ACOUSTICS AND AIR

DEE WHY RSL – STAGE 5 CLUB EXPANSION & BASEMENT CARPARK

S96 DEVELOPMENT APPLICATION
NOISE & VIBRATION ASSESSMENT

REPORT NO. 17038-DA2
VERSION A

MARCH 2018

PREPARED FOR

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

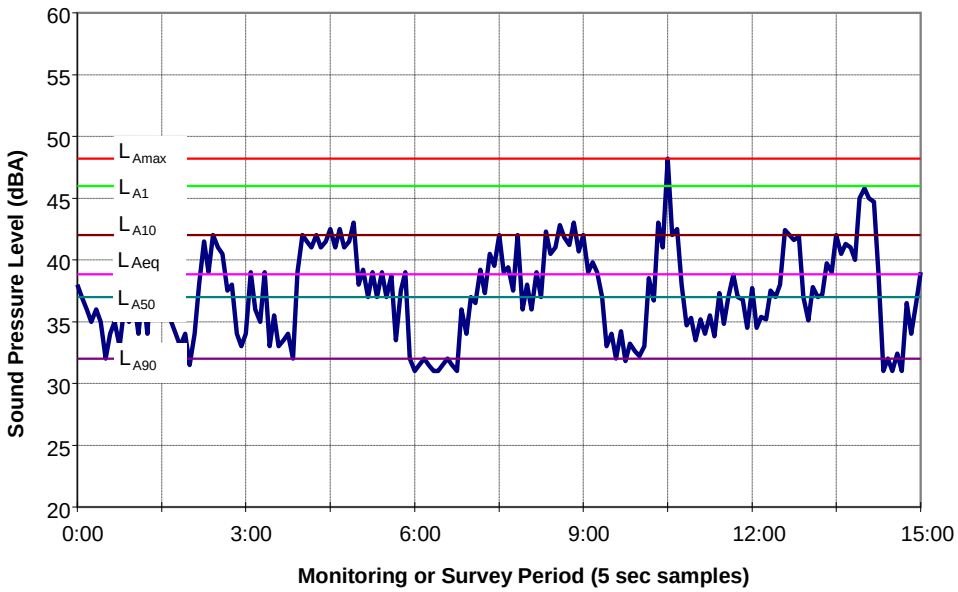
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

This S96 development application has been submitted to Northern Beaches Council seeking modification for the development of the Dee Why RSL – Stage 5 Club expansion and basement carpark. An acoustic report supporting the initial submission was prepared by *Wilkinson Murray titled "Dee Why RSL – Stage 5 Club Expansion & Basement Carpark - Development Application Noise & vibration Assessment"* dated March 2017 report number 17038-DA and was submitted with the original application.

Since the original submission some modifications to the development have been proposed which has necessitated a S96 application. These changes include the following:

- The introduction of an open central courtyards;
- Increase in the size of the eastern smoker's terrace area roof;
- Relocation of the loading dock, and;
- Reduction in the size of the carpark.

Wilkinson Murray Pty Limited (WMPL) has prepared this noise and vibration assessment of the construction and ongoing operations of the Club, to be submitted in support of the revised development application. The purpose of the assessment is to assess potential noise and vibration impacts at nearby residences and the nearby childcare centre with respect to Northern Beaches Council requirements and EPA policies and guidelines.

This assessment relies in part on noise logging data collected from areas surrounding the site.

2 PROPOSED WORKS & SITE DESCRIPTION

Dee Why RSL Club is proposing to deliver the fifth and final stage of its master plan development which will involve the following:

- Demolition of part of the existing southern carpark, and;
- Construction of one new level of club facilities over six new car parking levels, including refurbishment of the eastern Club entry and adjacent loading dock.

The project is located at Dee Why RSL, 932 Pittwater Road, Dee Why (being Lot 1 in DP706230) as shown in Figures 2-1 and 2-2.

Figure 2-1 Site Aerial showing the Club & Project Location

Figure 2-2 Area of Works

There are no entertainment facilities that will generate acoustically significant noise levels proposed for the extension. However, it is noted that there are outdoor areas consisting of a smoker's area that is located along the eastern side of the club and the central courtyard areas which will have two openings to the roof (see Figure 2-3, Figure 2-4 and Figure 2-5).

Full details of the works are contained in the Statement of Environmental Effects submitted with the S96 Application.

