Reference: # 15s1154000

22 June 2015

The General Manger
City of Canada Bay
1a Marlborough Street
DRUMMOYNE NSW 2047

Attention: Ms Narelle Butler (Manager Statutory Planning)

Dear Narelle

RE: PROPOSED REDEVELOPMENT OF LUCAS GARDENS SCHOOL 121 QUEENS ROAD, FIVE DOCK (DA 2015/0092) RESPONSE TO ENGINEERING COMMENTS & REVISED VEHICLE ACCESS

Thank you for the opportunity to meet with yourself and Brendan MacGillicuddy of Council to discuss (on site) matters relating to vehicle access and parking.

I trust that the discussions on site gave yourself and Brendan an insight into the specific arrangements that occur at this school with regard to the drop off and pick up of children.

As discussed the School currently has 12 minibuses that drop off and collect children who are primarily wheelchair bound each day. Generally buses carry between 3 – 4 children per minibus (although there are couple of severely disabled children who have to be transported by themselves in a bus).

Furthermore, there are 4 parents/carers who drop off and collect their children via private vehicles. Once the new school is fully operational, it is likely that the number of buses will increase to between 15 and 20 depending upon the number of increased school population and their physical/intellectual disabilities

Based on the discussions, modifications to the proposed vehicle access and parking arrangements have been made to address Council's concerns and comments. These changes are contained in the revised "Site Plan" provided in Attachment A.

It is acknowledge that Council has advised that the existing street tree in the proposed on street parking spaces in Walker Street can be removed.

The two traffic related issues discussed were:

- Vehicle access and direction of vehicle circulation through on site drop off / pick up facility
- Design of on street parking in Walker Street and associated parking controls.

Each of these issues is discussed below.

25 YEARS

melbourne
sydney
brisbane
canberra
adelaide
gold coast
townsville
perth

Level 6, 15 Help Street
CHATSWOOD NSW 2067

PO Box 5254
WEST CHATSWOOD NSW 1515

t// +612 8448 1800

www.gta.com.au

Vehicle Access Arrangements

The entry and exit driveways have been swapped as per Council's request with the northern driveway proposed to be an entry driveway and the southern driveway to be an exit.

Under this arrangement the first driveway that vehicles seeking to access the site encounter will be the entrance.

It is noted that should queuing issues associated with these access arrangements, the proposed design has the ability to reverse the direction of vehicle flow. However, any change to the direction of flow would need to be considered and approved by Council's Local Traffic Committee.

Walker Street On Street Parking

To accommodate vehicle manoeuvring to and from the proposed 90 degree angle parking along Walker Street in a manner which is consistent with the objectives of AS2890.5 the width of the parking spaces has been increased to 2.7m wide and set back from the existing kerb line.

These changes have the effect of increasing the available road pavement for vehicle manoeuvring and reducing the tightness of the vehicle approach angle to the parking spaces.

It is acknowledged that the 12 new on street parking spaces are public spaces and thus accessible by local residents, school visitors and general parking demand. It is proposed, in accordance with Council's recommendations, that to mitigate the potential for commuter parking in these spaces that the following time restrictions be applied:

- 1P 7:00am-9:00am and 3:00pm-5:00pm Monday to Friday

This would only allow vehicles to be parked for a maximum of 8:00am-4:00pm. This should meet the needs of staff, noting that should they arrive earlier or leave later than this, there is other off-street parking available in Walker Street.

We trust that these modifications to vehicle access arrangements and on street parking arrangements satisfactorily address Council's concerns regarding the proposed development.

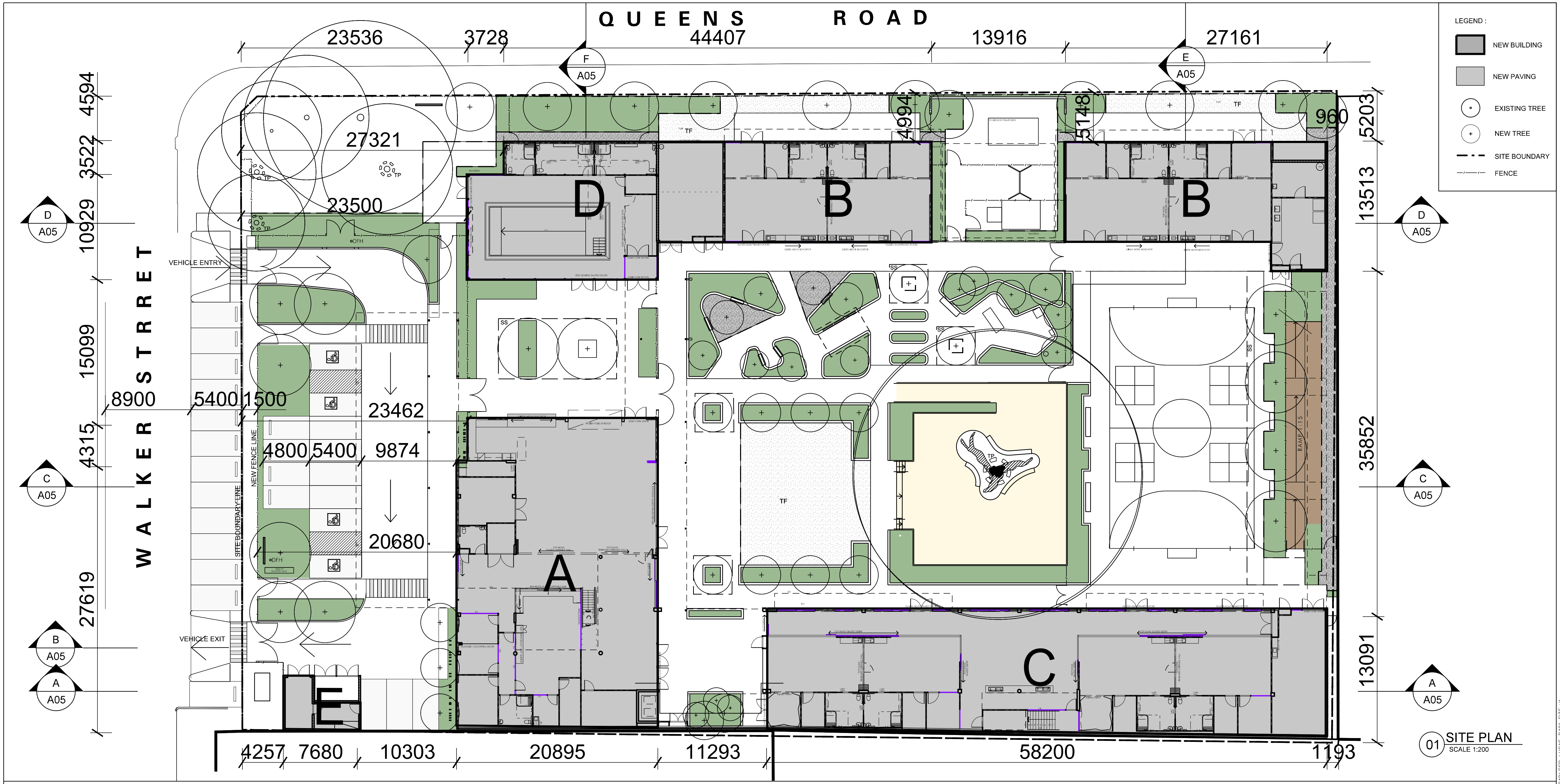
Naturally, should you have any questions or require any further information please do not hesitate to contact the undersigned on 02 8448 1800.

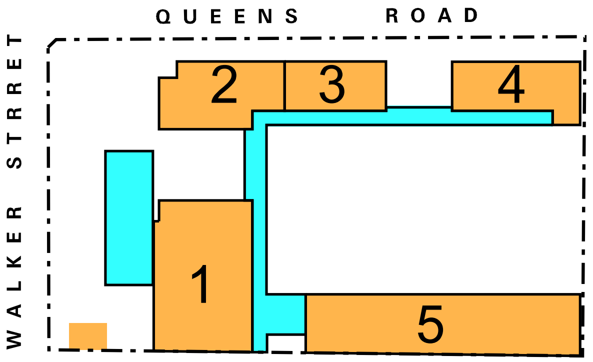
Yours sincerely

GTA CONSULTANTS

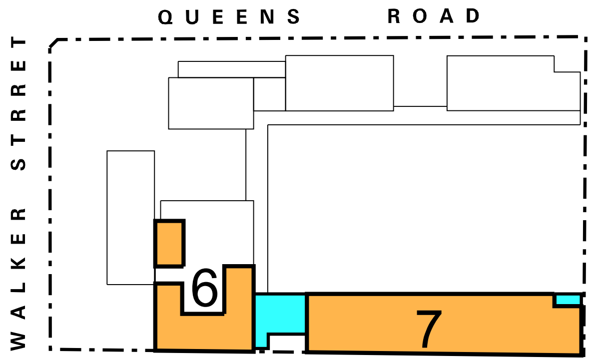
Jason Rudd
Director
encl.

Attachment A – Revised Site Plan





02 GROUND FLOOR AREAS
NTS



03 FIRST FLOOR AREAS
NTS

GROSS INTERNAL AREA			
GROUND FLOOR		FIRST FLOOR	
ACCOMM.	AREA	ACCOMM.	AREA
1	664 m²	6	323 m²
2	342 m²	7	727 m²
3	225 m²		
4	300 m²		
5	742 m²		
TOTAL	**2273 m²**	**TOTAL**	**1050 m²**

OUTDOOR COVERED AREA	
GROUND FLOOR	782 m²
FIRST FLOOR	121 m²
TOTAL	**903 m²**

1 The Government Architect's Office, a division of the Department of Finance & Services (the Department) shall not be liable or responsible for any loss or damage arising out of the conversion of any electronic document, data or program to any other format or medium, or arising out of any modification or changes that occur in the handling or use of the electronic document, data or program.

2 The recipient or user of any electronic document, data or program is solely responsible for ascertaining its accuracy and its suitability for their purposes.

3 The Department uses virus scanning software to prevent file and system virus attacks but gives no warranty. The recipient or user is solely responsible for their own virus protection.

LEGEND
ACP ALUMINIUM COVER PLATE
ALB ALUMINIUM BEAM
ALC ALUMINIUM COLUMN
ASC ASPHALTIC CONCRETE
AW AWNING WINDOW
B BOLLARD- REMOVABLE
BC BARGE CAPPING
BO BUILDING OVER
BP BITUMINOUS PAVING
BR BICYCLE RACK
BSN BASIN
BU BUILDING UNDER
BWU BOILING WATER UNIT
CAP CEILING ACCESS PANEL
CB CONCRETE BEAM
CDS CLEANERS DISTRIBUTED STORE
CDV ROOF VENT DIFFUSER
CFC COMPRESSED FIBRE CEMENT CEILING
CFS FIBRE CEMENT CEILING
CFW WATER RESISTANT FIBRE CEMENT CEILING
CH COAT HOOK
CHS CIRCULAR HOLLOW SECTION
CJ CONTROL JOINT
CMA PERFORATED CORRUGATED METAL ACOUSTIC CEILING
CMS CONCRETE MOWING STRIP
COM COMMUNICATIONS CUPBOARD
CON CONCRETE
CPA ACOUSTIC TILE CEILING
CPB PLASTERBOARD CEILING
CPF FIRE-RATED PLASTERBOARD CEILING
CPP PERFORATED PLASTERBOARD CEILING
CPW WATER RESISTANT PLASTERBOARD CEILING
CTS CENTRES
CW CONCRETE WALL
DG DOUBLE GLAZING
DGR GRATED DRAIN
DPT PAPER TOWEL DISPENSER
DSC SOLID CORE DOOR
DTP TOILET PAPER DISPENSER
EDB ELECTRICAL DISTRIBUTION BOARD
EGL EXISTING GROUND LINE
EQ EQUAL
FB FIRE BLANKET
FCP CARPET
FCS STEEL TROWEL CONCRETE
FCT CERAMIC FLOOR TILES
FD FOLD DOWN SEAT
FFL FINISHED FLOOR LEVEL
FG FIXED GLASS
FDG FIXED DOUBLE GLAZING
FGL FIXED GLASS LOUVRE
FHR FIRE HOSE REEL
FL FLASHING
FMP FIRE MIMIC PANEL
FT TIMBER COMPOSITE FLOORING
FW FLOOR WASTE
GF GROUND FLOOR
GL GROUND LINE
GLX EXISTING GROUND LINE
GR GRAB RAIL
GR-D DROP DOWN GRAB RAIL
HR HANDRAIL
HWU HOT WATER UNIT
KS KITCHEN SINK
LGA ADJUSTABLE GLASS LOUVRE
LGF FIXED GLASS LOUVRE
LHL HIGH LEVEL LOUVRE
LMA ADJUSTABLE METAL LOUVRE
LMF FIXED METAL SCREEN
LUM LUMINAIRE
MI MIRROR
NTS NOT TO SCALE
OP OPERABLE WALL
PB PUSHBUTTON TO BUZZER
PC CONCRETE PAVING
PERF PERFORATED
PCB POLYCARBONATE
PTD PAPER TOWEL DISPENSER
RAC ROOF APEX CAPPING
RB ROLLER BLIND
RBC BARGE CAPPING
RBR BARGE ROLL
RC RIDGE CAPPING
RF REFRIGERATOR
RMC ROOF MECHANICAL COIL
RO ROOF OVER
RRC RIDGE CAPPING
RS METAL ROOF SHEETING
RSF ROOF FLASHING
RV ROOF VENTILATOR
RWG RAIN WATER GUTTER
RWP RAINWATER DOWN PIPE
RWT RAINWATER TANK
S SEAT
S-B STEEL BEAM
SBO STEEL BEAM OVER
SC STEEL COLUMN
SDU SANITARY DISPOSAL UNIT
SFS FIBRE CEMENT SHEETING SOFFIT
SK SKIRTING
SKD DUCTED SKIRTING
SKT TIMBER SKIRTING
SNH SUNHOOD
SNS SUNSCREEN
Sh SHELF
TI TACTILE INDICATORS
TB TIMBER BATTENS
TD TIMBER DECK
TP TOILET PARTITION
UR URINAL
U/S UNDERSIDE
WBK BLOCKWORK WALL
WC TOILET
WCT CERAMIC WALL TILES
WFC COMPRESSED FIBRE CEMENT WALL SHEETING
WMS METAL MESH WALL
WPB PLASTERBOARD WALL
WPB1 13MM FIRE RATED PLASTERBOARD WALL
WPC POLYCARBONATE WALL
WPF FIRE-RATED PLASTERBOARD WALL
WPI IMPACT RESISTANT PLASTERBOARD WALL
WPN PINBOARD WALL FULL HEIGHT
WPW WATER RESISTANT PLASTERBOARD WALL
WT WALL TIMBER-COMPOSITE

