Canterbury South Public School

Environmental Noise Impact Assessment

S17560RP7 Revision E

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Resonate

Document Information

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Revision Table

Report revision	Date	Description	Author	Reviewer
0	20/12/2019	Draft	Sam Johnson	Elle Hewett
A	22/04/2020	Issue – Updated for no. of students and kiss-and-drop assessment	Elle Hewett	Raymond Sim
B	3/07/2020	Minor changes of description, result summary and conclusion	Elle Hewett	Raymond Sim
C	25/09/2020	Updated figures and noise emission assessment	Sam Johnson	Raymond Sim
D	29/09/2020	Minor amendments	Sam Johnson	Raymond Sim
E	01/10/2020	Kiss-and-drop traffic assumptions amended	Sam Johnson	Raymond Sim

Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Daytime	Between 7 am and 6 pm as defined in the NPI.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound level as a doubling of loudness.
dB(A)	'A' Weighted sound level in dB.
Evening	Between 6 pm and 10 pm as defined in the NPI.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second. The human ear responds to sound in the frequency range of 20 to 20,000 Hz.
NPI	New South Wales Noise Policy for Industry, 2017.
Intrusive Noise	Noise emission that when assessed at a noise-sensitive receiver (principally the boundary of a residence) is greater than 5 dB(A) above the background noise level.
L_{10}	Noise level exceeded for 10% of the measurement time. The L_{10} level is commonly referred to as the average maximum noise level.
L_{90}	Noise level exceeded for 90% of the measurement time. The L90 level is commonly referred to as the background noise level.
L_{eq}	Equivalent Noise Level—Energy averaged noise level over the measurement time.
L_{max}	Maximum measured sound pressure level in the time period.
Night-time	Between 10 pm on one day and 7 am on the following day as defined in the NPI.
Rating Background Level (RBL)	Overall single-figure A-weighted background level representing an assessment period (Day/Evening/Night). For the short-term method, the RBL is simply the measured $L_{90,15min}$ noise level. For the long-term method, it is the median value of all measured background levels during the relevant assessment period.

Resonate

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1 Introduction

Resonate Consultants has been engaged by NBRS Architecture to undertake an environmental noise assessment for the redevelopment of Canterbury South Public School.

The environmental noise assessment is to assist a Development Application (DA) to assess the potential acoustic impacts of the increase in pupil numbers in relation to play areas and kiss-and-drop traffic scheme, proposed mechanical plant and operational noise upon the surrounding environment. This report will address specifically operational noise requirements of Block C. This acoustic assessment has been conducted in accordance with the requirements of the NSW EPA *Noise Policy for Industry* (NPI, 2017).

The principal purpose of this commission and report is to:

- measure and document prevailing environmental noise;
- determine appropriate project specific noise trigger levels and acoustic criteria for nearby noise sensitive receivers;
- predict noise emission from outdoor mechanical plant and noise associated with the development to nearby noise sensitive receivers;
- predict noise emission from the school outside play areas and proposed kiss-and-drop traffic areas, and
- assess the predicted noise emissions against industry standard noise criteria.

This acoustic assessment has been conducted in accordance with the requirements of the NSW EPA *Noise Policy for Industry* (NPI, 2017). Unattended and attended noise monitoring was conducted by Resonate Consultants between 17 October to 25 October 2019 to obtain the existing ambient noise levels in the area, and this data has been used to inform this assessment.

2 Project description

The site is located at 20 High Street, Canterbury with residential receivers to the north, south and west of the school and shared public recreation area to the east. Block C specifically is located on the southern boundary of the site with the most affected residential receivers being 22-24 High Street to the west and 1-19 Napier Street to the south. This is shown in Figure 1.

Figure 1 Site map

The school currently caters for 252 pupils; however, the proposed development includes the removal of existing school buildings and a new design to cater for up to 690 children across 30 classrooms, and new core facilities for years K-6. The redevelopment will include interactive and flexible learning spaces and outdoor areas.

3 Existing Acoustic Environment

Noise monitoring was conducted during the period 1 November to 10 November, 2019 on the site. Noise monitoring was set up to measure background and ambient noise of the most affected residential receivers at a representative location. Unattended measurements were undertaken to determine the existing acoustic environment of the nearby sensitive receivers, as shown on Figure 1.

Table 1 presents the Rating Background Level (RBL) and ambient L_{Aeq} noise level for the surrounding environment. These noise levels were used to determine the relevant noise criteria in accordance with the NPI.

Table 1 Measured noise levels at noise logging location

Description	Noise Level (dB(A)) during Period		
	Daytime 07:00 – 18:00	Evening 18:00 – 22:00	Night-time 22:00 – 07:00
Rating Background Level (L_{A90})	41	39	33
Ambient Noise Level (L_{Aeq})	65	50	48

A detailed summary of the noise survey is provided in Appendix A and daily noise logging graphs are presented in Appendix C.

3.1 Equipment

Noise logging was conducted using a Rion NL-42 sound level meter. Field calibration was conducted at the commencement and conclusion of the logging period and no significant calibration drift was observed. The noise logger was configured to record all relevant noise indices, including background noise level (L_{A90}) and equivalent continuous noise levels (L_{Aeq}). Samples were accumulated at 15-minute intervals. The time response of the logger was set to 'fast'. The noise measurements were taken in general accordance with AS1055[1].

[1] AS 1055:2018 Australian Standard - Description and measurement of environmental noise

4 Acoustic Criteria

4.1 Noise Policy for Industry (NPI)

Noise emissions from the site when operational should comply with the requirements of the NSW *Noise Policy for Industry* (NPI).

The NPI sets two separate noise criteria to meet desirable environmental outcomes:

- Intrusiveness – steady-state noise from the site should be controlled to no more than 5 dB(A) above the background noise level in the area. In this case, the steady-state L_{eq} noise level should not exceed the background noise level measured for different time periods in the environment.
- Amenity – amenity criteria are set based on the land use of an area. It requires noise levels from new industrial noise sources to consider the existing industrial noise level such that the cumulative effect of multiple sources does not produce noise levels that would significant exceed the amenity criteria.

Based upon an unattended noise survey summarised in Appendix A, the project specific noise criteria for nearby residential receivers are provided in Table 2.

Table 2 Project specific noise emission criteria – residential receivers

Location	Noise Emission Criteria (dB L_{Aeq})		
	Daytime 07:00 – 18:00	**Evening 18:00 – 22:00**	**Night-time 22:00 – 07:00**
Nearby residential premises	46	44	38

Refer to Appendix B for further information on the derivation of the noise emission criteria.

4.2 NSW Road Noise Policy

The *NSW Road Noise Policy: 2011* (RNP), provides criteria for existing residences affected by noise from redevelopment of existing local roads, as follows:

- Local Roads – Existing residences affected by noise from redevelopment of existing local roads:
  - Day 07:00 – 22:00 $L_{Aeq\ 1\ hour}$ 55dB (external)
  - Night 22:00 – 07:00 $L_{Aeq\ 1\ hour}$ 50dB (external)

This is to be applied to the Kiss-and-Drop transport scheme.

5 Noise Impact Assessment

Noise emission predictions from the operation of Block C were calculated to the sensitive receivers at 22 – 24 High Street, and 11 Napier Street, shown in Figure 1. Noise emissions were predicted using the acoustic calculation software *Ping.Calculation*, which implements acoustic principles and formulas. The results of the predictions are presented below in Table 3, Table 4 and

Table 6.

The main contributors to operational noise which will be assessed in this report are from the following sources:

- Public Address (PA) system and school bells
- Mechanical services noise emission
- School outside playground
- School kiss-and-drop areas on France and Napier Streets.

5.1 PA system and school bell

Announcements and school bells are typical activities associated with school operations. Typically, these are produced by the school PA system and can vary significantly depending on the final volume settings of the system. At this stage, the full design of the PA system has not been determined. Loudspeakers are located internally and external to the building. See Figure 2, Table 3, and Figure 4 below for currently proposed locations. External loudspeakers/bells are indicated with blue circles and internal bells are in yellow.

The external PA speakers are located on the Northern wall aimed towards the external walkway and New Town Square. This orientation means that the building will shelter the nearest residents from direct noise and be an acoustic advantage.