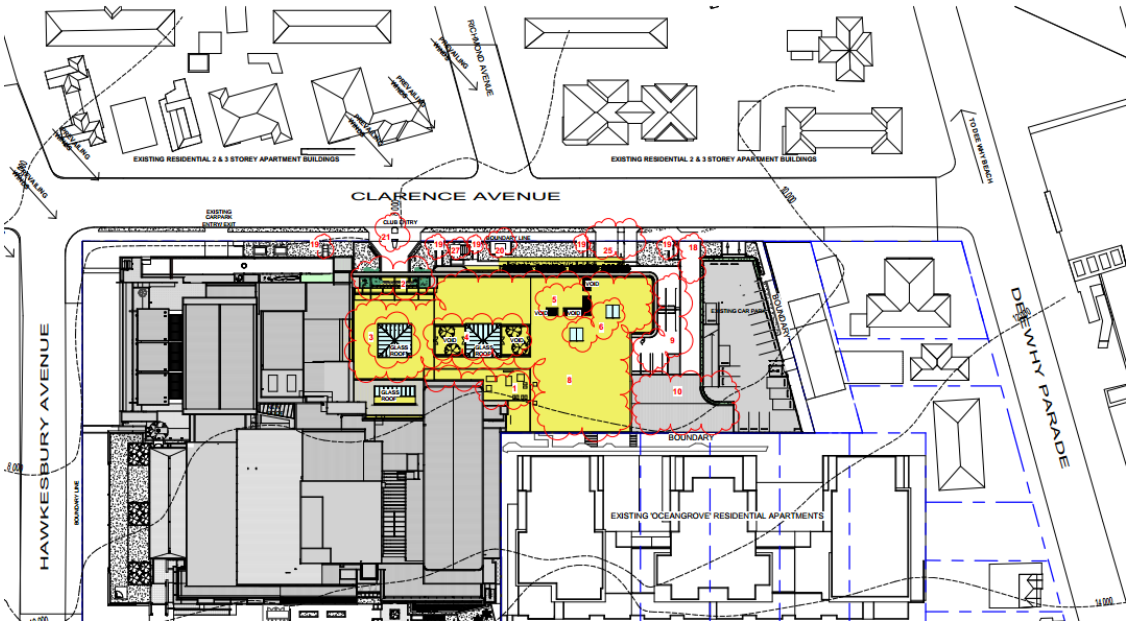
The operating hours proposed by the Club are consistent with existing operational hours being:

- Opening at 10.00am weekdays and 9.00am weekends;
- Closing at 4.00am Monday to Friday and 6.00am on Saturday and Sunday.
- Loading dock operations Monday to Sunday 7 am to 3 pm.

The following figures show proposed development on levels above future car parking areas, with

additional areas shaded in yellow:

Figure 2-2 Club Extension – Changes shown clouded in Red



The proposal for two sections of open roof and smoker's area are shown in the following figure:

Figure 2-3 Revised Roof Level of Club Extension showing smokers, open courtyard areas and loading dock locations