A1 0 10 20 30 40 50 60 70 80 90 100

USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING
CHECK ALL DIMENSIONS ON SITE

200MM 300MM ON ORIGINAL

REVISION

ISS	DATE	COMMENT
A	150622	PARKING REVISED AFTER DRAFT DA

STRUCTURAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8230 F 9372 8399

ARCHITECTURAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8411 F 9372 8399

ELECTRICAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8253 F 9372 8133

LANDSCAPE
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8428 F 9372 8444

MECHANICAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8253 F 9372 8133

QUANTITY SURVEYOR
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8311 F 9372 8444

HYDRAULIC
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8202 F 9372 8133

PROJECT MANAGEMENT
PROJECT MANAGEMENT GROUP
T 9372 8558 F 9372 8566

NSW GOVERNMENT
Public Works
Government Architect's Office
PETER POULET
NSW Government Architect
Nominated Architect ARN 5754
Level 19 McKell Building, 2-24 Rawson Place
Sydney NSW 2000 AUSTRALIA
A division of the Office of Finance & Services
PHIL GAETJENS
Secretary

NSW GOVERNMENT Education & Communities

LUCAS GARDENS SCHOOL

SITE PLAN SETOUTS AND FLOOR AREAS

PLAN RM NO

CONTRACT NUMBER

SCALES 1:200 @ A1 1:400 @ A3

DESIGNED CS | PLOT DATE 22/06/2015

DRAFTED GAO | VERIFIED GAO

SHEET NO DA01

REVISION A

22/06/2015 4:04:50 PM $NODE$ sogaric

DAY DESIGN PTY LTD
CONSULTING ACOUSTICAL ENGINEERS

SUITE 17, 808 FOREST ROAD, PEAKHURST 2210

P. 02 9046 3800 ACOUSTICS@DAYDESIGN.COM.AU WWW.DAYDESIGN.COM.AU

Noise Assessment Report

Lucas Gardens School for Specific Purposes
Cnr of Queens Road and Walker Street, Canada Bay, NSW

REPORT NUMBER

5530-1.1R Rev B

DATE ISSUED

15 June 2015

Prepared For:

NSW Public Works
Level 19, McKell Building
2-24 Rawson Place
Sydney NSW 2000

Attention: Mr Carlos Sogari

Revision History

Status	Date	Prepared	Checked	Comment
Draft 1	4/12/2014	Adam Shearer	Stephen Gauld	Emailed to Client for Review
Draft 2	10/12/2014	Adam Shearer	Stephen Gauld	Emailed to Client for Review
Final	10/12/2014	Adam Shearer	Stephen Gauld	Emailed to Client
Rev A	12/05/2015	Adam Shearer	William Wang	Emailed to Client
Rev B	15/06/2015	Adam Shearer	Thomas Roseby	Emailed to Client

Document 5530-1.1R Rev B, 30 pages plus attachments

Disclaimer

The work presented in this document was carried out in accordance with the Day Design Pty Ltd Quality Management System. Day Design is certified to AS9001.

This report has been prepared for the client identified in Section 1.0 only and cannot be relied or used by any third party. Any representation, statement, opinion or advice, expressed or implied in this report is made in good faith but on the basis that Day Design is not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in any respect of any representation, statement, or advice referred to above.

Recommendations made in this report are intended to resolve acoustical problems only. No claims of expertise in other areas are made and no liability is accepted in respect of design or construction for issues falling outside the specialist field of acoustical engineering including but not limited to structural, fire, thermal, architectural buildability, fit for purpose, waterproofing or other aspects of building construction. Supplementary professional advice should be sought in respect of these issues.

The information in this document should not be reproduced, presented or reviewed except in full. Prior to passing onto a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

TABLE OF CONTENTS

TABLE OF TABLES

1.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by NSW Public Works to assess the traffic noise intrusion and environmental noise impact of the proposed redevelopment of Lucas Gardens School for Specific Purpose (SSP), on the corner of Queens Road and Walker Street, Canada Bay, NSW.

This commission involves the following:

Scope of Work:

- Inspect the site and environs
- Measure the background noise levels at critical locations and times
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Measure road traffic noise levels at the proposed site, from Queens Road
- Carry out a noise intrusion computer analysis using the client's architectural drawings
- Establish acceptable indoor noise level criterion for the school rooms
- Design sound insulation of the building to meet the requirements of Australian Standard AS2107-2000
- Quantify noise emissions from the School (Students and mechanical equipment)
- Calculate the level of noise emission, taking into account building envelope transmission loss, screen walls and distance attenuation
- Provide recommendations for noise control
- Prepare a Noise Assessment Report.

2.0 PROJECT & DEVELOPMENT DESCRIPTION

NSW Public Works is proposing the redevelopment of the Lucas Gardens SSP at the corner of Queens Road and Walker Street, Canada Bay, NSW. The proposal involves the construction of 4 buildings, the closest of which is located approximately 10 metres from Queens Road which carries heavy traffic volumes. The school buildings will contain a library, Home Bases, multipurpose hall, administration offices and a hydrotherapy pool.

The School is bound by sound barrier walls to the east, 5 metres, and south, 7 and 3 metres, of the site. To the north and west of the site are Queens Road and Walker Street.

The residences most likely to be affected by the noise emission from the development are the dwellings located to the north of the proposed site on Queens Road and to the west on Walker Street.

The School will have a maximum capacity of 72 - 80 students. The students will be divided into 12 Home Bases, each with a capacity of 6 students.

The School will operate between the hours of 8.30 am to 3 pm, Monday to Friday.

Generally, the range of activities of the students of this school is restricted. 90% of the students are likely to be in a wheelchair and over 80% of the students will have speech disorders where verbalisation is their main means of communicating. As such the expected noise level from these students is likely to vary from that expected of students at main-stream schools.

This report also provides recommendations to reduce road traffic noise intrusion into Home Bases to comply with recommended design sound levels in The City of Canada Bay's DCP, the Educational Facilities Standards and Guidelines and Australian Standard AS2107-2000 "Acoustics – Recommended design sound levels and reverberation times for building interiors".

The noise impact from the site has also been considered and limits placed on the sound power levels of mechanical plant to meet the appropriate noise criteria.

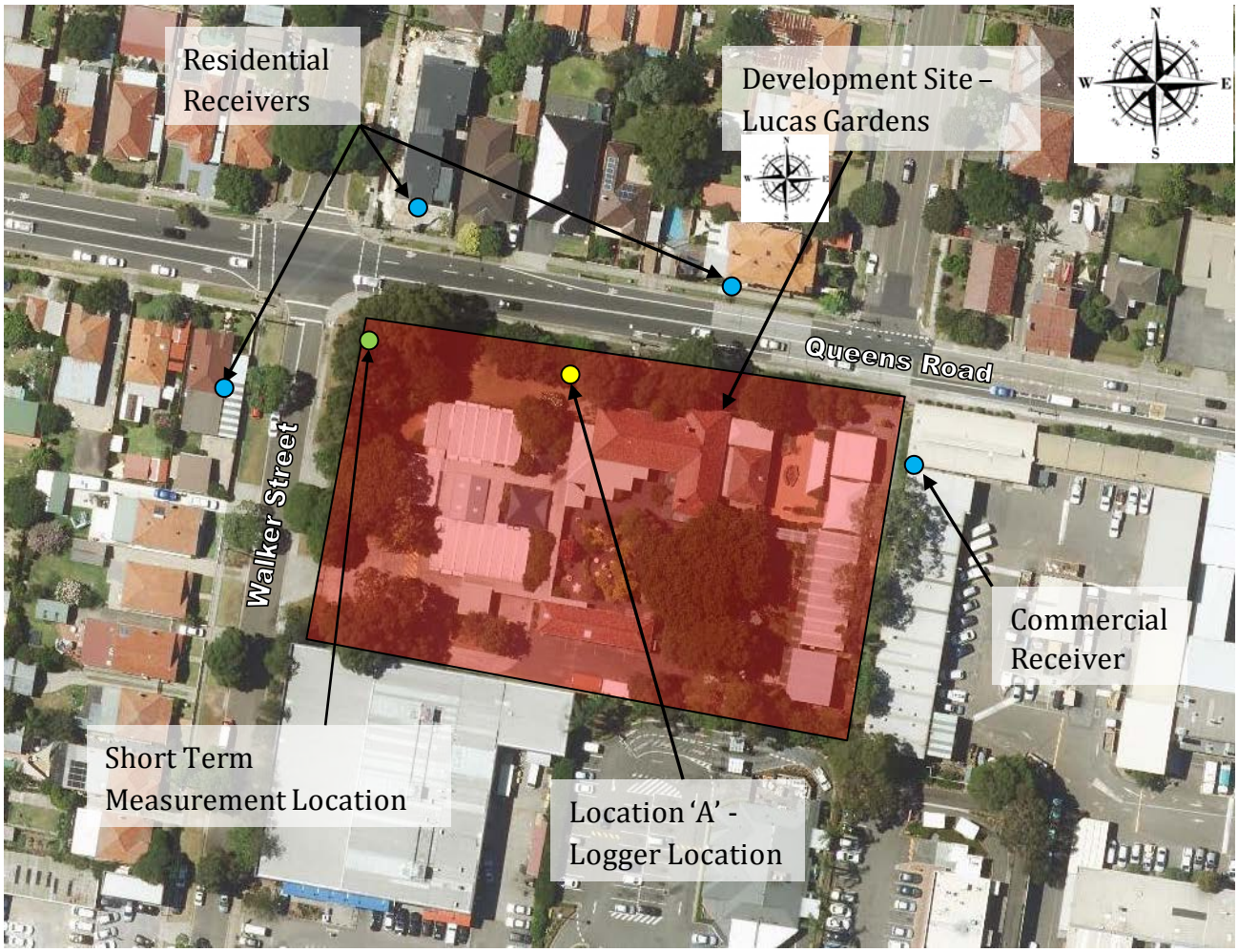


Figure 1. Development Site - Lucas Gardens SSP, Canada Bay, NSW.

3.0 AMBIENT NOISE LEVELS

3.1 Noise Survey Instrumentation

Noise level measurements and analysis were made with instrumentation as follows in Table 1.

Table 1 Noise Instrumentation

Description	Model No.	Serial No.
Infobyte Noise Logger	iM4	114
Condenser Microphone 0.5" diameter	MK 250	3047
Modular Precision Sound Analyser	B&K 2250	2690243
Condenser Microphone 0.5" diameter	B&K 4189	2754884
Acoustical Calibrator	B&K 4231	2721949

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 Monitor iM4 is a Type 1 precision environmental noise monitor meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

The B&K 2250 Sound Analyser is a real-time precision integrating sound level meter with octave and third octave filters, that sample noise at a rate of 10 samples per second and provides L_{eq}, L_{10} and L_{90} noise levels using both Fast and Slow response and L_{peak} noise levels on Impulse response time settings. The meter is frequency weighted to provide dBA, dBC or Linear sound pressure level readings as required. Results are normally downloaded to computer for rapid processing.

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 and within 0.3 dB for short term measurements. No adjustments for instrument drift during the measurement period were warranted.

3.2 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_{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 as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for the day, evening or night periods, measured over at least 7 days during the proposed days and times of operation.

The places of worst possible annoyance are the residences to the north and west. These residences are shown above on Figure 1. The times of worst possible annoyance will be from 8.30 am to 3 pm during the School's operating hours. Ambient L_{90} background noise levels were measured at Location "A" at the proposed site over eight (8) days from Tuesday 14 October 2014 to Wednesday 22 October 2014. These levels are presented in the attached Appendix A and also below in Table 2.

Table 2 Ambient Noise Level

Location	Time Period	Rating Background Level	Existing L_{eq} Level
Location 'A' –	Day (7 am to 6 pm)	**57 dBA**	**68 dBA**
Lucas Gardens SSP,	Evening (6 pm to 10 pm)	**55 dBA**	**68 dBA**
Canada Bay	Night (10 pm to 7 am)	**40 dBA**	**65 dBA**

Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor area.

4.0 ACOUSTICAL CRITERIA

The acoustical criteria in this report cover a number of different areas including road traffic noise intrusion, noise emission from the site and internal acoustics. We have presented each and established the project specific noise criteria.

4.1 The City of Canada Bay Council Conditions

The City of Canada Bay do not have a specific DCP for schools. However in their Development Control Plan (DCP), Part 10, 'Child Care Centres', Council states the following in relation to noise:

'10.9 - Visual and acoustic privacy

Objectives

O1 To ensure the privacy of surrounding properties is maintained and protected from overlooking and noise.

O2 To protect the visual and acoustic privacy needs of children using the Child Care Centres, staff and other users.

O3 To ensure the noise from Child Care Centres does not adversely impact upon the amenity of the Child Care Centre itself and surrounding properties.

Controls

C1 Where noise abatement from or to the Child Care Centre is required, an acoustic report prepared by a suitably qualified acoustic consultant is required to be submitted with the development application, describing and assessing the impact of noise emissions from the Child Care Centre or to the Child Care Centre from surrounding noise sources. The investigation should include but not be limited to the following:

(a) The identification of sensitive noise receivers potentially impacted;

(b) A statement of the proposed hours of operation of the Child Care Centre;

(c) The qualification of the existing acoustic environment at the receiver locations (measurement techniques and assessment period should be fully justified and in accordance with relevant Australian Standards and NSW EPA requirements);

(d) The identification of all noise that is likely to emanate from the Child Care Centre and the subsequent predication of resultant noise at the identified sensitive receiver locations from the operation of the premises. Where appropriate the prediction procedures should be justified and include an evaluation of prevailing atmospheric conditions that may promote noise propagation;

(e) Details of any acoustic control measures that will be incorporated into the proposal; and

(f) The prevention of a sense of enclosure.

