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# **Environmental Noise Assessment**

St Luke's Grammar School – New Senior Campus 800 Pittwater Rd & 224 Headland Rd, Dee Why, NSW

REPORT NUMBER 6479-5.1R

DATE ISSUED

3 April 2020



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# **Revision History**

Status	Date	Prepared	Checked	Comment
Draft	26/09/2019	Adam Shearer	Stephen Gauld	By email, for client review
Draft 2	10/03/2020	Adam Shearer	Stephen Gauld	By email, for client review
Final	03/04/2020	Adam Shearer	Stephen Gauld	

Document 6479-5.1R, 41 pages plus attachments

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# TABLE OF CONTENTS

1.0	CONS	SULTING BRIEF	6
2.0	PROJ	ECT DESCRIPTION & SUMMARY OF FINDINGS	7
3.0	ACOU	JSTIC CRITERIA	12
3.1	Mea	asured Ambient Noise Levels	12
3.2	SEF	P (Educational Establishments and Child Care Facilities) 2017	13
3.3	NSV	W Environment Protection Authority	14
3.	3.1	NSW Noise Policy for Industry	14
	3.3.1.	1 Project Intrusiveness Noise Levels	14
	3.3.1.	Project Amenity Noise Levels	15
3.	3.2	NSW Road Noise Policy	17
3.4	Pro	ject Specific Noise Criteria	18
3.	4.1	Residential Receivers	18
3.	4.2	Passive Recreation Receiver	19
3.	4.3	Industrial Receivers	19
3.	4.4	On – Road Traffic Noise Criteria	19
ł.0	SCHC	OOL NOISE EMISSION	20
4.1	Out	door Areas Noise Emissions	20
4.2	Gen	eral & Speciality Learning Areas Noise Emissions	21
4.3	Pub	olic Address System & School Bell Noise Emission	22
4.4	Med	chanical Plant Noise Emission	23
4.5	Enc	losed Basketball Courts Usage Noise Emission	24
4.6	Auc	litorium Noise Emission	25
4.7	Veh	icle Noise Emission	26
4.8	Pre	dicted Noise Level at Receptor Locations	27
4.	8.1	Predicted Noise Levels - Stage 1	27
	4.8.1.	1 Enclosed Basketball Courts – Stage 1	27
	4.8.1.	2 Use of Staff, Visitor and Student Car Parks – 224 Headland Road – Stage 1	28
4.	8.2	Predicted Noise Levels – Stage 2	29
	4.8.2.	1 Outdoor Areas – Stage 2	29
	4.8.2.	2 Cumulative Noise Level – GLAs & Mechanical Plant – Stage 2	30
	4.8.2.	3 Enclosed Basketball Courts – Stage 2	32
	4.8.2.	4 Use of Staff, Visitor and Student Car Parks – Stage 2	33

REF: 6479-5.1R

4.	.8.3 Pre	dicted Noise Levels – Stage 3	34
	4.8.3.1	Outdoor Areas – Stage 3	34
	4.8.3.2	Cumulative Noise Level – GLAs & Mechanical Plant – Stage 3	34
	4.8.3.3	Enclosed Basketball Courts – Stage 3	36
	4.8.3.4	Auditorium – Stage 3	37
	4.8.3.5	Use of Staff, Visitor and Student Car Parks – Stage 3	38
4.	.8.4 On	– Road Traffic Noise – Stage 3	39
5.0	NOISE CO	NTROL RECOMMENDATIONS	40
5.1	Noise Ma	anagement Plan	40
5.2	Mechani	cal Plant	40
5.3	Existing	Common Wall	40
6.0	NOISE IM	PACT STATEMENT	41



# **TABLES**

Table 1	Noise Sensitive Receptors - NSC (Completion Stages 1, 2 & 3)8
Table 2	Noise Sensitive Receptors – Completion Stages 1 and 29
Table 3	Ambient Noise Levels - Dee Why, NSW12
Table 4	Amenity Noise Levels15
Table 5	Road Traffic Noise Assessment Criterion – Residential17
Table 6	L <sub>eq, 15 minute</sub> Sound Power Levels - Students in Outdoor Areas21
Table 7	L <sub>eq, 15 minute</sub> Sound Power Levels – Teacher & Students – GLA & SLAs22
Table 8	L <sub>eq, 15 minute</sub> Sound Power Levels - Mechanical Plant23
Table 9	L <sub>eq, 15 minute</sub> Sound Power Levels - Enclosed Basketball Courts - Students24
Table 10	L <sub>eq, 15 minute</sub> Sound Power Levels - Proposed Auditorium
Table 11	SEL Sound Power Levels - Vehicles
Table 12	Predicted L <sub>eq, 15 minute</sub> Noise Levels – Enclosed Basketball Court – Stage 127
Table 13	$Predicted \ L_{eq,15 \ minute} \ Noise \ Levels - Use \ of \ Staff, \ Visitor \ \& \ Student \ Car \ Parks - Stage \ 1 28$
Table 14	Predicted L <sub>eq, 15 minute</sub> Noise Levels – Outdoor Areas – Stage 229
Table 15	$Predicted \ Cumulative \ L_{eq,15 \ minute} \ Noise \ Levels - GLAs \ \& \ Mechanical \ Plant \ - \ Stage \ 230$
Table 16	Predicted L <sub>eq, 15 minute</sub> Noise Levels – Enclosed Basketball Court – Stage 232
Table 17	$Predicted \ L_{eq,15 \ minute} \ Noise \ Levels - Use \ of \ Staff, \ Visitor \ \& \ Student \ Car \ Parks - Stage \ 233$
Table 18	Predicted L <sub>eq, 15 minute</sub> Noise Levels – Outdoor Areas – Stage 334
Table 19	$Predicted \ Cumulative \ L_{eq,15 \ minute} \ Noise \ Levels - GLAs \ \& \ Mechanical \ Plant - Stage \ 335$
Table 20	Predicted L <sub>eq, 15 minute</sub> Noise Levels – Enclosed Basketball Court – Stage 336
Table 21	$Predicted \ L_{eq,15 \ minute} \ Noise \ Levels - Auditorium - Evening \ (6 \ pm \ to \ 10 \ pm) - Stage \ 337$
Table 22	$Predicted \ L_{eq,15minute}\ Noise\ Levels-Use\ of\ Staff,\ Visitor\ \&\ Student\ Car\ Parks-Stage\ 338$
Table 23	Predicted Leq, 1 hour, Leq, 15 hour & Leq, 9 hour Noise Levels – On – Road Traffic – Stage 339

3-Apr-2020 REF: 6479-5.1R



## 1.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by Midson Group on behalf of The Anglican Schools Corporation to carry out an acoustic assessment of the proposed new St Luke's Grammar School Senior Campus at 800 Pittwater Road and 224 Headland Road, Dee Why, 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 new St Luke's Grammar School Senior Campus 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 Luke's Grammar School propose to construct a new Senior Campus (*NSC*) at 800 Pittwater Road and 224 Headland Road, Dee Why, NSW, for 600 students.

The *NSC* is proposed to be situated on land zoned *B5 – Business Development* (800 Pittwater Road) and *IN1 – General Industrial* (224 Headland Road) under Warringah Local Environmental Plan (LEP) 2011. 800 Pittwater Road currently contains a three storey commercial building with 224 Headland Road containing at two storey industrial building.

The existing St Luke's Grammar School is located at 210 Headland Road, Dee Why and caters for approximately 1130 students (*information from www.myschool.edu.au provided by Australian Curriculum, Assessment and Reporting Authority*) in years K to 12. No work is proposed to the existing School at 210 Headland Road as part of this development.

The proposal seeks approval for the following:

#### 800 Pittwater Road:

Village Centre: Welcoming the community into the building, cafe and heart of the

building, natural daylight + green spaces and administration zone.

*Gathering Spaces*: Auditorium for 700+ students, library hubs and social + informal learning

hubs.

Science and Maths Precinct: Speciality learning areas (Physics, Chemistry, Biology), general

learning areas; connection to support units and seminar rooms.

Arts Precinct: Speciality learning areas (Visual Art, Kiln), general learning areas;

connection to support units and seminar rooms.

Design + Technology Precinct: Speciality learning areas (Food technology, Design and

technology), general learning areas; connection to support units and

seminar rooms.

*Humanities Precinct*: General learning areas; connection to support units and seminar rooms.

Wellness Precinct: Pool with change facilities, dance studio, gymnasium and general learning

areas; connection to support units.

Media Centre: Recording studio, editing studio, green screen and media presentation

room.

External Areas: External hardcourts and open space.

Car Parking 91 spaced for staff, visitors or student and bicycle parking.

# 224 Headland Road:

Sports Precinct: 2 new basketball courts, existing half basketball court, existing change

rooms and existing school clothing store.

*Car Parking*: 41 spaces for staff, visitors or student and bicycle parking.



The development is required to be staged to accommodate existing lease agreements. The development will take place over three stages, as follows:

- Stage 1 224 Headland Road;
- Stage 2 Units 1, 3 and 5 (Fitness First and I-Med), 800 Pittwater Road; and
- Stage 3 Units 2 and 4 (Officeworks), 800 Pittwater Road.

It is noted that the majority of the works proposed above are internal works to the existing commercial and industrial buildings on 800 Pittwater Road and 224 Headland Road.

Mechanical plant, including but not limited to air conditioning condenser units and exhaust fans, will be required to serve the proposed centres, spaces and precincts.

The proposed *NSC* site is bounded by land zoned *RE1 – Public Recreation* (Stony Range Botanic Garden) to the north and north-east, industrial premises to the east, Headland Road and industrial premises to the south and south-west and Pittwater Road to the west. The nearest residential premises to the site are located on the opposite side of Stony Range Botanic Garden to the north-east, Headland Road to the south-west and the opposite side of Pittwater Road to the west and north-west, as shown on Figure 1 and Figure 2.

The nearest noise sensitive receptors to the proposed *NSC* at the completion of Stage 3, in various directions, are shown on Figure 2 and as follows in Table 1.

Table 1 Noise Sensitive Receptors - NSC (Completion Stages 1, 2 & 3)

Receptor and Type	Address	Direction from site		
R1 – Passive Recreation	Stony Range Botanic Garden	North		
R2 – Residential	10 Tango Avenue	North - East		
R3 – Industrial	222 Headland Road	East		
R4 – Residential	213 Headland Road	South - East		
R5 – Industrial	226 Headland Road	South		
R6 – Industrial	275 Harbord Road	South - West		
R7 – Residential	589 Pittwater Road	West		
R8 – Residential	595 Pittwater Road	North-West		

Each receptor location has been selected to represent the adjacent premises (where applicable), eg R7 is representative of all residential receptors to the west of the *NSC*; R6 is representative of all industrial receptors to the south-west of the *NSC*; etc.



In addition to the noise sensitive receptor locations shown in Table 1, at the completion of Stage 1 and Stage 2 of the development potential noise sensitive receptors will also be located within the development site itself. Additional Stage 1 and 2 receptor locations are shown in Table 2 below.

Table 2 Noise Sensitive Receptors - Completion Stages 1 and 2

Receptor and Type	Address	Direction from site
Stage 1		
R9 – Industrial	All Units, 800 Pittwater Road	N/A
Stage 2		
R10 – Industrial	Units 2 and 4, 800 Pittwater Road	N/A

The assumed operating hours for the *NSC* are:

#### Standard Hours:

Monday – Friday: 8 am – 4 pm; including

• Recess: 11 am – 11.30 am; and

• Lunch: 1 pm – 1.30 pm.

The assumed out of school hours use of the auditorium or playing courts are:

• Monday – Sunday: 7 am – 10 pm

The assumed out of school hours use of the Wellness Centre are:

• Monday – Friday: 6 am – 9 pm; and

• Saturday: 7 am – 5 pm.

The proposal is a State Significant Development (SSD) and has been issued by the NSW Department of Planning and Environment with the Secretary's Environmental Assessment Requirements (SEARs) – *SSD 10291*. The SEARs require an assessment against the NSW Environment Protection Authority's (EPA) *Noise Policy for Industry 2017*.

This proposal is also 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 outdoor play areas, general learning areas (GLAs) and speciality learning areas (SLAs), public address system and school bell, mechanical plant, enclosed basketball courts, auditorium and vehicle movements has been carried out to ensure the noise impact of the *NSC* will not adversely affect the acoustic amenity of the local neighbourhood.



Calculations show that, provided the recommendations in Section 5 of this report are implemented and adhered to, the level of noise emission from the NSC 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 Noise Policy for Industry and NSW Road Noise Policy.



Figure 1 - Location Plan, 800 Pittwater & 224 Headland Road, Dee Why, NSW.





Figure 2 - Site Plan, 800 Pittwater & 224 Headland Road, Dee Why, NSW.

## 3.0 ACOUSTIC CRITERIA

The assumed operating hours of the *NSC* are between 7 am and 10 pm. This period can be defined as the day, 7 am to 6 pm, and as evening, 6 pm to 10 pm. Therefore, the acoustic criteria in this Section are based on the day and evening periods, only.

#### 3.1 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.

The ambient L<sub>90</sub> 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<sub>90</sub> 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 residential dwellings. These locations are shown in the Site Plan on Figure 2 as 'R2', 'R4', 'R7' and 'R8'. The times of worst possible annoyance will be during the day or evening when the *NSC* is operating.

Ambient noise levels were previously measured in the backyard of 20 Quirk Street, shown as Location 'A' on Figure 1, from Tuesday 10 April to Tuesday 17 April, 2018. Ambient noise level were also recently measured in the front yard of 209 Headland Road, shown as Location 'B' on Figure 1, and in the north-western corner of 800 Pittwater Road, shown as Location 'C' on Figure 1, from Tuesday 28 May to Wednesday 5 June, 2019.

The day time ambient noise levels are presented in the attached Appendix B1, B2 and B3, and also below in Table 3.

Table 3 Ambient Noise Levels - Dee Why, NSW

Noise Measurement Location	Time Period	L <sub>90</sub> Rating Background Level	Existing L <sub>eq</sub> Noise Level
Location 'A' <i>(10/4 to 17/4/18)</i> - Backyard, 20 Quirk St	Early Morning (6 am to 7 am) Day (7 am to 6 pm) Evening (6 pm to 10 pm)	42 dBA 42 dBA 40 dBA	n/a 56 dBA 48 dBA
Location 'B' <i>(28/5 to 5/6/2019)</i> - Front yard, 209 Headland Rd	Early Morning (6 am to 7 am) Day (7 am to 6 pm) Evening (6 pm to 10 pm)	52 dBA 51 dBA 48 dBA	n/a 62 dBA 60 dBA
Location 'C' <i>(28/5 to 5/6/2019)</i> - NW Corner, 800 Pittwater Rd	Early Morning (6 am to 7 am) Day (7 am to 6 pm) Evening (6 pm to 10 pm)	60 dBA 59 dBA 56 dBA	n/a 67 dBA 66 dBA



The measured ambient noise levels at Location 'C' were affected by road traffic noise from Pittwater Road. Where the existing  $L_{eq}$ , traffic noise level is 10 dB or more above the recommended amenity noise level, the area is considered to have high traffic noise (EPA, *Noise Policy for Industry*, Section 2.4.1).

Meteorological conditions during the testing from Tuesday 10 April to Tuesday 17 April, 2018 typically consisted of clear skies. Temperatures ranged from 15 to 31°C. Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor area.

Meteorological conditions during the testing from Tuesday 28 May to Wednesday 5 June, 2019 typically consisted of clear skies with some rain. Rain affected data has been removed from the assessment period. Temperatures ranged from 8 to 18°C. Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor areas.

# 3.2 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

- (1) Development for the purpose of a school may be carried out by any person with development consent on land in a prescribed zone..
- (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.

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.'



# 3.3 NSW Environment Protection Authority

# 3.3.1 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 framework to assess noise emission from a premises, and whether that premises produces intrusive or non-intrusive noise and / or maintains the acoustic amenity.

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.

Section 2.1 of the *NPI* states the following:

"Intrusive noise levels are only applied to residential receivers (residences). For other receiver types identified in Table 2.2, only the amenity levels apply."

## 3.3.1.1 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 RBLs at Location 'A' were 42 dBA during the early morning and day and 40 dBA in the evening (see Table 3). Therefore the acceptable  $L_{eq}$  noise intrusiveness criteria in these areas are:

- (42 + 5 =) 47 dBA L<sub>eq, 15 minute</sub> in the early morning and during the day; and
- $(40 + 5 =) 45 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the evening.

The RBLs at Location 'B' were 52 in the early morning, 51 dBA during the day and 48 dBA in the evening (see Table 3). Therefore the acceptable  $L_{\text{eq}}$  noise intrusiveness criteria in these areas are:

•  $(52 + 5 =) 57 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the early morning; and



- $(51 + 5 =) 56 \text{ dBA L}_{eq, 15 \text{ minute}}$  during the day; and
- $(48 + 5 =) 53 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the evening.

The RBLs at Location 'C' were 60 in the early morning, 59 dBA during the day and 56 dBA in the evening (see Table 3). Therefore the acceptable  $L_{eq}$  noise intrusiveness criteria in these areas are:

- $(60 + 5 =) 65 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the early morning; and
- $(59 + 5 =) 64 \text{ dBA L}_{eq, 15 \text{ minute}}$  during the day; and
- $(56 + 5 =) 61 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the evening.

# 3.3.1.2 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<sub>eq</sub> noise levels in Table 4 are taken from Section 2.4, Table 2.2 of the NPI.

**Table 4** Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day	L <sub>eq,</sub> dBA, Recommended Amenity Noise Level
		Day	55
Residential	Suburban	Evening	45
		Night	40
		Day	60
	Urban	Evening	50
		Night	45
Area specifically reserved for passive recreation (eg national park)	All	When in use	50
Industrial premises	All	When in use	70

The L<sub>Aeq</sub> 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<sub>Aeq,15min</sub> will be taken to be equal to the L<sub>Aeq,period</sub> + 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 following exceptions to the above method to derive the project amenity noise level apply:

3. Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.'

In addition, the level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the  $L_{Aeq}$  noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the  $L_{Aeq, period (traffic)}$  minus 15 dBA.

The existing  $L_{eq}$  noise level at Location 'A' was 56 dBA during the day and 48 dBA in the evening (see Table 3), In accordance with Table 2.3 of the *NPI*, Location 'A' is considered to be a 'Suburban' Noise Amenity Area. Therefore, the acceptable amenity noise level for the residential receptors in this area, 'R2', are:

- $(55 5 + 3 =) 53 \text{ dBA L}_{eq, 15 \text{ minute}}$  during the day; and
- $(45 5 + 3 =) 43 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the evening.

The existing  $L_{eq}$  noise level at Location 'B' was 62 dBA during the day and 60 dBA in the evening (see Table 3), In accordance with Table 2.3 of the *NPI*, Location 'B' is considered to be an 'Urban' Noise Amenity Area. Therefore, the acceptable amenity noise level for the residential receptors in this area, 'R2', are:

- $(60 5 + 3 =) 58 \text{ dBA L}_{eq, 15 \text{ minute}}$  during the day; and
- $(60 10 + 3 =) 53 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the evening.

The existing  $L_{eq}$  noise level at Location 'C' was 67 dBA during the day and 66 dBA in the evening (see Table 3), In accordance with Table 2.3 of the *NPI*, Location 'C' is considered to be an 'Urban' Noise Amenity Area. Therefore, the acceptable amenity noise level for the residential receptors in this area, 'R2', are:

- (67 10 + 3 =) 60 dBA Leq, 15 minute during the day; and
- $(66 15 + 3 =) 54 \text{ dBA L}_{eq, 15 \text{ minute}}$  in the evening.