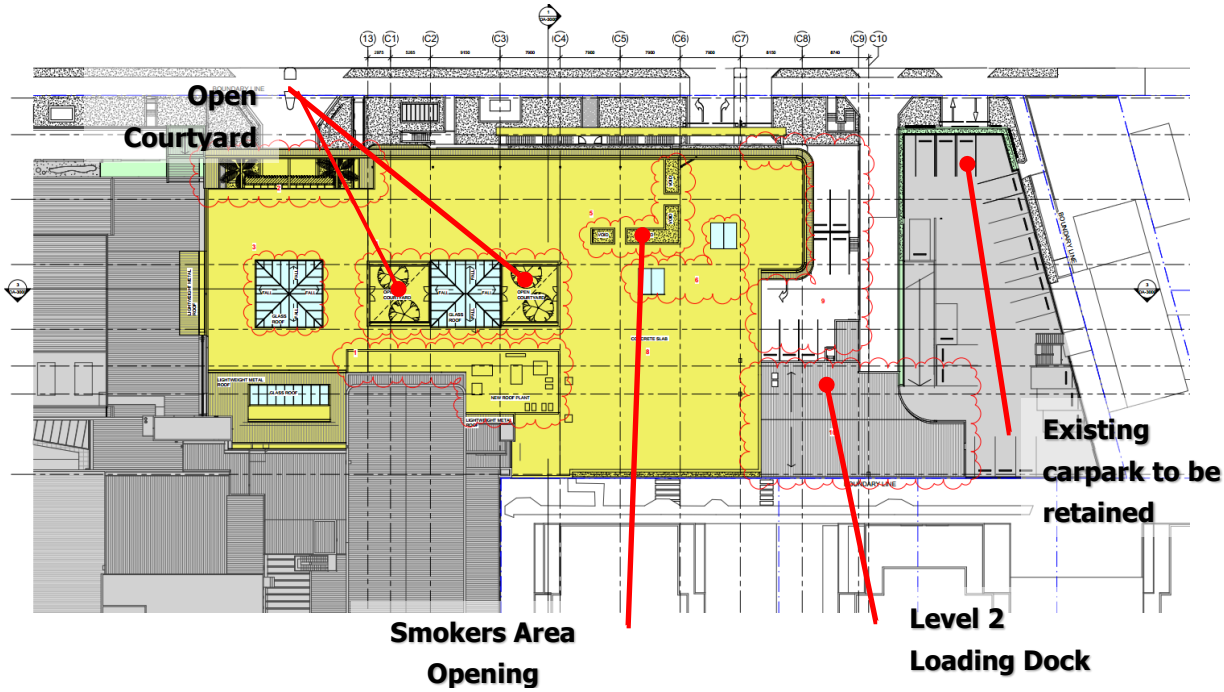
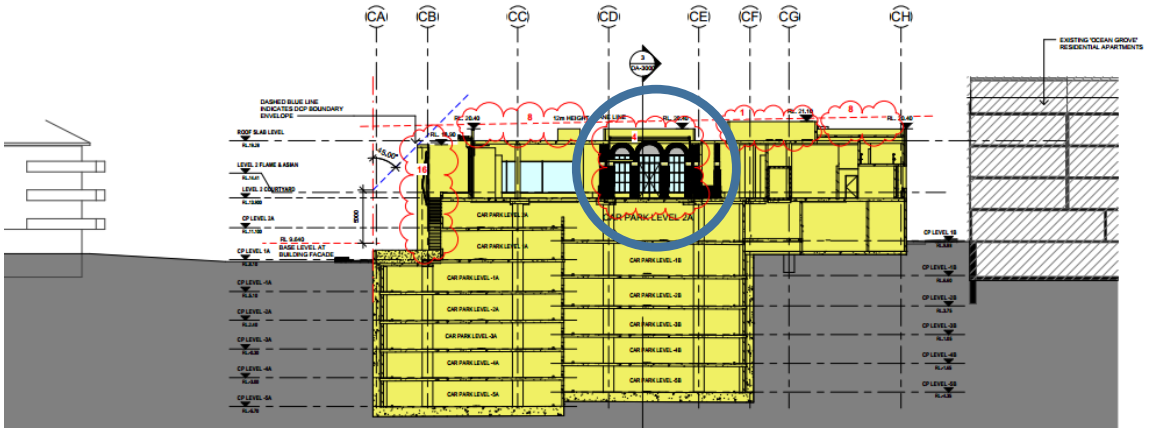


Figure 2-4 – East- West Section showing Central Courtyard



Additionally, it is proposed to relocate the loading dock entrance to the northern side of the site on level 2 of the development adjacent to the retained existing carpark. Further the area of underground carpark size has been reduced. These changed are shown in the following figure:

Figure 2-5 – Level 2 showing the Proposed Loading Dock

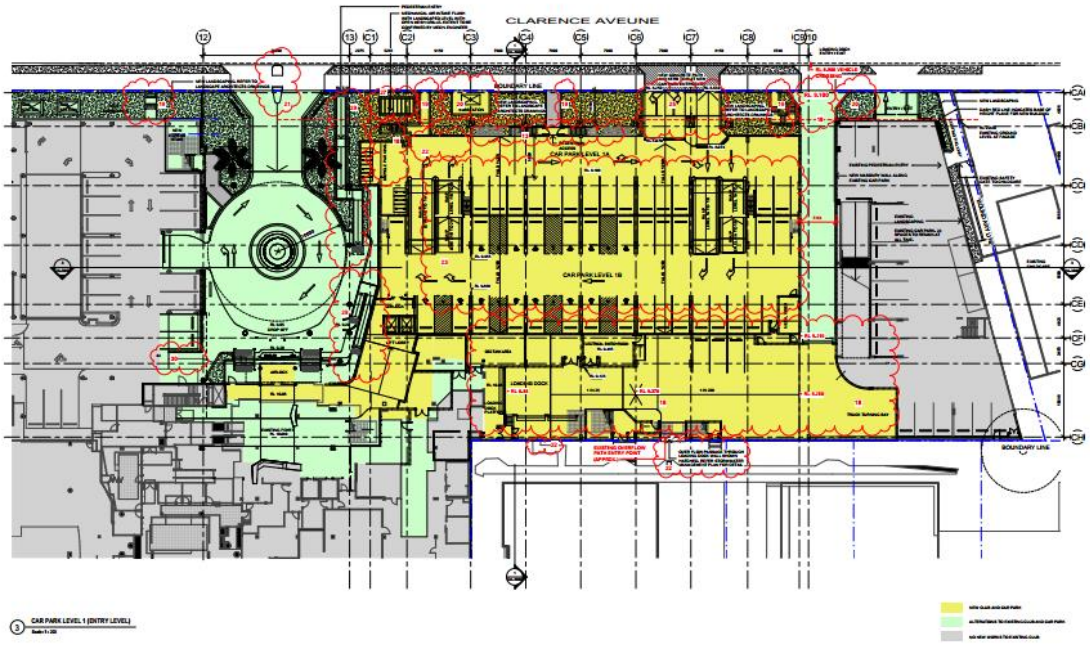
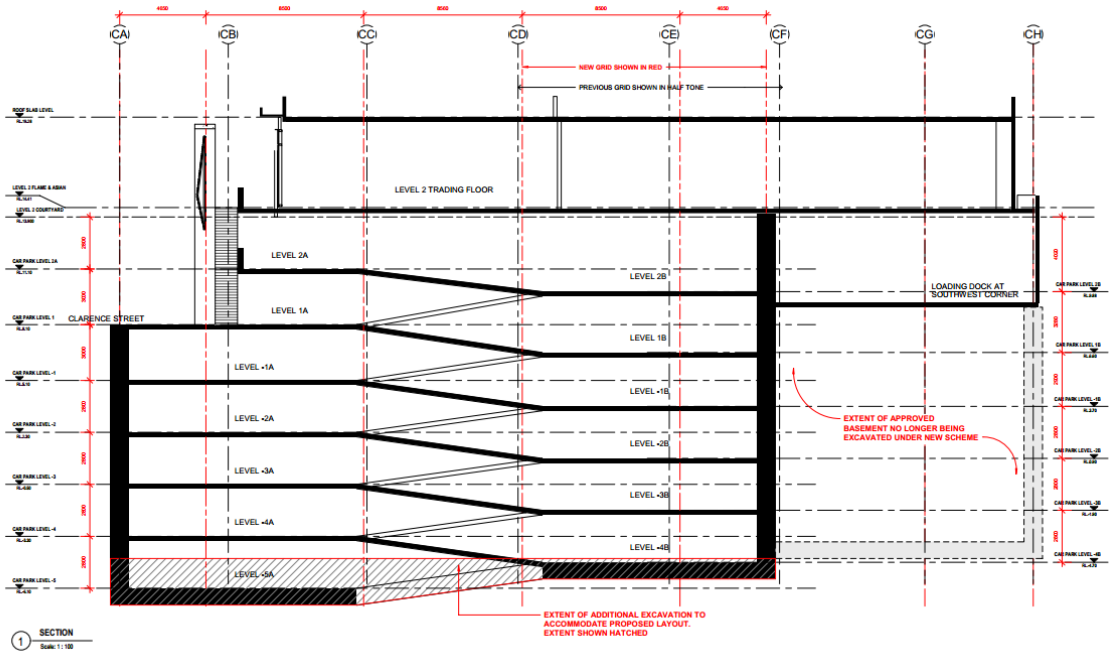


Figure 2-6 – East- West Section showing the Proposed Carpark



The proposed development retains a portion of the southern carpark, providing a separation from the existing childcare centre by approximately 20 to 34 metres.

