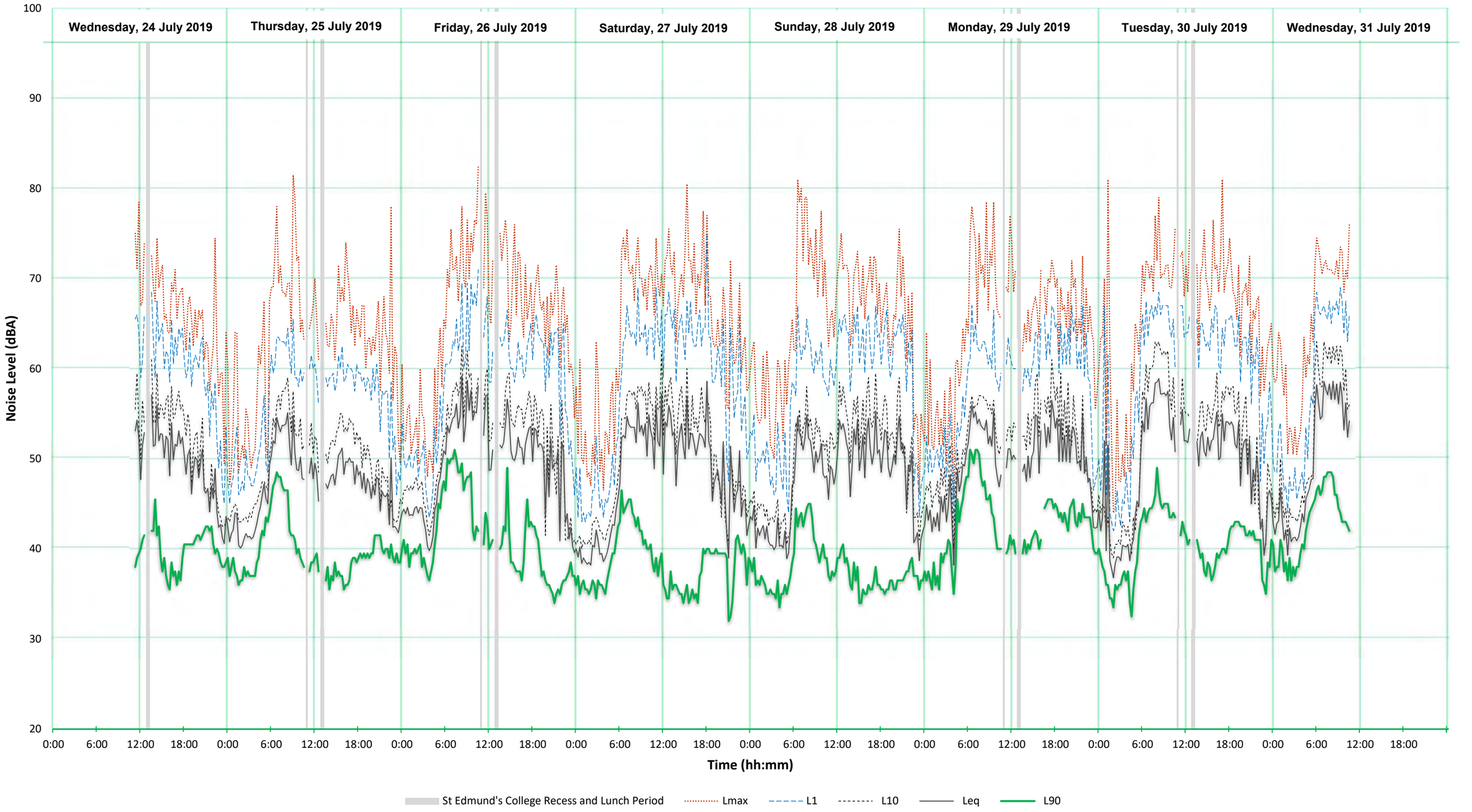
Table A Noise Instrumentation

Description	Model No.	Serial No.
Infobyte Noise Logger	iM4	106
Condenser Microphone 0.5" diameter	MK 250	106
Infobyte Noise Logger	iM4	117
Condenser Microphone 0.5" diameter	MK 250	117
Infobyte Noise Logger	iM4	120
Condenser Microphone 0.5" diameter	MK 250	15361