The acceptable amenity criteria for the adjacent Stony Range Botanic Garden, 'R1', is:

•  $(50 - 5 + 3 =) 48 \text{ dBA L}_{eq, 15 \text{ minute}}$  when in use.

The acceptable amenity criteria for the adjacent Industrial premises, 'R3', 'R5', 'R6', 'R9' and 'R10', is:

• (70 - 5 + 3 =) 68 dBA Leq, 15 minute when in use.

# 3.3.2 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 5.

Table 5 Road Traffic Noise Assessment Criterion - Residential

Road		Assessmen dB	
Category	Type of project/land use	Day (7 am - 10 pm)	Night (10 pm – 7 am)
Freeway/ arterial/ sub-arterial roads	<ol> <li>Existing residences affected by additional traffic on existing freeways/arterial/sub- arterial roads generated by land use developments</li> </ol>	L <sub>Aeq, (15 hour)</sub> 60 (external)	L <sub>Aeq, (9 hour)</sub> 55 (external)
Local roads	<ol> <li>Existing residences affected by additional traffic on existing local roads generated by land use developments</li> </ol>	L <sub>Aeq, (1 hour)</sub> 55 (external)	L <sub>Aeq, (1 hour)</sub> 50 (external)

# 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 of the new school buildings, mechanical plant and the use of the staff, visitor and student car park will be assessed against requirements of the *NSW EPA NPI* and on-road traffic noise associated with vehicles arriving / leaving the *NSC* assessed against requirements of the *NSW EPA RNP*.

## 3.4.1 Residential Receivers

Residential Receiver – 'R2', based on the measured noise levels in Location 'A'

- **47 dBA** L<sub>eq, 15 minute</sub> in the early morning for the use of the car park for access to the Wellness Centre.
- **53 dBA¹** L<sub>eq, 15 minute</sub> during the day for activities in the outdoor areas;
- **47 dBA** L<sub>eq, 15 minute</sub> during the day for all noise associated with the use of the new school buildings and use of the staff, visitor and student car park; and
- **43 dBA** L<sub>eq, 15 minute</sub> during the evening for all noise associated with the use of the new school buildings and use of the staff, visitor and student car park.

Residential Receiver - 'R4', based on the measured noise levels in Location 'B'

- ullet 57 dBA  $L_{eq, 15 \ minute}$  in the early morning for the use of the car park for access to the Wellness Centre.
- **58 dBA**<sup>2</sup> L<sub>eq, 15 minute</sub> during the day for activities in the outdoor areas;
- **56 dBA** L<sub>eq, 15 minute</sub> during the day for all noise associated with the use of the new school buildings and use of the staff, visitor and student car park; and
- **53 dBA** L<sub>eq, 15 minute</sub> during the evening for all noise associated with the use of the new school buildings and use of the staff, visitor and student car park.

Residential Receivers – 'R7' and 'R8', based on the measured noise levels in Location 'C'

- **65 dBA** L<sub>eq, 15 minute</sub> in the early morning for the use of the car park for access to the Wellness Centre.
- **60 dBA**<sup>3</sup> Leq, 15 minute during the day for activities in the outdoor areas;
- **60 dBA** L<sub>eq, 15 minute</sub> during the day for all noise associated with the use of the new school buildings and use of the staff, visitor and student car park; and



<sup>&</sup>lt;sup>1</sup> **NOTE**: It is noted that the existing L<sub>eq</sub> noise level at Location 'A' already exceeds this amenity noise level, see Table 2.

<sup>&</sup>lt;sup>2</sup> **NOTE**: It is noted that the existing  $L_{eq}$  noise level at Location 'B' already exceeds this amenity noise level, see Table 2.

 $<sup>^3</sup>$  **NOTE**: It is noted that the existing  $L_{eq}$  noise level at Location 'C' already exceeds this amenity noise level, see Table 2.

• **54 dBA** L<sub>eq, 15 minute</sub> during the evening for all noise associated with the use of the new school buildings and use of the staff, visitor and student 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 Passive Recreation Receiver

Passive Recreation Receiver - 'R1'

• **48<sup>4</sup> dBA** L<sub>eq, 15 minute</sub> for activities in the outdoor areas, the use of the new school buildings and use of the staff, visitor and student car park, when in use.

This criterion applies at the most-affected point within the area that is reasonably expected to be used by people, when in use.

#### 3.4.3 Industrial Receivers

Industrial Premises Receivers – 'R3', 'R5', 'R6', 'R9' and 'R10'

• **68 dBA** (external) L<sub>eq, 15 minute</sub> for activities in the outdoor areas, the use of the new school buildings and use of the staff, visitor and student car park, when in use;

This criterion applies at the reasonably most-affected point on or within the property boundary.

# 3.4.4 On – Road Traffic Noise Criteria

The following criterion will be applied at 1 metre from the most affected façade of 'R4', for on – road traffic noise:

- 55 dBA (external) Leq, 1 hour between 7 am and 10 pm; and
- **50 dBA** (external) L<sub>eq, 1 hour</sub> between 10 pm and 7 am.

The following criterion will be applied at 1 metre from the most affected façade of 'R7' and 'R8', for on – road traffic noise:

- **60 dBA** (external) L<sub>eq, 15 hour</sub> between 7 am and 10 pm; and
- **55 dBA** (external) L<sub>eq</sub>, 9 hour between 10 pm and 7 am.



<sup>&</sup>lt;sup>4</sup> **NOTE**: It is noted that the existing  $L_{eq}$  noise level at Location 'C' already exceeds this amenity noise level, see Table 2.

## 4.0 SCHOOL NOISE EMISSION

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

- Students using the outdoor play areas Stage 2 (480 Students) and 3 (600 Students);
- Students inside the GLAs and SLAs Stage 2 and 3;
- Public address system and school bell Stage 2 and 3;
- Mechanical plant Stage 2 and 3;
- Use of the enclosed basketball courts Stage 1, 2 and 3;
- Use of the auditorium Stage 3; and
- Use of the staff, visitor and student car park Stage 1, 2 and 3.

The noise assessment was based on the drawings by Tonkin Zulaikha Greer Architects for Project Number 18032, dated 23 August 2019, attached as Appendix C.

**Note:** calculations of noise emissions for Stage 1 include noise sources associated with Stage 1 only, calculations of noise emissions for Stage 2 include noise sources associated with Stage 1 and Stage 2 (where relevant) only, and calculations of noise emission for Stage 3 include noise sources associated with Stages 1, 2 and 3 (where relevant).

## 4.1 Outdoor Areas Noise Emissions

Students will be outside for a range of times, including before school, recess, lunch, PE classes and after school, however the outdoor areas are only likely to be at capacity during recess and lunch.

Stage 2 - In order to model the worst case scenario of noise emissions from students outdoors at the completion of Stage 2, we have assumed that 2/3 of the 480 students (320) will be outside at the one time, with half (160) of those students making noise at any given time. We have assumed the other 1/3 of the students (160) will be located indoors throughout the NSC building, ie in the 'Café' or 'Wellness Precinct'.

Stage 3 - In order to model the worst case scenario of noise emissions from students outdoors at the completion of Stage 3, we have assumed that 2/3 of the 600 students (400) will be outside at the one time, with half (200) of those students making noise at any given time. We have assumed the other 1/3 of the students (200) will be located indoors throughout the *NSC* building, ie in the 'Village Centre' or 'Wellness Precinct'.



Sound power levels of children at play were previously measured for other similar projects and are presented below in Table 6. 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 6 Leq, 15 minute Sound Power Levels - Students in Outdoor Areas

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
1 student – male with loud voice	80	59	61	70	77	76	72	65	56
320 x secondary students in outdoor areas	102	81	83	92	99	98	94	87	78
400 x secondary students in outdoor areas	103	82	84	93	100	99	95	88	79

# 4.2 General & Speciality Learning Areas Noise Emissions

We have assumed that the average class size within the NSC at the completion of Stage 3 will be (600 / 33 = ) 18 students, based on the total number of students (600) and the total number of GLA / SLAs (33). A class size of 18 will also be used for Stage 2 calculations.

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 (6) talking normally in the GLA and SLAs. 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 amplified band, including drums, electric guitar, electric bass, electric keyboard and an amplified vocal, may be playing in the music SLA during classroom activities (Stage 3 only).

Calculations assume students are distributed evenly throughout the inside of the GLA and SLAs 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  $L_{eq, 15 \text{ minute}}$  sound power levels of teachers and students are shown in Table 7.

Table 7 Leq, 15 minute Sound Power Levels – Teacher & Students – GLA & SLAs

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
General and Specialty Learni	General and Specialty 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 18 students – Block A	80	63	64	72	78	76	72	66	58
Small Amplified Band	105	114	110	109	102	99	89	89	88

# 4.3 Public Address System & School Bell Noise Emission

The *NSC* will be provided with a public address system and a bell to signal the start and end of classes. The location of the new speakers has not yet been determined, however assuming up to 6 external speaker locations are provided, the maximum sound pressure level should be no greater than **81 dBA** at 3 metres from each speaker in order to meet the noise criterion at the nearest noise sensitive premises.



# 4.4 Mechanical Plant Noise Emission

The mechanical spatial drawings, provided by Wood and Grieve Engineers for Project Number 43194, dated 17 September 2019, attached as Appendix E, show several items of mechanical plant throughout the *NSC*, including but not limited to, two chillers and one car park and pool exhaust fan in a roof top plant area on the north-eastern side of the *NSC* and one air handling unit (AHU) in a roof top plant area on the north side of the *NSC*.

The specific type/model of mechanical plant have not yet been selected. The proposed mechanical plant will typically only operate during day time hours, Monday to Friday and when required during the evening period, Monday to Sunday.

The  $L_{eq, 15 \text{ minute}}$  sound power levels for typical equipment used at school sites are presented in Table 8.

 Table 8
 Leq, 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
Car Park/Pool Exhaust Fan	89	88	90	86	86	83	82	80	77
Air Handling Unit	89	89	89	90	86	84	80	76	71
Chiller (Condenser Unit) (8 fans)	89	94	88	89	87	84	79	74	66

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



# 4.5 Enclosed Basketball Courts Usage Noise Emission

We have assumed the proposed Enclosed Basketball Courts (EBCs) will have capacity for up to 200 students. From our observations of other sites, we have modelled the noise emission from the EBCs 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 %)
- We have assumed as a worst case scenario the EBCs may operate at full capacity during recess or lunch time on a rainy day.
- We have assumed that the windows on the southern and western sides of the EBCs are of fixed frame construction, with 6.38 mm laminated glass installed within the frames.
- We have assumed the doors on the western sides of the EBCs may be partially opened during the use, approximately 10% of the floor area.
- We have assumed the celling / roof system consists of a metal deck roof with standard thermal insulation batts installed beneath.
- We have assumed the walls are of pre-fabricated concrete panel construction.

Based on information in Harris<sup>5</sup> and in our noise level database gathered over many years, we calculate the sound power levels shown below in Tables 9.

Table 9 Leq, 15 minute Sound Power Levels - Enclosed Basketball Courts - Students

Description	L <sub>eq</sub> Sound Power Level dBA
One Male Student Talking Loudly	80
One Male Student Talking with Raised Voice	69
One Male Student Talking Normally	63
200 Students	93



<sup>&</sup>lt;sup>5</sup> Handbook of Acoustical Measurements and Noise Control, Third Edition, Cyril M. Harris, McGraw-Hill Inc, New York, (Page 16.2)

## 4.6 Auditorium Noise Emission

The auditorium will have capacity for up to 761 people (Stage 3 only). From our observations of other sites, we have modelled the noise emission from the auditorium as follows:

- People talking loudly (10%), guests talking with a raised voice (20 %), guests talking normally (20 %) and the rest are not talking or listening (50 %)
- Amplified music will be played during performances and will consist predominantly of either pre-recorded amplified music or live performances.
- We have assumed as a worst case scenario the auditorium may operate at full capacity during a performance.
- We have assumed that the double glazed operable tilt doors on the northern side of the auditorium will be closed during performances.
- We have assumed that the louvre windows on the northern side of the auditorium will have 6.38 mm laminated glass installed within the frames.
- We have assumed the windows will be partially opened during a performance, approximately 27 m<sup>2</sup> open area.
- We have assumed the walls are of pre-fabricated concrete panel construction

Based on information in Harris<sup>5</sup> and in our noise level database gathered over many years, we calculate the sound power levels shown below in Table 10.

Table 10 Leq, 15 minute Sound Power Levels - Proposed Auditorium

Description	L <sub>eq</sub> Sound Power Level dBA
One Man Talking Loudly	80
One Man Talking with Raised Voice	69
One Man Talking Normally	63
Amplified Live Band	105
761 People	99
761 People with Amplified Live Band	106



## 4.7 Vehicle Noise Emission

The staff/student car park on 224 Headland Road provides a total of 41 parking spaces for vehicles with the staff/student car park on 800 Pittwater Road providing a total of 90 parking spaces for vehicles at the completion of Stage 2 and a total of 91 parking spaces for vehicles at the completion of Stage 3.

As a worst case scenario, we have assumed all spaces in both car parks will be filled / emptied within a 30 minute period either before or after school or during a special event in the auditorium (or Wellness Centre). This is equivalent to the following vehicle trip rates over a 15 minute period during the abovementioned periods:

- Stage 1 224 Headland Road Car Park 21 vehicles entering/exiting the car park;
- Stage 2 800 Pittwater Road Car Park 45 vehicles entering/exiting the car park and
- Stage 3 800 Pittwater Road Car Park 46 vehicles entering/exiting the car park.

The Sound Exposure Level<sup>6</sup> (SEL) sound power level and spectra of vehicle noise is shown below in Table 11 and is based on previous measurements by Day Design.

Table 11 SEL 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 20 km/h (on an incline)	86	101	94	85	81	81	76	75	68
SEL level of car drive by at approximately 50 km/h (flat road)	93	95	93	90	89	91	83	73	66
SEL level of car door slam, ignition and drive away	91	104	96	89	87	86	83	81	75



 $<sup>^{6}</sup>$  SEL is the total sound energy of a single noise event condensed into a one second duration.

# 4.8 Predicted Noise Level at Receptor Locations

Knowing the sound power level of a noise source (See Tables 6 - 11), 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, educational and industrial receptors from the various noise producing facets of the development are shown below.

Where applicable, calculations include acoustic shielding provided by the *NSC* buildings to the residential, educational and industrial receptors.

# 4.8.1 Predicted Noise Levels - Stage 1

# 4.8.1.1 Enclosed Basketball Courts - Stage 1

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

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

Table 12 Predicted Leq, 15 minute Noise Levels - Enclosed Basketball Court - Stage 1

Receptor Location	Predicted L <sub>eq</sub> Noise Level (dBA)	Acceptable L <sub>eq</sub> Noise Level (dBA)	Compliance
R1 – Stony Range Botanic Garden			
- Students	30	48	Yes
R2 – 10 Tango Avenue			
- Students	22	47	Yes
R3 – 222 Headland Road			
- Students	46	68	Yes
R4 – 213 Headland Road			
- Students	34	56	Yes
R5 – 226 Headland Road			
- Students	41	68	Yes
R6 – 275 Harbord Road			
- Students	28	68	Yes
R7 – 589 Pittwater Road			
- Students	29	60	Yes
R8 – 595 Pittwater Road			
- Students	30	60	Yes
R9 – 800 Pittwater Road			
- Students	41	68	Yes



The predicted level of noise from the Enclosed Basketball Courts at the receptor locations 'R1' to 'R9', complies with the criteria in Section 3.4 of this report, and is therefore acceptable.

# 4.8.1.2 Use of Staff, Visitor and Student Car Parks – 224 Headland Road – Stage 1

The external  $L_{eq, 15 \text{ minute}}$  noise levels at the receptor locations from noise associated with the use of the staff, visitor and student car park at 224 Headland Road throughout the day are calculated to be as shown below in Table 13.

Table 13 Predicted L<sub>eq, 15 minute</sub> Noise Levels – Use of Staff, Visitor & Student Car Parks – Stage 1

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Stony Range Botanic Garden	16	48	Yes
R2 – 10 Tango Avenue	< 10	47	Yes
R3 – 222 Headland Road	19	68	Yes
R4 – 213 Headland Road	30	56	Yes
R5 – 216 Headland Road	30	68	Yes
R6 – 275 Harbord Road	19	68	Yes
R7 – 589 Pittwater Road	18	60	Yes
R8 – 595 Pittwater Road	18	60	Yes
R9 – 800 Pittwater Road	30	68	Yes

The predicted external levels of noise from the use of the staff, visitor and student car park at 224 Headland Road are within the noise criteria in Section 3.4, and are therefore acceptable.



# 4.8.2 Predicted Noise Levels - Stage 2

# 4.8.2.1 Outdoor Areas - Stage 2

Based on a maximum of 320 students in the outdoor play areas at any one time at the completion of Stage 2, the predicted  $L_{eq\,15\,minute}$  noise level is calculated to be as shown below in Table 14. The noise prediction was determined by placing all 320 students into two groups throughout the outdoor areas as follows and as shown in Appendix D:

- Group 1 'External Hardcourt' = 160 students;
- Group 2 Northern outdoor area = 160 students.

Table 14 Predicted Leq, 15 minute Noise Levels - Outdoor Areas - Stage 2

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Stony Range Botanic Garden	50	48	Yes*
R2 – 10 Tango Avenue	48	53	Yes
R3 – 222 Headland Road	36	68	Yes
R4 – 213 Headland Road	23	58	Yes
R5 – 216 Headland Road	27	68	Yes
R6 – 275 Harbord Road	28	68	Yes
R7 – 589 Pittwater Road	28	60	Yes
R8 – 595 Pittwater Road	53	60	Yes
R10 – 800 Pittwater Road	21	68	Yes

<sup>\*</sup>An exceedance of 2 dB in not considered significant as it is generally not discernable to the human ear.

The predicted level of noise from the students in the outdoors at the receptor locations 'R1' to 'R8' and 'R10' complies with the criteria in Section 3.4 of this report, and is therefore acceptable.

# 4.8.2.2 Cumulative Noise Level – GLAs & Mechanical Plant – Stage 2

The cumulative noise impact from the GLAs and mechanical plant associated with the  $\it NSC$  are summarised and shown in Table 15.

Table 15 Predicted Cumulative Leq, 15 minute Noise Levels – GLAs & Mechanical Plant - Stage 2

Receptor Location	Predicted L <sub>eq</sub> Noise Level (dBA)	Acceptable L <sub>eq</sub> Noise Level (dBA)	Compliance
R1 – Stony Range Botanic Garden			
- GLA / SLAs	40		
- Mechanical plant	38		
Cumulative Noise Level	42	48	Yes
R2 – 10 Tango Avenue			
- GLA / SLAs	32		
- Mechanical plant	41		
Cumulative Noise Level	42	47	Yes
R3 – 222 Headland Road			
- GLA / SLAs	47		
- Mechanical plant	56		
Cumulative Noise Level	57	68	Yes
R4 – 213 Headland Road			
- GLA / SLAs	< 20		
- Mechanical plant	25		
Cumulative Noise Level	25	56	Yes
R5 – 226 Headland Road			
- GLA / SLAs	51		
- Mechanical plant	40		
Cumulative Noise Level	51	68	Yes
R6 – 275 Harbord Road			
- GLA / SLAs	45		
- Mechanical plant	24		
Cumulative Noise Level	45	68	Yes
R7 – 589 Pittwater Road			_
- GLA / SLAs	42		
- Mechanical plant	28		
Cumulative Noise Level	42	60	Yes



Table 15 Predicted Cumulative Leq, 15 minute Noise Levels – GLAs & Mechanical Plant - Stage 2 - Continued

Receptor Location	Predicted L <sub>eq</sub> Noise Level (dBA)	Acceptable L <sub>eq</sub> Noise Level (dBA)	Compliance
R8 – 595 Pittwater Road			
- GLA / SLAs	43		
- Mechanical plant	28		
Cumulative Noise Level	44	60	Yes
R10 – 800 Pittwater Road			
- GLA / SLAs	45		
- Mechanical plant	18		
Cumulative Noise Level	45	68	Yes

The predicted cumulative level of noise from the GLA / SLAs and mechanical plant at the receptor locations 'R1' to 'R8' and 'R10', complies with the criteria in Section 3.4 of this report, and is therefore acceptable.