C2 *Consideration is to be given to the following design mechanisms in respect to noise abatement for properties in the surrounding area:*

(a) *The appropriate design and siting of the Child Care Centre;*

(b) *The appropriate layout and arrangement of outdoor space and activities;*

(c) *The location of windows in respect to the location of windows in neighbouring properties;*

(d) *The appropriate location of outdoor play areas away from main living area or bedroom windows of any surrounding dwellings in predominantly residential area, and away from external noise sources;*

(e) *The use of acoustic barriers and design, such as screen fencing or planting as noise buffers for external noise sources or transmission of noise from the child care centre to surrounding properties; and*

(f) *Noise abatement measures are to be undertaken to ensure that inside noise levels do not exceed 40 dB(A) (Leq 24)'.*

4.2 NSW EPA's Noise Guide for Local Government

The NSW Environment Protection Authority (EPA) published the *Noise Guide for Local Government* in June 2013. The guide is specifically aimed at assessing noise from light industry, shops, entertainment, public buildings, air conditioners, pool pumps and other noise sources in residential areas.

The appropriate regulatory authority (The City of Canada Bay Council) may, by notice in writing given to such a person, prohibit the person from causing, permitting or allowing:

(a) any specified activity to be carried on at the premises, or

(b) any specified article to be used or operated at the premises,

or both, in such a manner as to cause the emission from the premises, at all times or on specified days, or between specified times on all days or on specified days, of noise that, when measured at any specified point (whether within or outside the premises,) is in excess of a specified level.

It is an offence to contravene a noise control notice. However, prior to being issued with a noise control notice, no offence has been committed.

The *Noise Guide for Local Government* provides a useful framework to assess noise emission from non-scheduled premises, whether that premises produces offensive or non-offensive noise.

The Protection of the Environment Operations Act 1997 defines "Offensive Noise" as noise:

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulation.

The limits set out in the NSW *Noise Guide for Local Government* were used as a guide for determining whether predicted levels of noise were considered intrusive or not.

4.3 Residential Receptor Intrusiveness Criteria

The EPA states in Section 2.2.1 of the *Noise Guide for Local Government* that the L_{eq} level of noise intrusion from broad-band industrial noise sources may be up to 5 dB above the L_{90} background noise level at the receptor without being considered intrusive.

The Rating Background Level at Lucas Gardens SSP as shown in Table 2 above was 57 dBA during the daytime. Therefore the acceptable L_{eq} noise intrusiveness criteria for **broadband noise** in this area is (57 + 5 =) **62 dBA during the day** and (55.

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Correction factors may be applied to the noise annoyance criteria to determine the project specific criteria.

The noise from students playing is typically tonal over short durations but is not tonal over a 15 minute period. Therefore, correction factors will not be applied to the noise criteria.

The noise from the car park and the air conditioning condenser is expected to be of a steady broadband nature without annoying characteristics, therefore modifying factors are also not applicable.

4.4 Protection of the Environment Operations (Noise Control) Regulation 2008

The Protection of the Environment Operations (Noise Control) Regulation 2008 provides specific controls for common neighbourhood noise problems such as air conditioners, swimming pool pumps, power tools, alarms and loud music.

The Regulation (clause 52) states the following in relation to the use of air conditioners and heat pump water heaters:

"A person must not cause or permit an air conditioner or heat pump water heater to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or

(b) before 7 am or after 10 pm on any other day".

Provided the noise emission from an air conditioner or heat pump water heater complies with the inaudibility criterion of the Regulation, the air conditioner or heat pump water heater may operate at any time during the day or night. In order for the noise emission from an air conditioner or heat pump water heater to meet the inaudibility requirement as outlined above, we recommend a design noise goal of background noise level minus 5 dB outside any neighbouring residential window (ie 35 dBA).

4.5 Australian Standard AS2107-2000

We recommend that the design sound levels below in Table 3 be used as the noise criteria for assessing the noise inside the Home Bases from traffic noise.

The Australian Standard AS 2107 – 2000 "Acoustics – Recommended design sound levels and reverberation times for building interiors" provides a list of recommended design sound levels for different areas of occupancy in buildings. The recommended internal noise levels and reverberation times for various rooms in Educational buildings are shown below in Table 3.

Table 3 Recommended L_{eq} Design Sound Level (AS2107-2000)

Type of occupancy/activity	Recommended design sound level L_{eq} dB(A)		Recommended Reverberation Time (T).s
	Satisfactory	Maximum	
EDUCATIONAL BUILDINGS			
Teaching Spaces –			
Primary Schools	35	45	0.4 to 0.5
Secondary Schools	35	45	0.5 to 0.6
Libraries –			
General areas	40	50	0.4 to 0.6
Reading areas	40	45	0.4 to 0.6
Office areas	40	45	0.6 to 0.8
Gymnasiums	45	50	See Note 2
Assembly Halls up to 250 Seats	30	40	0.4 to 0.6
INDOOR SPORTS BUILDINGS			
All other indoor sports -			
With coaching	45	50	See Note 3
Without coaching	50	55	See Note 3

The above recommended sound levels should be achieved inside the rooms with the windows and external doors closed. We recommend that the noise level should not be higher than 10 dB above the recommended sound levels with the windows open. This is in line with recommendation in the Environmental Criteria for Road Traffic Noise for an internal noise level to be not more than 10 dB below the relevant external noise level on the basis of opened windows to provide adequate ventilation.

4.6 Educational Facilities Standards and Guidelines

The NSW Department of Education and Communities (DEC) requires certain acoustic standards for the construction of school facilities. These acoustic criteria cover areas such as isolation of sound from one area to another, control of reverberation time in noise sensitive spaces and reduction of external noise. The following section summarises the DEC requirement related to noise intrusion from traffic:

4.6.1 Educational Facilities Standards and Guidelines Acceptable Noise Levels

The maximum internal noise level from traffic noise is:

- **35 dBA** internal noise level from traffic for teaching areas.

4.7 AAAC Noise Criteria for Outdoor Play Areas

In May 2008, the Association of Australian Acoustical Consultants (AAAC) first published the *Technical Guideline for Child Care Centre Noise Assessment*. The guideline was updated in 2010 to assist both AAAC members and local councils to assess the noise impact from proposed child care centres both accurately and fairly, (see www.aaac.org.au).

As the proposed development is a school, there are similarities in noise emission from uses of their outdoor play areas to that of childcare centres. Students do not play outdoors continuously for long periods of time, and as the duration of time for students playing outside is reduced, the overall noise annoyance reduces. Therefore, it is reasonable to allow a higher level of nose impact for a shorter duration. The AAAC document states that a total time limit of 2 hours of outdoor play per day (e.g. 1 hour in the morning and 1 hour in the afternoon) should allow an additional 5 dB noise impact.

We recommend that the noise criteria detailed in *Technical Guideline for Child Care Centre Noise Assessment* be applied to outdoor play for the School.

The relevant criteria is $L_{eq,\ 15min}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10 dB at the residential assessment location.

Up to 2 hours (total) per day – The $L_{eq,\ 15min}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10 dB at the assessment location.

More than 2 hours per day – The $L_{eq,15min}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.

The *Technical Guideline for Child Care Centre Noise Assessment* in Section 7.0, 'External Noise Impact on Children', also states the following when assessing the impact of traffic noise on students in outdoor play areas:

> *'The noise level $L_{eq,1\ hr}$ from road, rail traffic or industry at any location within the outdoor play or activity area during the hours when the Centre is operating shall not exceed **55 dBA'.***

4.8 Road Traffic Noise Policy

The NSW Road Noise Policy, Section 2.3.1, Table 3, Point 6states:

> *'Existing residences affected by additional traffic on existing roads generated by land use development may have an assessment criteria of – dB(A):*
>
> *(i) $L_{Aeq,}$(1 hour) 55 (external) Day (7 am – 10 pm)*

4.9 Commercial Receptor Amenity Criterion

The L_{eq} intrusive noise level criterion at nearby commercial offices is 65 dBA. (refer Table 2.1, Amenity Criteria of the NSW Industrial Noise Policy).

4.10 Project Specific Noise Criteria

When all the above factors are considered, we find that the most stringent noise criterion for noise emission from the School is the Intrusiveness Criteria of:

- **62 dBA for broadband noise sources,** during the day;
- **60 dBA for broadband noise sources,** during the evening; and
- **40 dBA for broadband noise sources,** during the night.

This criteria is to be assessed at the most affected point on or within the residential property boundary – or, if that is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence during the day, evening and night respectively. For upper floors, the noise is assessed outside the nearest window.

In addition, for the noise emission to be inaudible within a habitable room of any nearby residential dwelling, the level of noise should not exceed **35 dBA** outside the nearest window during the night.

Noise emission from the proposed school should not exceed **65 dBA** at the most affected point on or within any receiving commercial property boundary during the daytime.

The most appropriate noise criterion for traffic noise intrusion in to the proposed schools classrooms is:

- **$L_{eq,\ 24\ hour}$ 40 dBA,** for traffic noise inside the classrooms when in use; and

The most appropriate noise criterion for traffic noise intrusion in to the proposed schools play areas is the AAAC Noise Criteria for Outdoor Play Areas criterion of:

- **55 dBA** for noise in outdoor play areas when in use.

5.0 TRAFFIC NOISE INTRUSION

5.1 Measured Traffic Noise Levels

Long term traffic noise level measurements were carried out on the site and the daytime L_{Aeq} noise level was found to be 68 dBA at the location of the proposed building facade closest to Queens Road. Day Design also conducted short term measurements to establish the spectrum of traffic noise across the entire site.

Short term measurements were taken on Thursday 27 November 2014. The short term measurements were conducted on the corner of Queens Road and Walker Street in line with the proposed façade location.

Octave band noise levels are presented below in Table 4.

Table 4 Road Traffic Sound Pressure Levels (Fast response)

Description	Measured Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Building Facade	**68**	73	72	65	63	63	61	54	48

Acoustic predictions of road traffic noise intrusion have been made on the assumption that the classrooms walls are to be constructed from hinged glass doors, fixed glazing and plasterboard stud walls. It is assumed the ceiling is constructed from 0.42 mm metal roof sheeting with 50 mm glasswool insulation and a 6 mm fibre cement ceiling.

Based on the above construction, the traffic noise level inside the Home Base classrooms adjacent to Queens Road on the north side of the development will be 55 dBA with the windows and doors closed. This level exceeds the requirements of the City of Canada Bay Council of 40 dBA as determined in Section 4.9.

Home Base classrooms on the south side of the development are calculated to have an internal noise level of 19 dBA with the construction details mentioned above and therefore satisfy the requirements of the City of Canada Bay Council.

Based on the required internal L_{Aeq} noise level of 40 dBA for Classrooms, the effective noise reduction required from outside to inside is therefore:

- (68 – 40 =) 28 dBA for school teaching spaces during use.

5.2 Recommended Acoustical Treatment

We have modelled the façade of the building on computer and calculated the level of road traffic noise intrusion through the roof, walls, windows and doors.

The necessary noise reduction for Home Bases adjacent to Queens Road on the north side of the development (Homebases 1–4) can be achieved if the following noise control recommendations are complied with, and there are no gaps at construction joints, around plumbing penetrations in external walls, at window sills, door frames, etc., through which sound may penetrate.

5.2.1 Walls / Windows / Doors

The external walls, windows and doors of Home Bases 1-4 are to be constructed with laminated glass.

- Operable hinged doors on the northern façade should be constructed using 10.38 mm laminated glass with Q-lon seals.
- Operable hinged doors on the southern façade should be constructed using 6.38 mm laminated glass with Q-lon seals.
- The remaining areas of glass on the north, west and eastern sides of the façade should be constructed using 10.38 mm laminated glass.

Areas of stud wall construction should consist:

- External lining is to be one layer of 13 mm fire rated plasterboard and one layer of 9 mm fibre cement on 92 mm steel studs.
- Insulation batts are to be placed between the studs. The recommended insulation specifications are, R1.5, 75 mm thick glasswool or polyester insulation (minimum density 11 kg/m^3).
- Internal lining is to be two layers of 13 mm fire rated plasterboard.

5.2.2 Ceiling and Roof System

- All roofs may be of metal deck construction,
- Thermal insulation and a heavy duty sarking vapour barrier laid below the roof,
- Insulation batts are to be placed between the ceiling joists. The recommended, insulation specifications are 100 mm thick glasswool (min 10 kg/m^3 density),
- Ceilings under the roof are to comprise two layers of 10 mm sound rated plasterboard suspended with at least 300 mm below the roof.

5.2.3 Air Conditioning

To achieve the required internal noise levels the classrooms require the windows and doors on the northern façade to be closed. The classrooms are to be ventilated to the standards set out in clause F4.5 of the Building Code of Australia and Australian Standards AS 1668.2-1991.

An air conditioning system with fresh air supply may be used to achieve the required ventilation.

6.0 SCHOOL NOISE EMISSION

The main sources of noise from the School are students and teachers talking in the proposed classrooms, students playing in the outdoor area and mechanical plant including air-conditioning units and pool pumps. Calculations are based on the building and mechanical plant layout provided by Public Works dated 30 April 2015 shown in Appendix B.

Knowing the sound power level of the noise sources at the Lucas Gardens SSP, (see below), 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, etc.

6.1 Students and Teachers Inside Home Bases

During normal classroom activities, the main source of noise will be from the teachers and students talking. We have assumed the worst case scenario where all of the 6 students will be talking normally and the teacher in each classroom is talking loudly.

From time to time a child may become distressed and create a higher level of noise than normal. This has been taken into consideration by using a louder sound power level than we would otherwise use.

The $L_{eq\ (15\ min)}$ sound power levels of students are shown below in Table 5.

Table 5 L_{eq} Sound Power Levels

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Teacher talking loudly	**79**	60	70	75	80	73	70	62	55
Child Playing (8 – 11 year old)	**89**	65	74	79	83	86	83	78	75
1 Teacher and 6 students	**97**	73	82	87	91	94	91	86	83

The predicted noise level from 6 students (100%) and one teacher talking loudly in all 12 classrooms with windows closed is calculated to be as shown below in Table 6.