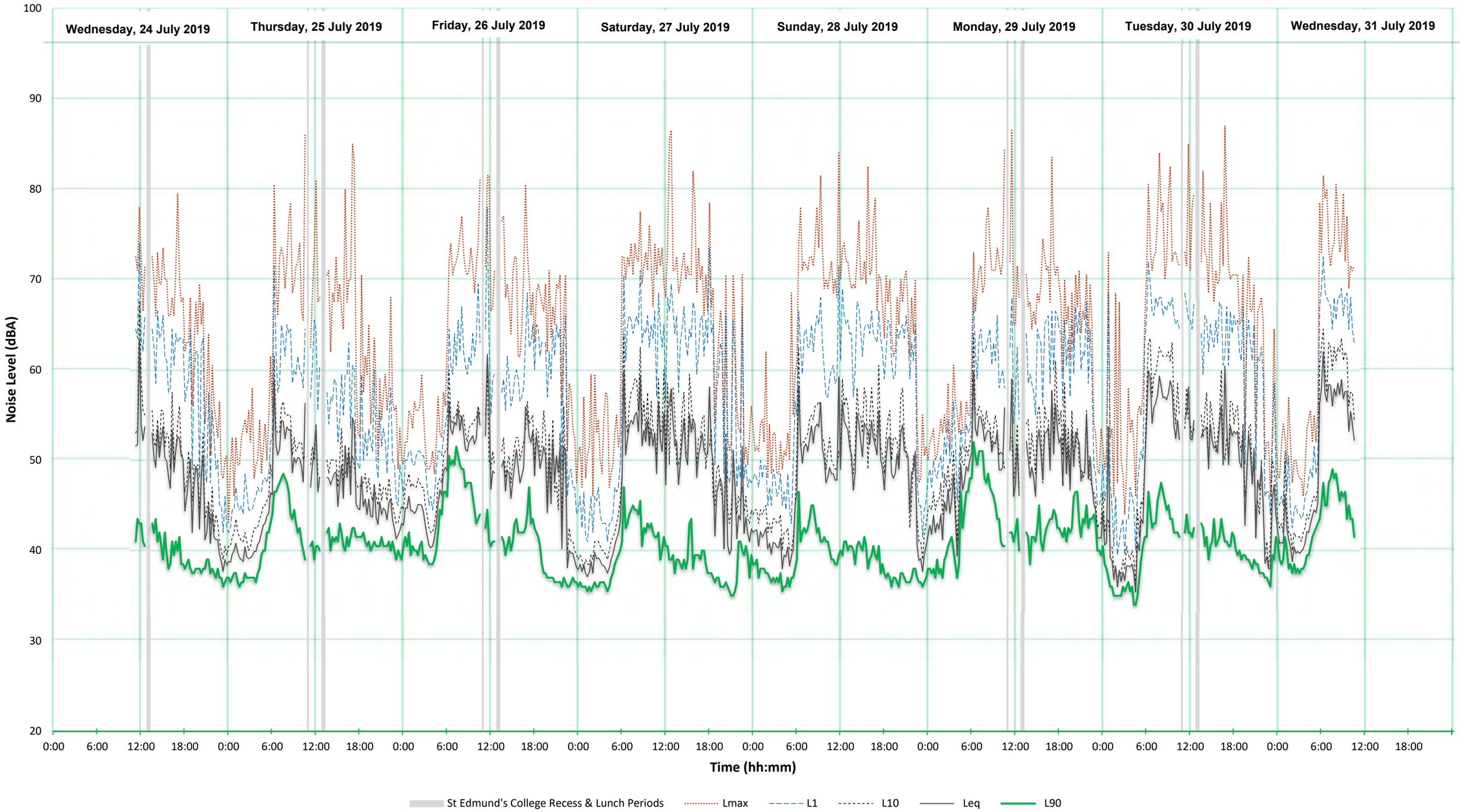
An environmental noise logger is used to continuously monitor ambient noise levels and provide information on the statistical distribution of noise during an extended period of time. The Infobyte Noise Monitors iM4 #106, 117 and 120 are Type 1 or 2 precision environmental noise monitor meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be within 1 dB for long-term measurements. No adjustments for instrument drift during the measurement period were warranted.