# 4.8.2.3 Enclosed Basketball Courts - Stage 2

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

The noise impact from the *EBCs* during recess or lunch time is summarised and shown in Table 16.

Table 16 Predicted Leq, 15 minute Noise Levels - Enclosed Basketball Court - Stage 2

Receptor Location	Predicted L <sub>eq</sub> Noise Level (dBA)	Acceptable L <sub>eq</sub> Noise Level (dBA)	Compliance
R1 – Stony Range Botanic Garden			
- Students	30	48	Yes
R2 – 10 Tango Avenue			
- Students	22	47	Yes
R3 – 222 Headland Road			
- Students	46	68	Yes
R4 – 213 Headland Road			
- Students	34	56	Yes
R5 – 226 Headland Road			
- Students	41	68	Yes
R6 – 275 Harbord Road			
- Students	28	68	Yes
R7 – 589 Pittwater Road			
- Students	29	60	Yes
R8 – 595 Pittwater Road			
- Students	30	60	Yes
R10 – 800 Pittwater Road			
- Students	39	68	Yes

The predicted level of noise from the Enclosed Basketball Courts at the receptor locations 'R1' to 'R8' and 'R10', complies with the criteria in Section 3.4 of this report, and is therefore acceptable.



# 4.8.2.4 Use of Staff, Visitor and Student Car Parks - Stage 2

The external  $L_{\text{eq, 15 minute}}$  noise levels at the receptor locations from noise associated with the use of the staff, visitor and student car parks – 224 Headland Road and 800 Pittwater Road - throughout the day are calculated to be as shown below in Table 17.

Table 17 Predicted Leq, 15 minute Noise Levels – Use of Staff, Visitor & Student Car Parks – Stage 2

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Stony Range Botanic Garden	41	48	Yes
R2 – 10 Tango Avenue	21	47	Yes
R3 – 222 Headland Road	36	68	Yes
R4 – 213 Headland Road	30	56	Yes
R5 – 216 Headland Road	48	68	Yes
R6 – 275 Harbord Road	54	68	Yes
R7 – 589 Pittwater Road	43	60	Yes
R8 – 595 Pittwater Road	43	60	Yes
R10 – 800 Pittwater Road	54	68	Yes

The predicted external levels of noise from the use of the staff, visitor and student car park at the completion of Stage 2 are within the noise criteria in Section 3.4, and are therefore acceptable.

# 4.8.3 Predicted Noise Levels - Stage 3

# 4.8.3.1 Outdoor Areas - Stage 3

Based on a maximum of 400 students in the outdoor play areas at any one time at the completion of Stage 3, the predicted  $L_{eq\,15\,minute}$  noise level is calculated to be as shown below in Table 18. The noise prediction was determined by placing all 400 students into three groups throughout the outdoor areas as follows and as shown in Appendix D:

- Group 1 'External Hardcourt' = 100 students;
- Group 2 Northern outdoor area = 100 students; and
- Group 3 Western outdoor area = 200 students.

Table 18 Predicted Leq, 15 minute Noise Levels - Outdoor Areas - Stage 3

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Stony Range Botanic Garden	49	48	Yes*
R2 – 10 Tango Avenue	46	53	Yes
R3 – 222 Headland Road	35	68	Yes
R4 – 213 Headland Road	24	58	Yes
R5 – 216 Headland Road	34	68	Yes
R6 – 275 Harbord Road	57	68	Yes
R7 – 589 Pittwater Road	55	60	Yes
R8 – 595 Pittwater Road	56	60	Yes

<sup>\*</sup>An exceedance of 1 dB in not considered significant as it is generally not discernable to the human ear.

The predicted level of noise from the students in the outdoors at the receptor locations 'R1' to 'R8' complies with the criteria in Section 3.4 of this report, and is therefore acceptable.

## 4.8.3.2 Cumulative Noise Level – GLAs & Mechanical Plant – Stage 3

The cumulative noise impact from the GLAs and mechanical plant associated with the *NSC* are summarised and shown in Table 19.



Table 19 Predicted Cumulative Leq, 15 minute Noise Levels – GLAs & Mechanical Plant – Stage 3

Receptor Location	Predicted L <sub>eq</sub> Noise Level (dBA)	Acceptable L <sub>eq</sub> Noise Level (dBA)	Compliance
R1 – Stony Range Botanic Garden			
- GLA / SLAs	43		
- Mechanical plant	38		
Cumulative Noise Level	44	48	Yes
R2 – 10 Tango Avenue			
- GLA / SLAs	35		
- Mechanical plant	41		
Cumulative Noise Level	42	47	Yes
R3 – 222 Headland Road			
- GLA / SLAs	50		
- Mechanical plant	56		
Cumulative Noise Level	57	68	Yes
R4 – 213 Headland Road			
- GLA / SLAs	< 20		
- Mechanical plant	25		
Cumulative Noise Level	25	56	Yes
R5 – 226 Headland Road			
- GLA / SLAs	54		
- Mechanical plant	40		
Cumulative Noise Level	54	68	Yes
R6 – 275 Harbord Road			
- GLA / SLAs	48		
- Mechanical plant	24		
Cumulative Noise Level	48	68	Yes
R7 – 589 Pittwater Road			
- GLA / SLAs	45		
- Mechanical plant	28		
Cumulative Noise Level	45	60	Yes
R8 – 595 Pittwater Road			
- GLA / SLAs	46		
- Mechanical plant	28		
Cumulative Noise Level	46	60	Yes



The predicted cumulative level of noise from the GLA / SLAs and mechanical plant at the receptor locations 'R1' to 'R8' at the completion of Stage 3, complies with the criteria in Section 3.4 of this report, and is therefore acceptable.

## 4.8.3.3 Enclosed Basketball Courts - Stage 3

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

The noise impact from the *EBCs* during recess or lunch time is summarised and shown in Table 20.

Table 20 Predicted Leq, 15 minute Noise Levels - Enclosed Basketball Court - Stage 3

Receptor Location	Predicted L <sub>eq</sub> Noise Level (dBA)	Acceptable L <sub>eq</sub> Noise Level (dBA)	Compliance
R1 – Stony Range Botanic Garden			
- Students	30	48	Yes
R2 – 10 Tango Avenue			
- Students	22	47	Yes
R3 – 222 Headland Road			
- Students	46	68	Yes
R4 – 213 Headland Road			
- Students	34	56	Yes
R5 – 226 Headland Road			
- Students	41	68	Yes
R6 – 275 Harbord Road			
- Students	28	68	Yes
R7 – 589 Pittwater Road			
- Students	29	60	Yes
R8 – 595 Pittwater Road			
- Students	30	60	Yes

The predicted level of noise from the Enclosed Basketball Courts at the receptor locations 'R1' to 'R8', complies with the criteria in Section 3.4 of this report, and is therefore acceptable.



#### 4.8.3.4 Auditorium – Stage 3

We have assumed the auditorium may be used at full capacity during recess, lunch or assemblies and during evening performances.

The noise impact from the auditorium during the evening is summarised and shown in Table 21. Compliance with the more stringent evening criterion will also ensure compliance during the day.

Table 21 Predicted L<sub>eq, 15 minute</sub> Noise Levels – Auditorium – Evening (6 pm to 10 pm) – Stage 3

Receptor Location	Predicted L <sub>eq</sub> Acceptable n Noise Level L <sub>eq</sub> Noise (dBA) Level (dBA)		Compliance	
R1 – Stony Range Botanic Garden				
- Special Event	44	48	Yes	
R2 – 10 Tango Avenue				
- Special Event	31	43	Yes	
R3 – 222 Headland Road				
- Special Event	17	68	Yes	
R4 – 213 Headland Road				
- Special Event	13	53	Yes	
R5 – 226 Headland Road				
- Special Event	22	68	Yes	
R6 – 275 Harbord Road				
- Special Event	20	68	Yes	
R7 – 589 Pittwater Road				
- Special Event	20	54	Yes	
R8 – 595 Pittwater Road				
- Special Event	43	54	Yes	

The predicted level of noise from the Auditorium at the receptor locations 'R1' to 'R8', complies with the day and evening criteria in Section 3.4 of this report, and is therefore acceptable.



### 4.8.3.5 Use of Staff, Visitor and Student Car Parks – Stage 3

The external  $L_{\text{eq, 15 minute}}$  noise levels at the receptor locations from noise associated with the use of the staff, visitor and student car park – 224 Headland Road and 800 Pittwater Road - throughout the day are calculated to be as shown below in Table 22.

Table 22 Predicted L<sub>eq, 15 minute</sub> Noise Levels – Use of Staff, Visitor & Student Car Parks – Stage 3

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Stony Range Botanic Garden	41	48	Yes
R2 – 10 Tango Avenue	21	47	Yes
R3 – 222 Headland Road	36	68	Yes
R4 – 213 Headland Road	30	56	Yes
R5 – 216 Headland Road	48	68	Yes
R6 – 275 Harbord Road	54	68	Yes
R7 – 589 Pittwater Road	43	60	Yes
R8 – 595 Pittwater Road	43	60	Yes

The predicted external levels of noise from the use of the staff, visitor and student car park are within the noise criteria in Section 3.4, and are therefore acceptable.

### 4.8.4 On – Road Traffic Noise – Stage 3

As a worst-case scenario, on-road traffic noise has been calculated for Stage 3 only using the assumed worst case peak day time vehicle flow rate (see Section 4.7).

The external  $L_{eq, 1 \text{ hour}}$  (R4), and  $L_{eq, 15 \text{ hour}}$  and  $L_{eq, 9 \text{ hour}}$  (R7 and R8) noise levels at the most affected residential receptor locations, 'R4', 'R7' and 'R8', from noise associated with on – road traffic throughout the day and night (6 am to 7 am) are calculated to be as shown below in Table 23.

Table 23 Predicted L<sub>eq, 1 hour</sub>, L<sub>eq, 15 hour</sub> & L<sub>eq, 9 hour</sub> Noise Levels – On – Road Traffic – Stage 3

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
Day - 7 am to 10 pm			
R4 – 213 Headland Road	47	55	Yes
R7 – 589 Pittwater Road	48	60	Yes
R8 – 595 Pittwater Road	48	60	Yes
Night - 10 pm to 7 am			
R4 – 213 Headland Road	47	50	Yes
R7 – 589 Pittwater Road	48	55	Yes
R8 – 595 Pittwater Road	48	55	Yes

The predicted external levels of noise from on – road traffic are within the noise criteria in Section 3.4.4, and are therefore acceptable.

#### 5.0 NOISE CONTROL RECOMMENDATIONS

### 5.1 Noise Management Plan

With regard to the *NSC's* delivery, garbage pickup and ground maintenance schedule, we recommend the following:

- We recommend that any deliveries to the *NSC*, such as food for the canteen, or garbage pickup from the *NSC* 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 the *NSC* grounds occur between the hours of 7 am and 6 pm.

#### 5.2 Mechanical Plant

The specifications for the mechanical plant have not yet been finalised for this development. For typical mechanical plant equipment with sound power levels not exceeding those listed in Table 8, 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 Existing Common Wall

We recommend that the common wall between the Stage 2 (I-MED and Fitness First) and Stage 3 (Officeworks) buildings be maintained at the completion of the Stage 2 construction period. Should a justified noise complaint be received during the use of the Stage 2 areas, an investigation to determine whether the existing wall can be acoustically improved (to reduce the noise transmission) should be undertaken.



#### 6.0 NOISE IMPACT STATEMENT

Day Design Pty Ltd was engaged by Midson Group on behalf of The Anglican Schools Corporation to carry out an acoustic assessment of the proposed new St Luke's Grammar School Senior Campus at 800 Pittwater Road and 224 Headland Road, Dee Why, NSW.

Calculations show that provided the recommendations in Section 5 of this report are implemented and adhered to, the level of noise emitted from St Luke's Grammar School Senior Campus at 800 Pittwater Road and 224 Headland Road, Dee Why, NSW, 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 Noise Policy for Industry and NSW Road Noise Policy, as detailed in Section 3 of this report, and be considered acceptable.

In addition, the amenity of adjacent developments 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 20 Quirk Street, Dee Why
- Appendix B2 Ambient Noise Survey 209 Headland Road, Dee Why
- Appendix B3 Ambient Noise Survey 800 Pittwater Road, Dee Why
- Appendix C Proposed Site Layout
- Appendix D Approximate Noise Source Locations
- Appendix E Mechanical Spatial



#### **Environmental Noise Assessment**

#### 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	113
Condenser Microphone 0.5" diameter	MK 250	113
Infobyte Noise Logger	iM4	117
Condenser Microphone 0.5" diameter	MK 250	117
Infobyte Noise Logger	iM4	118
Condenser Microphone 0.5" diameter	MK 250	118

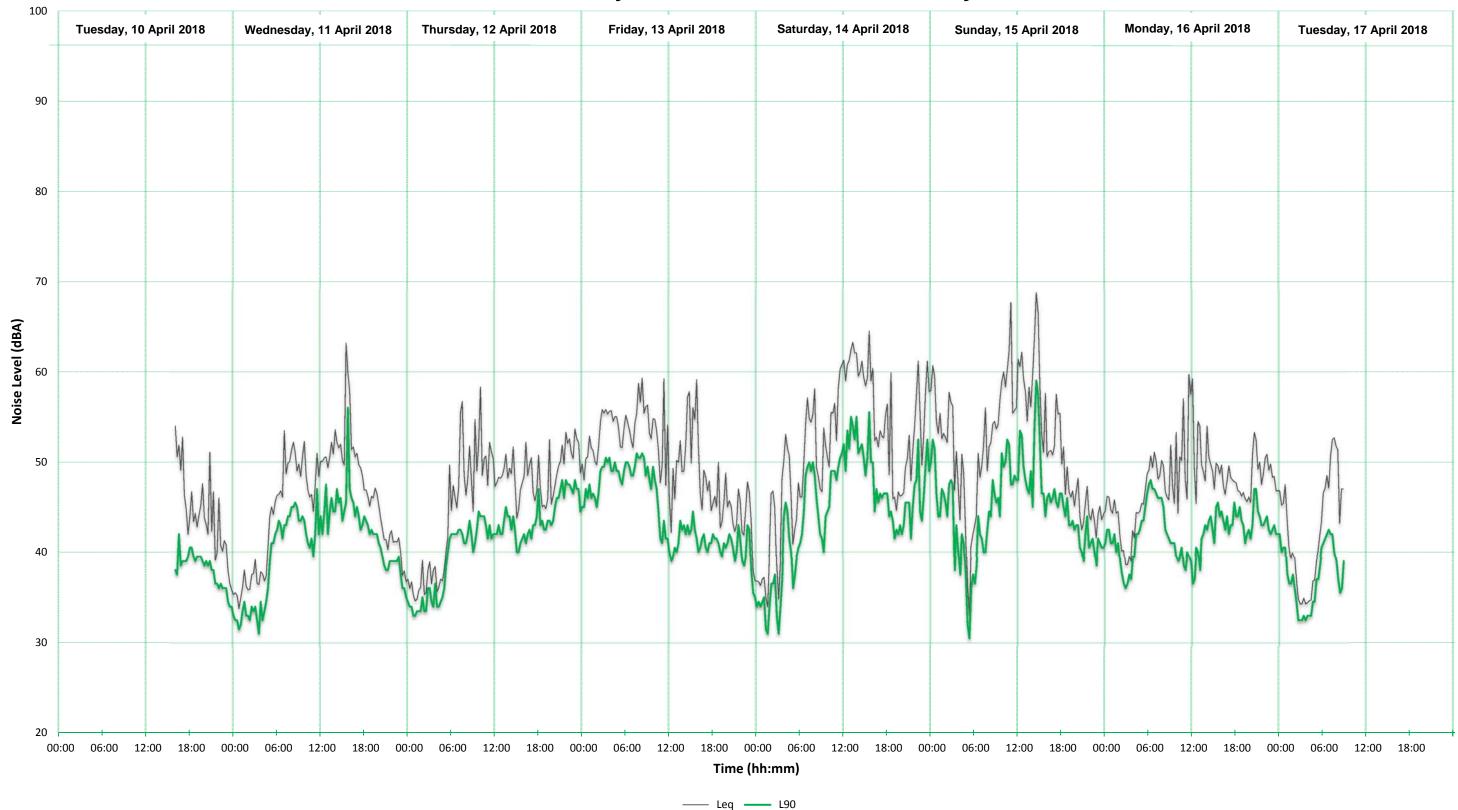
An environmental noise logger is used to continuously monitor ambient noise levels and provide information on the statistical distribution of noise during an extended period of time. The Infobyte Noise Monitors iM4 #113, #117 and #118 are Type 2 precision environmental noise monitor meeting all the applicable 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.