Table 6 Predicted L_{eq} Indoor Noise Levels

Receptor Location	Predicted Noise Level	Noise Criteria	Compliance (Yes/No)
Residential -			
First floor of 152 Queens Road	32 dBA	62 dBA	Yes
1 Bayview Road	37 dBA	62 dBA	Yes
131 Queens Road	31 dBA	62 dBA	Yes
Commercial – Lot 12, Regatta Road	31 dBA	65 dBA	Yes

The levels of noise above in Table 6 are within the acceptable noise criteria in Section 4 and are therefore acceptable.

6.2 Students in Outdoor Areas

Students will be outside for a range of times, including before school, recess, lunch and after school.

Sound power levels of students at play were previously measured for other similar projects and are presented below in Table 7. We believe these levels represent the maximum noise levels of students at play and will be used in the noise impact assessment.

Table 7 Students at Play (outside) L_{eq} Sound Power Levels

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
1 Child at play 5 to 7 years old	**78**	54	63	68	72	75	72	67	64
1 Child at play 8 to 11 years old	**89**	65	74	79	83	86	83	78	75
Group of 72 students at play	**105**	81	90	95	99	102	99	94	91

The predicted level of noise from all 72 students playing in the courtyard was used as a worst case scenario and is calculated to be as shown below in Table 8.

Table 8 Predicted L_{eq} Outdoor Noise Levels

Receptor Location	Predicted Noise Level	Noise Criteria	Compliance (Yes/No)
Residential -			
First floor of 152 Queens Road	47 dBA	62 dBA	Yes
1 Bayview Road	48 dBA	62 dBA	Yes
131 Queens Road	42 dBA	62 dBA	Yes
Commercial – Lot 12, Regatta Road	46 dBA	65 dBA	Yes

The levels of noise above in Table 8 are within the acceptable noise criteria in Section 4 and are therefore acceptable.

6.3 Noise Emission from Hall Activities

The Hall will be used by students and teachers during school hours for activities such as indoor sport and fitness, assemblies, drama and music rehearsal and production. The School may be used infrequently outside these hours by community groups and after hour school events.

A schedule of the sound power levels for activities that may occur within the School Hall is presented below in Table 9.

Table 9 Hall Activity L_{eq} Sound Power Levels

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
Amplified Music	**105**	110	113	109	102	97	93	88	85
Indoor ball sports	**97**	71	74	79	84	94	92	87	81
Male talking into microphone	**79**	60	70	75	80	73	70	62	55

The calculated noise impact from the typical worst case scenario of an amplified music performance with a sound power level of 105 dBA is calculated to be **58 dBA** with windows and doors open at the nearest and potentially most affected residential premises to the west at 131 Queens Road.

If the hall were used for similar activities in the evening, the noise impact of this alone would also comply with the evening criterion of 60 dBA.

6.4 Noise Emission from Hydrotherapy Pool Activity

The Hydrotherapy Pool will be used by students and teachers during school hours for activities such as fitness, rehabilitation and leisure. The School may be used infrequently outside these hours by community groups and after hour school events.

A schedule of the sound power levels for activities that may occur within the Hydrotherapy Pool is presented below in Table 10. A worst case scenario of 6 students playing in the pool at once has been used to assess noise emissions from the Hydrotherapy Pool.

Table 10 Hydrotherapy Pool L_{eq} Sound Power Levels

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
Leisure Activities – Group of 6 students at play (8 – 11 years old)	**97**	73	82	87	91	94	91	86	83

The calculated noise impact from the worst case scenario of a group of 6 students at play with a sound power level of 97 dBA is calculated to be **51 dBA** with windows and doors open at the nearest and potentially most affected residential premises to the west at 131 Queens Road.

6.5 Pool Plant

The Hydrotherapy Pool will be serviced by mechanical plant including pool pumps, blowers and a packaged air-conditioning unit. As the plant equipment will generate high levels of noise it is to be housed in an enclosed plant room. The room is situated between the proposed Hydrotherapy Pool and Home Base 1 as shown in Appendix B.

Measured Sound pressure levels were provided by the manufacturers at 1 and 4 metres. The sound pressure levels were then calculated into sound power levels for the pool pumps, blower and air-conditioning unit to be used at the development. The Octave Band Centre Frequencies shown below in Table 11 are taken from manufacturer's data and similar products that have been obtained by Day Design Pty Ltd for previous projects.

Table 11 Mechanical Plant L_{eq} Sound Power Levels - Pool

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Reticulation Pump 5.5 kW	**76**	76	77	76	73	72	68	62	51
Discharge Pump 0.92 kW	**69**	69	70	69	66	65	61	55	44
Vacuum Blower 1.1 kW	**75**	75	76	75	72	71	67	61	50
Heat Pump Water Heater -									
- 2 x 0.37 kW	**76**	76	77	76	73	72	68	62	51
- 1 x 0.55 kW	**71**	71	72	71	68	67	63	57	46
Poolpac – ACPP2300									
- Intake	**85**	90	95	91	80	73	69	61	57
- Exhaust	**84**	86	91	88	80	76	75	69	65

The predicted levels of noise from the mechanical plant servicing the hydrotherapy pool is calculated to be as shown below in Tables 12 and 13 for day and evening and night time respectively.

The Hydrotherapy Pool and will operate between the hours of 7 am and 10 pm. During these hours all associated pool plant and air-conditioning will be required to operate. To ensure a conservative prediction, the evening criteria of 60 dBA will be used to assess noise levels at all residential receivers. The predicted day time and evening noise levels are shown below in Table 12.

Table 12 Pool Plant - Predicted L_{eq} Noise Levels – Day and Evening – (7 am – 10 pm)

Receptor Location	Predicted Noise Level	Noise Criteria	Compliance (Yes/No)
First floor of 152 Queens Road	36 dBA	60 dBA	Yes
1 Bayview Road	34 dBA	60 dBA	Yes
131 Queens Road	26 dBA	60 dBA	Yes
Internal Playground	50 dBA	55 dBA	Yes

The noise levels above in Table 12 are within the acceptable day time and evening noise criteria in Section 4 and are therefore acceptable.

The Hydrotherapy Pool's plant equipment will also be required to run during the night time period to maintain the pool. We have been advised by the mechanical services engineers, Public Works, Geoff Ninnes Fong & Partners Pty Ltd and Parsons Brinckerhoff, the equipment will be run at reduced capacities during the night time period.

The mechanical plant associated with the hydrotherapy pool running during the night, at reduced capacities, have been assessed against the POEO criterion of 35 dBA in Section 4.4, outside the nearest residential window and is shown below in Table 13.

Table 13 Pool Plant - Predicted L_{eq} Noise Levels – Night – (10 pm – 7 am)

Receptor Location	Predicted Noise Level	Noise Criteria	Compliance (Yes/No)
First floor of 152 Queens Road	33 dBA	35 dBA	Yes
1 Bayview Road	31 dBA	35 dBA	Yes
131 Queens Road	24 dBA	35 dBA	Yes

The levels of noise above in Table 13 are within the acceptable night time noise criteria in Section 4 and are therefore acceptable.

The predicted noise levels at the residential receptors in Tables 12 and 13 may be achieved providing the following noise controls are implemented:

6.5.1 Mechanical Plant Specifications

We recommend that all mechanical plant including the pumps, fans and air handling units be vibration isolated from the building structure.

The vibration isolators should achieve a minimum static deflection of 25 mm for the pumps, fans and air handling units. All pipe work inside plant rooms should be vibration isolated using spring hangers to achieve static deflection of 25 mm. Pipe work outside plant rooms,

within 15 metres of pumps, should be vibration isolated to achieve minimum static deflection of 10 mm.

Ducting associated with the 'Poolpac' unit (PAC – 1), shown in Appendix B5, is to be internally lined with 75 mm thick glasswool insulation (density 32 kg/m^3) and faced with a minimum of 20% open area perforated steel or foil, as specified below:

- We recommend the full length of the duct and all bends be lined on the outside air duct of the PAC-1.
- We recommend the full length of the duct and all bends be lined on the exhaust air duct of the PAC-1.

6.5.2 Acoustic Louvres

As the plant rooms will require ventilation, acoustic louvres are to be installed in the northern façade, facing Queens Road. The louvres may be designed to fit the height and width of the northern facade of the plant room. An example of the Fantech SBL1 can be seen in the attached Appendix C.

The acoustic louvres, shown in Appendix B4, should have an insertion loss performance equal to or greater than that specified below in Table 14.

Table 14 Sound Bar Louvre Specifications – Plant Room Northern Facade

Description	Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Attenuator*	4	7	9	13	14	12	12	8

**Manufacturer's data for the Fantech SBL1 can be seen in the attached Appendix C.*

The doors on the southern façade, facing the internal playground, are to be acoustic louvered doors. The acoustic louvres should be a maximum 2000 mm in height, and 2000 mm wide. An example of the Fantech SBL2 can be seen in the attached Appendix D.

The acoustic louvres, shown in Appendix B4, should have an insertion loss performance equal to or greater than that specified below in Table 15.

Table 15 Sound Bar Louvre Specifications – Plant Room Doors

Description	Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Attenuator†	5	10	14	22	27	25	21	17

†Manufacturer's data for the Fantech SBL2 can be seen in the attached Appendix D.

6.6 Air Conditioning Plants – Blocks A, B and C

We understand that all new buildings as part of the development are to be air-conditioned. The air-conditioning condensing units will be located inside four plant rooms located in each building block. The corresponding plant rooms for the Home Bases 1 - 4 and 5 - 12 are to be of an open top design.

Octave band centre frequency sound pressure levels were provided by Public Works. The sound pressure levels were then calculated into octave band sound power levels for the air conditioning condensers and fan coil units to be used at the development and are shown below in Table 16.

Table 16 Air Conditioning Condenser L_{eq} Sound Power Levels

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
CU-A.1	**70**	74	71	70	67	66	61	54	50
CU-A.2	**69**	73	70	69	66	65	60	53	49
CU-A.3	**71**	75	72	71	68	67	62	55	51
CU-B	**71**	75	72	71	68	67	62	55	51
CU-C.1	**71**	75	72	71	68	67	62	55	51
CU-C.2	**71**	75	72	71	68	67	62	55	51
FCU-A.1/1	**60**	71	65	63	58	55	49	44	38
FCU-A.2/1	**60**	71	65	63	58	55	49	44	38
FCU-A.3/1	**60**	71	65	63	58	55	49	44	38

The predicted level of noise from the air conditioning units servicing the Home Bases and the admin building is calculated to be as shown below in Table 17.

Table 17 Air Conditioning Plant - Predicted L_{eq} Noise Levels

Receptor Location	Predicted Noise Level	Noise Criteria	Compliance (Yes/No)
First floor of 152 Queens Road	**35 dBA**	**62 dBA**	**Yes**
1 Bayview Road	**41 dBA**	**62 dBA**	**Yes**
131 Queens Road	**38 dBA**	**62 dBA**	**Yes**

The levels of noise above in Table 17 are within the acceptable noise criteria in Section 4 and are therefore acceptable.

Aluminium louvres may be installed in the façade of the plant rooms in Blocks A, B and C.

6.7 Car Park Noise Emission

Staff parking and a drop off zone are provided in a car park at the western end of the site adjacent to Walker Street, with a capacity for approximately 21 cars. There is also a drop off zone for mini buses which are used to transport the students between home and school.

Based on the RTAs 'Guide to Traffic Generating Developments' prediction of 1.4 peak vehicle trips per child (across 2 hours) for pre-schools, we have assumed a flow of cars equivalent to 50 cars in 1 hour arriving and leaving the School both in the morning or in the afternoon. This is equivalent to 13 vehicle trips in a 15 minute period. The L_{eq} sound power level and spectrum of such noise was previously measured by Day Design and is given below in Table 18.

Table 18 L_{eq} Levels of Car Park Noise

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
L_{eq} level of car park noise	**77**	89	81	74	72	71	68	66	60

The predicted L_{eq} level of noise from the car park (car doors being closed, engines starting and cars accelerating), is 53 dBA at the front ground floor bedroom window of 131 Queens Road. The calculated noise level complies with the criteria in Section 4 of this report and is therefore acceptable.

6.8 Cumulative Noise Impact

The noise emissions from students playing outdoors, traffic in the car park, mechanical plant and indoor activities will not occur simultaneously and therefore the noise impact from these sources is assessed separately. The results are summarised below in Table 19 and Table 20.

Table 19 Predicted Overall Noise Levels – Outdoor Activities

Receptor Location	Predicted L_{eq} Noise Level	Acceptable L_{eq} Noise Level	Compliance
First Floor 152 Queens Road - Residential			
- Students playing outside	47 dBA		
- Mechanical Plant	38 dBA		
- Noise from teachers car park	47 dBA		
Cumulative Noise Level	50 dBA	62 dBA	Yes
1 Bayview Road - Residential			
- Students playing outside	48 dBA		
- Mechanical Plant	42 dBA		
- Noise from teachers car park	25 dBA		
Cumulative Noise Level	49 dBA	62 dBA	Yes
131 Queens Road - Residential			
- Students playing outside	42 dBA		
- Mechanical Plant	38 dBA		
- Noise from teachers car park	53 dBA		
Cumulative Noise Level	53 dBA	62 dBA	Yes
Lot 12, Regatta Road - Commercial			
- Students playing outside	46 dBA		
- Mechanical Plant	25 dBA		
- Noise from teachers car park	N/A		
Cumulative Noise Level	46 dBA	65 dBA	Yes

The overall cumulative levels of noise from outdoor noise sources, including activities such as students playing outside, mechanical plant and car park comply with the noise criterion of 62 dBA, provided the noise controls as recommended in Section 6 are implemented, and are therefore also acceptable.