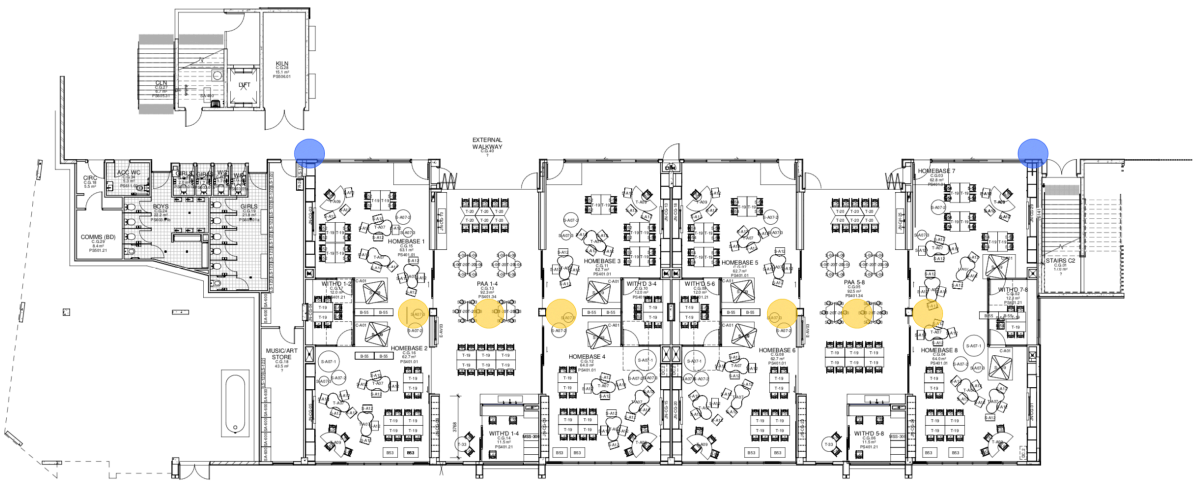


Figure 2 Loudspeaker locations ground floor

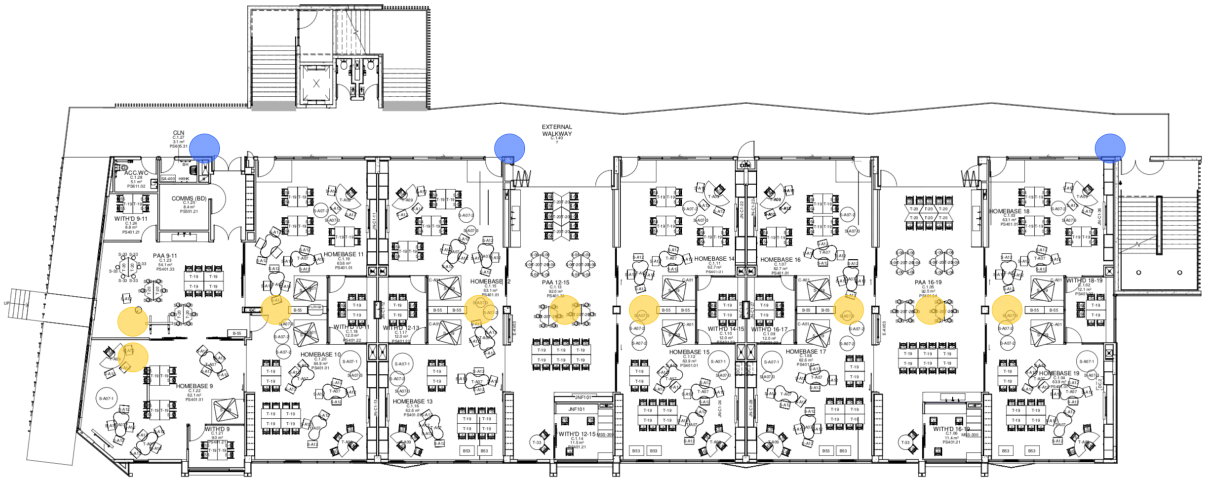


Figure 3 Loudspeaker locations level 1

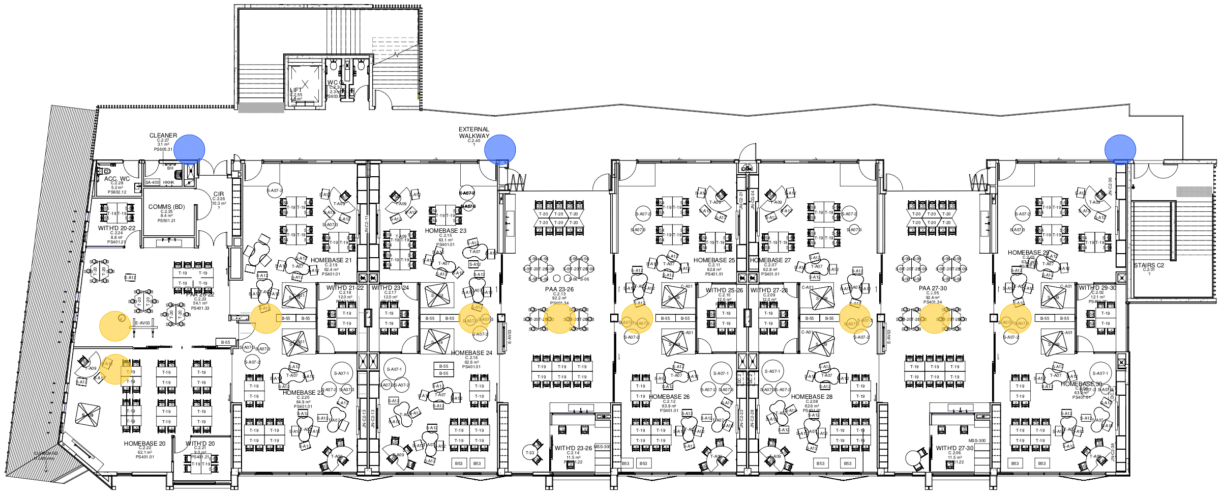


Figure 4 Loudspeaker locations level 2

The following measures should be adopted to ensure that their impact at all surrounding residences is minimised:

- Loudspeakers should be located and orientated to provide good coverage of the school areas while being directed away from residences. The coverage of the system should be subject of the detail design of the sound system.
- The volume of the system should be adjusted on site so that announcements and bells are clearly audible on the school site without being excessive. The system should initially be set so that noise at surrounding residences does not exceed the ambient noise levels by more than 5 dB(A).
- Once the appropriate level has been determined on site, the system should be limited to the acceptable level so that staff cannot increase noise levels. A sound level limiting circuit is an option to be incorporated in the amplifier to control the signal amplitude to a fixed level, regardless of the loudness of the operator's voice.
- Loudspeakers should be small, low-power units located in areas close to the listener position. It is recommended to have a higher number of smaller loudspeakers distributed to be close to the listeners rather than fewer more powerful loudspeakers that are required to project the sound over large distances to reach the listeners.

- The system bell should be set so that it only occurs on school days i.e. not after school hours or weekends, when the school grounds may be in use by the community.

5.2 External Mechanical plant

Rooftop mechanical plant servicing Block C is housed in an enclosure and is shown in context in Figure 5 below. The enclosure has full height walls facing residential receivers with some solid barrier screening behind battens facing toward the school grounds.

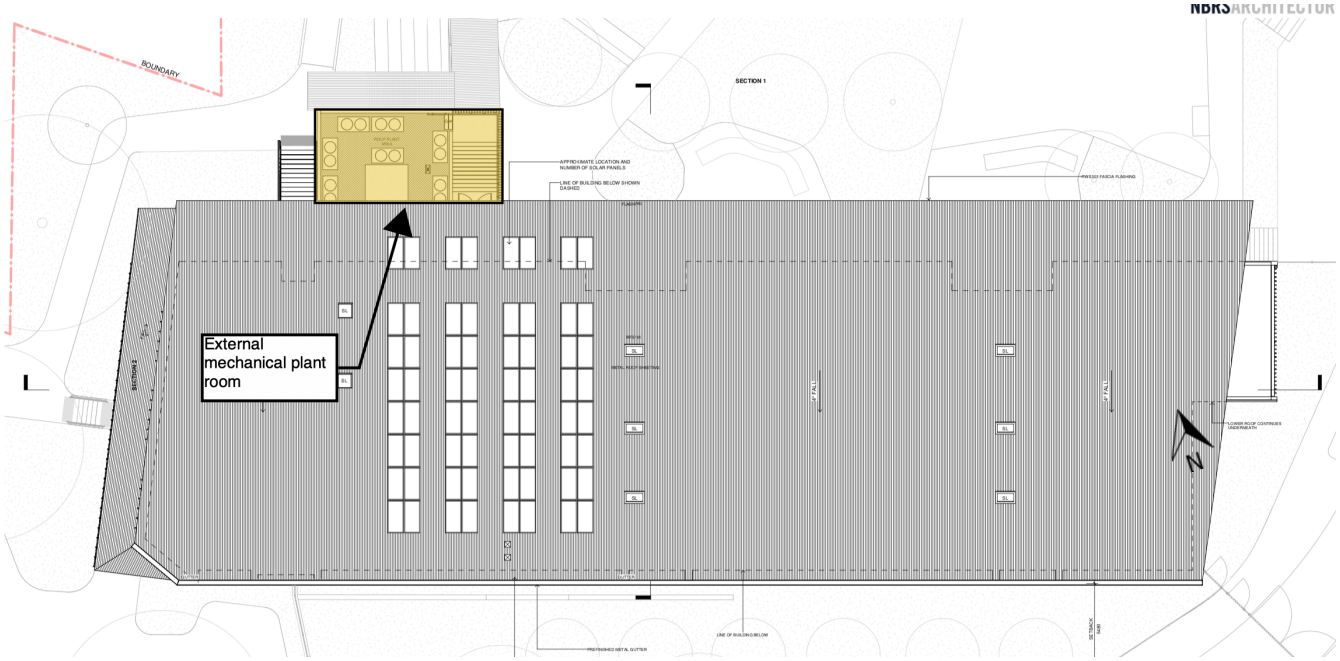


Figure 5 Proposed location of roof mounted mechanical services – Block C

It is our understanding the following recommendations have been adopted into the design, and have therefore, been assumed in this noise assessment:

- Close the gap between the southern plant room wall and the under-side of the roof.
- All walls surrounding the plant room are to be solid, (this may mean installing a barrier behind the battens) and are to extend above the height of the condenser units by at least 100mm.
- Installing a solid barrier and door to the plant room at the top of the stairs to minimise noise down the stairs into the walkway.
- Figure 6 and Figure 7 present details and sections of the plant room.