## **AMBIENT NOISE SURVEY**

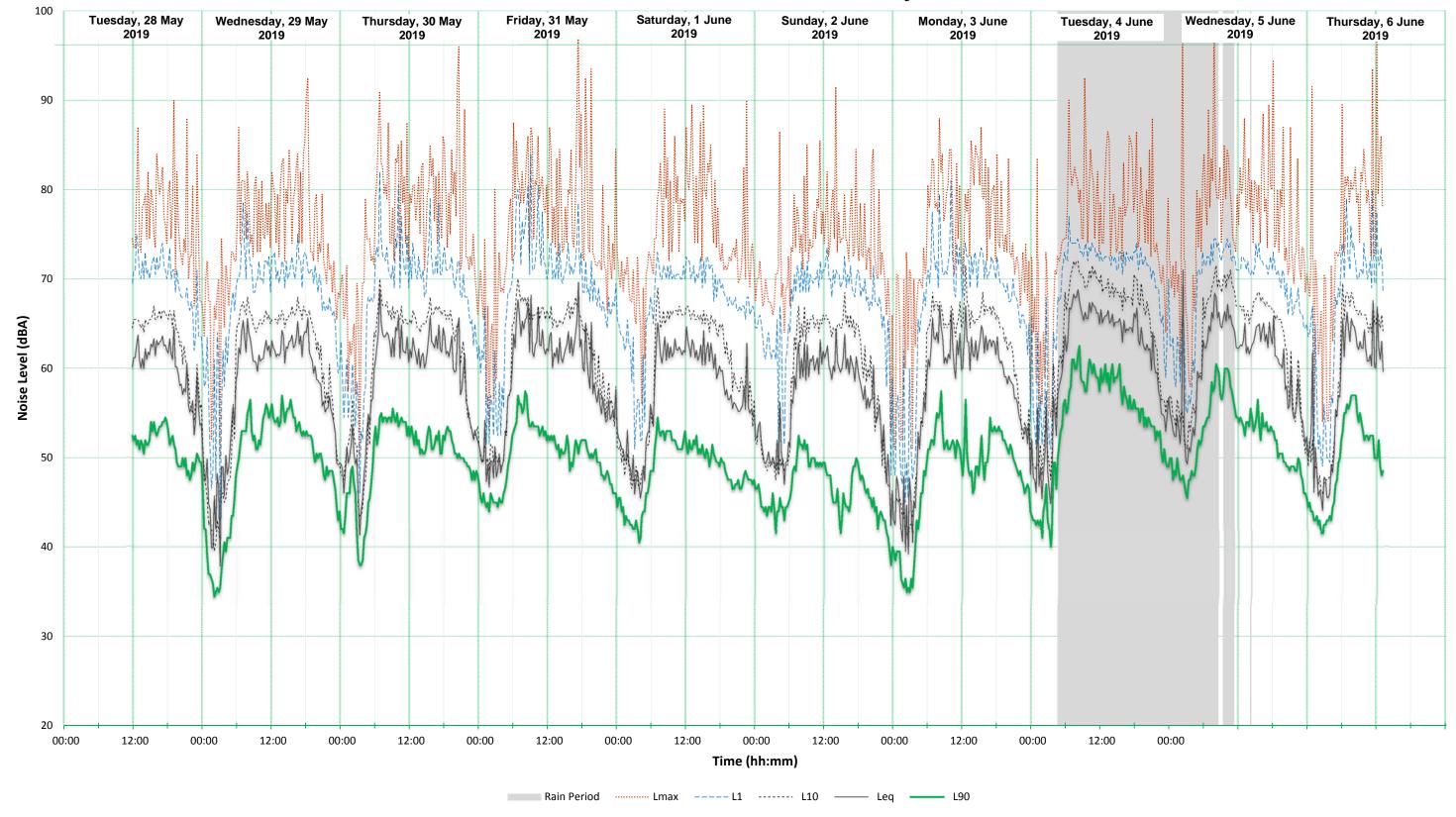
## Located at Rear yard - 20 Quick Street, Dee Why, NSW





## **AMBIENT NOISE SURVEY**

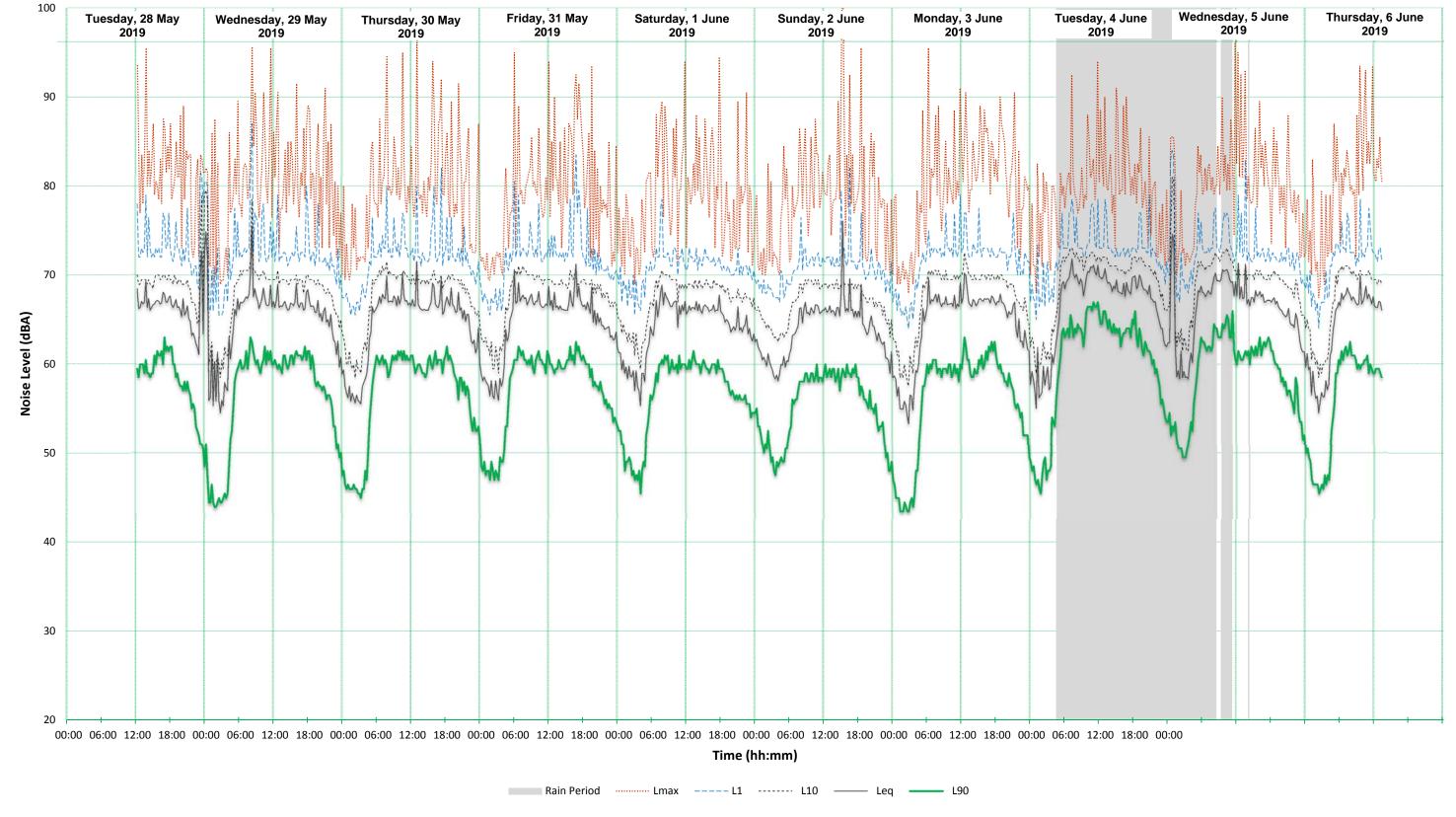
## Located at 209 Headland Rd, Dee Why, NSW





## **AMBIENT NOISE SURVEY**

## Located at 800 Pittwater Rd, Dee Why, NSW





# ST. LUKE'S GRAMMAR SCHOOL - NEW SENIOR SCHOOL CAMPUS



DRAWING LIST		Scale @ A1
A 000 GENERAL INFO	DRMATION	
A-000	COVER PAGE	1:1000, 1:1
A-001	SITE PLAN	1:500
A-002	STAGING DIAGRAMS	1:500
	LANS - 224 HEADLAND RD	4.000
A-031 A-032	LEVEL 0 DEMOLITION PLAN_224  LEVEL 1 DEMOLITION PLAN_224	1:200 1:200
A-032 A-033	ROOF DEMOLITION PLAN_224	1:200
A-034	DEMOLITON ELEVATIONS - 224 HEADLAND ROAD	1:200
	LANS - 800 PITTWATER RD	11200
A-040	LEVEL 0 DEMOLITION PLAN_800	1:200, 1:10
A-041	LEVEL 1 DEMOLITION PLAN_800	1:200, 1:10
A-042	LEVEL 2 DEMOLITION PLAN_800	1:200, 1:10
A-043	LEVEL 3 DEMOLITION PLAN_800	1:200, 1:10
A-044	LEVEL 4 DEMOLITION PLAN_800	1:10, 1:200
A-045	WEST + NORTH DEMOLITION ELEVATIONS_800	1:200, 1:10
A-046	EAST + SOUTH DEMOLITION ELEVATIONS_800	1:200, 1:10
A-047	CHANGE PLANS_800	1:500
100 GENERAL ARR	ANGEMENT PLANS - 224 HEADLAND RD	
A-100	LEVEL 0 PLAN - STAGE 1 + 3_224	1:200
A-101	LEVEL 0 PLAN - STAGE 2_224	1:200
A-102	LEVEL 1 PLAN - STAGE 1_224	1:200
A-103	ROOF PLAN - STAGE 1_224	1:200
110 GENERAL ARR	ANGEMENT PLANS - 800 PITTWATER RD	
A-110	LEVEL 0 PLAN - STAGE 2_800	1:200
A-111	LEVEL 1 PLAN - STAGE 2_800	1:200
A-112	LEVEL 2 PLAN - STAGE 2_800	1:200
A-113	LEVEL 3 PLAN - STAGE 2_800	1:200
A-114	LEVEL 4 PLAN - STAGE 2_800	1:200
A-115	LEVEL 0 PLAN - STAGE 3_800	1:200
A-116 A-117	LEVEL 1 PLAN - STAGE 3_800  LEVEL 2 PLAN - STAGE 3_800	1:200
A-117 A-118	LEVEL 2 PLAN - STAGE 3_600  LEVEL 3 PLAN - STAGE 3 800	1:200
A-119	LEVEL 3 PLAN - STAGE 3_000 LEVEL 4 PLAN - STAGE 3_800	1:200
	PRDINATION - 224 HEADLAND RD	1.200
A-121	SERVICES COORDINATION LEVEL 0_224	1:200
A-122	SERVICES COORDINATION 3D VIEWS_224	1.200
	RDINATION - 800 PITTWATER RD	
A-130	SERVICES COORDINATION LEVEL 0_800	1:200, 1:10
A-131	SERVICES COORDINATION LEVEL 1_800	1:200, 1:10
A-132	SERVICES COORDINATION LEVEL 2_800	1:200, 1:10
A-133	SERVICES COORDINATION LEVEL 3_800	1:200, 1:10
A-134	SERVICES COORDINATION LEVEL 4_800	1:200, 1:10
A-135	SERVICES COORDINATION 3D VIEWS_800	, , , , , , , , , , , , , , , , , , ,
A-136	POPULATION NUMBERS - STAGE 2_800	1:500
A-137	POPULATION NUMBERS - STAGE 3_800	1:500
200 ELEVATIONS -	224 HEADLAND RD	
A-200	ELEVATIONS_224	1:200
210 ELEVATIONS -	800 PITTWATER RD	
A-210	ELEVATIONS WEST + NORTH_800	1:200
A-211	ELEVATIONS EAST + SOUTH_800	1:200
300 SECTIONS - 22	4 HEADLAND RD	
A-300	SECTIONS 1_224	1:200
310 SECTIONS - 80		
A-310	SECTIONS 1_800	1:200
A-311	SECTIONS 2_800	1:200
A-312	SECTIONS 3_800	1:200
A-313	DETAIL SECTIONS 2_800	1:100
A-314	DETAIL SECTIONS 3_800	1:100
A-315	DETAIL SECTIONS 4_800	1:100
A-316	TYPICAL WALL SECTIONS	1:50
400 AREA CALCUL	ATIONS - 224 HEADLAND RD	
A-400	ACCOMMODATION SCHEDULE _224	1:1
410 AREA CALCUL	ATIONS - 800 PITTWATER RD	
A-410	ACCOMMODATION SCHEDULE - STAGE 2_800	
A-411	ACCOMMODATION SCHEDULE - STAGE 3_800	1:1
A-412	GFA CALCULATION_800	1:500
	OPEN SPACE AND LANDSCAPE AREA CALCULATION	
A-413	RAMS - 224 HEADLAND RD	
	SHADOW DIAGRAMS - 21 JUNE	
A 500 SHADOW DIAG A-500	SHADOW DIAGRAMS - 21 JUNE  GRAMS - 800 PITTWATER RD	
A-500 SHADOW DIAG A-500		
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117 Percentain Street

ARCHITECT

TONKIN ZULAIKHA GREER ARCHITECTS

117 Percentain Street

ST. LUKE'S GRAMMAR

SCHOOL - NEW SENIOR

SCHOOL CAMPUS

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PROJECT NO: 18032

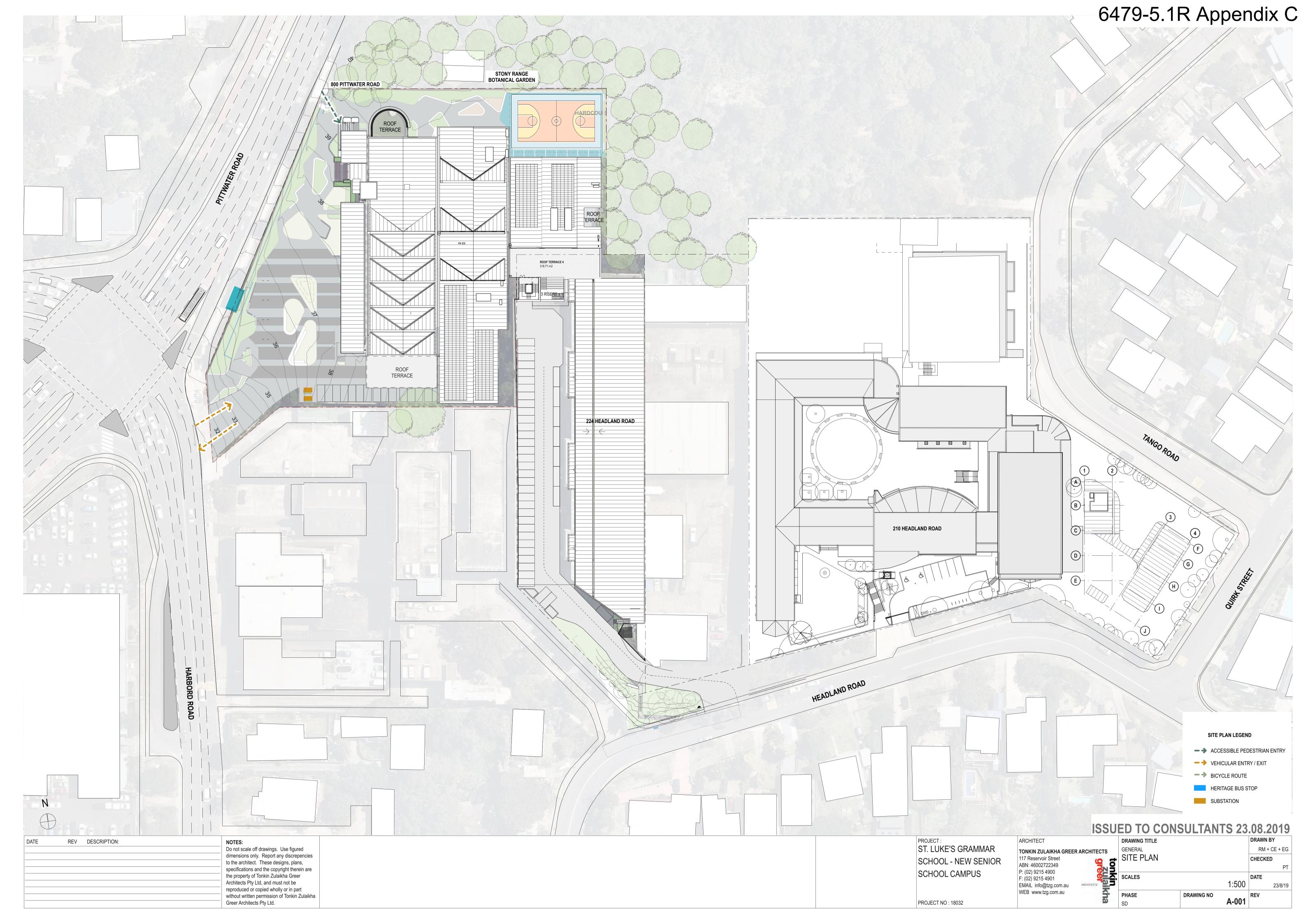
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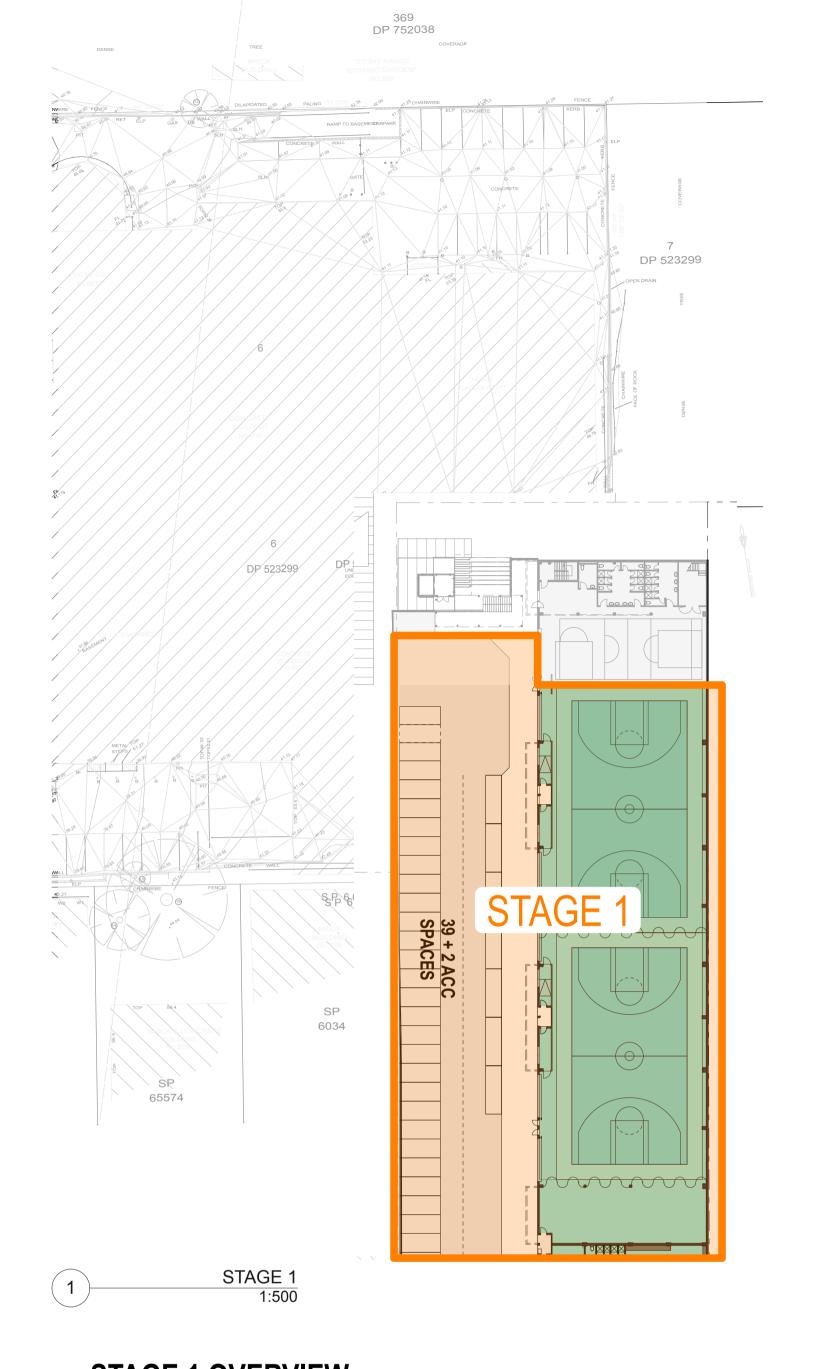
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## **STAGE 1 OVERVIEW**