Table 20 Predicted Overall Noise Levels - Daytime – Indoor Activities

Receptor Location	Predicted L_{eq} Noise Level	Acceptable L_{eq} Noise Level	Compliance
First Floor 152 Queens Road - Residential			
- Classrooms	32 dBA		
- School Hall	43 dBA		
- Hydrotherapy Pool	50 dBA		
Cumulative Noise Level	51 dBA	62 dBA	Yes
1 Bayview Road - Residential			
- Classrooms	37 dBA		
- School Hall	47 dBA		
- Hydrotherapy Pool	40 dBA		
Cumulative Noise Level	48 dBA	62 dBA	Yes
131 Queens Road - Residential			
- Classrooms	31 dBA		
- School Hall	58 dBA		
- Hydrotherapy Pool	51 dBA		
Cumulative Noise Level	59 dBA	62 dBA	Yes
Lot 12, Regatta Road - Commercial			
- Classrooms	31 dBA		
- School Hall	32 dBA		
- Hydrotherapy Pool	26 dBA		
Cumulative Noise Level	35 dBA	65 dBA	Yes

The overall cumulative levels of noise from indoor noise sources, including activities inside the classrooms, multi-purpose hall and hydrotherapy pool, mechanical plant and car park comply with the noise criterion of 62 dBA, provided the noise controls as recommended in Section 5 of this report are implemented, and are therefore also acceptable.

7.0 CONCLUSION

Measurements and computations show that, provided the recommendations in this report are implemented, the level of noise emitted by students, teachers, mechanical plant and road traffic associated with the proposed redevelopment of Lucas Garden SSP will meet the Environmental Protection Authority's acceptable noise level requirements as detailed in Section 4 of this report.

With the recommendations in this report implemented, the intrusive road traffic noise levels will also conform to the indoor noise requirements set by The City of Canada Bay Council and recommended in the AAAC *Technical Guideline for Child Care Centre Noise Assessment*.

Adam Shearer, MDesSc (Audio and Acoustics), MAAS
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 Australian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

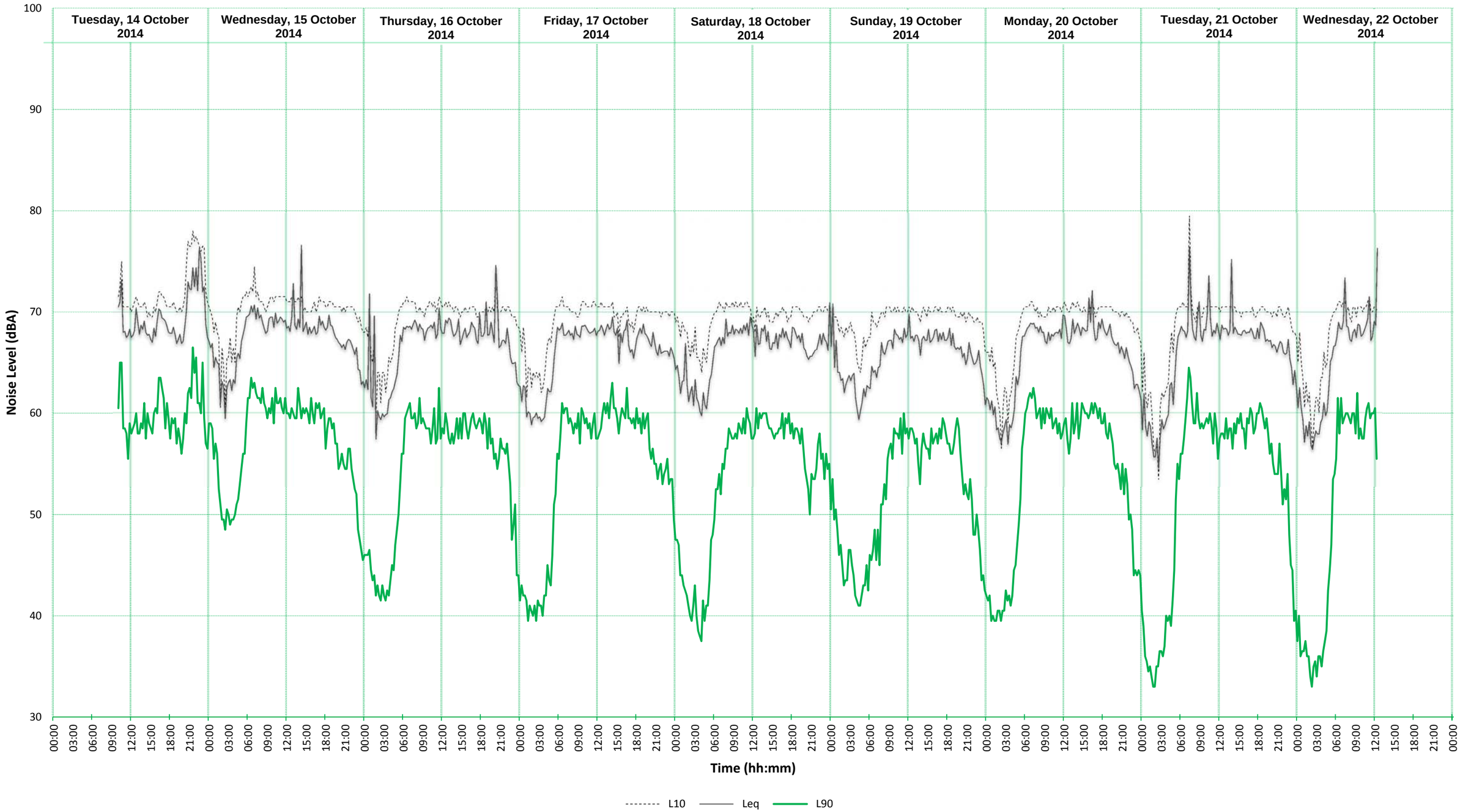
Attachments:

- Appendix A – Ambient Noise Survey
- Appendix B1 – B5 – Proposed Building Layout & Markups
- Appendix C – Fantech SBL1
- Appendix D – Fantech SBL2

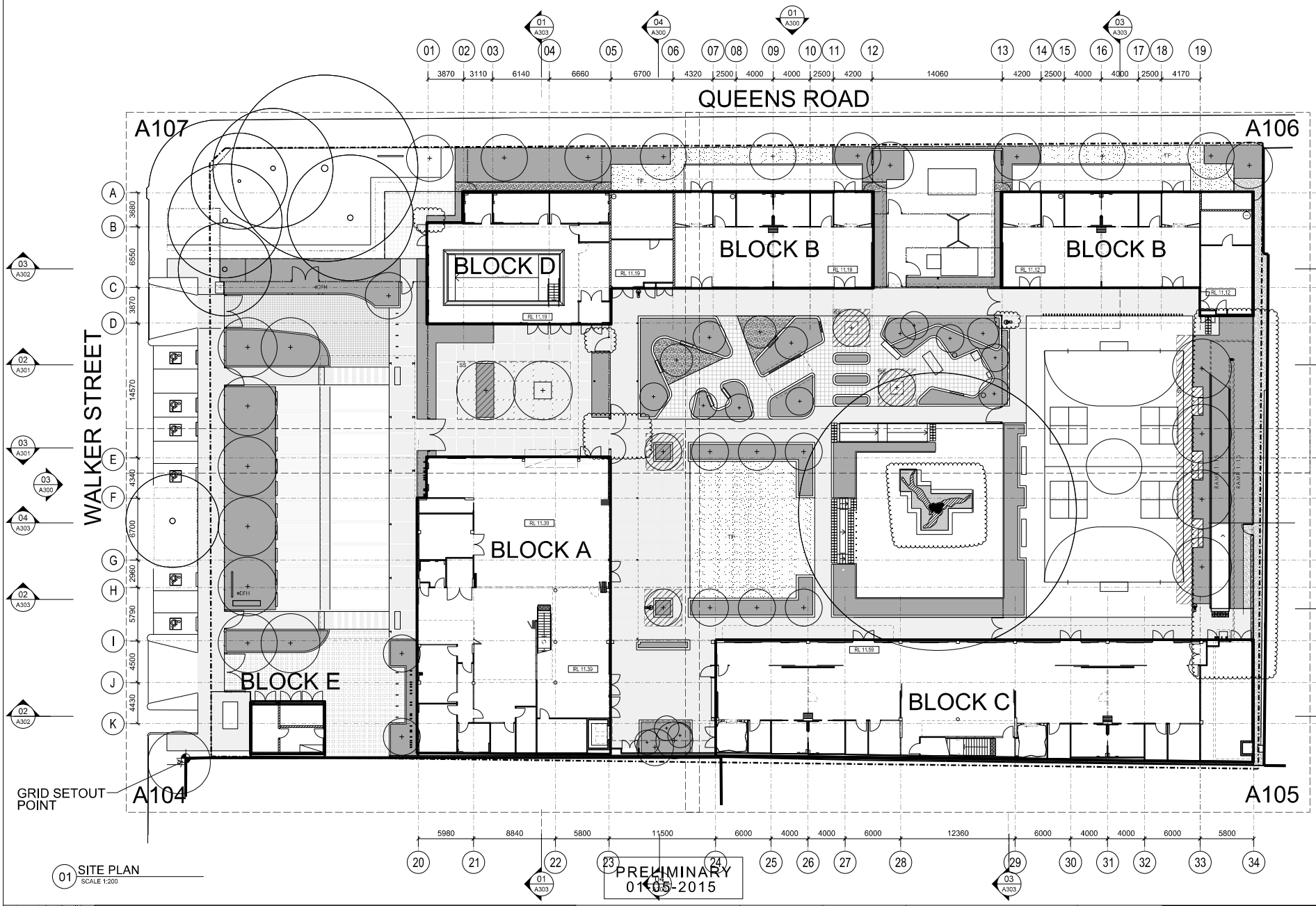
AMBIENT NOISE SURVEY

5530-1
Appendix A

Located at Cnr Walker and Queens Road, Five Dock, NSW



5530-1 Appendix B1



01 SITE PLAN
SCALE 1:200

LEGEND :

AC10	ASPHALTIC CONCRETE PAVING, REFER CIVIL DRAWINGS
BE	BRICK EDGE,NOM 150 TALL
BS1	BENCH SEAT 1
BS2	BENCH SEAT 2
BS3	BENCH SEAT 3
BW	BRICK WALL,NOM 375 TALL
CK	CONCRETE KERB, REFER CIVIL DRAWINGS
CSG	CEMENT STABILISED DECOMPOSED GRANITE PAVING
DF	DRINKING FOUNTAIN
IGT	IN-GROUND TRAMPOLINE
HC	HEADER COURSE
MP	MASS PLANTING
ME1	MUSIC EQUIPMENT 1: DRUM SET
ME2	MUSIC EQUIPMENT 2: METAL CHIMES
ME3	MUSIC EQUIPMENT 3: PLASTIC DRUM
ME4	MUSIC EQUIPMENT 4: METAL SPINNER
ME5	MUSIC EQUIPMENT 5: TIMBER XYLOPHONE
PB	PEDESTRIAN BOLLARD
PE1	PLAY EQUIPMENT 1: DOUBLE SWING
PE2	PLAYEQUIPMENT 2: LIBERTY SWING
PER	PER, PERGOLA, REFER ARCHITECTS DRAWINGS
PM	PROTECTIVE MESH
R1	RAIL TYPE 1: HAND AND KERBRAIL
R2	RAIL TYPE 2: HANDRAIL
R3	RAIL TYPE 3: HANDRAIL AND BALUSTRADE
R4	RAIL TYPE 4: BALUSTRADE
RW	RETAINING WALL, REFER CIVIL DRAWINGS
SE	STEEL EDGE
SF	SOFT-FALL
SS	STRUCTURAL SOIL
TD	TIMBER DECK, REFER ARCHITECTS DRAWINGS
TF	TIMBED EDGE
TF	TURF
TGSI	TACTILE GROUND SURFACE INDICATORS
TP	TACTILE PLAY PANEL
TPC	TREE PROTECTION CLADDING
TPF	TREE PROTECTION FENCE
TPZ	TREE PROTECTION ZONE (HATCHED)
UP1	UNIT PAVER TYPE 1 - SENSORY GARDEN
UP2	UNIT PAVER TYPE 2 - POROUS PAVING
UP3	UNIT PAVER TYPE 3 - POOL TERRACE
VC	VEHICLE CROSS-OVER, REFER CIVIL DRAWINGS

PRELIMINARY
01-05-2015

REVISION		
ISS	DATE	COMMENT

STRUCTURAL GOVERNMENT ARCHITECTS OFFICE T 9372 9239 F 9372 8399	ARCHITECTURAL GOVERNMENT ARCHITECTS OFFICE T 9372 8491 F 9372 8399
ELECTRICAL GOVERNMENT ARCHITECTS OFFICE T 9372 8253 F 9372 8133	SARM ARCHITECTS T 9922 2199 F 9922 2755
MECHANICAL GOVERNMENT ARCHITECTS OFFICE T 9372 8253 F 9372 8133	
HYDRAULIC GOVERNMENT ARCHITECTS OFFICE T 9372 8252 F 9372 8133	QUANTITY SURVEYOR GOVERNMENT ARCHITECTS OFFICE T 9372 8311 F 9372 8444
LANDSCAPE GOVERNMENT ARCHITECTS OFFICE T 9372 8458 F 9372 8444	PROJECT MANAGEMENT PROJECT MANAGEMENT GROUP T 9372 8558 F 9372 8599

NSW GOVERNMENT Public Works
Government Architect's Office
PETER POULET
NSW Government Architect
Nominated Architect: ARN 5751
Level 18 McKell Building, 2-24 Rawson Place
Sydney NSW 2000 AUSTRALIA
A division of the Office of Finance & Services
PHIL GAETJENS
Secretary

NSW GOVERNMENT Education & Communities

LUCAS GARDENS SCHOOL

SITE PLAN

PLAN RUN NO

CONTRACT NUMBER 15xxxx

SCALES 1:200 @ A1

DESIGNED CS | PLOT DATE 1/05/2015

DRAFTED GAO | VERIFIED GAO

SHEET NO A103

REVISION

SHEET 1

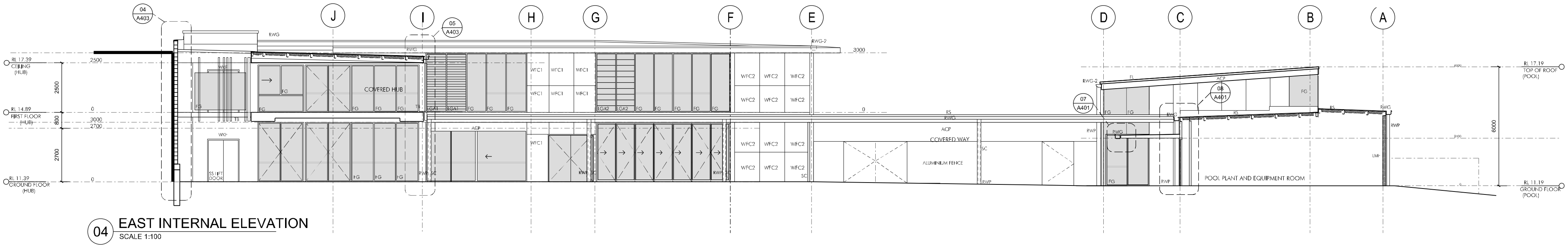
1 The Government Architect's Office, a division of the Department of Finance & Services (the Department) shall not be liable or responsible for any loss or damage arising out of the conversion of any electronic document, data or program to any other format or medium, or adding out of any modification or changes that occur in the handling or use of the electronic document, data or program.