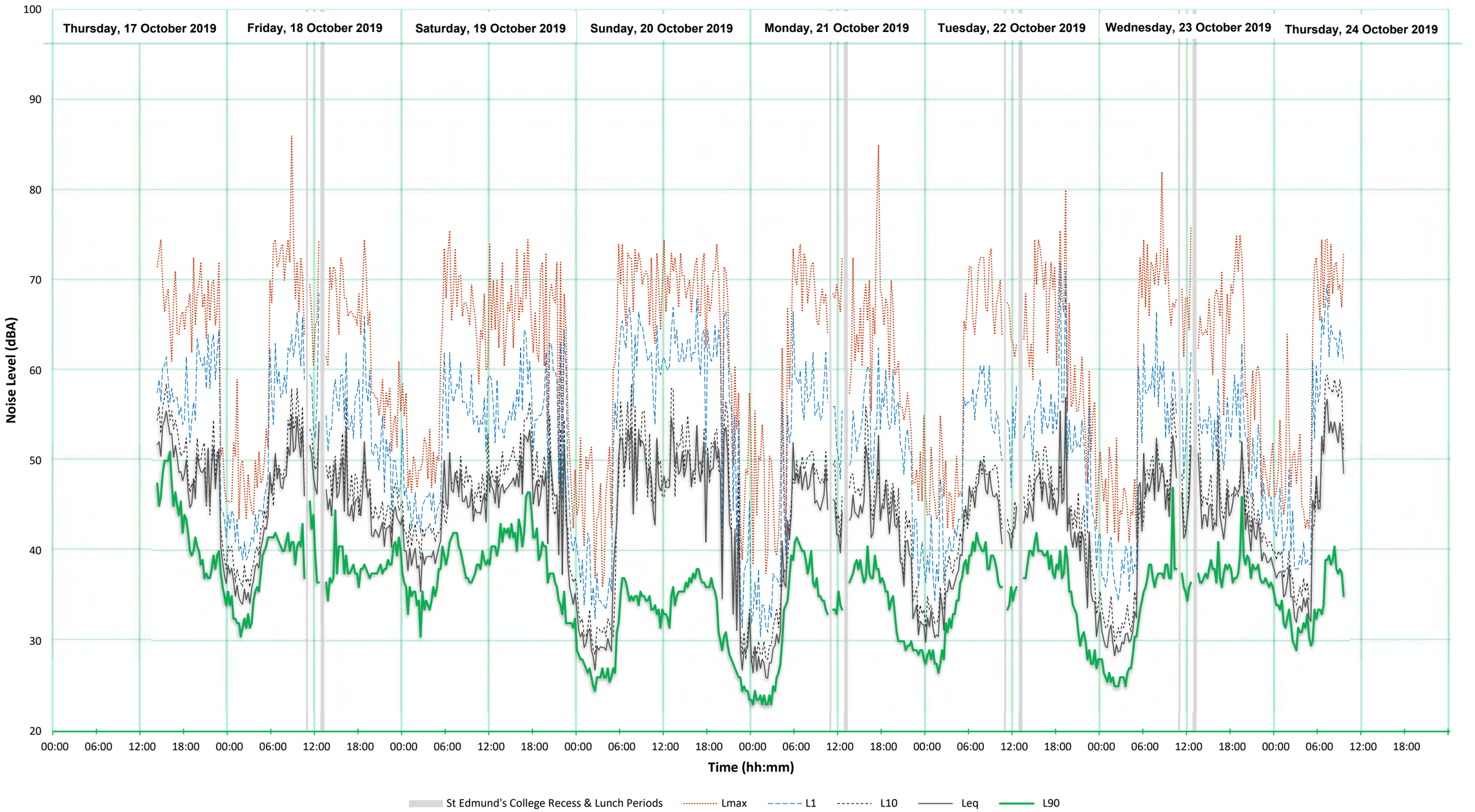
Located at Front Yard - 41 Braeside St, Wahroonga, NSW