**LOCATION - 224 HEADLAND ROAD** 

LEASE END DATE - 30 June 2022

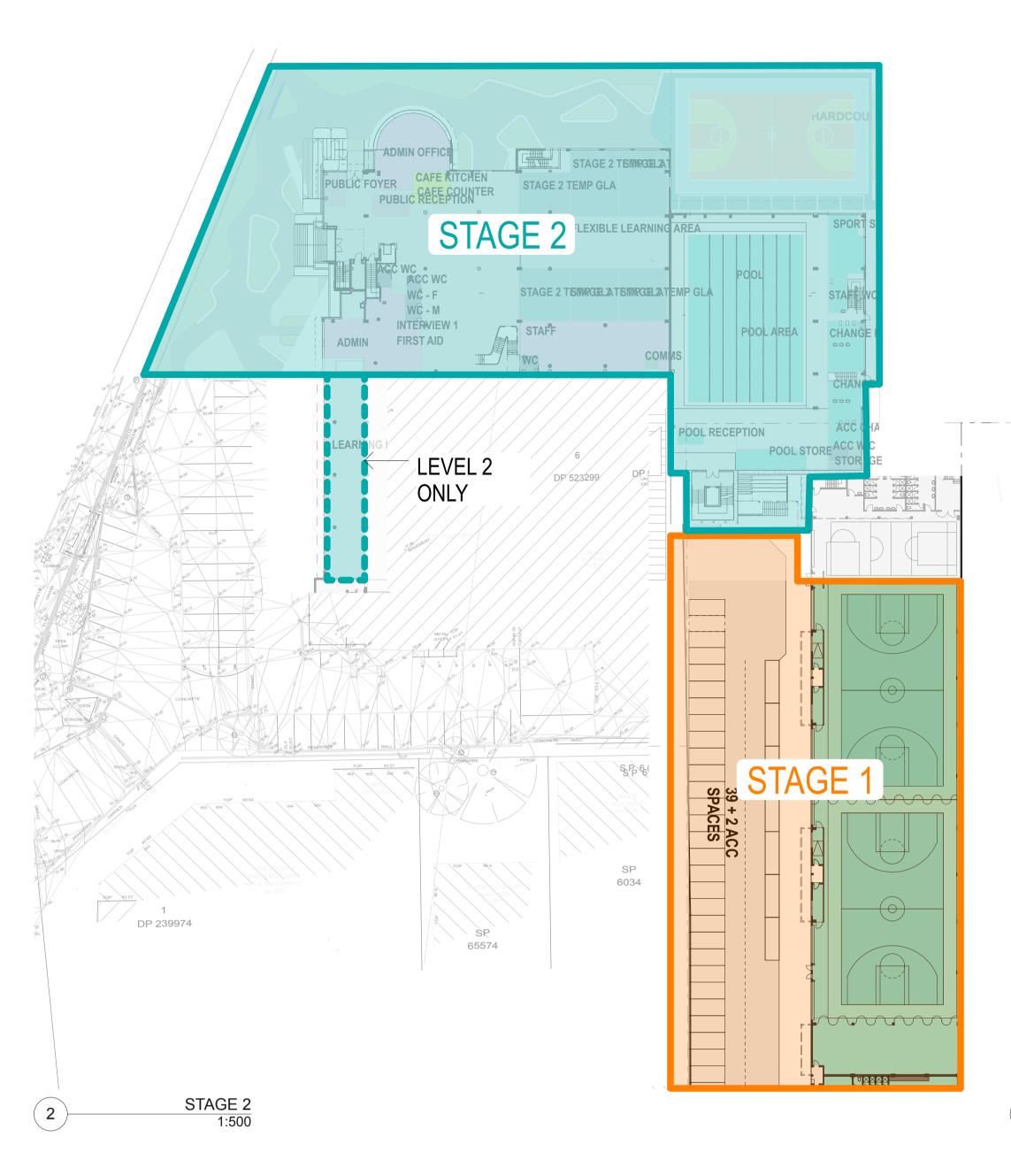
## **STAGE 1 SUMMARY**

- 1. Remove existing internal walls to create large open space for two basketball courts within footprint of former units 2-6 of 224 Headland Road.
- In stage 1 Basketball courts will also be used as Dance Studio and Multi Purpose Hall.

## **ADDITIONAL STUDENTS: NIL**

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## **STAGE 2 OVERVIEW**

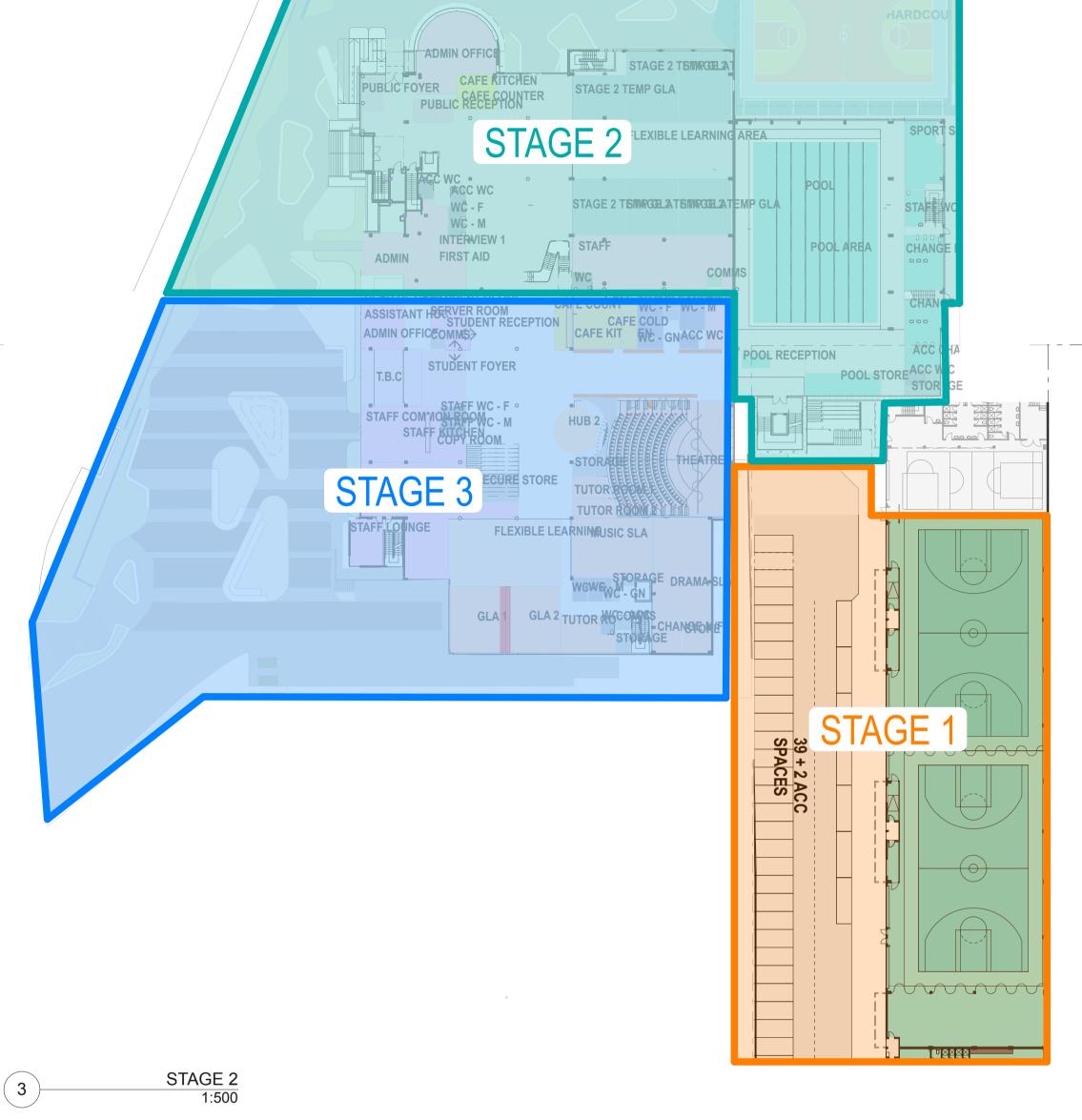
**LOCATION** - 800 PITTWATER ROAD

LEASE END DATE - IMED - 31 August 2024; Fitness First - 30 June 2025

## **STAGE 2 SUMMARY**

- 1. Internal refurbishment of IMED and Fitness First tenancies as per Architectural drawings
- 2. Landscaping to Northern portion of site as per Landscape design
- 3. Accessible path to main entrance of school as per Architectural and Landscape drawings
- 4. Basement North carparking reconfigured
- 5. Basement South carparking retained
- 6. New pedestrian path from Officeworks Basement carparking to Officeworks entrance.

## **ADDITIONAL STUDENTS: 480**



## **STAGE 3 OVERVIEW**

**LOCATION** - 800 PITTWATER ROAD

LEASE END DATE - Officeworks - 30 April 2029

## **STAGE 3 SUMMARY**

- 1. Internal refurbishment of Officeworks as per Architectural drawings
- 2. New extension to south of existing building as per Architectural drawings
- 3. Temporary spaces in Stage 2 reconfigured as per Architectural drawings
- 4. Landscaping to remainder of site as per Landscape design
- 5. Front parking area to be reconfigured to accomodate bus and kiss and drop area
- 6. Basement carpark reconfigured, entrance to carpark relocated to South.

224 Headland Road

PROJECT NO: 18032

North Curl Curl NSW 2099

## **ADDITIONAL STUDENTS: 600**

APPLICANT:

ST LUKE'S GRAMMAR SCHOOL

Mrs Jane Hughes (Business Manager)
210 Headland Road
Dee Why NSW 2099

PROJECT:

ST. LUKE'S GRAMMAR

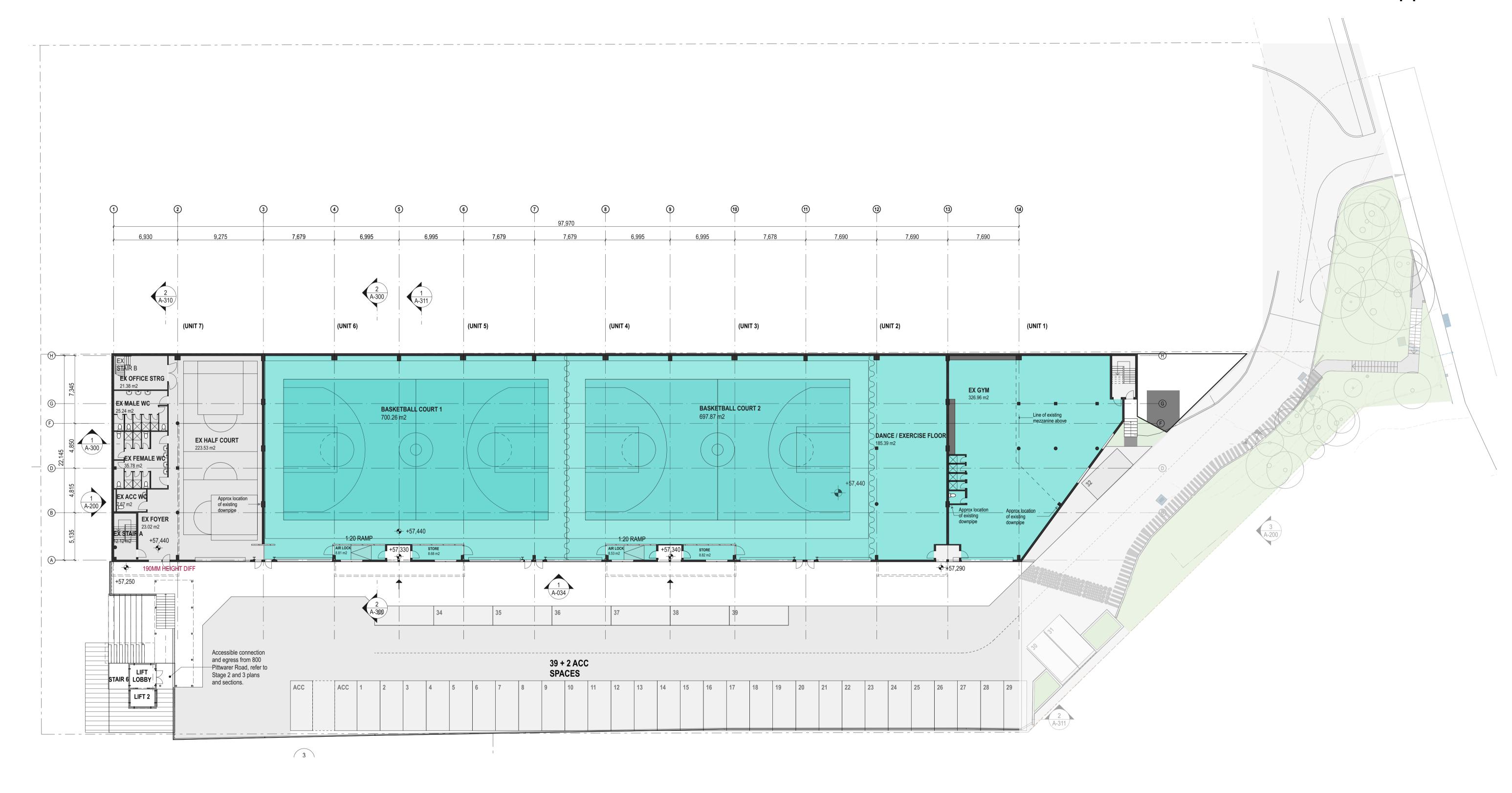
SCHOOL - NEW SENIOR

800 Pittwater Road
SCHOOLS AND SW 2009 MPUS

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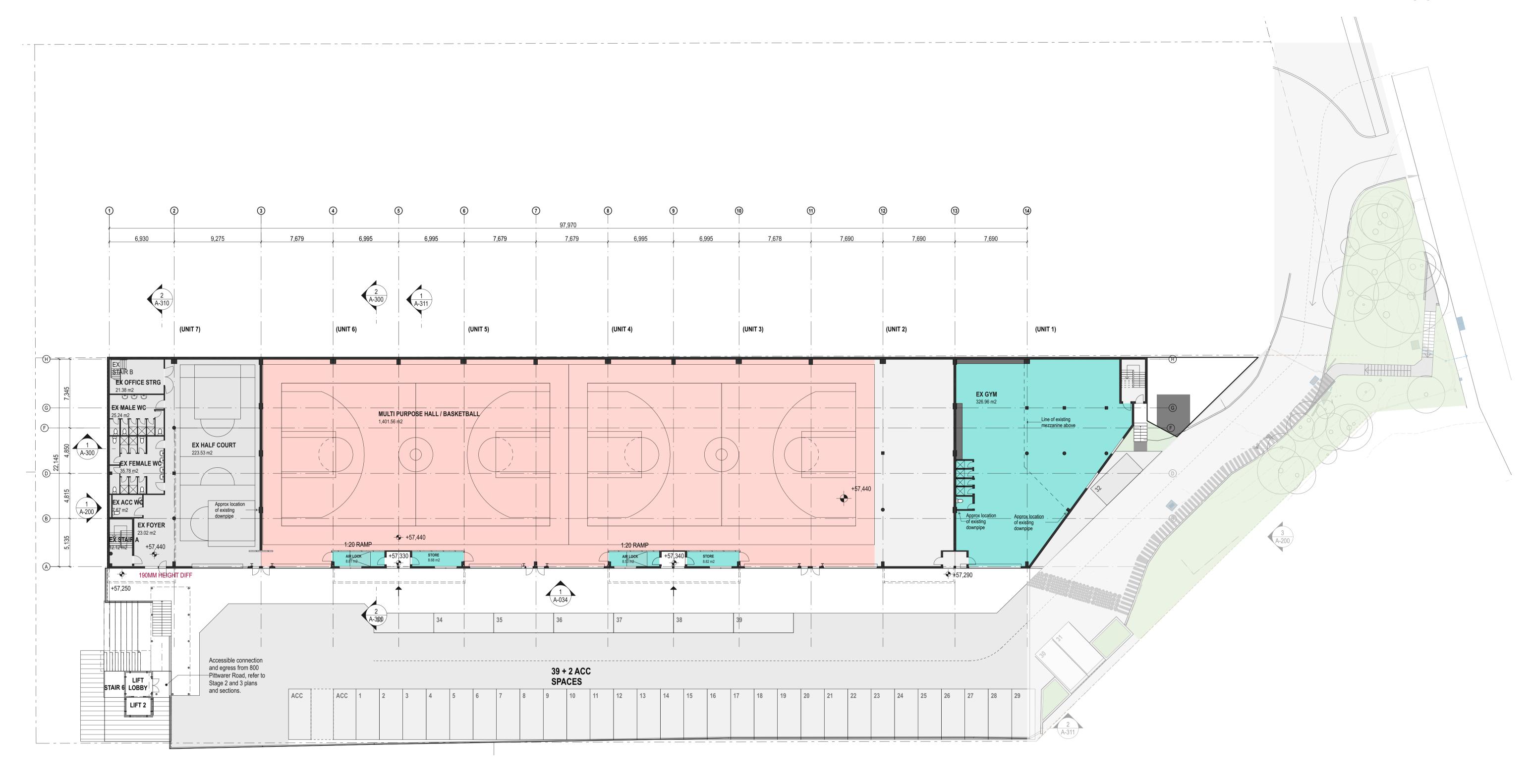
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Mrs Jane Hughes (Business Manager)
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Dee Why NSW 2099

PROJECT:
ST. LUKE'S GRAMMAR
SCHOOL - NEW SENIOR
800 Pittwater Road
Sec Wilchight 2009 MPUS
and
224 Headland Road

North Curl Curl NSW 2099 PROJECT NO : 18032 ARCHITECT

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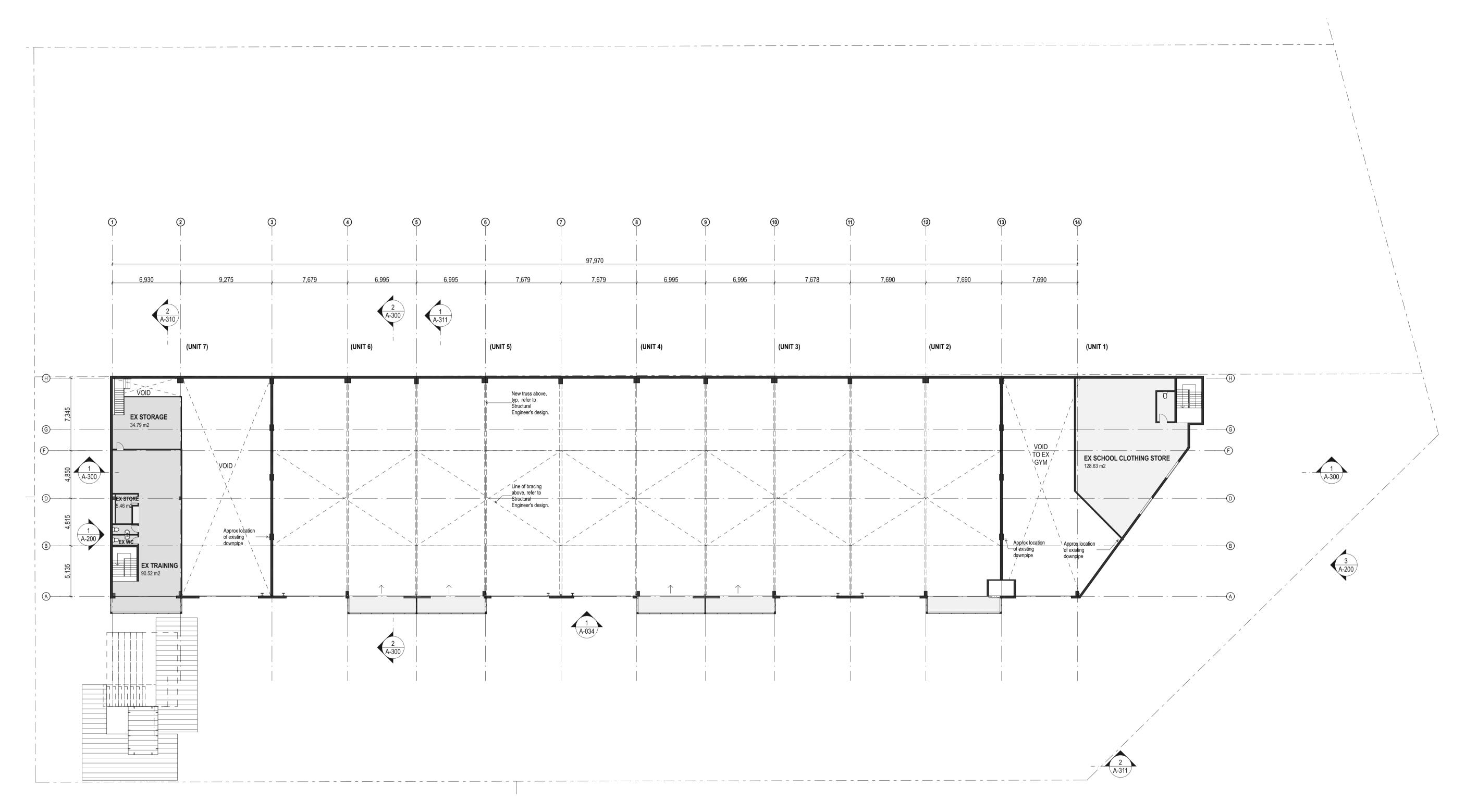
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224 HEADLAND ROAD
LEVEL 0 PLAN - STAGE 2\_224