3 SURROUNDING RECEIVERS & AMBIENT NOISE LEVELS

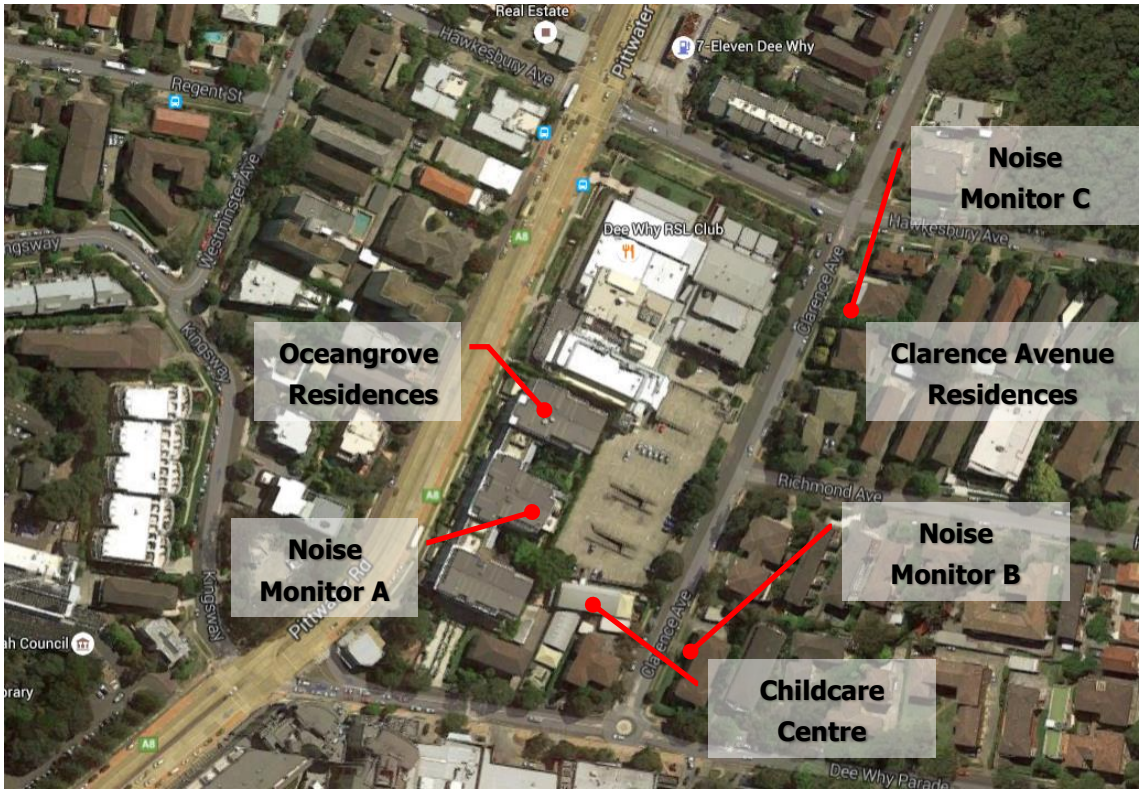
Surrounding residential receivers have been identified as multi-level residences located in residential zoned areas on Pittwater Road and Clarence Avenue.

The nearest residential premises have been identified as:

- Location 1 – Adjacent multi-level residences in the Oceangrove development located to the west of the development site (fronting onto Pittwater Road); and
- Location 2 – Multi-level residences on Clarence Avenue at a distance of 30-40m from the eastern facade.

The nearest residential locations are indicated in Figure 3-1.

Figure 3-1 Site Location



To the south of the proposed site is Dee Why Kindergarten which consists of a 2-storey Colorbond clad building with standard glazing. It is understood that childcare facilities are air-conditioned and are located on the ground level of the building, whilst it is understood that the upper level currently accommodates DYRSL offices. In addition, there are outdoor play areas at the front and rear of the building.

3.1 Unattended Noise Measurements

Unattended ambient noise measurements were conducted using three ARL Environmental Noise Loggers type EL-215 at surrounding residences as detailed in Table 3-1.

Table 3-1 Noise Monitoring Locations

Location	Period of Noise Monitoring
A – Unit 6 at 20-22 Dee Why Parade, Dee Why*	Tuesday 3rd to Tuesday 10th May 2016
B – Roof Level of Oceangrove Pittwater Road	Tuesday 3rd to Tuesday 10th May 2016
C- 13 Clarence Street Dee Why	Tuesday 16th to Wednesday 24th May 2017

* This unit is located at the rear of the building on Clarence Avenue adjacent to the Childcare

The results of noise measurements were processed in general accordance with the NSW EPA procedures to establish relevant noise descriptors. The results of the noise measurements are shown in graphical form in Appendix A.

The Rating Background Levels (RBLs) are presented in Table 3-2. The RBLs for the standard periods of daytime, evening and night are shown.

Table 3-2 Measured L_{A90} Noise Levels (RBL)

Location	Daytime (7am–6pm)	Evening (6pm–10pm)	Night (10pm–7am)
A – Unit 6 at 20-22 Dee Why Parade	52	48	39
B – Oceangrove – Pittwater Road	54	52	46
C- 13 Clarence Street Dee Why	52	50	44

4 CONSTRUCTION NOISE & VIBRATION ASSESSMENT

This section of the assessment reviews construction impacts with respect to noise and vibration. The purpose of this assessment is to identify methodology and equipment that have the potential to impact on surrounding receivers and remains essentially unchanged from the previous Development Application.

The resultant findings and recommendations can be utilised in the project specific final Construction Environmental Management Plan that will be prepared by the successful contractor to ensure any impacts are minimised.

Section 4.14 includes the conditions of consent that have been applied to the initial DA application which remain relevant to this application.

4.1 Construction Noise Criteria

The following sections detail the applicable site-specific noise and vibration criteria based on the EPA *Interim Construction Noise Guideline*.

4.1.1 Construction Noise Management Levels

The EPA released the "*Interim Construction Noise Guideline*" *(ICNG)* in July 2009. The guideline provides noise management levels (NMLs) above which all feasible and reasonable work practices should be adopted. The NMLs assist in assessing the impact of construction noise.