Located at Backyard - 62 Burns Road, Wahroonga, NSW



Located at Backard - 37 Braeside St, Wahroonga, NSW



DEVELOPMENT APPLICATION

CONTENTS

GLENDENNING
SZOBOSZLAY
ARCHITECTS

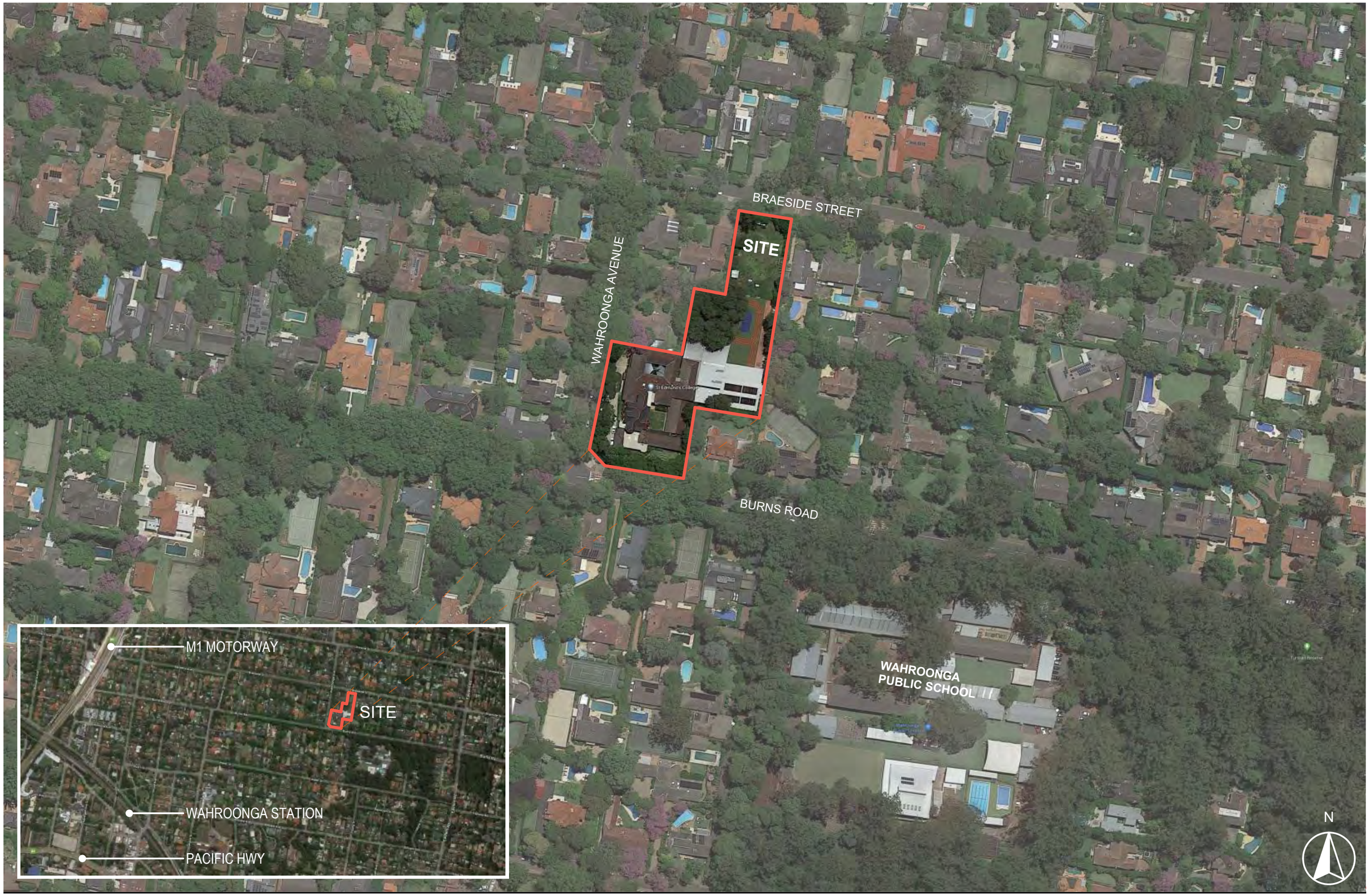
REV [02]