2 The recipient or user of any electronic document, data or program is solely responsible for assessing its accuracy and its suitability for their purposes.

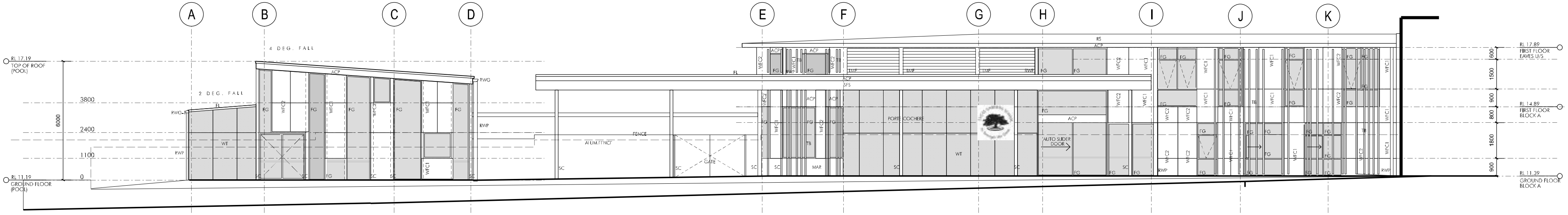
3 The Department uses virus scanning software to prevent file and system virus attacks but gives no warranty. The recipient or user is solely responsible for their own virus protection.

A1 0 10 20 30 40 50 60 70 80 90 100 USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING CHECK ALL DIMENSIONS ON SITE 200MM 300MM ON ORIGINAL

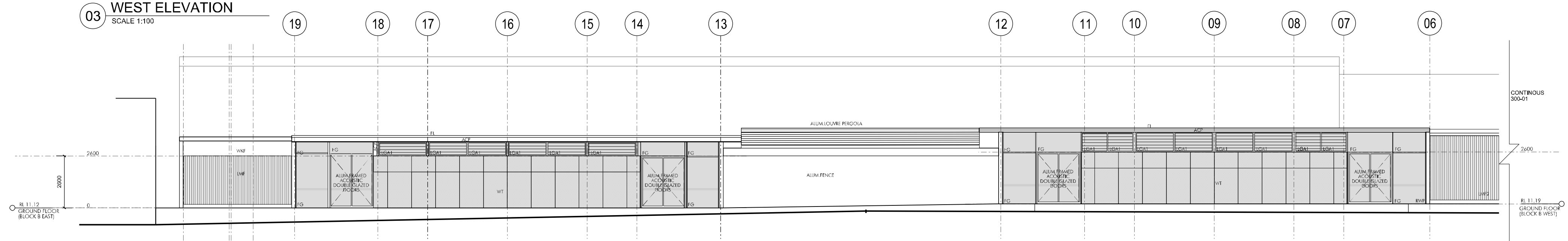
1/05/2015 4:29:13 PM J:\15\1500_Lucas Gardens SSP\10-Drawings\10.04 CC\A03_SSP_LUC_SITE_PLT James



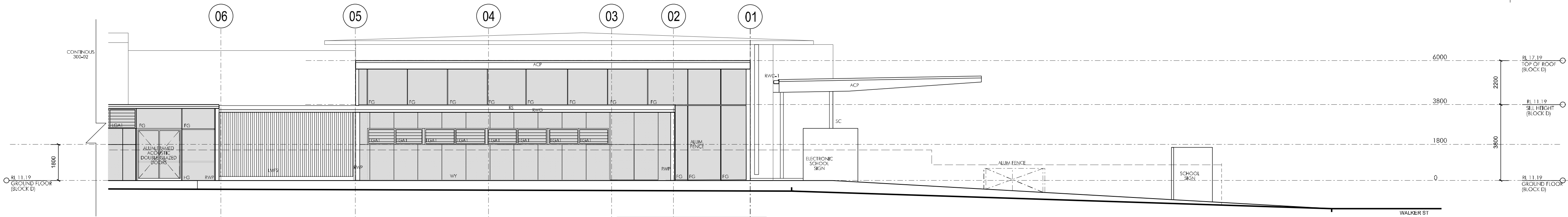
04 EAST INTERNAL ELEVATION
SCALE 1:100



03 WEST ELEVATION
SCALE 1:100



02 QUEENS ROAD NORTH ELEVATION (PART 2)
SCALE 1:100



01 QUEENS ROAD NORTH ELEVATION (PART 1)
SCALE 1:100

PRELIMINARY
01-05-2015

LEGEND

USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING
CHECK ALL DIMENSIONS ON SITE

STRUCTURAL — GOVERNMENT ARCHITECT'S OFFICE
ELECTRICAL — GOVERNMENT ARCHITECT'S OFFICE
MECHANICAL — GOVERNMENT ARCHITECT'S OFFICE
HYDRAULIC — GOVERNMENT ARCHITECT'S OFFICE
LANDSCAPE — GOVERNMENT ARCHITECT'S OFFICE
ARCHITECTURAL — GOVERNMENT ARCHITECT'S OFFICE
SARM ARCHITECTS
QUANTITY SURVEYOR — GOVERNMENT ARCHITECT'S OFFICE
PROJECT MANAGEMENT — PROJECT MANAGEMENT GROUP

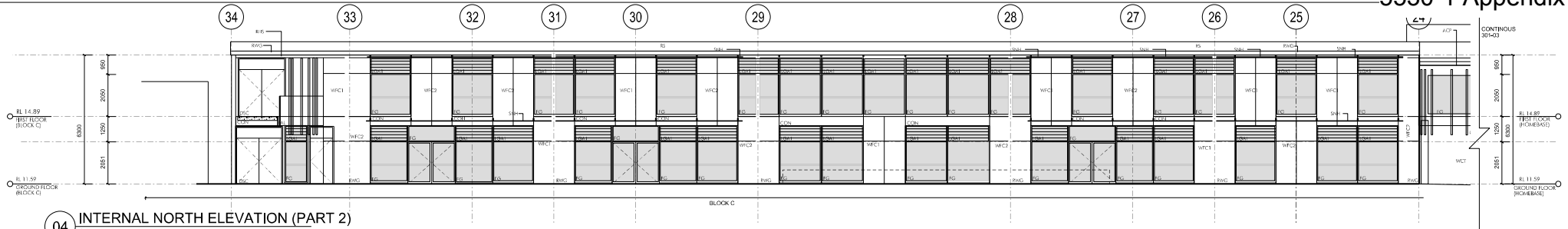
Public Works
Government Architect's Office
PETER POULET
PHIL GAETJENS
Secretary

Education & Communities

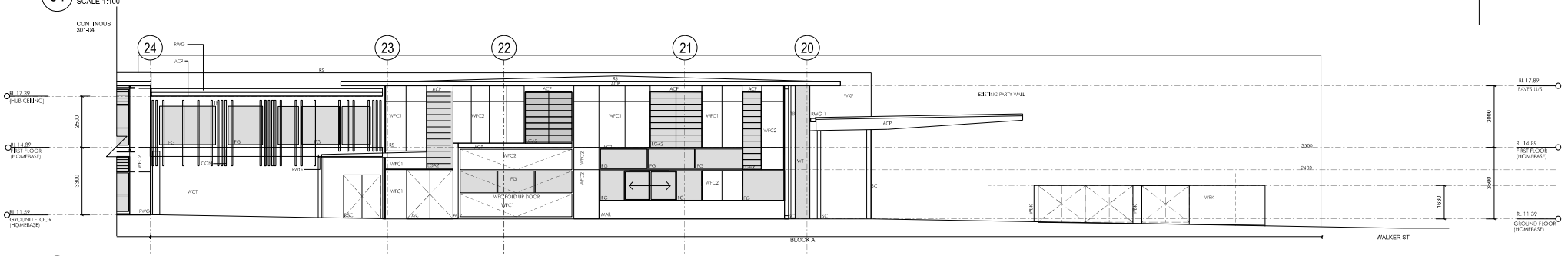
LUCAS GARDENS SCHOOL

ELEVATIONS

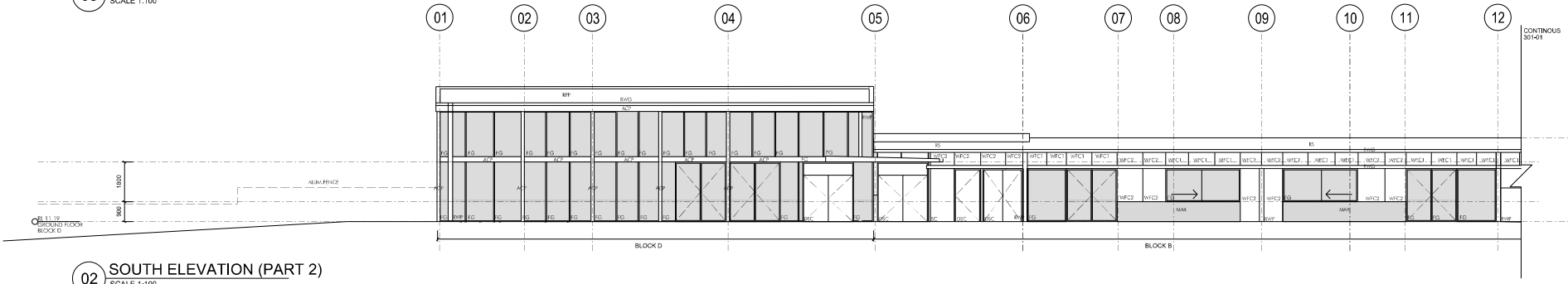
CONTRACT NUMBER	15xxxx
SCALE	1:100 @ A1
SHEET NO	A300
DESIGNED	CS
PLOT DATE	1/05/2015
DRAFTED	GAO
VERIFIED	GAO



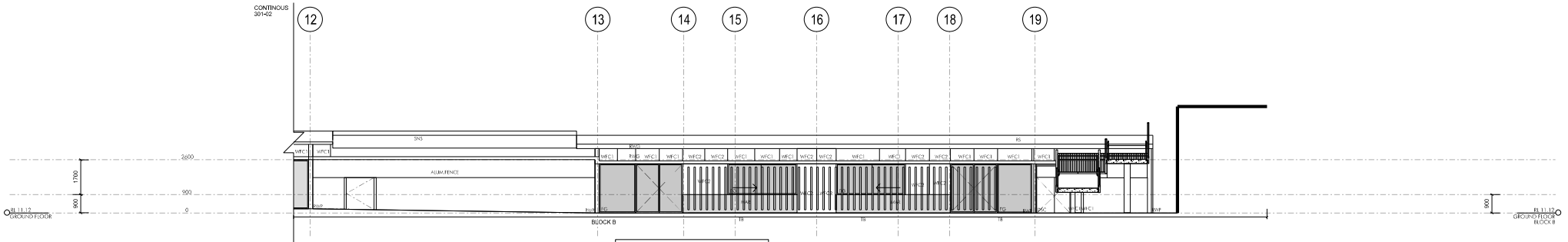
04 INTERNAL NORTH ELEVATION (PART 2)
SCALE 1:100



03 INTERNAL NORTH ELEVATION (PART 1)
SCALE 1:100



02 SOUTH ELEVATION (PART 2)
SCALE 1:100



01 SOUTH ELEVATION (PART 1)
SCALE 1:100

PRELIMINARY
01-05-2015

LEGEND

REVISION		
ISS	DATE	COMMENT

STRUCTURAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8239 F 9372 8399	ARCHITECTURAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8411 F 9372 8399
ELECTRICAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8253 F 9372 8133	SARM ARCHITECTS T 9922 2799 F 9922 2755
MECHANICAL GOVERNMENT ARCHITECT'S OFFICE T 9372 8253 F 9372 8133	
HYDRAULIC GOVERNMENT ARCHITECT'S OFFICE T 9372 8252 F 9372 8133	QUANTITY SURVEYOR GOVERNMENT ARCHITECT'S OFFICE T 9372 8311 F 9372 8444
LANDSCAPE GOVERNMENT ARCHITECT'S OFFICE T 9372 8403 F 9372 8444	PROJECT MANAGEMENT PROJECT MANAGEMENT GROUP T 9372 8555 F 9372 8599

NSW GOVERNMENT Public Works
Government Architect's Office
PETER POULET
NSW Government Architect
Nominated Architect: ARPH 5756
Level 15 McKell Building, 2-24 Rawson Place
Sydney NSW 2000 AUSTRALIA
A division of the Office of Finance & Services