For residences, the basic daytime construction NML is that the $L_{Aeq,\ 15min}$ noise level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside of the standard hours, where construction is justified, the noise management level would be background + 5dBA. Table 4-1 details the *ICNG* noise management levels.

Table 4-1 Construction Noise Management Levels at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL* + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

* RBL – Rating Background Level.

Based on the above, Table 4-2 presents the applicable noise management levels for construction activities at surrounding receivers that have been adopted for this application.

Table 4-2 Site-Specific Construction Noise Management Levels

Area	Construction Noise Management Level, L_{Aeq} – dBA			Highly noise affected Noise Level, L_{Aeq} dBA
	Day	Evening	Night	
A – South Eastern Residences – Clarence Avenue	62	53	44	75
B – Western Residences – Oceangrove Residences	64	57	51	75
C - Eastern Residences Clarence Street	62	55	49	75

The NSW EPAs *Interim Construction Noise Guideline (ICNG)* does not specifically mention childcare centres, however it recommends an internal noise management level of 45dBA for classrooms at schools and other educational institutions. In the case of sleeping areas, a lower criterion of 40dBA is considered appropriate in recognition of the use of these areas for sleeping. We recommend these levels be adopted for the interior areas of the childcare centre.

Assuming a reduction from outside to inside of 10dBA and 20dBA for windows open and closed respectively, the following external noise objectives are applicable at the facade of the building.

Table 4-3 Childcare External Facade Construction Noise Management Levels

Area	Windows Open	Windows Closed
Classroom	55	65
Sleeping Area	50	60

It is noted that construction noise management levels (NMLs) are not limits; rather these are objectives to be adopted on each particular project to provide a reference point to trigger determination that management of potential construction noise issues associated with the construction stage should be considered where reasonable and feasible.

In the case of other areas, the guideline recommends the following:

- Upper level office areas (external) — Maximum $L_{Aeq,15min}$ of 70dBA
- External active play area — Maximum $L_{Aeq,15min}$ of 65dBA
- External passive play area — Maximum $L_{Aeq,15min}$ of 60dBA

4.2 Construction Vibration Criteria

The EPA document *Assessing Vibration: A Technical Guideline* (2006) is used to set criteria in relation to human comfort within buildings. This document refers to international standards. A British Standard is used to set criteria to avoid damage.

4.2.1 Human Comfort within Buildings

Methods and criteria in that Standard are used to set "preferred" and "maximum" vibration levels.

Acceptable values of human exposure to continuous vibration, such as that associated with underground drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 4-4.

Table 4-4 Criteria for Exposure to Continuous Vibration

Place	Time	Peak Component Particle Velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or night time	0.56	1.1
Workshops	Day or night time	1.1	2.2

In the case of intermittent vibration which is caused by plant such as rock breakers, the criteria are expressed as a Vibration Dose Value (VDV) and are presented in Table 4-5.

Table 4-5 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime		Night Time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Calculation of VDV requires knowledge of the number and duration of events in the relevant time period.

4.2.2 Building Damage

It is noted that the Geotechnical engineers (Douglas Partners) in Section 9.3 of "Report on Geotechnical Investigation" recommends a vibration level of 8mm/s to protect surrounding properties from structural damage.

4.3 The Construction Equipment Noise Source Levels

Typical plant that may be used during the proposed works are identified in Table 4-6. The table gives both L_{Aeq} Sound Power Level (SWL) and Sound Pressure Levels at 7m (SPL) for the equipment during a normal operating cycle. Sound Power Levels (SWL) is independent of measurement position. The SWLs shown have recently been measured at other similar construction sites.

Table 4-6 Typical General Construction Plant L_{Aeq} Sound Levels – dBA

Plant	Sound Power Level	Sound Pressure Level at 7m
Excavator	108	83
Excavator with normal Rock Breaker	122	97
Excavator with Rock Breaker Silent	116	91
Excavator with Diamond Saws	108	83
Excavator with Shears	110	85
Dozer	114	89
Dump Truck	108	83
Tower Crane	110	85
Concrete Truck	109	84
Concrete Pump	112	87
Forklifts	97	72
Compressors	100	75
Cranes	104	79
Angle Grinder	109	84
Concrete Saw	113	88
Bobcat	103	78
Hand Tools	90	65
Concrete Crushing & Screening Plant	116	91

4.4 Construction Hours

The proposed construction hours for the works will be between 7.00am and 6.00pm Monday to Friday and between 7.00am and 2.00pm on Saturdays. No construction work is proposed to be undertaken outside the proposed construction hours, including on Sundays or Public Holidays, with the exception of specialist or emergency work.