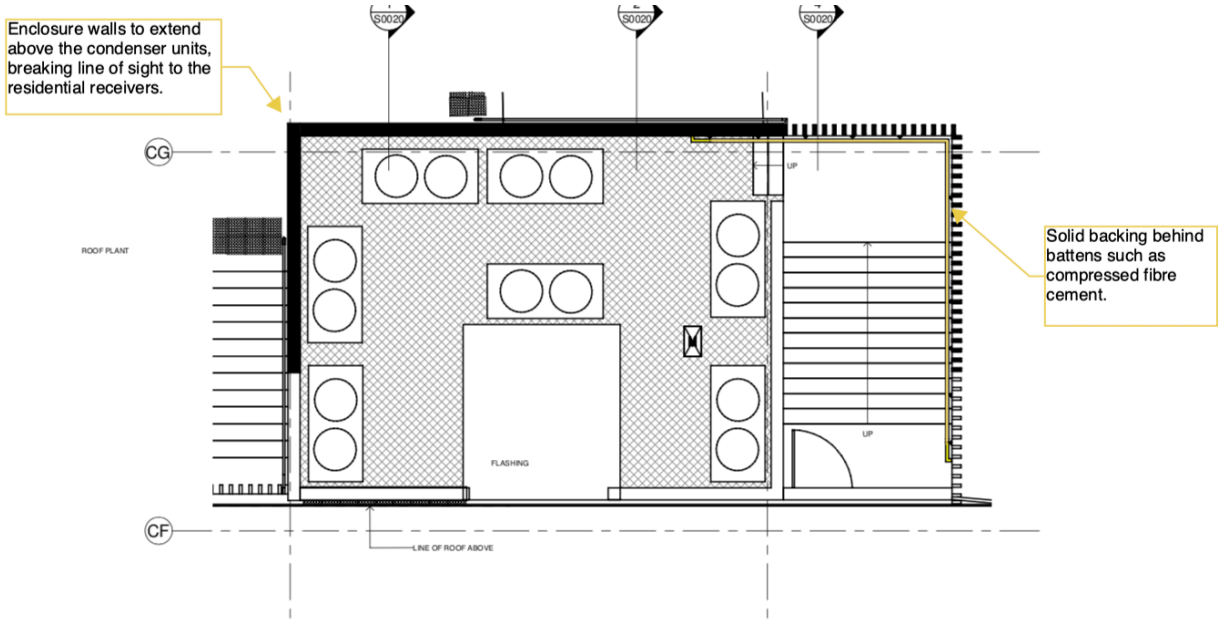


Figure 6 Block C mechanical plant room acoustic requirements

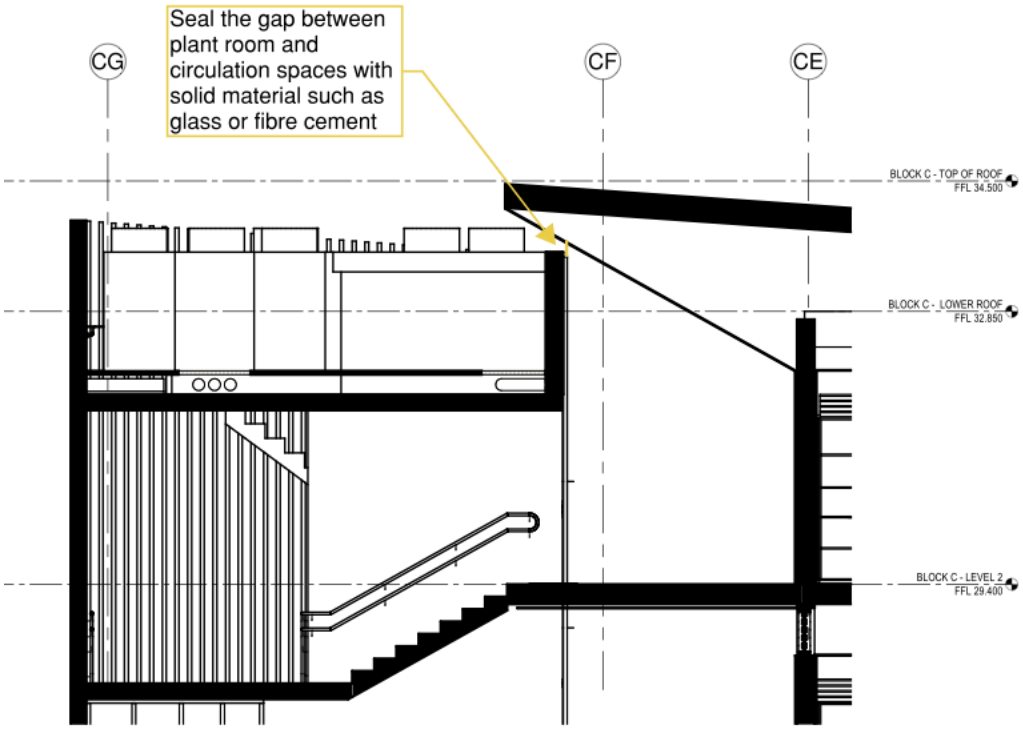


Figure 7 Section view of Block C mechanical plant room acoustic requirements

Noise emissions from the condenser units were calculated to the most affected receivers, being 7 to 19 Napier Street located (Figure 1) to the south and 22-24 High Street to the north west. The predictions adopt the following assumptions:

- The above recommendations are implemented
- The minimum distance between the plant room and residential receivers on High Street is 8 m
- The minimum distance between the plant room and residential receivers on Napier Street is 50 m
- The mechanical plant has no direct line of sight to the residential receiver's due to the recessed location of the plant room and the barrier effect of the roof.
- It is assumed that the mechanical services will not be operational during the night time period (10pm to 7am)

Provided the above assumptions of noise emission not altered during the detailed design phase, the predicted noise levels at the most affected receivers are presented in Table 3. No exceedance of the NPI criteria are expected.

Table 3 Predicted operational noise levels

Receiver	Predicted noise level at receiver locations dB(A)	Criteria dB(A)		*Compliance Achieved* ✓ / ✗
		Daytime	Evening	
High Street	42	46	44	✓
Napier Street	28			✓

5.3 School outside play area

The school currently caters for 252 pupils and this is proposed to increase to a maximum of 690. These pupils will, as a worst-case scenario play outside during the school breaks including morning, lunchtime and afternoon. The school play areas are located in the New Green Square located between blocks A, B and C and the covered outdoor leaning area (COLA) to the south of Block B and east of Block A. An existing timber decking play area, which will be retained is located to the west of Block A (Figure 8). The presence of Blocks A, B and C provide some significant acoustic shielding to residential noise sensitive receivers from these play areas.

The nearest residential noise sensitive receivers to the outdoor play areas are as follows:

- Receiver 1: 11 Rome Street
- Receiver 2: 22 and 24 High Street
- Receiver 3: 1-19 Napier Street