St Edmund's
COLLEGE

ST. EDMUND'S COLLEGE

60 BURNS ROAD
WAHROONGA NSW 2076
9/12/2019

FOR APPROVAL



NOTE
The Builder shall check all dimensions and levels on site prior to construction. Notify any errors, discrepancies or omissions to the architect. Refer to written dimensions only. Do not scale drawings. Drawings shall not be used for construction purposes until issued for construction. This drawing reflects a design by Glendenning Szoboszlay Architects and is to be used only for work when authorised in writing by Glendenning Szoboszlay Architects.

All boundaries and contours are subject to survey drawing **W-01**. All levels to Australian Height Data. It is the contractors responsibility to confirm all measurements on site and locations of any services prior to work on site.

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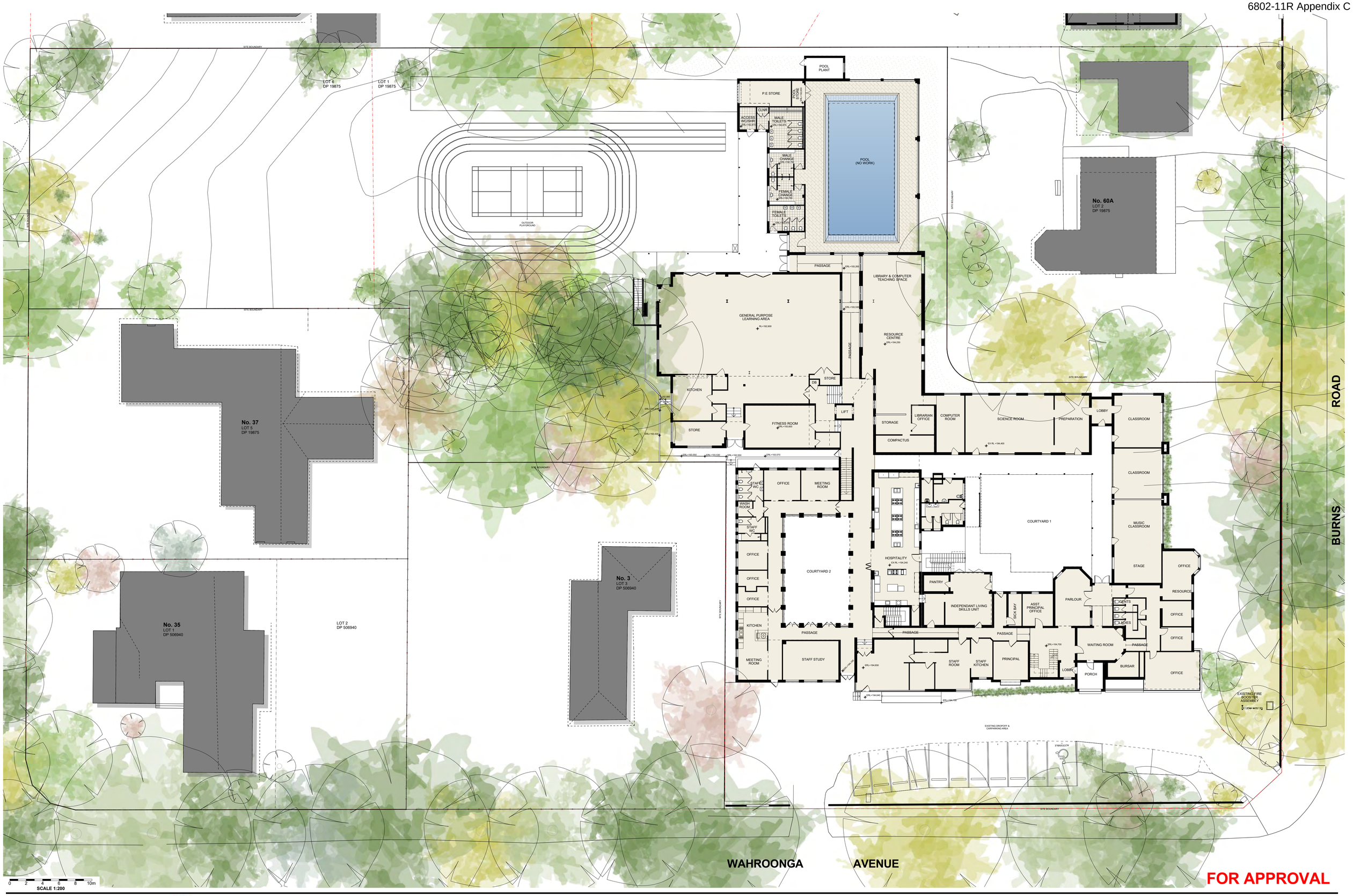
Issue	Description	Date
01	DA ISSUE	6/12/2019