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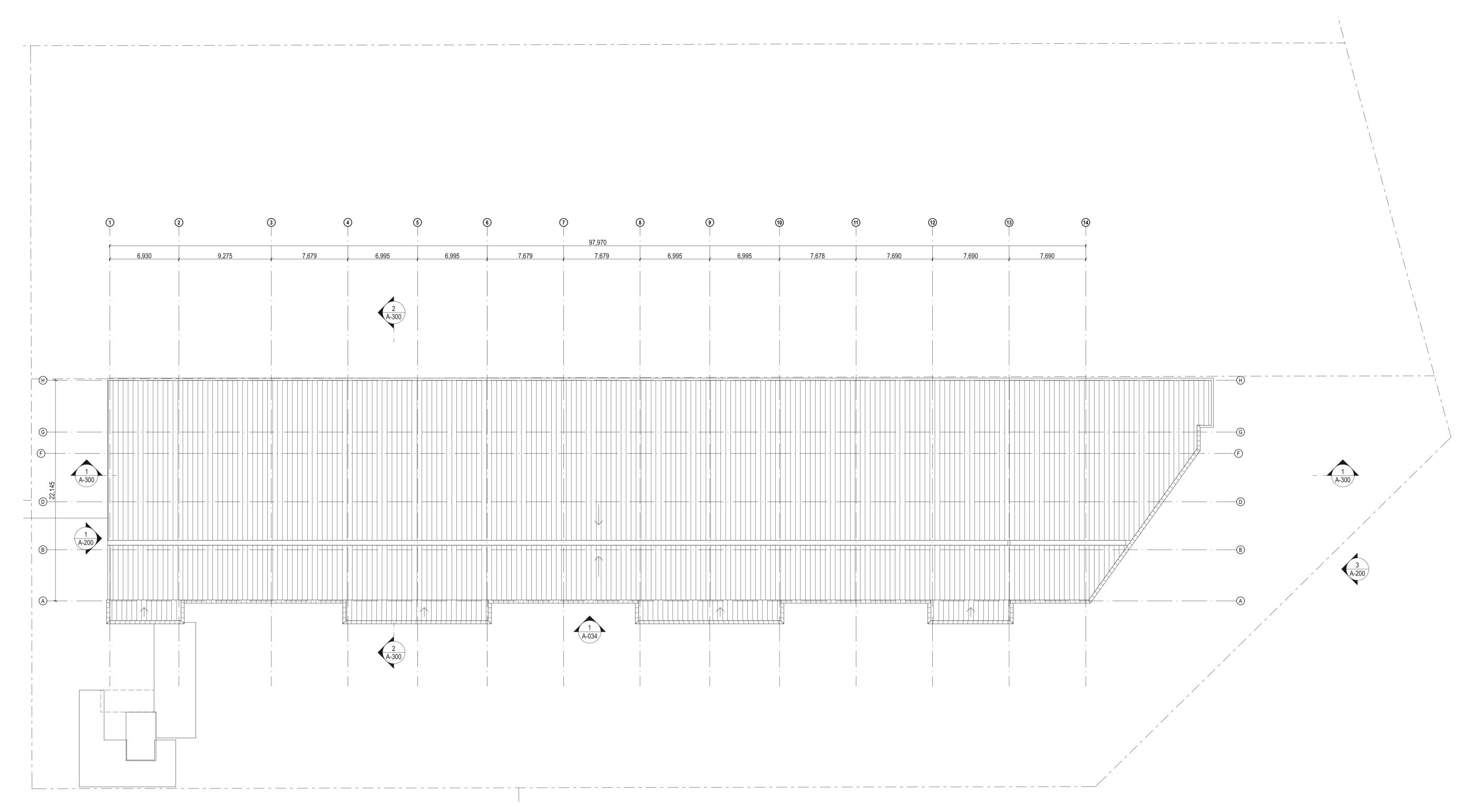
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PROJECT: ST. LUKE'S GRAMMAR SCHOOL - NEW SENIOR

224 Headland Road

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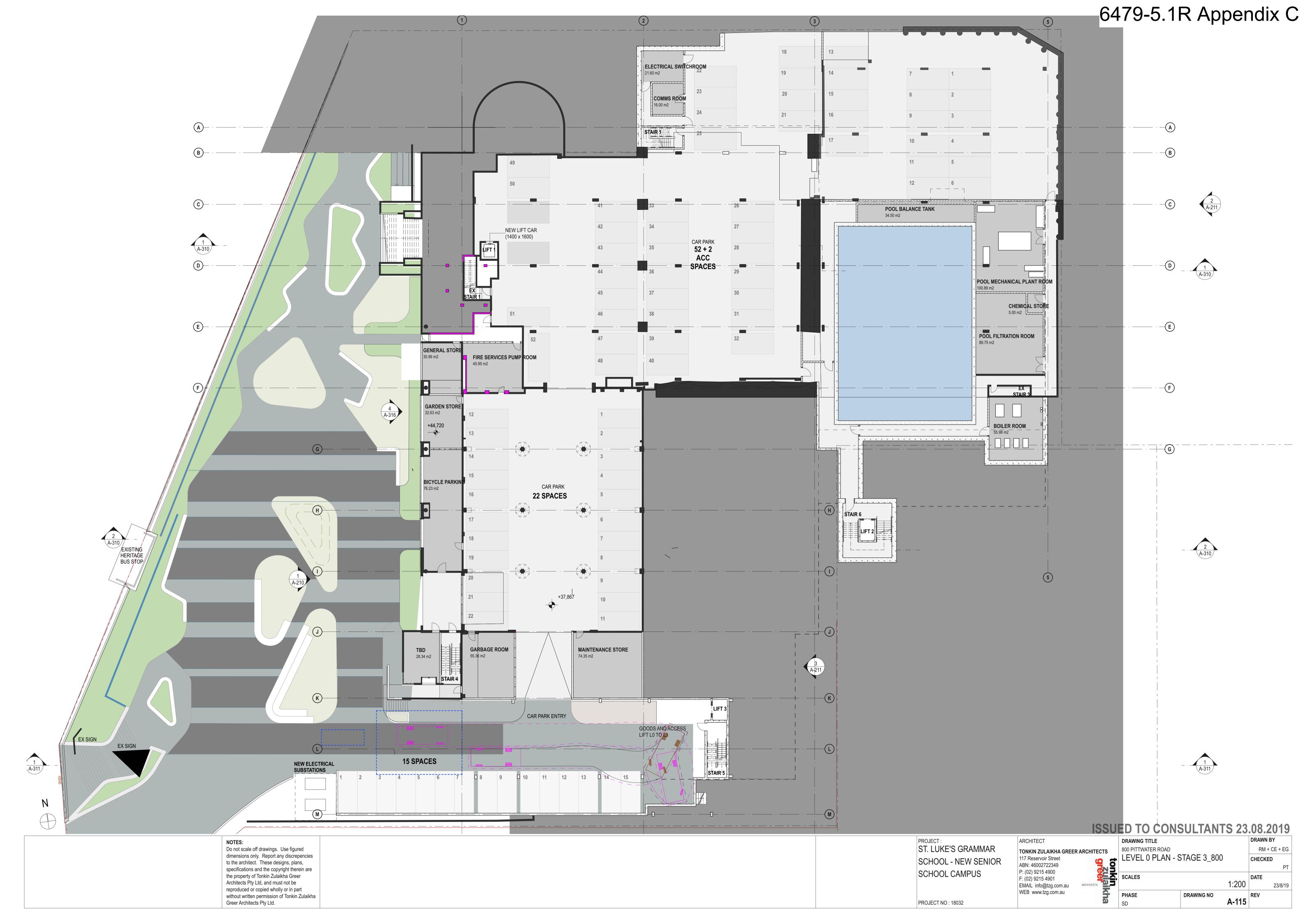
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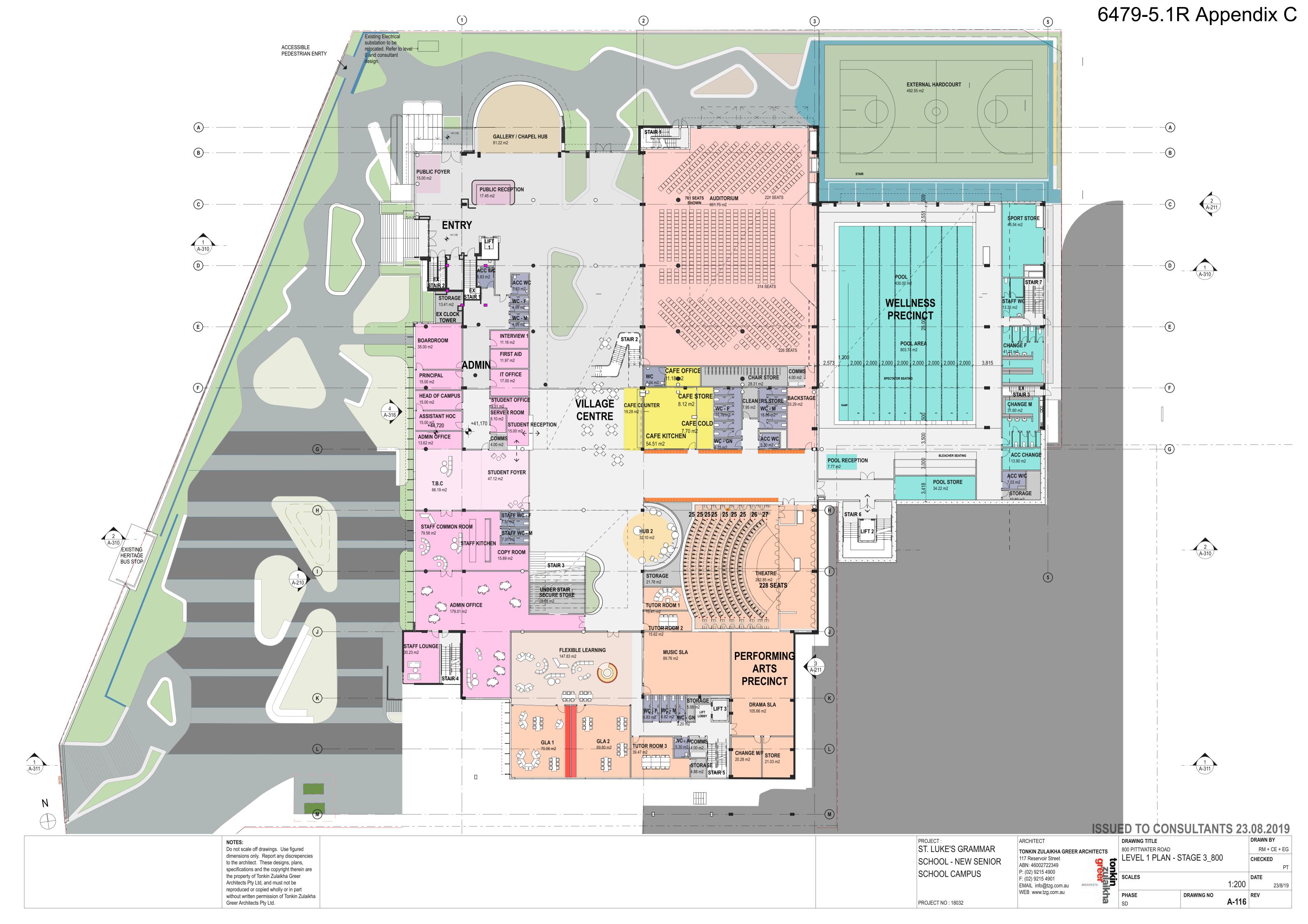
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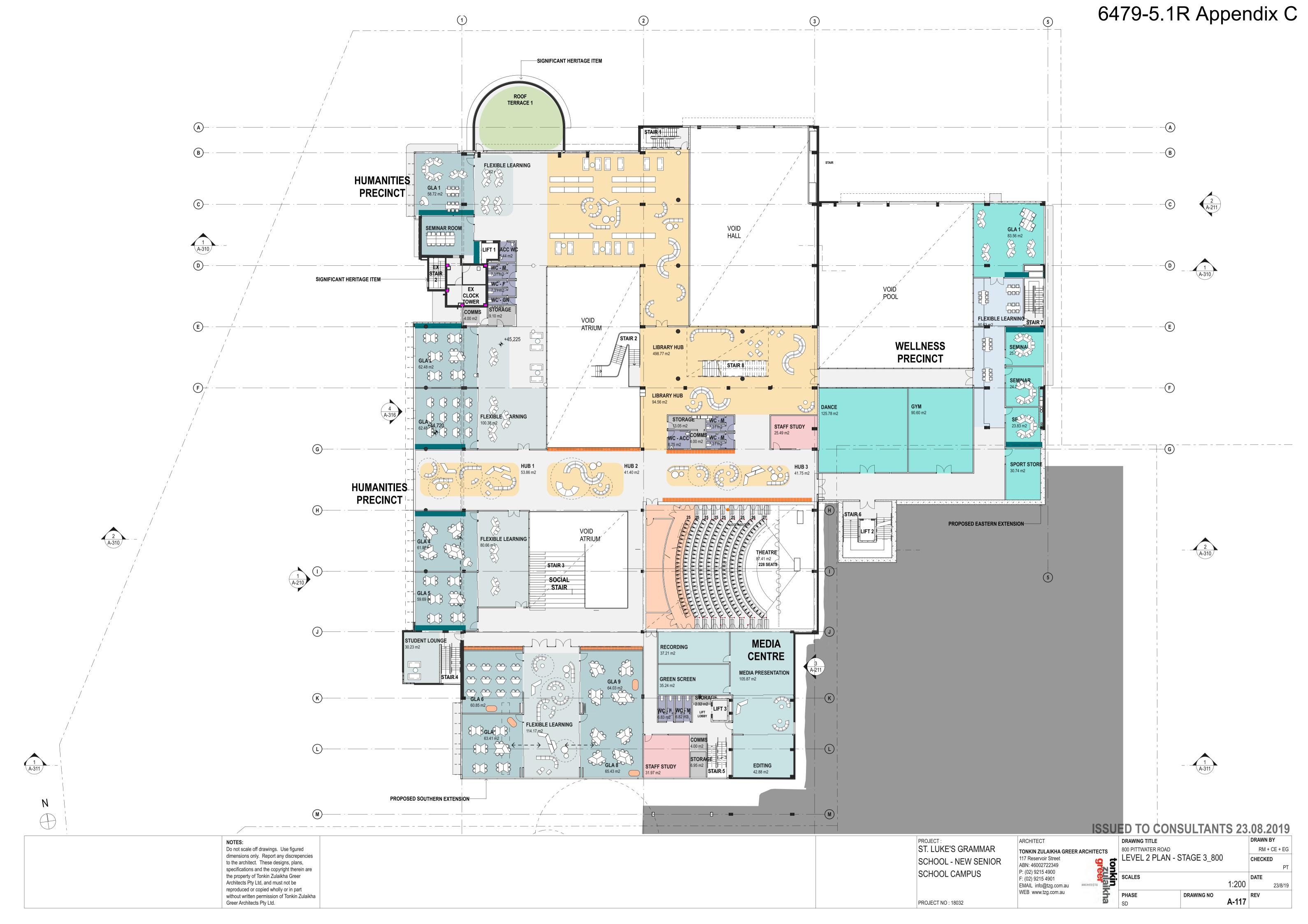
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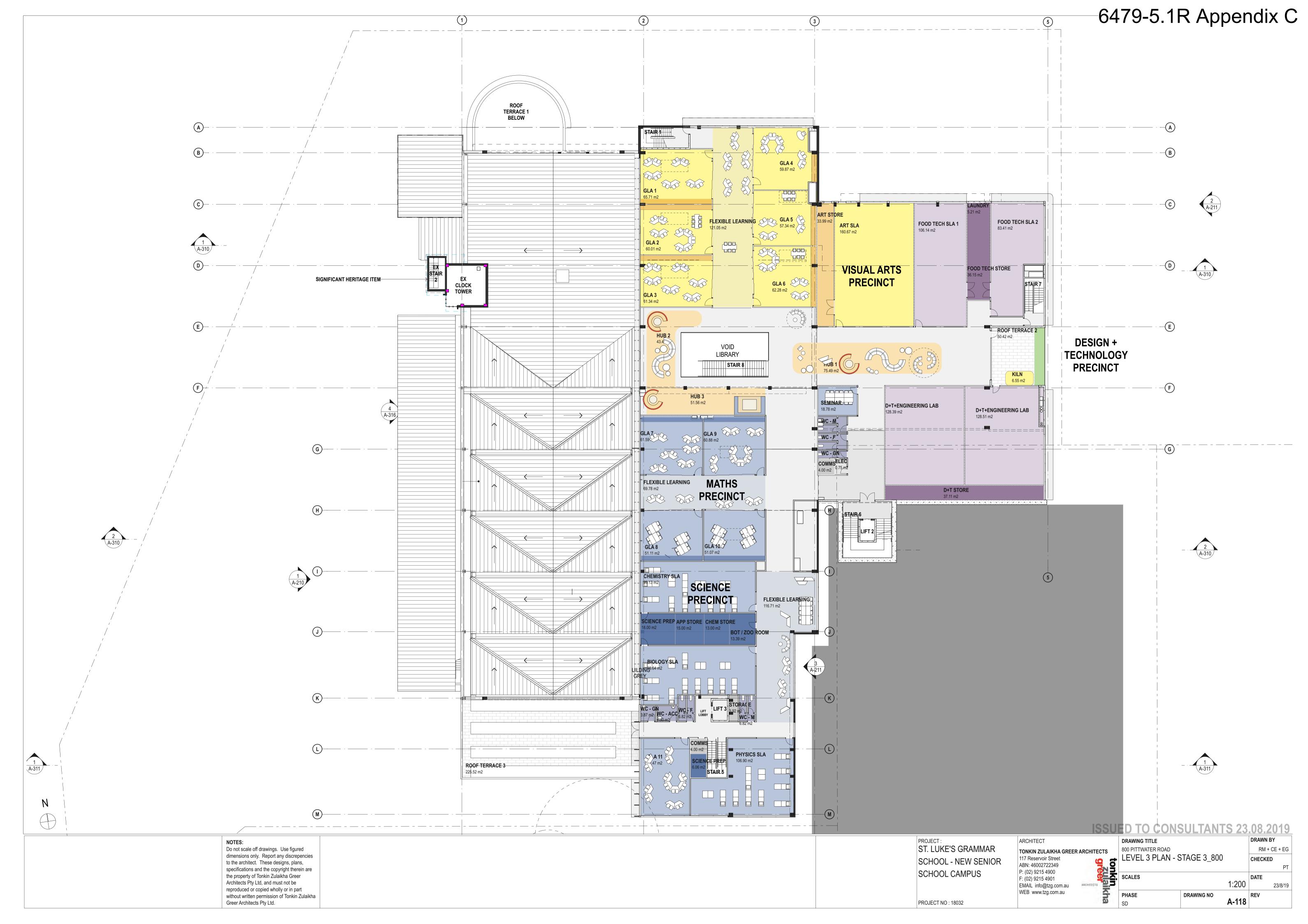
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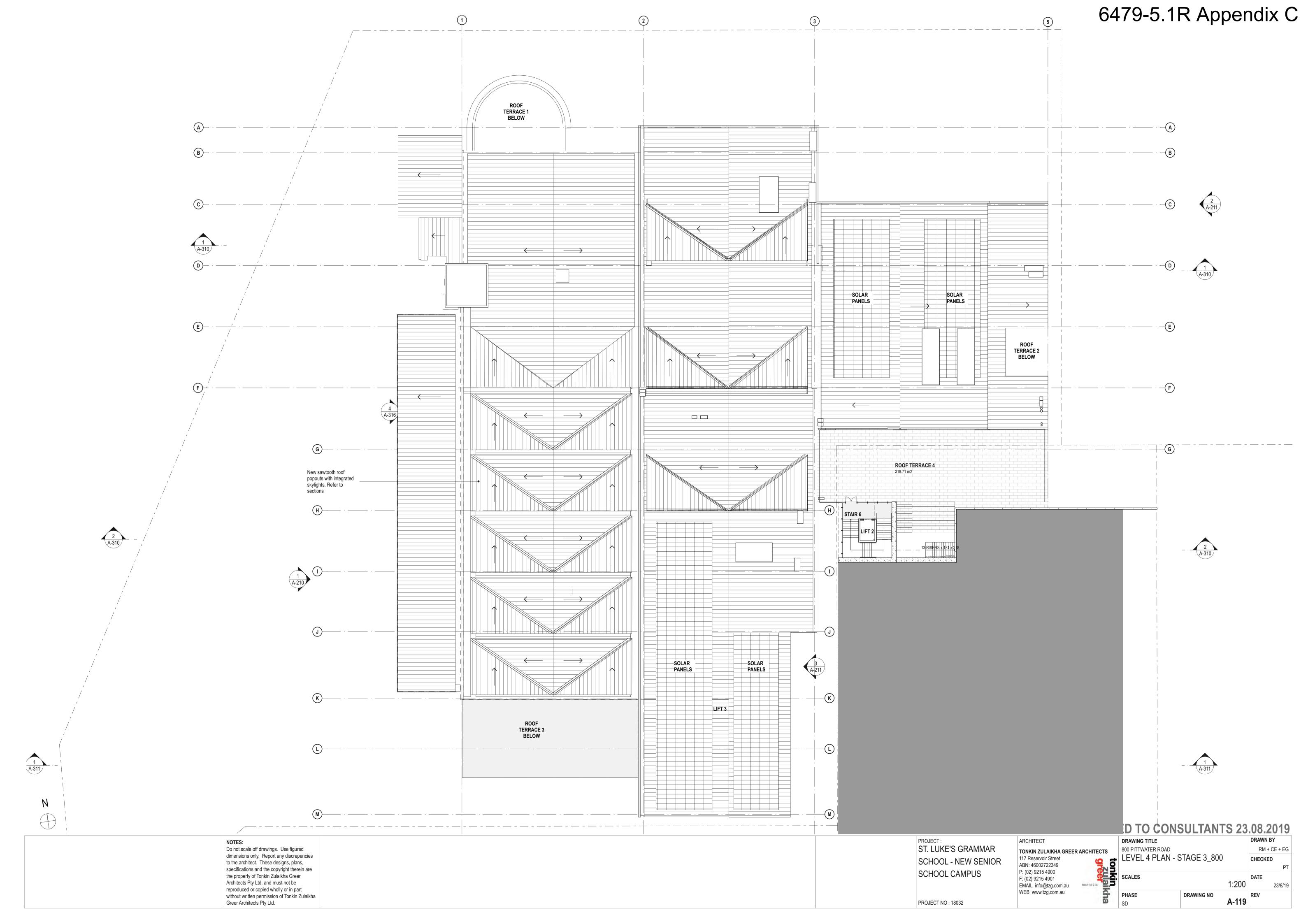
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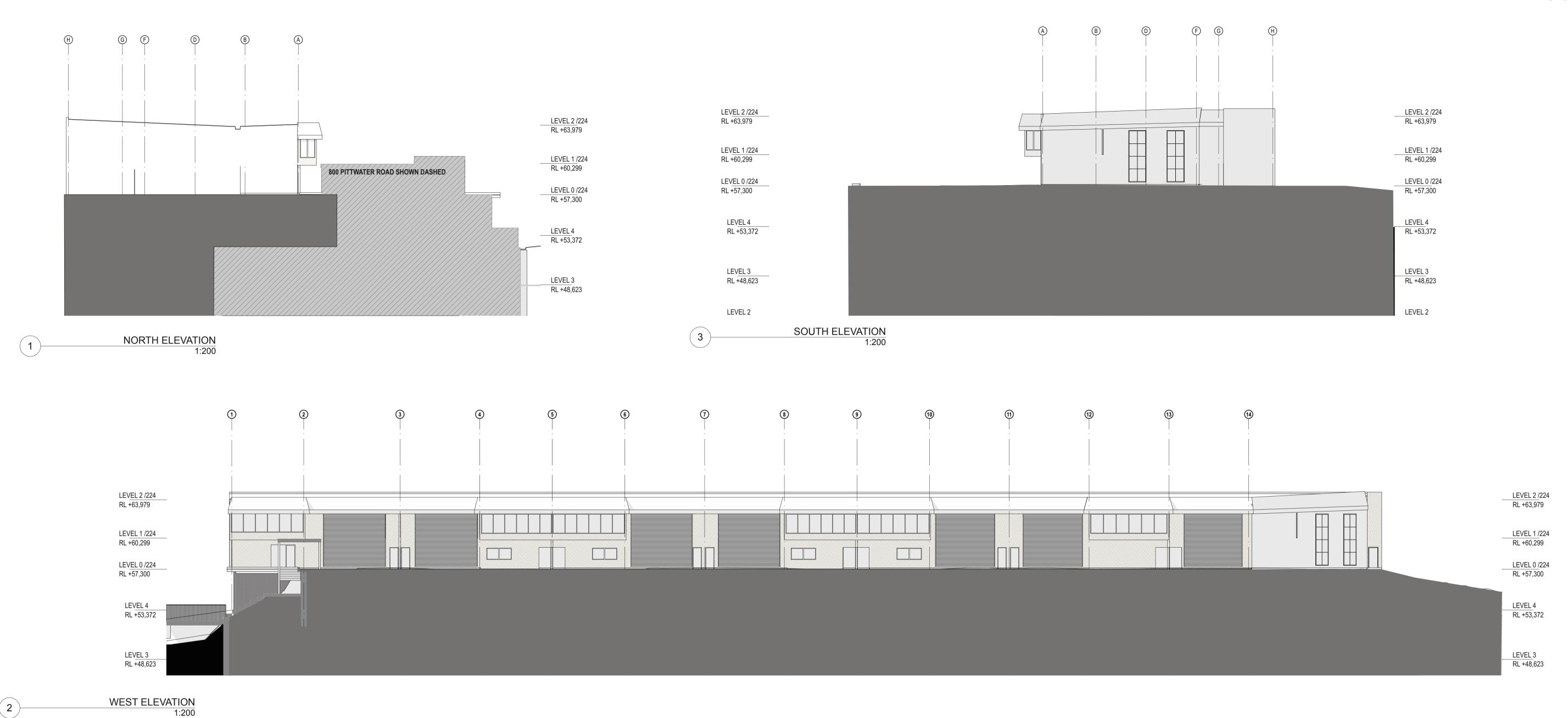