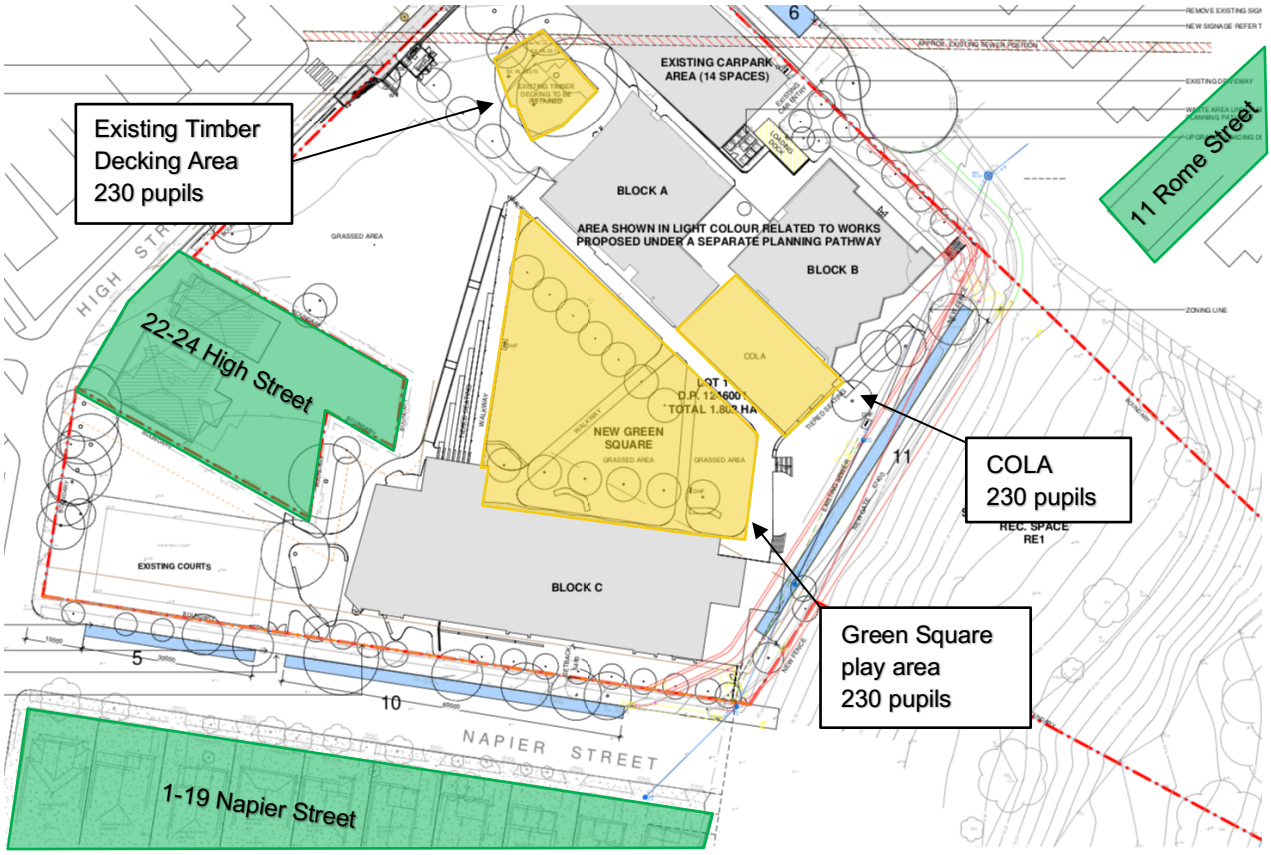


Figure 8 School play areas in relation to noise sensitive receivers

Noise predictions from pupils using playgrounds during breaks have been made at the boundaries of the residential noise sensitive receivers shown above.

The predictions include the following assumptions:

- Up to 690 pupils could be using the combined new Green Square and COLA areas, and the existing timber decking area to the west of the administration building during breaks such as lunchtime.
- This covers a significant area and locations with varying degrees of shielding by buildings and the roof of the COLA. Therefore, the 690 pupils have been split up into three groups of 230 as shown in Figure 8 above to represent the spread. However, it is unlikely that these numbers of pupils will all be playing in the same location. There will likely be small pockets of pupils scattered over a much larger area. Nevertheless, this split is considered conservative and appropriate for this assessment.
- Distance and shielding from fences or structures of buildings have been considered in the assessment.

5.3.1 Noise predictions results

The predicted noise levels at the most affected receivers are presented in Table 4.

Table 4 Predicted noise levels from playground areas versus NPI criteria

Receiver	Predicted External Noise Level dB(A) combined from all three areas	Daytime NPI criterion (07:00 to 18:00)
		46 dB $L_{Aeq,15min}$
11 Rome Street	43	✓
22-24 High Street	46	✓
5 Napier St	40	✓

Table 4 shows that the noise criteria is met at the most sensitive noise sensitive receivers during the day when the play areas will be in use. It should be noted that Blocks A, B and C all provide beneficial acoustic shielding surrounding residential receivers to the school

The existing courts are not expected to have any additional impact on existing use and therefore, associated noise levels as a result of the increase in pupils. This is because the courts are limited in how many pupils can use them at once.

The existing timber decking play area to be retained will not increase in size and therefore, is not expected to receive an increase in the number of pupils playing in this area. Therefore, the existing noise levels at break times are not expected to increase resulting in no increase in any existing noise impact.

5.4 Kiss-and-Drop traffic assessment

Following the publication of the *Canterbury South Public School Rapid Transport Assessment Report, Dated: 14 August 2020* conducted by SCT Consulting, the school currently proposes that a Kiss-and-Drop system be adopted to cater for 60% of the school capacity as a base case and 45% as a stretch case.

This assessment will focus on the base case as it will entail a greater number of car movements and therefore a greater noise impact. Based on the Rapid Transport Assessment Report, the following assumptions are considered for the assessment:

5.4.1 Assumptions

Trip generation rates identified by Roads and Maritime Services Trip Generation Surveys Schools Analysis Report are 0.67 vehicles per hour per student in the AM peak and 0.53 in the PM peak for primary schools in a metropolitan area. With a total student population of 690 students, this would result in a total of 462 vehicle movements in the morning peak hour and 366 vehicle movements in the afternoon peak hour. In both peak periods, the directional split of traffic is within one percentage point of 50% inbound traffic and 50% outbound traffic, indicating that all traffic entering the site also leaves the site. This is consistent with traffic being almost exclusively for kiss and drop movements, so indicates that 231 vehicles and 183 vehicles would perform a drop off or pick up in the morning and afternoon peak, respectively.

The above scenario could be considered a worst case as numbers will likely be reduced in line with the recommendations of the proposed Green Travel Plan.

Proposed Kiss-and-Drop Zones

- **France Street** – Reconfiguration of exiting parking to have dedicated section to allow drop off/pickup, widen the turning circle, 2-5 min limit on parking in the hours before opening and closing of the school. Equates to 45m of Drop off space.
- **Napier Street** – Dedicated section to allow for drop off/pick up, 2-5 min limit on parking in the hours before opening and closing of the school. Equates to 90m of Drop off space.
- **New Kiss and Drop roadway on eastern boundary** – A new roadway to the east of the site has been proposed to connect France Street and Napier Street, and spread out kiss and drop activities. Dedicated section to allow for drop off/pick up, 2-5 min limit on parking in the hours before opening and closing of the school. Equates to 67m of Drop off space
- Equal activity has been assumed for all Kiss and Drop sites it has been assumed that cars will continue along the roadway and not turn around between 8:30am - 9:00am during the morning peak and 3:00pm - 3:30pm during the afternoon peak.
- This assessment is based on 231 vehicles in the morning peak and 183 vehicles in the afternoon peak. It is assumed that each vehicle enters and leaves the kiss and drop area.
- We have conservatively assumed that a three parking bays will directly affect each residence for car door closures and engine starts, as other bays further away will add little if any noise to individual residents, however, not all of cars will be at the closest location to the residents.
- Each Kiss-and-Drop trip is taken to consist of 2 car passby, 2 door closures and 1 ignition Table 5.
- No shielding or barrier effect has been considered, only the distance loss has been applied to the source noise level.
- Noise predictions are made at the boundary of the residential premises.

Table 5 shows typical Kiss-and-Drop noise sources used in this assessment.

Table 5 Typical car park noise sources measured at 1m

Noise source	Location	Duration	$L_{eq,T}$ dB	L_{AE}[1] dB	Assumed maximum events per 15 minutes	
					Residence opposite nearest three (3) parking spaces	
					France Street	Napier Street
Car door closure	1 metre from source	2	75	78	20	20
Car engine start/idling	1 metre from source	3	72	77	10	10
Car pass-by	1 metre from source	5	76	86	76	120

(1) L_{AE} is the sound energy for the $L_{eq,T}$ event compressed (normalised) into 1 second, referred to as the sound exposure level.

5.4.2 Noise prediction results

The *NSW Road Noise Policy: 2011* (RNP), provides criteria for existing residences affected by noise from redevelopment of existing local roads, as follows:

- Local Roads – Existing residences affected by noise from redevelopment of existing local roads:
  - Day 07:00 – 22:00 $L_{Aeq\ 1\ hour}$ 55dB (external)
  - Night 22:00 – 07:00 $L_{Aeq\ 1\ hour}$ 50dB (external)

The Kiss-and-Drop schemes propose some redevelopment of France and Napier Streets by providing improvements to allow for larger turning circles and car parking spaces along the roads. Therefore, the RNP criterion cited above is considered to be relevant and appropriate for assessing the Kiss-and-Drop noise emissions.

Table 6 Predicted Kiss-and-Drop noise levels at each nearest residential receivers against the NSW RNP

Receiver	Time period	Predicted External Noise Level $L_{eq,1\text{-hour}}$ dB(A) Base Case	Daytime RNP criterion (07:00 to 22:00) $L_{eq,1\text{-hour}}$ dB(A)	Compliance achieved
France Street Impacted Residents (Side 8 High St, Rear of 1,3,5 Rome St)	Morning peak	57	55	×
	Afternoon peak	56		×
1-19 Napier St	Morning peak	53		✓
	Afternoon peak	52		✓

Table 6 shows that when RNP criterion is applied which is assessed over an hour period the criterion is met at Napier Street and exceeds by 1-2 dB(A) at France Street. This is because of the proposed roadway increasing traffic on France Street. The presented scenario could be considered a worst-case scenario and could be revised pending the outcome of the mode share targets identified in the Green Travel Plan.