Drawn | Checked |
Plot Date: 6/12/2019
Lot LOT 1 & LOT 6
Plan Type DP 19875 & DP 198725
Client ST EDMUND'S COLLEGE
Site: 60 BURNS ROAD WAHROONGA NSW 2076

DRAWING TITLE : SITE SURVEY
SITE LOCATION PLAN
DRAWING SCALE : **NTS @ A3**
PROJECT NAME : **ST. EDMUND'S COLLEGE**
PROJECT NUMBER : **1302**
REVISION NO. **01**
STAGE. **DA -** DRAWING NO. **A-0100**



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Rev		Date
02	ISSUED FOR DA	6/12/2019
01	DRAFT DA	4/12/2019

Drawn | Checked	MS | MG
Plot Date:	6/12/2019
Lot	LOT 1 & LOT 6
Plan Type	DP 19875 & DP 198725
Client	ST EDMUND'S COLLEGE
Site:	60 BURNS ROAD WAHROONGA NSW 2076

DRAWING TITLE :
EXISTING BUILDINGS
EXISTING GROUND FLOOR PLAN

PROJECT NAME :
ST. EDMUND'S COLLEGE

DRAWING SCALE :
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1:400 @ A3

PROJECT NUMBER :
1302

REVISION NO.
02

STAGE. **DA -**