NSW GOVERNMENT Education & Communities

LUCAS GARDENS SCHOOL

ELEVATIONS

PLAN REV NO

SCALES 1:100 @ A1

DESIGNED CS | PLOT DATE 1/05/2015

DRAFTED GAO | VERIFIED GAO

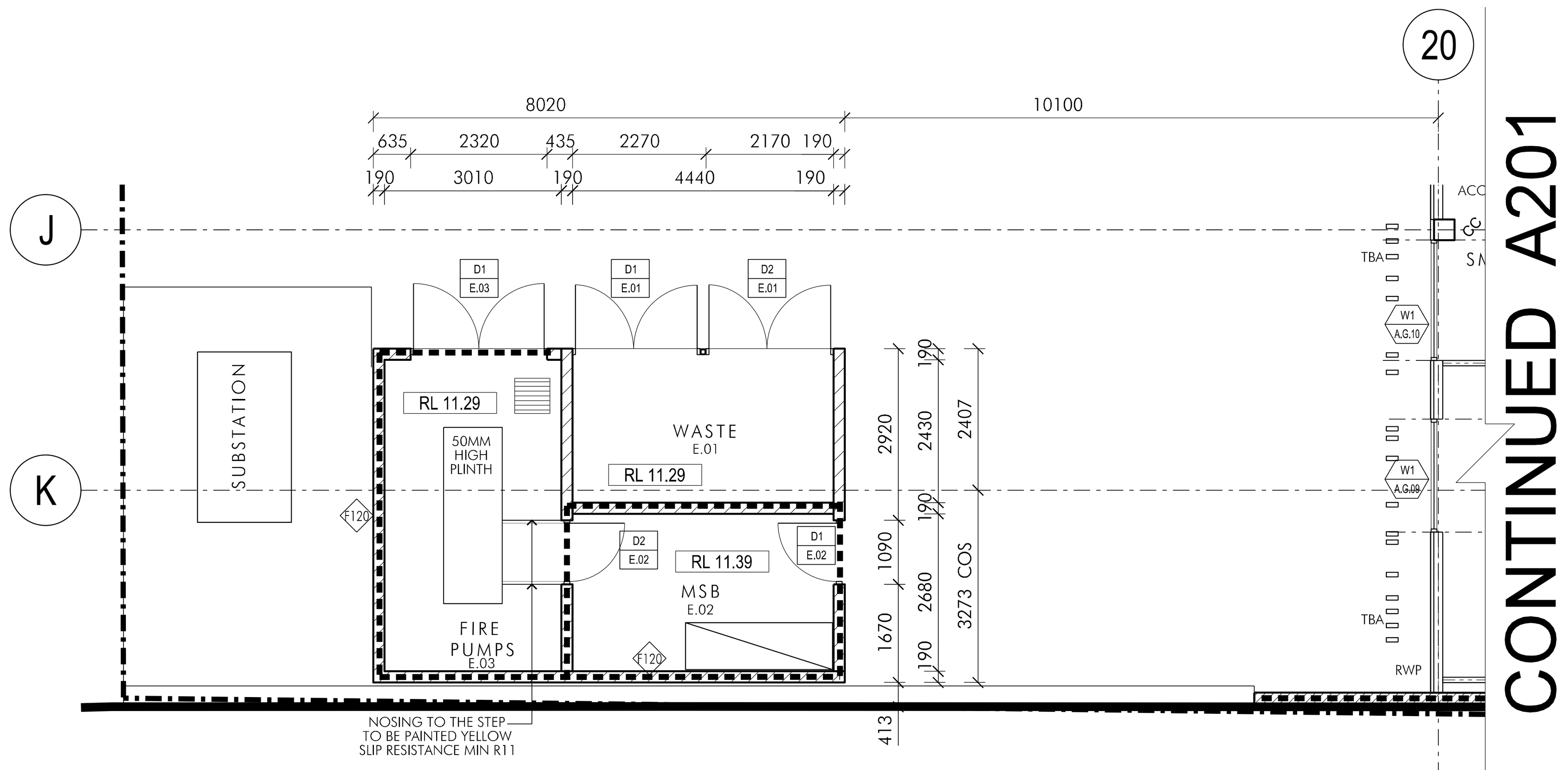
CONTRACT NUMBER 15xxxx

SHEET NO A301

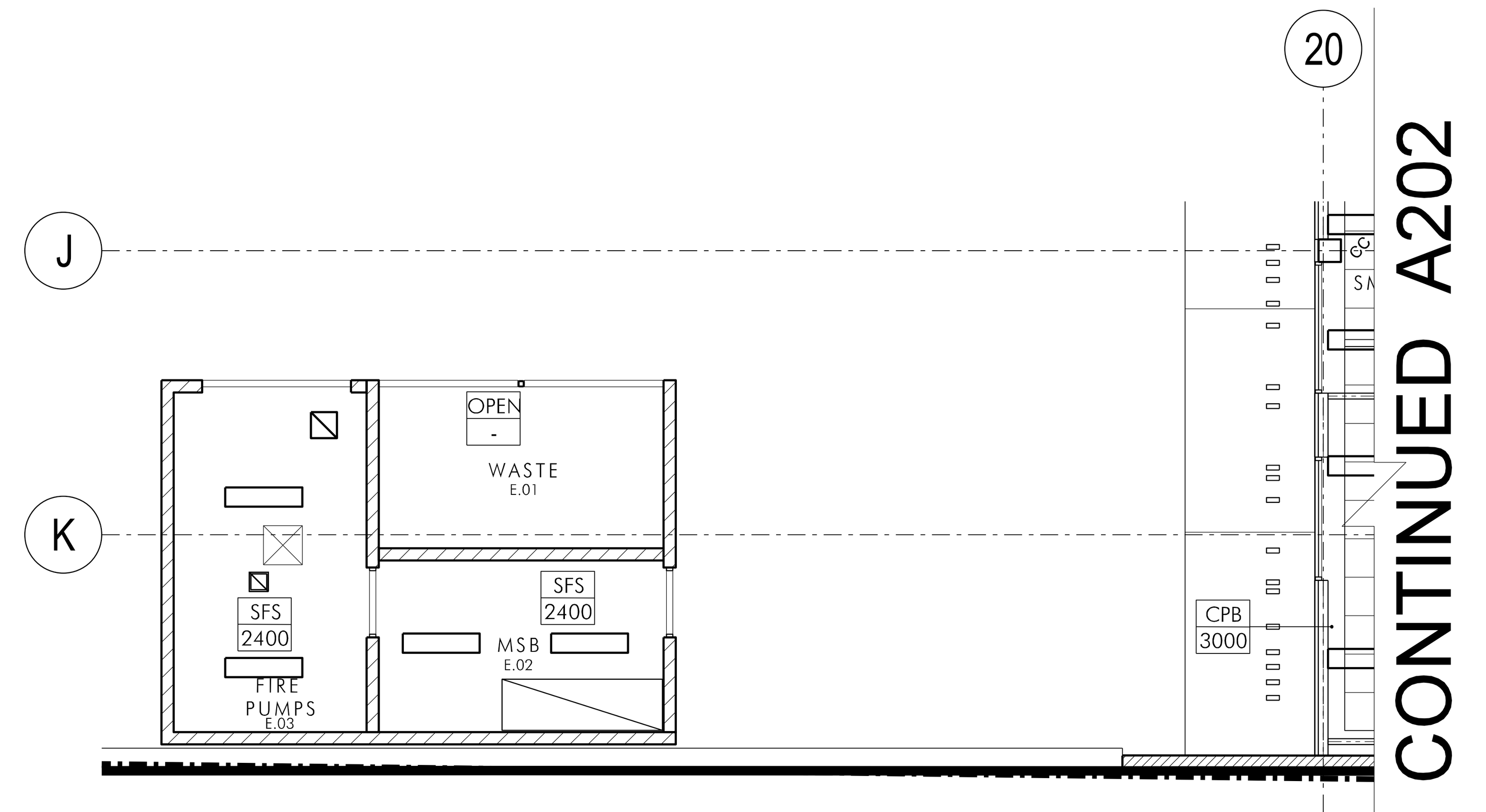
REVISION

A1 0 10 20 30 40 50 60 70 80 90 100 USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING CHECK ALL DIMENSIONS ON SITE 200MM 300MM ON ORIGINAL

1/05/2015 4:32:13 PM J:\15\1500\...Lucas Gardens SSP\10-Drawings\10.04 CV-A301_SSP_LUC_ELEC21.PLT $MODEL James



BLOCK E
GROUND FLOOR PLAN
03 SCALE 1:100

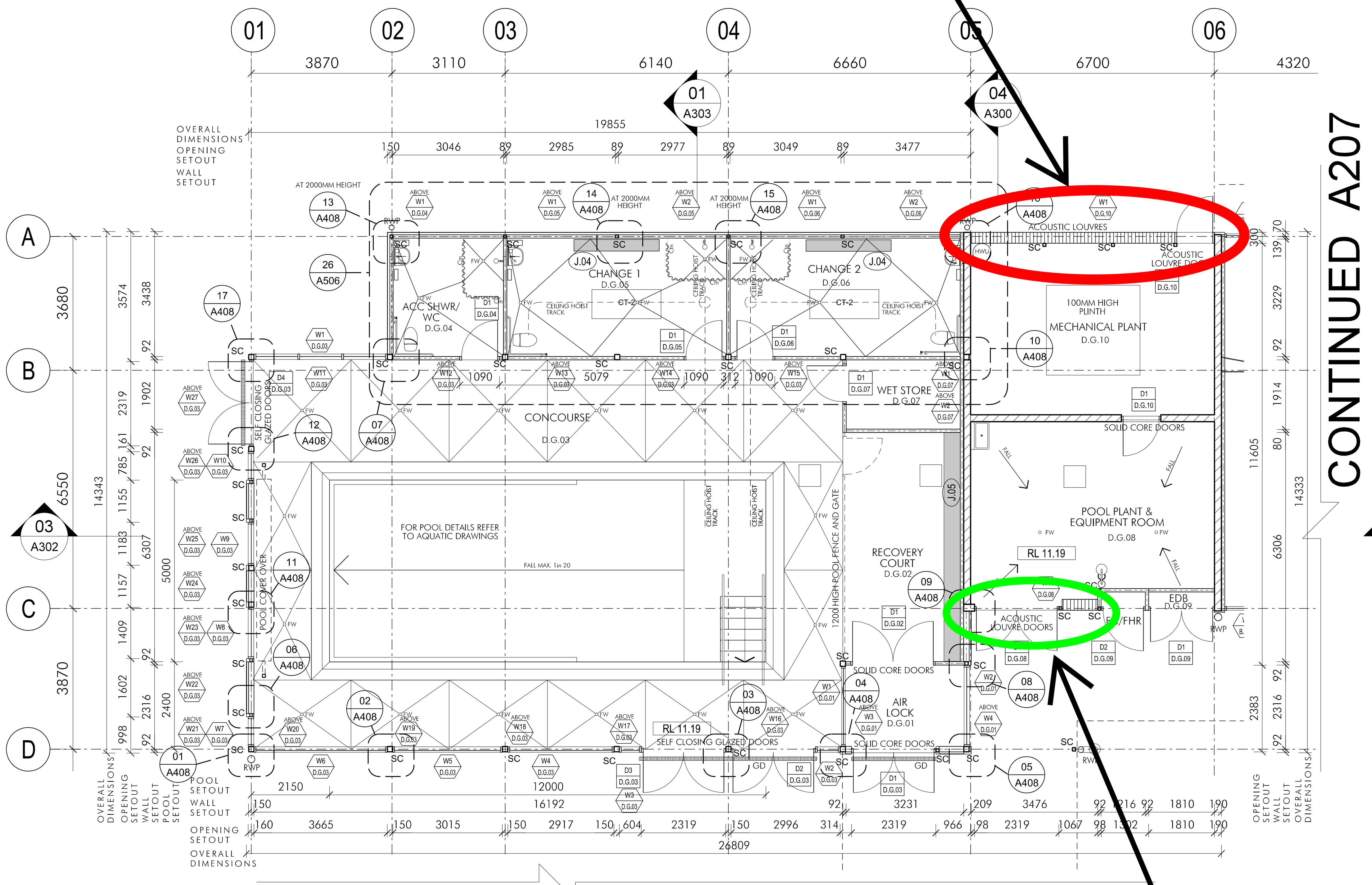


BLOCK E
GROUND FLOOR RCP PLAN
04 SCALE 1:100

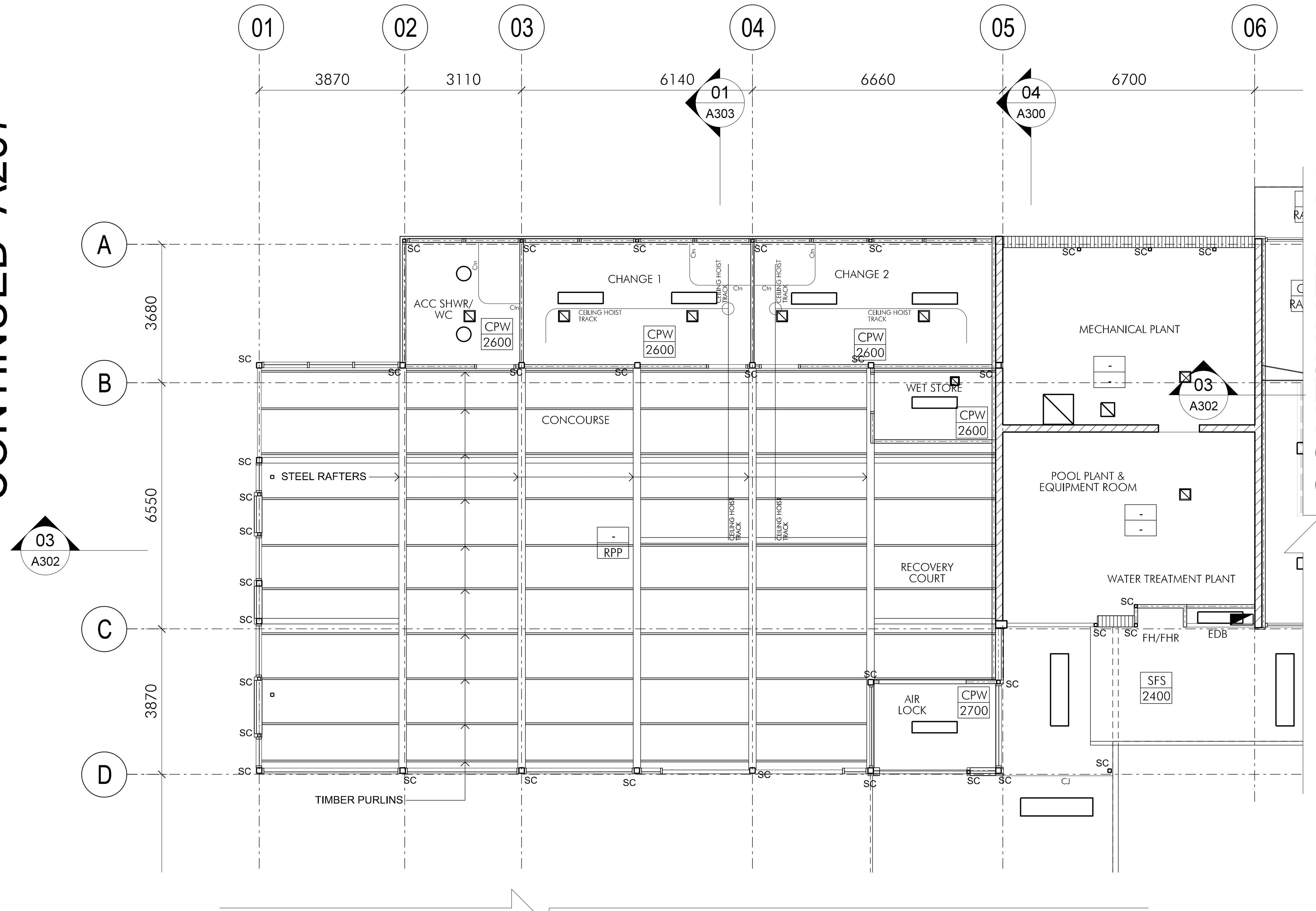
WALL TYPES:
ALL WALLS MUST HAVE INTERNAL LINING AS SHOWN
ALL WALLS MUST HAVE A Rw RATING OF 42 U.N.O.
AND EXTEND TO CEILING HEIGHT
ALL FIRE RATED WALLS TO BE FROM FLOOR TO U/S OF STRUCTURE OR ROOF SHEETING ABOVE