A 1-2 dB difference in noise levels is generally imperceptible by the human ear in the environment. Therefore, this can be considered as a marginal compliance. Strict compliance with the NSW RNP is expected to be met outside of the periods.

6 Conclusion

To support a Development Application for Canterbury South Public School's redevelopment, Resonate Consultants has conducted an environmental noise assessment to determine the potential for operational noise impact to the surrounding receivers, and prepared an acoustic report specifically addressing operational noise mitigation requirements for Block C, where required. Site-specific noise criteria have been established based on unattended and attended noise measurements conducted for this project, and in accordance with the requirements of the NSW *Noise Policy for Industry* (NPI).

Operational noise emissions associated with Block C including school bells and mechanical plant were predicted at the most affected receivers using the acoustic calculation software *Ping.Calculation*, which implements acoustic principles and formulas.

The predicted noise levels for the externally located mechanical plant have been shown to comply with the NPI acoustic criteria provided the recommendations for external plant detailed in Section 5.2 of this report are implemented.

Section 5.3 assesses the impact of noise from play areas based on the increased pupil numbers from 252 to 690. Due to existing fences and proposed structures of Blocks A, B and C the NPI noise criterion is predicted to be met at all receivers.

Section 5.4 assesses the proposed Kiss-and-Drop scheme located in France Street and Napier Street. When assessed against the NSW Road Noise Policy, Napier Street meets the relevant criterion, however France Street exceeds by 2 dB(A). That said, it is understood that there is a Green Travel Plan under preparation at the moment. The predicted scenario in this report could be considered conservative as the Green Travel Plan will likely reduce the number of car movements by encouraging the use of sustainable transport options such as public transport, walking and cycling.

Appendix A – Noise Survey

Unattended noise logging

Unattended background noise logging was conducted between Wednesday, 1st November 2017 and Friday, 10th November 2017. Noise surveys were conducted in accordance with the NSW Noise Policy for Industry NPI.

Equipment and set-up

A Rion NL-42 sound level meter was used. Field calibration was conducted at the commencement and conclusion of the logging period and no significant calibration drift was observed.

The noise logger was configured to record all relevant noise indices, including background noise level (L_{A90}) and equivalent continuous noise levels (L_{Aeq}). Samples were accumulated at 15-minute intervals. The time response of the logger was set to 'fast'.

The noise measurements were taken in general accordance with AS1055.1[2]

Weather conditions

It is a requirement that noise data is captured during periods of favourable weather conditions avoiding adverse impacts of wind and rain on background noise levels. In order to assess weather conditions for the measurement period, half-hourly weather data was obtained from the Bureau of Meteorology (BOM) Automatic Weather Station (AWS) 066194 at Canterbury Racecourse.

Noise data has been excluded from the processed results if:

- Rain was observed during a measurement period, and/or
- Wind speed exceeded 5 m/s (18 km/h) at the measurement height of 1.5 m above ground. Wind data obtained from the BOM is presented as the value at 10 m above ground.

The BOM wind speed data obtained for this report was measured at a height of 10 m above ground level. It is therefore necessary to apply a correction factor in order to estimate the wind speed at the height of the logger (1.5 m).

The methodology to formulate a correction factor has been derived[3]. The correction multiplier for the measured wind speed at 10 m is derived by the following formula:

$$W_{1.5} = W_{10} \times \left(\frac{M_{1.5,cat}}{M_{10,cat}} \right)$$

where:

$W_{1.5}$ = Wind speed at height of 1.5 m
W_{10} = Wind speed at height of 10 m
$M_{1.5,cat}$ = AS 1170 multiplier for receiver height of 1.5 m and terrain category
$W_{10,cat}$ = AS 1170 multiplier for receiver height of 10 m and terrain category

[2] Australian Standard AS1055.1 1997: Description and measurement of environmental noise – Part 1: General Procedures

[3] Gowen, T., Karantonis, P. & Rofail, T. (2004), *Converting Bureau of Meteorology wind speed data to local wind speeds at 1.5m above ground level*, Proceedings of ACOUSTICS 2004

Noise Policy for Industry

In order to determine mechanical services noise emission criteria, data from the unattended noise monitoring outlined in above was processed according to the procedures and time periods in the NSW Noise Policy for Industry (NPI) time periods as follows:

- Daytime: 7 am to 6 pm
- Evening: 6 pm to 10 pm
- Night-time: 10 pm to 7 am

It is necessary to establish a representative noise level for each of these time periods. The procedure set out in the NSW NPI has been used to derive a representative background noise level (Rating Background Level or RBL) for the daytime, evening and night-time periods. An RBL is the median of the lowest 10th percentile of the background L_{A90} samples for each daytime, evening and night-time measurement period.

Measured Rating Background Noise Levels and ambient noise levels for Canterbury South Public School are provided in Table 7.

Table 7 Noise survey results (Canterbury South)

Description	Measured noise level, dB(A)		
	Day (7 am—6 pm)	Evening (6 pm—10 pm)	Night (10 pm—7 am)
Rating Background Level, L_{A90}	41	39	33
Ambient noise level, L_{eq}	65	50	48

Supplementary short-term attended measurements were conducted during operating hours of the school to capture existing noise levels of children at play for each school site. Short-term measurements results are provided in Table 8.

Table 8 Short-term attended noise measurements (Canterbury South)

Location	Measured $L_{Aeq(15minute)}$, in dB for each Octave Band (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
At logger location (no children at play)	32	35	35	37	40	40	36	30	46
Near basketball court with children at play approx. 30-40 m away	43	49	53	58	63	63	55	45	67

Appendix B – Derivation of Noise Criteria

In consideration of the above, project specific criteria have been established in accordance with the NSW NPI.

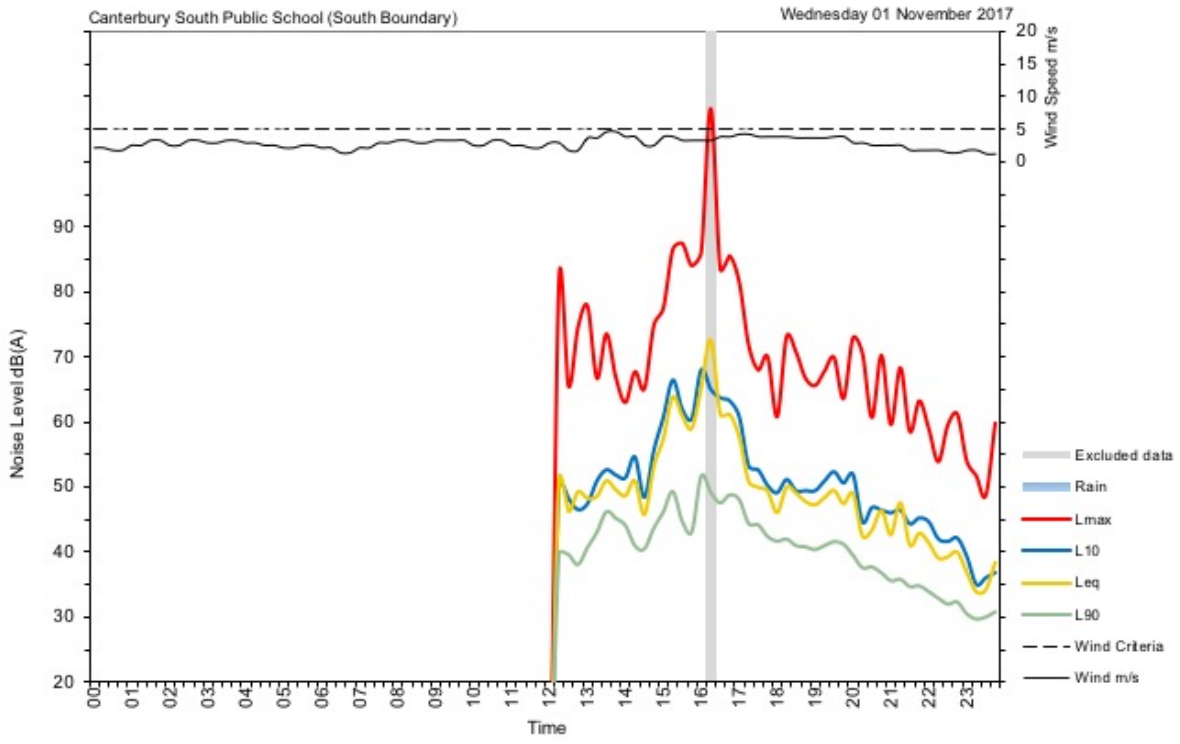
Criteria for continuously operational mechanical services and other operational noise sources at the proposed development site are shown in bold in Table 9. For the purpose of determining amenity criteria at this site, the nearby residentially zoned land is considered to be located in a 'suburban' noise environment as defined in the NSW NPI.