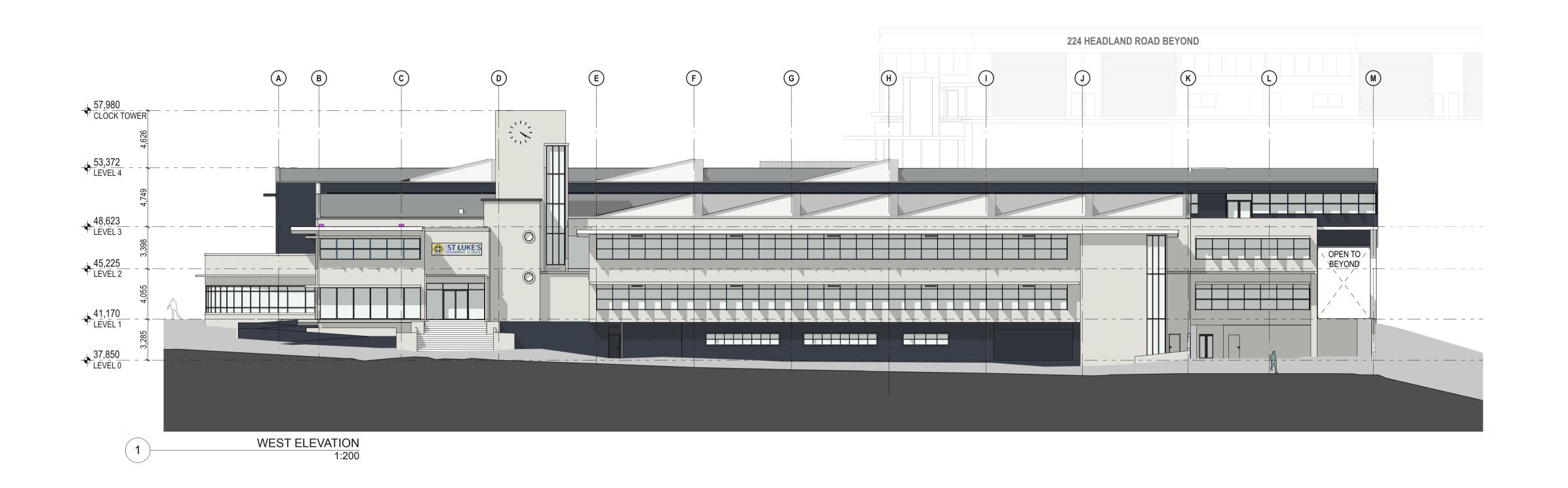






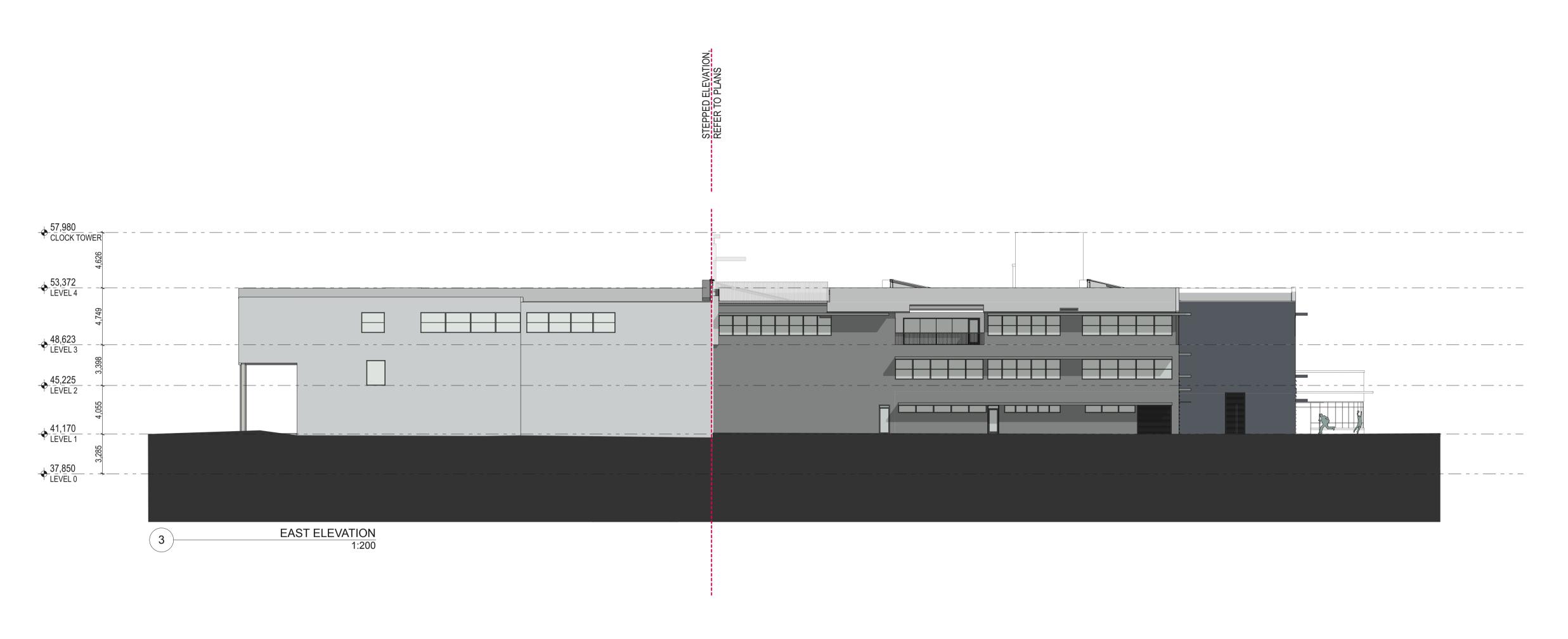
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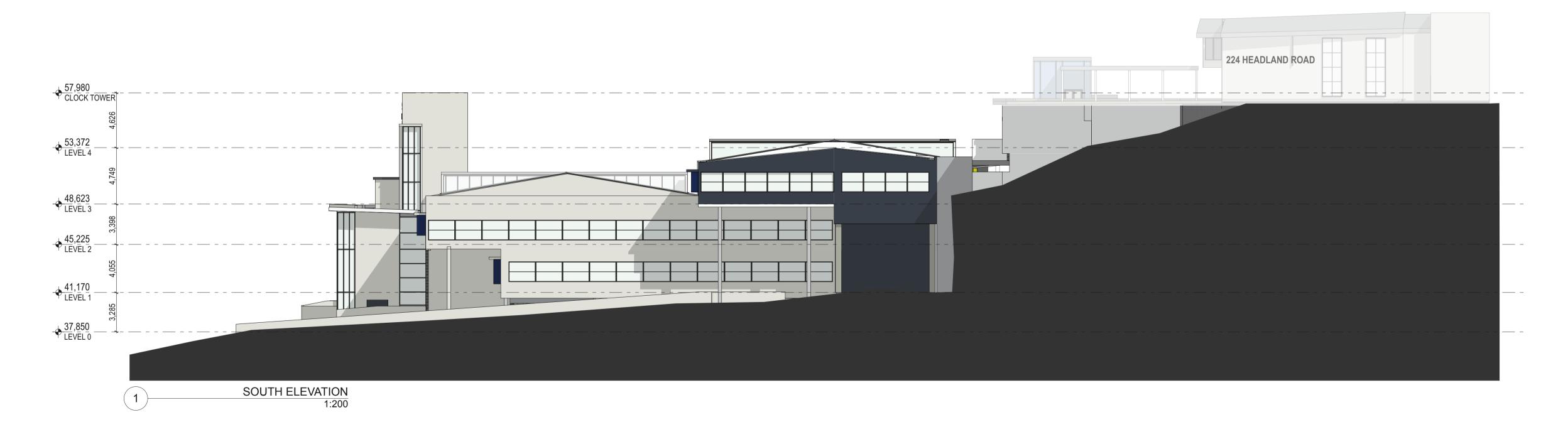