LEGEND:

Refer to Table 14 for Insertion Loss Specifications

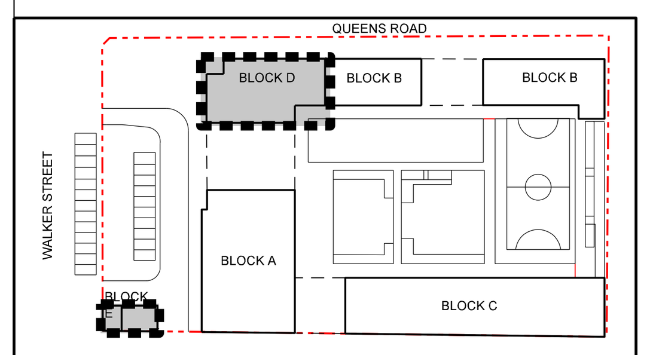


BLOCK D
GROUND FLOOR PLAN
01 SCALE 1:100



BLOCK D
GROUND FLOOR RCP PLAN
02 SCALE 1:100

Refer to Table 15 for Insertion Loss Specifications



SITE KEY PLAN
N.T.S.

LUCAS GARDENS SCHOOL

BLOCK D, BLOCK E
FLOOR PLAN AND
REFLECTED CEILING PLAN

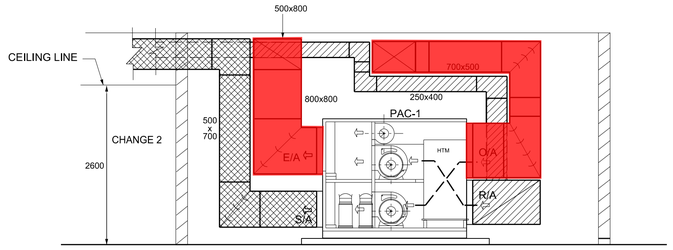
Public Works
Government Architect's Office

NSW Education & Communities

CONTRACT NUMBER	SCALES	SHEET NO	DESIGNED	PLOT DATE	DRAFTED	VERIFIED
1500322	1:100 @ A1	A213	CS	3/06/2015	GAO/SARM	GAO/SARM

ISS	DATE	COMMENT
	29-5-2015	TENDER ISSUE

USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING. CHECK ALL DIMENSIONS ON SITE



SECTION A
SCALE 1:50

DUCTWORK LAYOUT - BLOCK D
SCALE 1:100

Acoustic Treatment Legend:

75 mm Thick Acoustic Lining

1 The Government Architect's Office, a division of the Department of Finance & Services (the Department) shall not be liable or responsible for any loss or damage arising out of the conversion of any electronic document, data or program to any other format or medium, or arising out of any modification or changes that occur in the handling or use of the electronic document, data or program.

2 The recipient or user of any electronic document, data or program is solely responsible for ascertaining its accuracy and its suitability for their purposes.

3 The Department uses virus scanning software to prevent file and system virus attacks but gives no warranty. The recipient or user is solely responsible for their own virus protection.

REVISION		
ISS	DATE	COMMENT
	29-5-2015	TENDER ISSUE

STRUCTURAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8227 F 9372 8399

CIVIL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8230 F 9372 8399

ELECTRICAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8253 F 9372 8133

MECHANICAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8253 F 9372 8133

HYDRAULIC
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8262 F 9372 8133

LANDSCAPE
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8428 F 9372 8444

ARCHITECTURAL
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8411 F 9372 8399

SARM ARCHITECTS
Documentation architects
T 9922 2799 F 9922 2755

SUBSTATION
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8511 F 9372 8444

POOL
GEOFF NINNES, FONG 7 PARTNERS
T 333 5100 F 9331 2963

QUANTITY SURVEYOR
GOVERNMENT ARCHITECT'S OFFICE
T 9372 8511 F 9372 8413

PROJECT MANAGEMENT
PROJECT MANAGEMENT GROUP
T 9372 8558 F 9372 8566

NSW GOVERNMENT
Public Works
Government Architect's Office

PETER POULET
NSW Government Architect
Nominated Architect: ARN 5754
Level 18 McKell Building, 2-24 Rawson Place
Sydney NSW 2000 AUSTRALIA

A division of the Office of Finance & Services

SIMON SMITH
Chief Executive

MANAGER ENGINEERING

NSW GOVERNMENT Education & Communities

LUCAS GARDENS SCHOOL

MECHANICAL SERVICES
BLOCK D - HYDROTHERAPY POOL
DUCTWORK LAYOUT

PLAN RM NO	
CONTRACT NUMBER	1500322
SCALES	1:50, 1:100 @ A1
SHEET NO	M07
DESIGNED	B.Nguyen
PLOT DATE	27/05/2015
DRAFTED	B.Nguyen
VERIFIED	J.Smith
REVISION	

A1 0 10 20 30 40 50 60 70 80 90 100
USE FIGURED DIMENSIONS IN PREFERENCE TO SCALING
CHECK ALL DIMENSIONS ON SITE
200MM
300MM ON ORIGINAL

Sound Bar Louvre – SBL1

Detailed Information - SBL1

Width Range	Height Range	Length [mm]	dB(A) reduction	Weight [per m^2 face area] [Kg]
200- 2400	500 - 2250	300	12	47

Insertion Loss - SBL1

63	125	250	500	1000	2000	4000	8000
4	7	9	13	14	12	12	8

Features

In modern buildings there is an increasing need to provide large air flow openings for plant and equipment, whilst minimising noise impact effects on the environment.

The Q-Tech range of aesthetically-designed acoustic weatherproof louvres not only acts as an efficient sound barrier, but also permits the accurate prediction of the corresponding resistance to air flow. This enables the designer to confidently match the louvre size precisely to the building plant's needs.

Two models are available in the range, designated SBL1 (300mm deep) for standard applications and SBL2 (600mm deep) for more demanding applications. These units are available in standard module height increments of 250mm, up to a single module size of 2400mm wide and 2250mm high. The design of the louvre profile ensures a high level of sight-proofness and an aesthetically-pleasing view from below.

Larger opening sizes are catered for by the use of a number of individual modules, site-assembled. This results in simpler site handling and a reduced risk of site damage. Should architectural form require special shapes or sizes please contact your Q-Tech distributor for assistance.

Acoustic Performance

The acoustic performance of the SOUND BAR acoustic louvre range is based on tests conducted in Australia in accordance with AS1191:1985. The Standard requires the test louvre to be placed in a partition wall dividing two suitably sized reverberation rooms. This test Standard determines the 'Sound Transmission Loss' which is the ratio of the sound power incident onto the louvre to the sound power transmitted through the louvre.

The transmission loss is numerically equal to the 'Insertion Loss' and can be applied in a similar fashion.

It has become common practice to report the performance of acoustic louvres in terms of 'Noise Reduction'. This is the difference in sound pressure levels between a reverberant room and the free field. The numerical difference between 'Sound Transmission Loss' and 'Noise Reduction' is 6dB.

For convenience the performance data has been quoted as 'Noise Reduction' in bold, with 'Sound Transmission Loss' in smaller type below.

The performance data is based on tests conducted in Australia using Australian-sourced and manufactured materials.

Aerodynamic Performance

The aerodynamic performance of the SOUND BAR acoustic louvre range is based on tests conducted by the CSIRO. These test results were obtained by carrying out a Type A test (open inlet and open outlet) on their air flow test facility conforming to BS848:Part 1, 1980.

Figure 2. details the resistance to air flow for both SBL1 and SBL2 louvres. This data is based on an open inlet and open discharge situation as would be found in a typical plant room application. The pressure loss is not only affected by the area of the louvre, but also by the louvre height. A 500mm high louvre will have a much higher flow resistance than a 2250mm high louvre for the same face velocity.

When bird mesh is used the pressure loss increases by 2%.

Construction

The standard SBL1 Sound Bar acoustic louvre construction consists of a 1.2mm thick galvabond case with a return fold all around to increase unit rigidity. The 300mm deep louvre is manufactured from galvabond and filled with acoustic infill.

	The SBL2 unit is similar in construction, but also includes an additional 300mm deep module supplied separately. Each splitter is filled with sound-absorbing material. The infill material is covered with gauze scrim to prevent erosion of the fibres and then encased in perforated metal to enhance the acoustic performance and to prevent mechanical damage. The Sound Bar louvre range can be manufactured from aluminium or anodised aluminium on request. It is important to consider whether full aluminium construction (including perforated metal) or partial aluminium (externally-visible sections only) is required. Q Seal lining of the infill material can also be provided to suit applications where regular washing of the perforated metal surfaces may be necessary or where contaminants are present, such as oils, etc. Note, the use of an impervious lining will impact on the acoustic performance of the Sound Bar Louvres. Other finishes such as stainless steel are available on request.

Sound Bar Louvre – SBL2

Detailed Information - SBL2

Width Range	Height Range	Length [mm]	dB(A) reduction	Weight [per m^2 face area] [Kg]
200- 2400	500 - 2250	600	20	87

Insertion Loss - SBL2

63	125	250	500	1000	2000	4000	8000
5	10	14	22	27	25	21	17

Features

In modern buildings there is an increasing need to provide large air flow openings for plant and equipment, whilst minimising noise impact effects on the environment.

The Q-Tech range of aesthetically-designed acoustic weatherproof louvres not only acts as an efficient sound barrier, but also permits the accurate prediction of the corresponding resistance to air flow. This enables the designer to confidently match the louvre size precisely to the building plant's needs.

Two models are available in the range, designated SBL1 (300mm deep) for standard applications and SBL2 (600mm deep) for more demanding applications. These units are available in standard module height increments of 250mm, up to a single module size of 2400mm wide and 2250mm high. The design of the louvre profile ensures a high level of sight-proofness and an aesthetically-pleasing view from below.

Larger opening sizes are catered for by the use of a number of individual modules, site-assembled. This results in simpler site handling and a reduced risk of site damage. Should architectural form require special shapes or sizes please contact your Q-Tech distributor for assistance.

Acoustic Performance

The acoustic performance of the SOUND BAR acoustic louvre range is based on tests conducted in Australia in accordance with AS1191:1985. The Standard requires the test louvre to be placed in a partition wall dividing two suitably sized reverberation rooms. This test Standard determines the 'Sound Transmission Loss' which is the ratio of the sound power incident onto the louvre to the sound power transmitted through the louvre.

The transmission loss is numerically equal to the 'Insertion Loss' and can be applied in a similar fashion.

It has become common practice to report the performance of acoustic louvres in terms of 'Noise Reduction'. This is the difference in sound pressure levels between a reverberant room and the free field. The numerical difference between 'Sound Transmission Loss' and 'Noise Reduction' is 6dB.

For convenience the performance data has been quoted as 'Noise Reduction' in bold, with 'Sound Transmission Loss' in smaller type below.

The performance data is based on tests conducted in Australia using Australian-sourced and manufactured materials.

Aerodynamic Performance

The aerodynamic performance of the SOUND BAR acoustic louvre range is based on tests conducted by the CSIRO. These test results were obtained by carrying out a Type A test (open inlet and open outlet) on their air flow test facility conforming to BS848:Part 1, 1980.

Figure 2. details the resistance to air flow for both SBL1 and SBL2 louvres. This data is based on an open inlet and open discharge situation as would be found in a typical plant room application. The pressure loss is not only affected by the area of the louvre, but also by the louvre height. A 500mm high louvre will have a much higher flow resistance than a 2250mm high louvre for the same face velocity.

When bird mesh is used the pressure loss increases by 2%.

Construction

The standard SBL1 Sound Bar acoustic louvre construction consists of a 1.2mm thick galvabond case with a return fold all around to increase unit rigidity. The 300mm deep louvre is manufactured from galvabond and filled with acoustic infill.

The SBL2 unit is similar in construction, but also includes an additional 300mm deep module supplied separately. Each splitter is filled with sound-absorbing material.

The infill material is covered with gauze scrim to prevent erosion of the fibres and then encased in perforated metal to enhance the acoustic performance and to prevent mechanical damage.

The Sound Bar louvre range can be manufactured from aluminium or anodised aluminium on request. It is important to consider whether full aluminium construction (including perforated metal) or partial aluminium (externally-visible sections only) is required.

Q Seal lining of the infill material can also be provided to suit applications where regular washing of the perforated metal surfaces may be necessary or where contaminants are present, such as oils, etc. Note, the use of an impervious lining will impact on the acoustic performance of the Sound Bar Louvres.

Other finishes such as stainless steel are available on request.