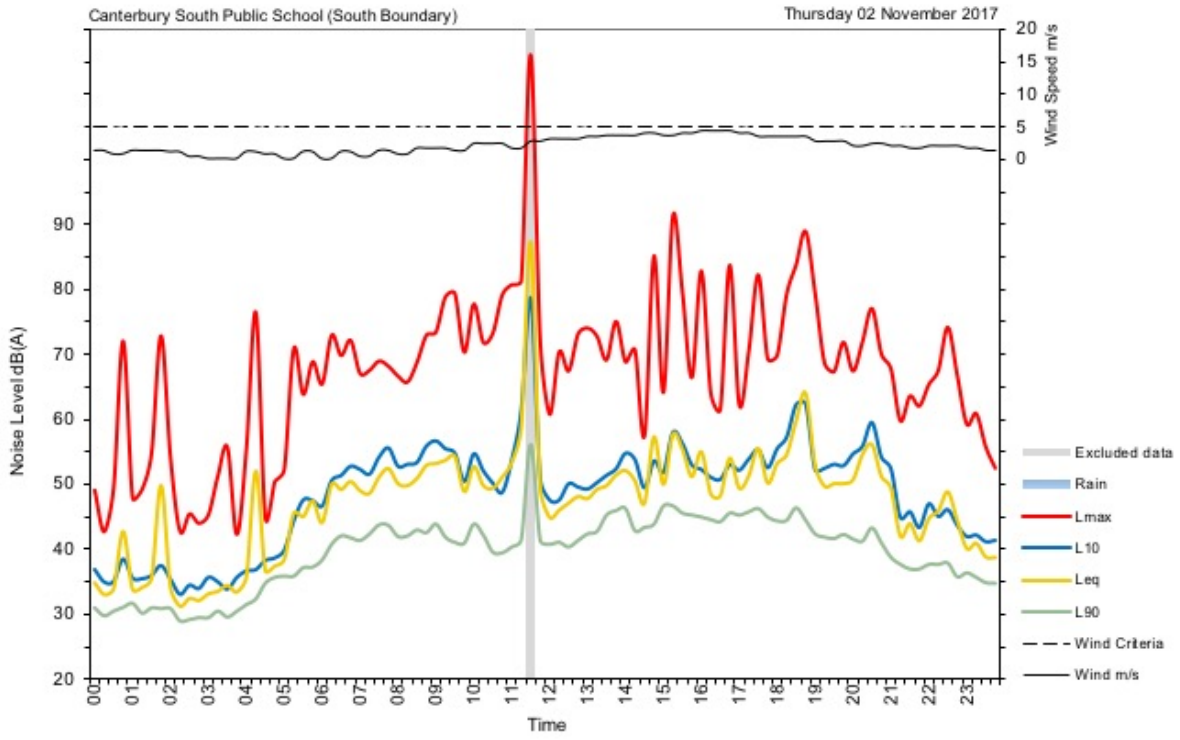
Table 9 NPI Noise emission criteria – residential receivers

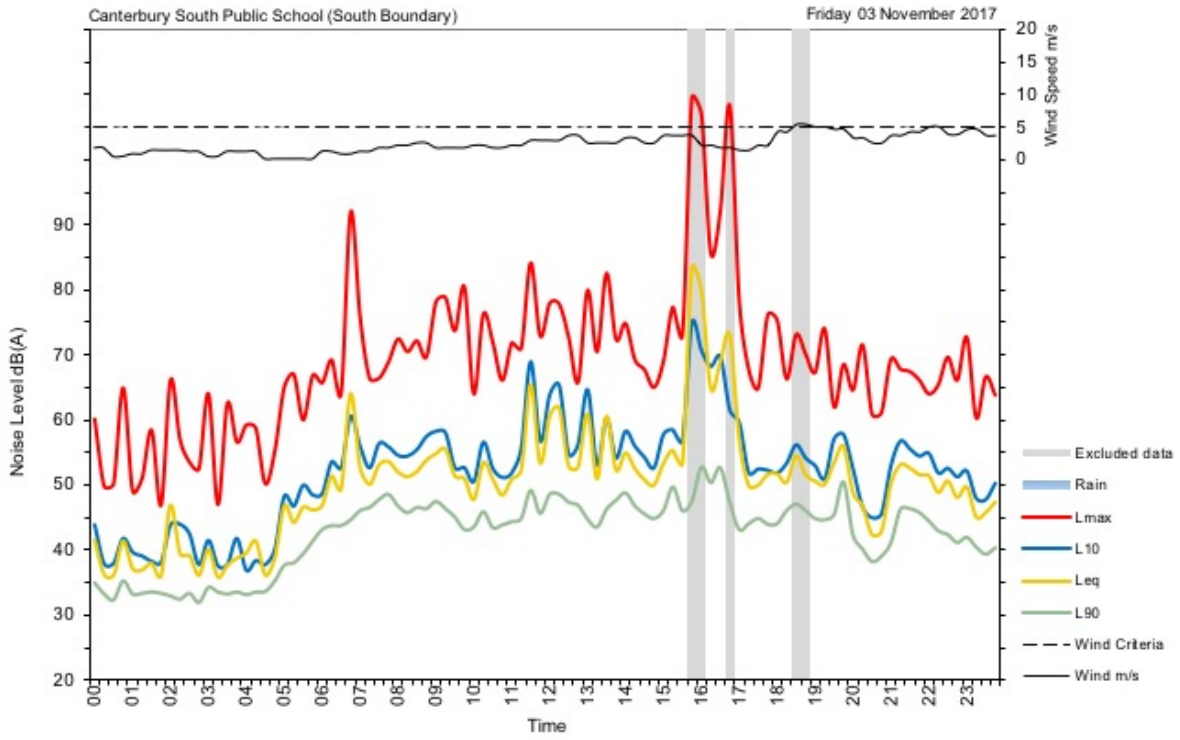
Location	Noise Level (dB re 20 µPa) during Period		
Residential receivers	**NPI Daytime 07:00 – 18:00**	**NPI Evening 18:00 – 22:00**	**NPI Night-time 22:00 – 07:00**
Rating Background Level (RBL)	41	39	33
Intrusive criterion (RBL + 5 dB)	46	44	38
Acceptable Noise Level (ANL) Suburban	55	45	40
Amenity Criterion (ANL – 5dB(A) + 3dB(A))	53	43	38
NPI Project specific criteria	**46**	**44**	**38**

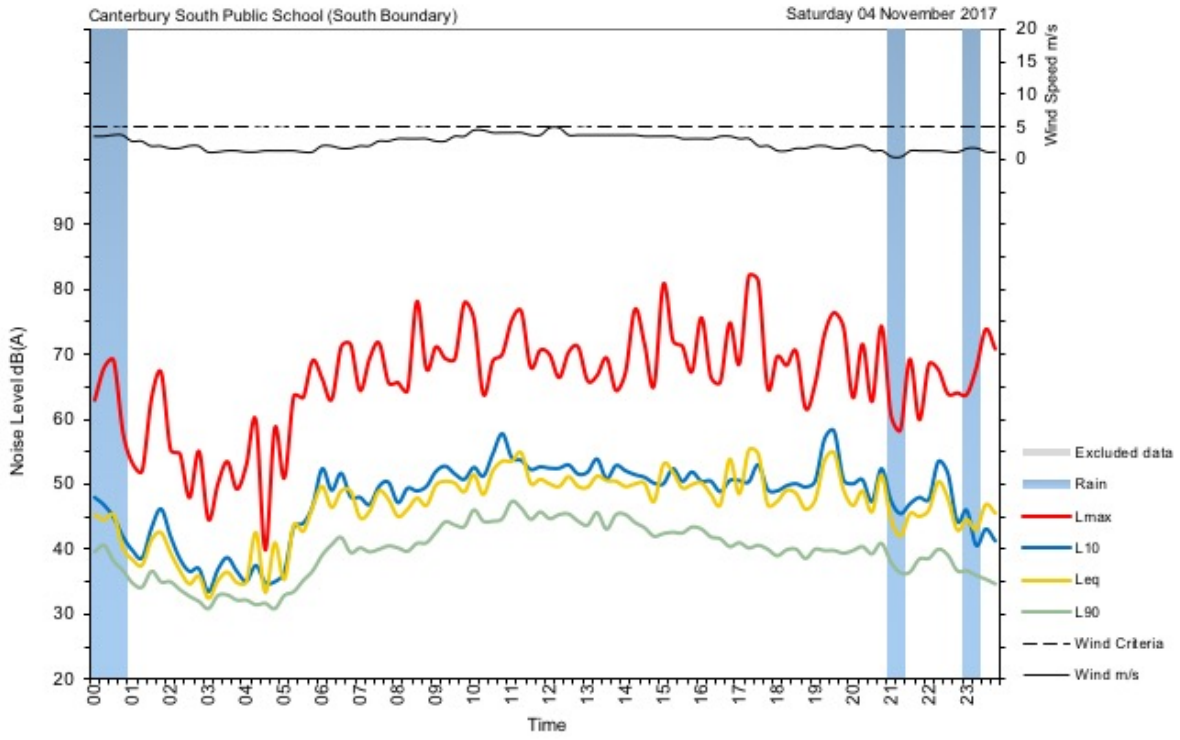
The amenity criteria presented in Table 9 consider the Modification Factors presented in Table 2.2 of the NPI, existing measured energy average noise levels presented in Table 7 above and our impressions of the site during multiple site visits.