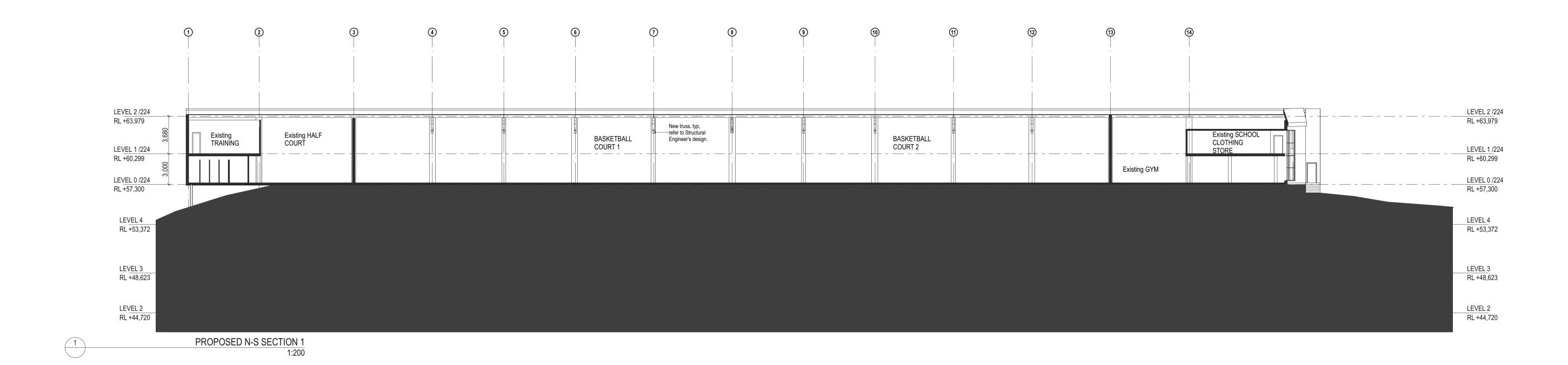


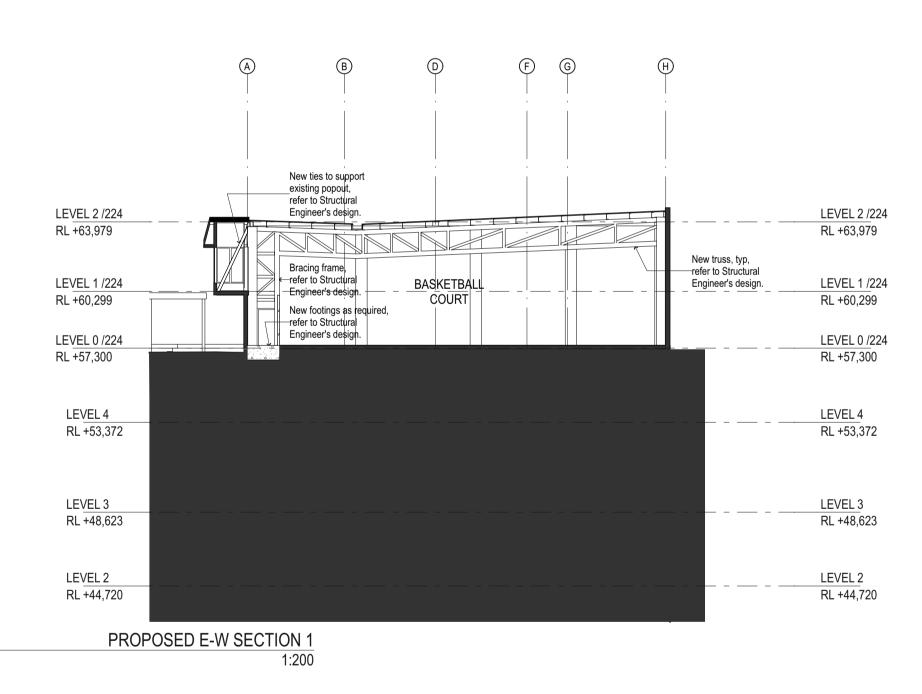
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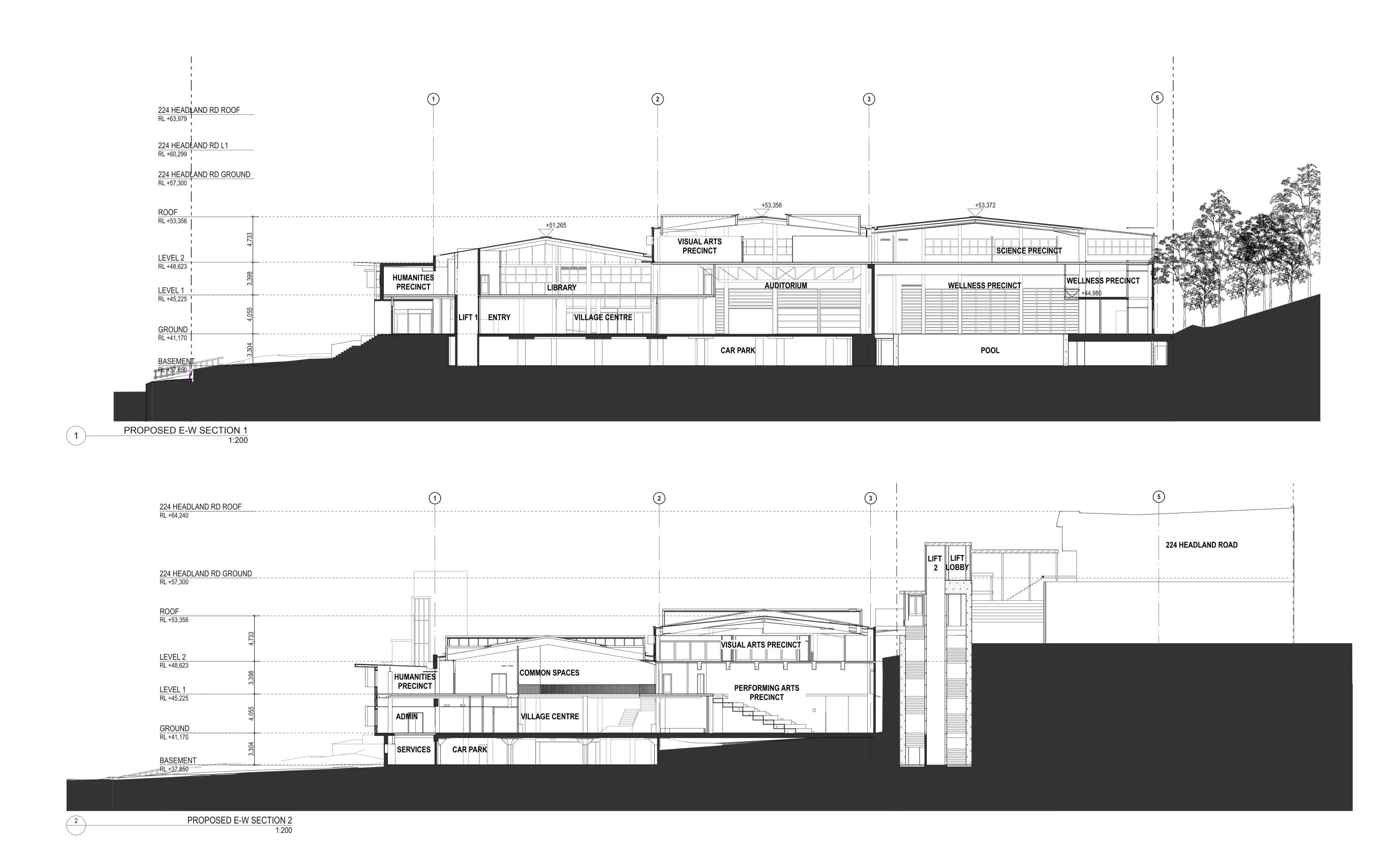


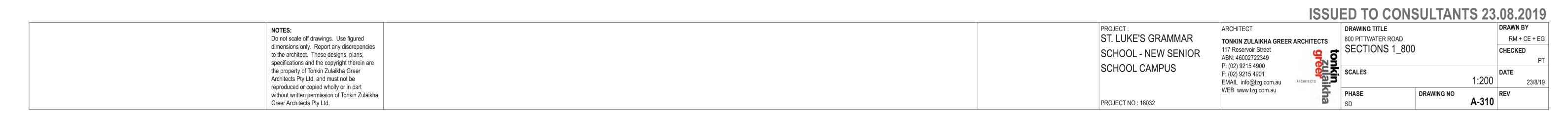


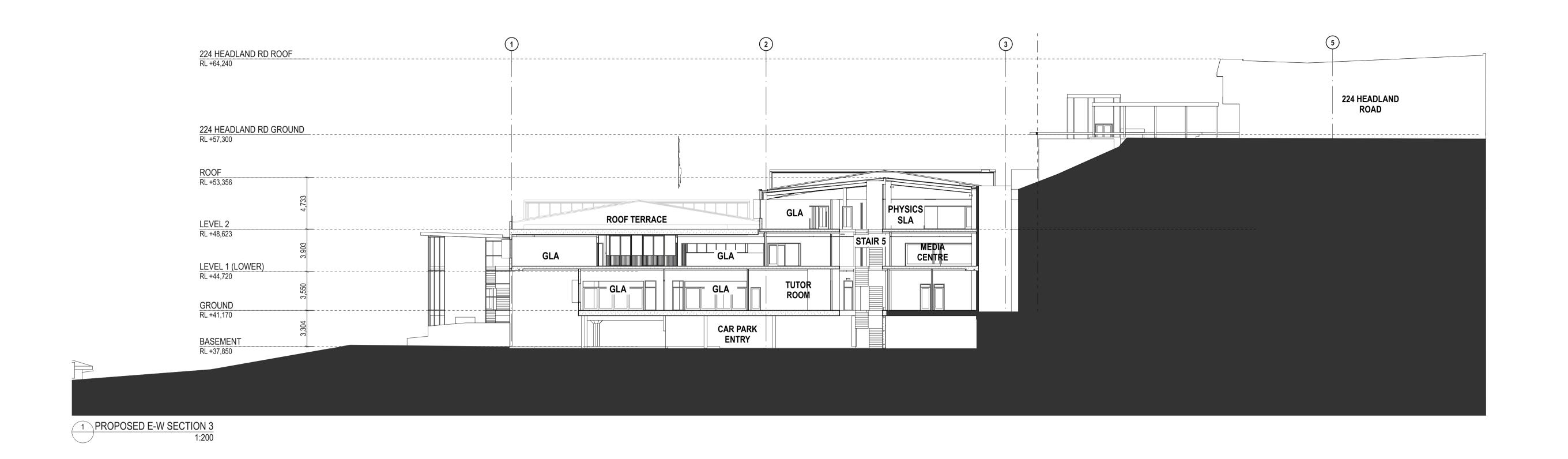
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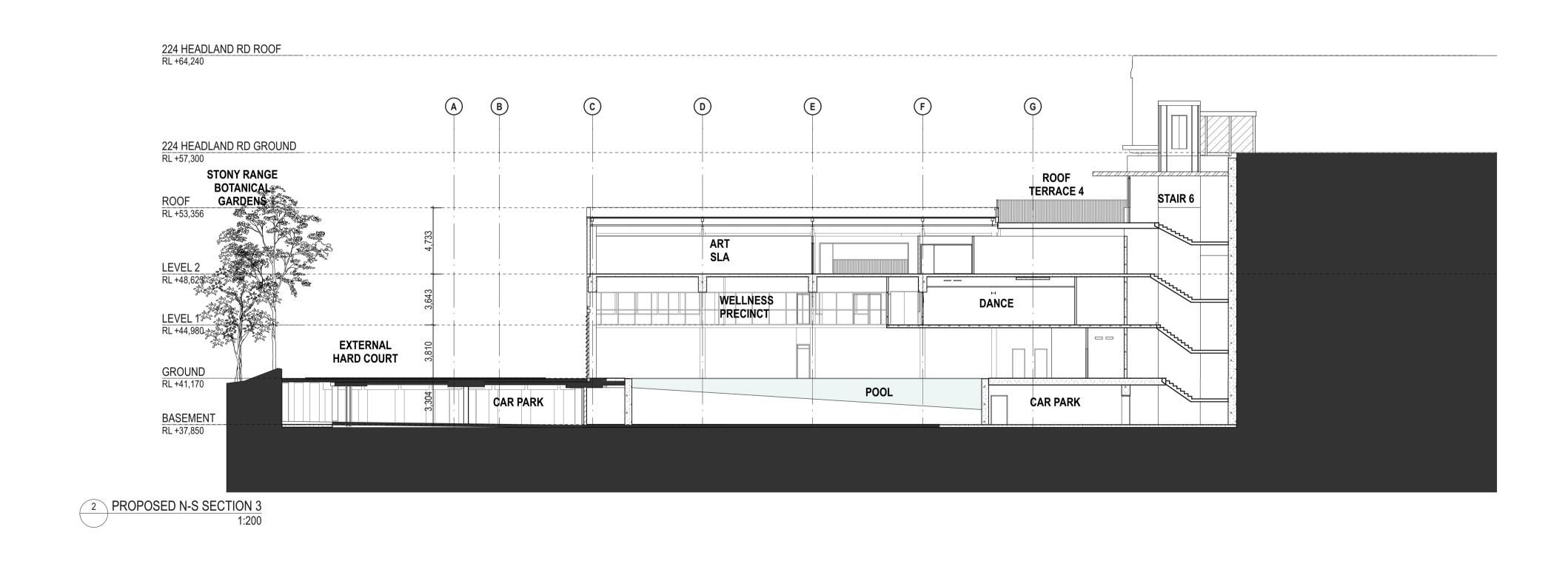




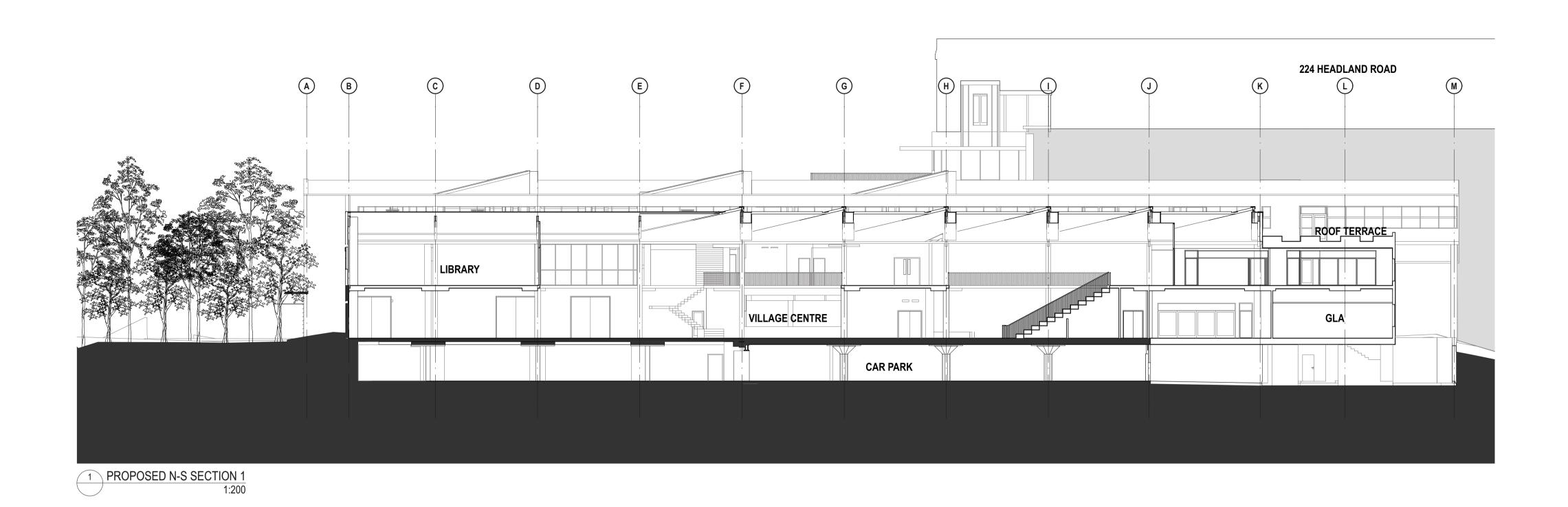


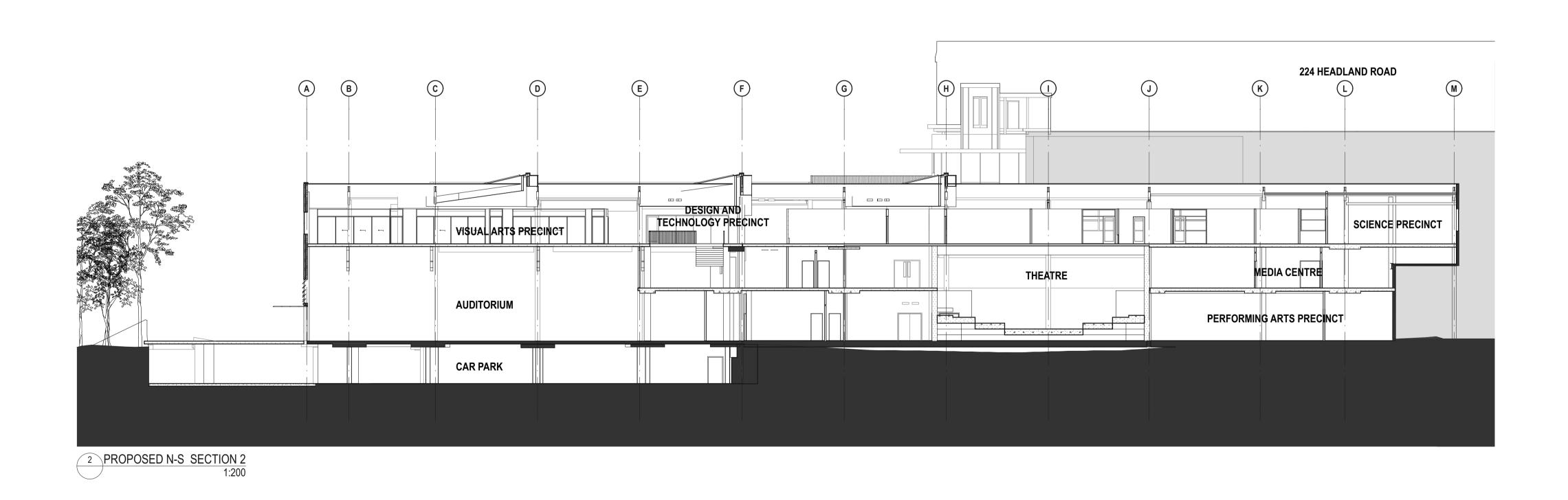






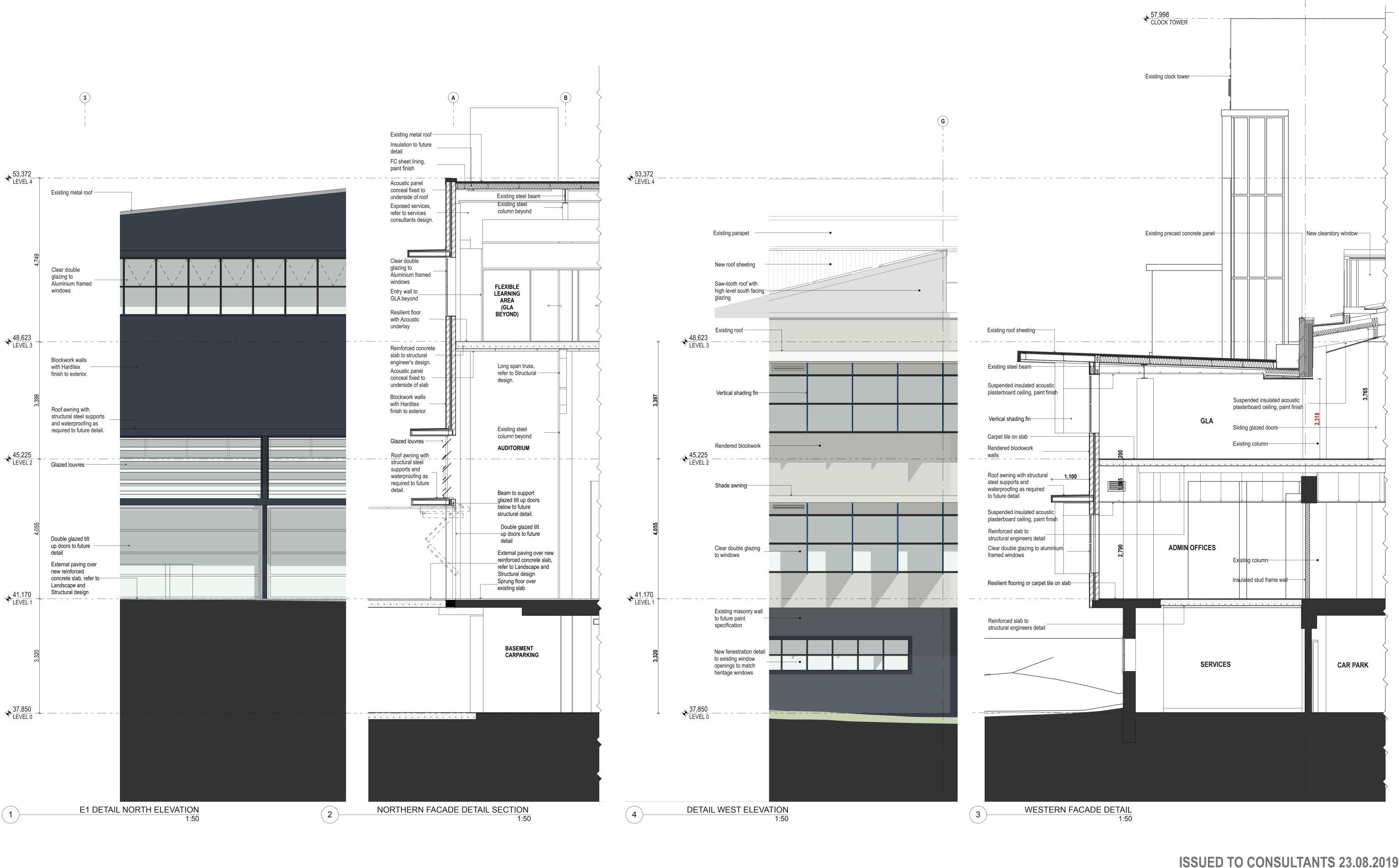
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## 6479-5.1R Appendix C



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