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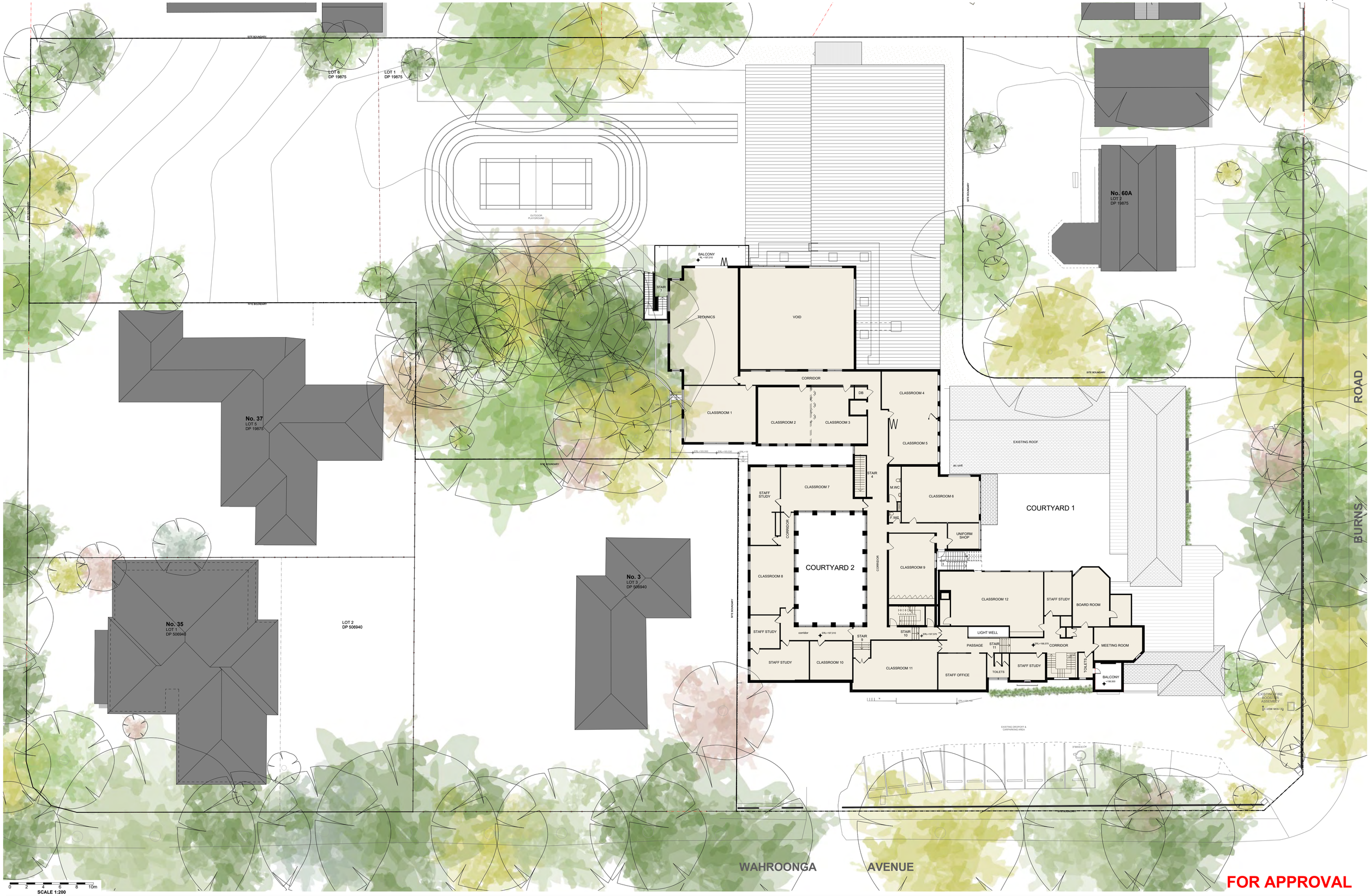

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01	DRAFT DA	4/12/2019

Drawn | Checked	MS | MG
Plot Date:	6/12/2019
Lot	LOT 1 & LOT 6
Plan Type	DP 19875 & DP 198725
Client	ST EDMUND'S COLLEGE
Site:	60 BURNS ROAD WAHROONGA NSW 2076

DRAWING TITLE :
EXISTING BUILDINGS
EXISTING FIRST FLOOR PLAN

PROJECT NAME :
ST. EDMUND'S COLLEGE

DRAWING SCALE :
1:200 @ A1
1:400 @ A3

PROJECT NUMBER :
1302

REVISION NO.
02

STAGE. **DA -**

DRAWING NO.
A-0201

FOR APPROVAL

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Client	ST EDMUND'S COLLEGE
Site:	60 BURNS ROAD WAHROONGA NSW 2076

DRAWING TITLE :
EXISTING BUILDINGS

EXISTING ROOF PLAN

PROJECT NAME :
ST. EDMUND'S COLLEGE

DRAWING SCALE :
1:200 @ A1
1:400 @ A3

PROJECT NUMBER :
1302

REVISION NO.
02

STAGE. **DA -**

DRAWING NO.
A-0202