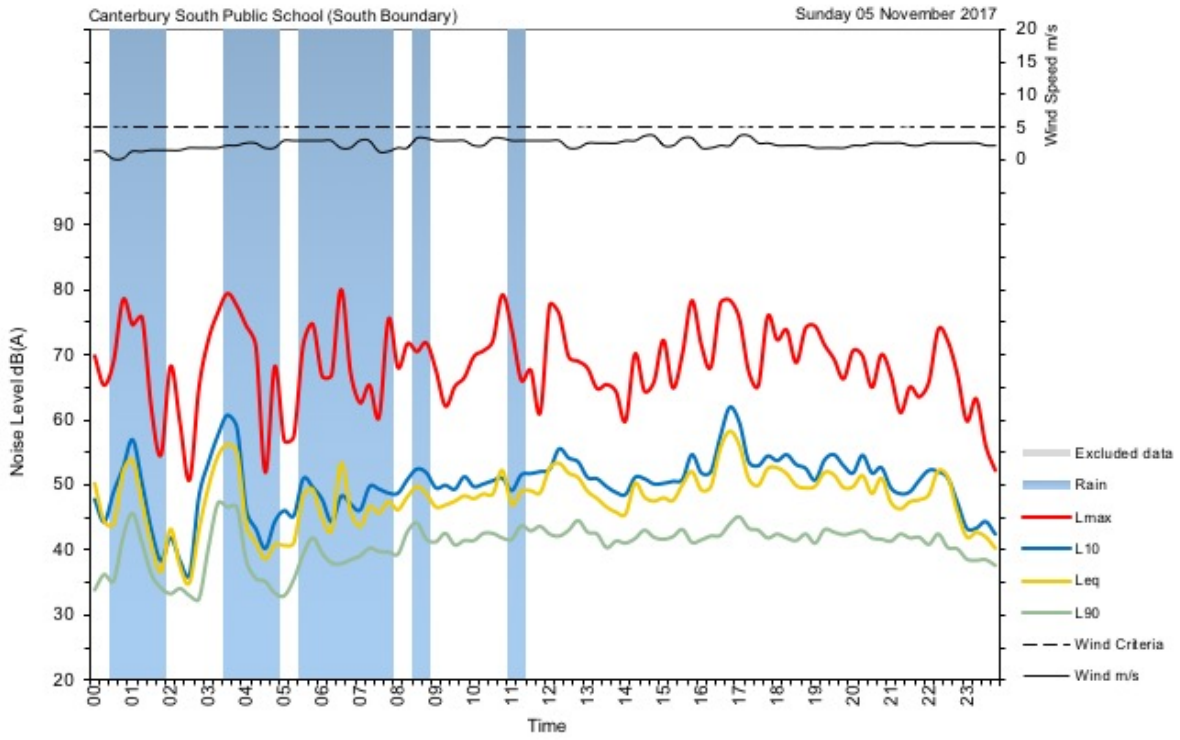
Appendix C – Noise Logging Graphs

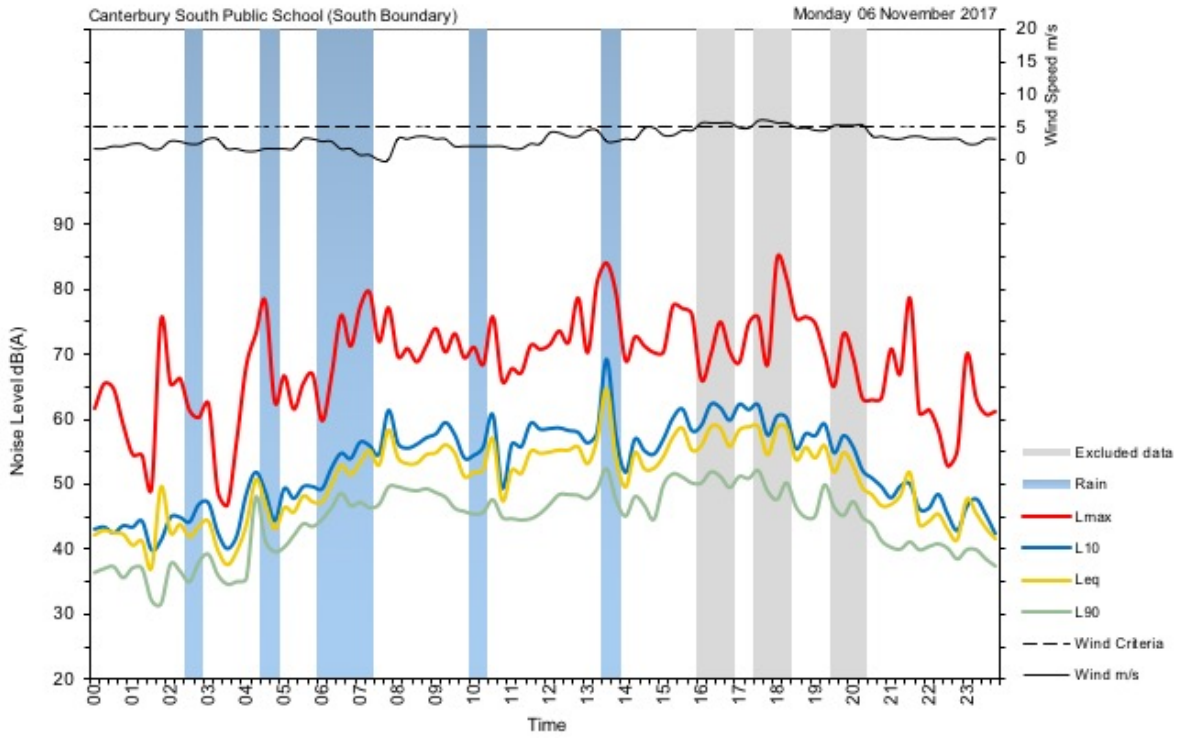


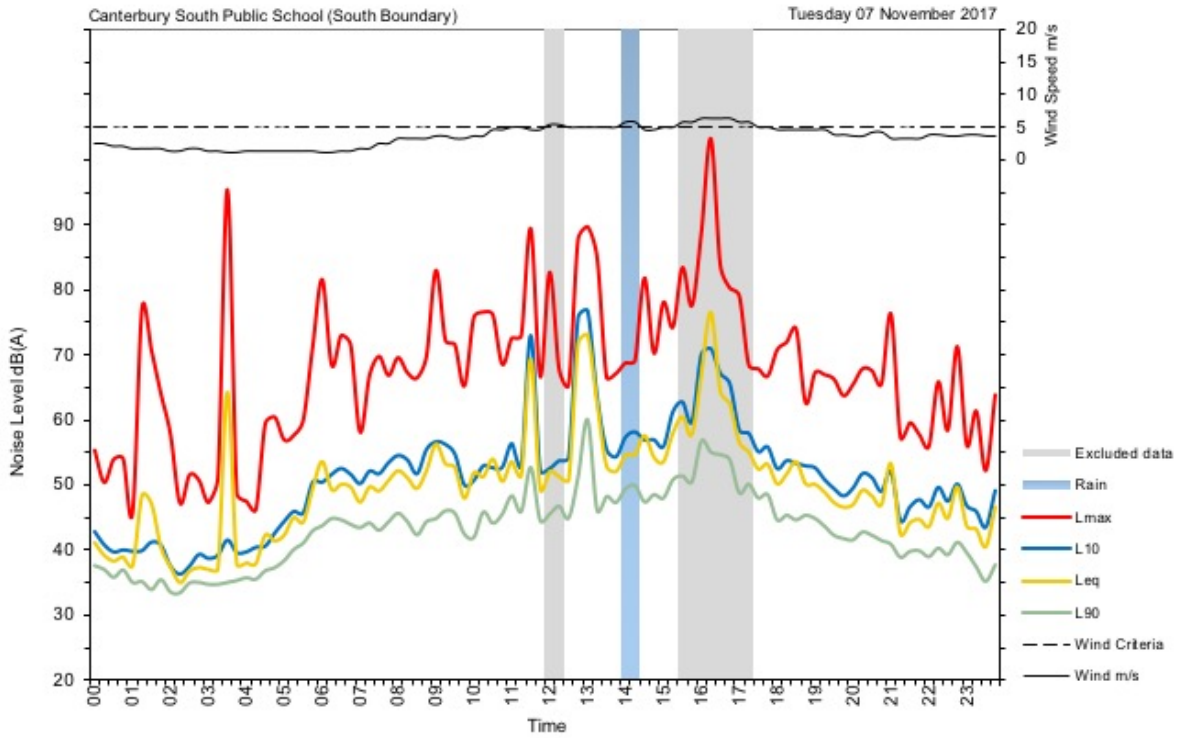

Canterbury South Public School (South Boundary)
Thursday 02 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s

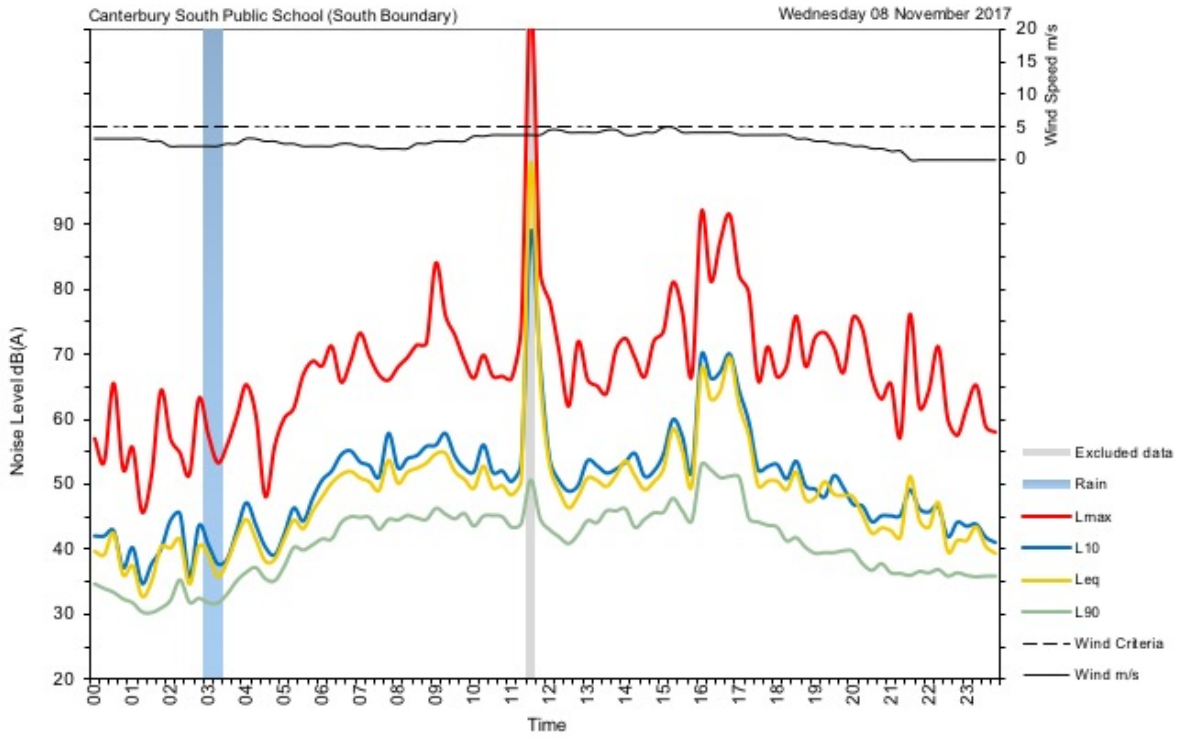

Canterbury South Public School (South Boundary)
Friday 03 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s

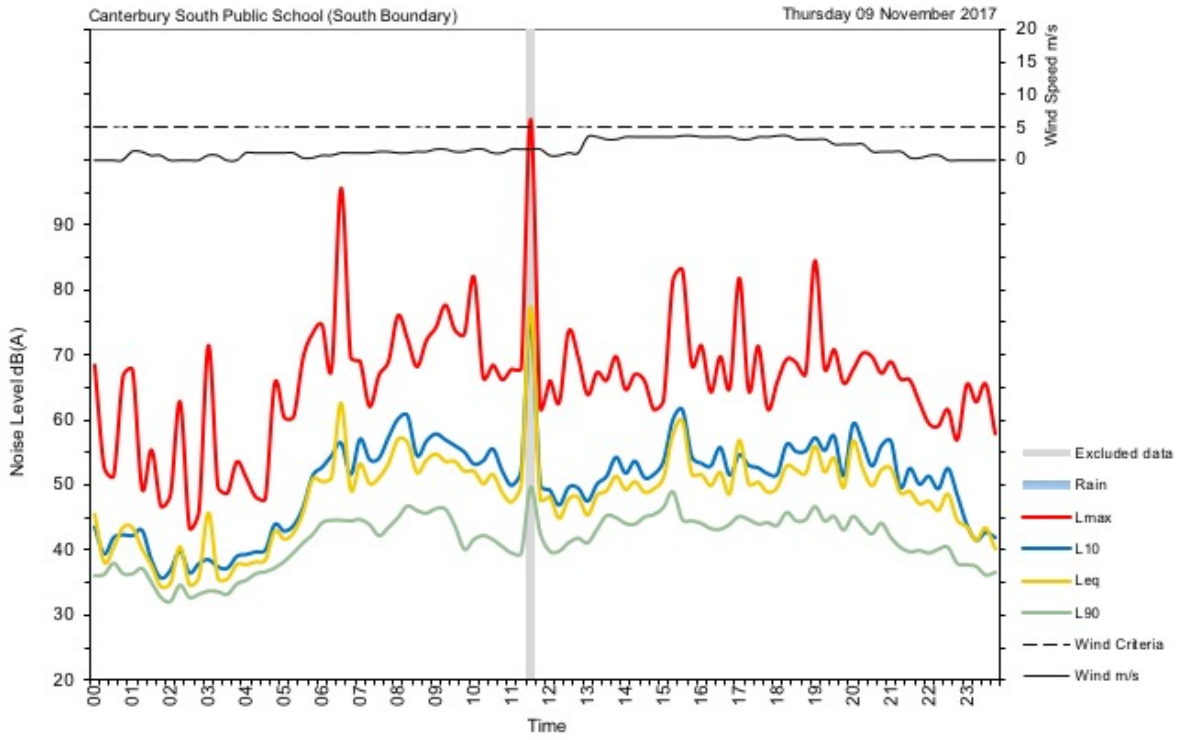

Canterbury South Public School (South Boundary)
Saturday 04 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s

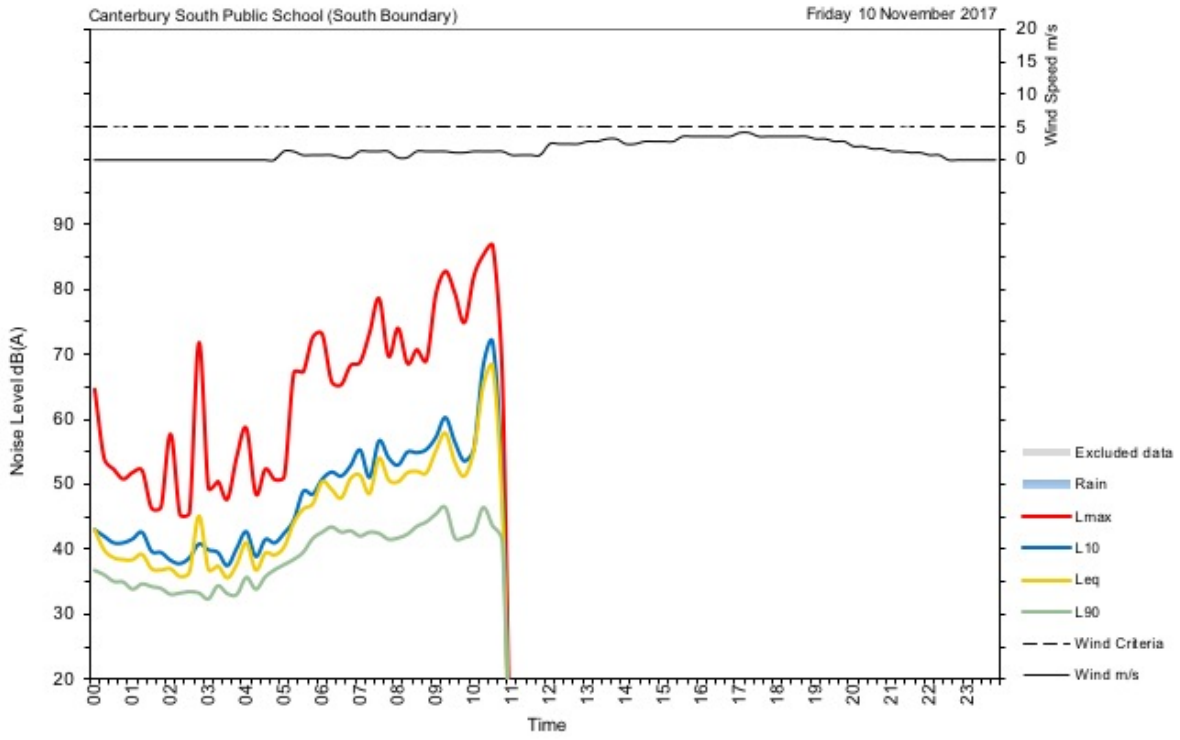

Canterbury South Public School (South Boundary)
Sunday 05 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s


Canterbury South Public School (South Boundary)
Monday 06 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s


Canterbury South Public School (South Boundary)
Tuesday 07 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s


Canterbury South Public School (South Boundary)
Wednesday 08 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s


Canterbury South Public School (South Boundary)
Thursday 09 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s


Canterbury South Public School (South Boundary)
Friday 10 November 2017
Noise Level dB(A)
Wind Speed m/s
Time
Excluded data
Rain
Lmax
L10
Leq
L90
Wind Criteria
Wind m/s