4.5 Construction Methodology

The indicative time frames provided for the works are set out in Tables 4-8. These have been used to inform this construction noise and vibration assessment.

Table 4-7 Construction Works

Stage	Description	Total
1	Demolition Work	4-6 weeks (approx.)
2	Diaphragm Wall	8-10 Weeks (approx.)
3	Basement Excavation	16 weeks (approx.)
4	Structure	8 months (approx.)
5	Fitout	6 months (approx.)

The timeframes described above are indicative only and subject to design development and the broader requirements of the development program.

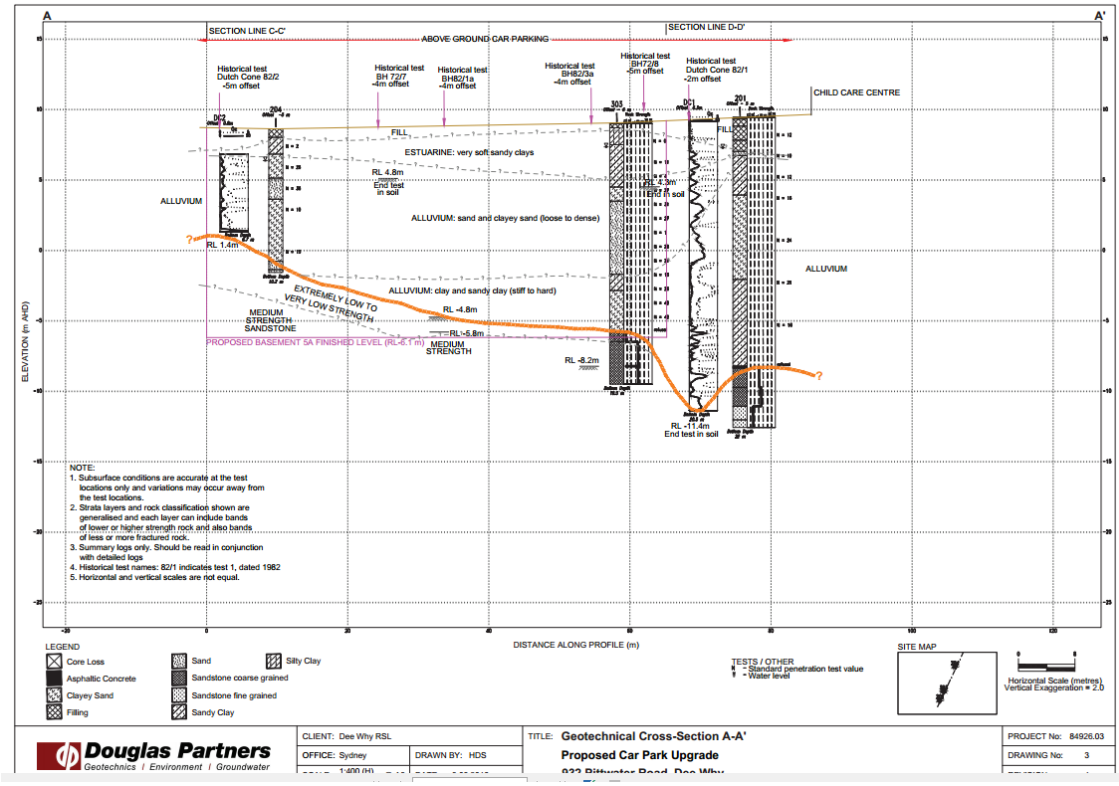
4.6 Geology

Investigations on the site have determined that much of the site is located on sand with an underlying bedrock of sandstone (refer to the Douglas Partners Geotechnical Report included as part of this application).

Figure 4-1 shows a section of the site noting the excavation will occur down to RL-4-2.

Generally, excavation will be in sand, clayey sand and sandy clay until sandstone bedrock is reached of varying strengths and depths. Broadly, sandstone is deepest to the south and east of the site and closer to the surface to the north and west.

Figure 4-1 Rock Profile



4.7 Construction Noise Assessment

Site-related noise emissions were modeled with the "CadnaA" noise prediction program, using CONCAWE noise prediction algorithms. Factors that are addressed in the noise modeling are:

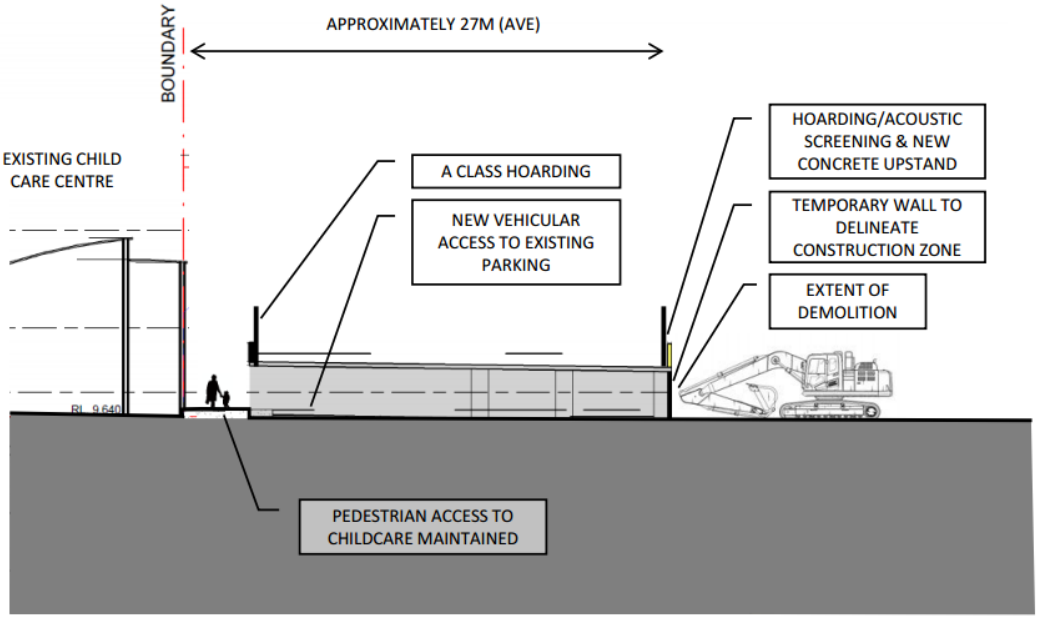
- equipment sound level emissions and location;
- screening effects from buildings;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- a 2m high Class A hoarding on the eastern and western site boundaries;
- An acoustic infill on the northern end of the retained carpark;
- A 3m acoustic barrier on the northern end of the retained carpark and a Class A hoarding on the southern end of the retained carpark;
- ground absorption; and
- atmospheric absorption.

4.8 Construction Scenarios

The noise modelling has been conducted for acoustically significant scenarios summarised as follows:

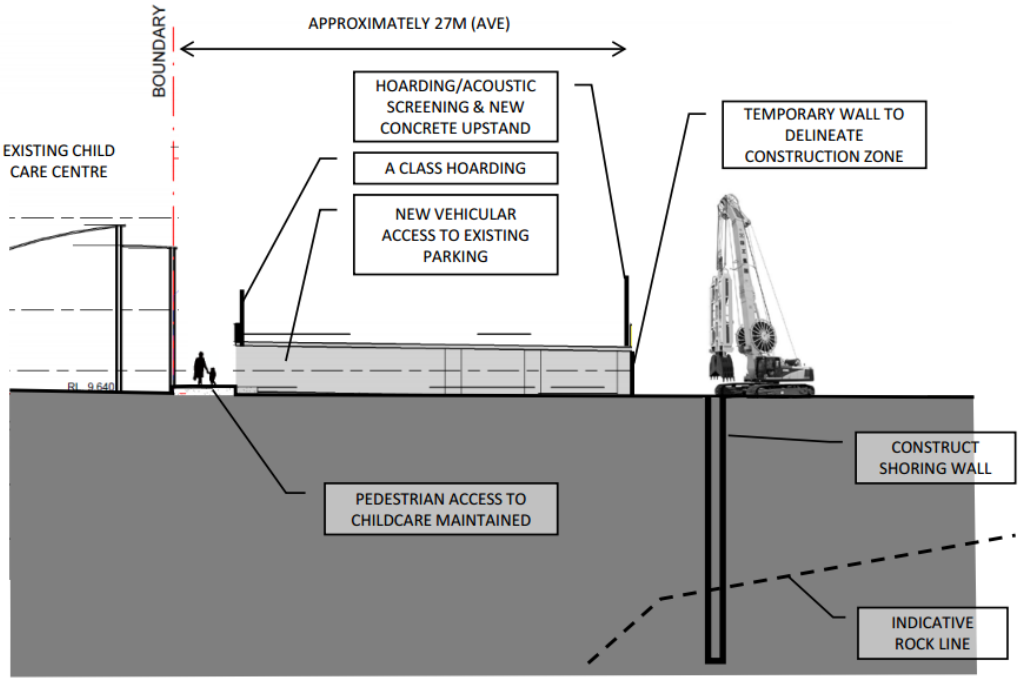
Scenario A – Demolition of Existing Carpark

The scenario includes demolition of the existing carpark structure. Equipment includes an excavator with rock-breaker and shears, trucks and a Concrete Crushing and Screening Plant.



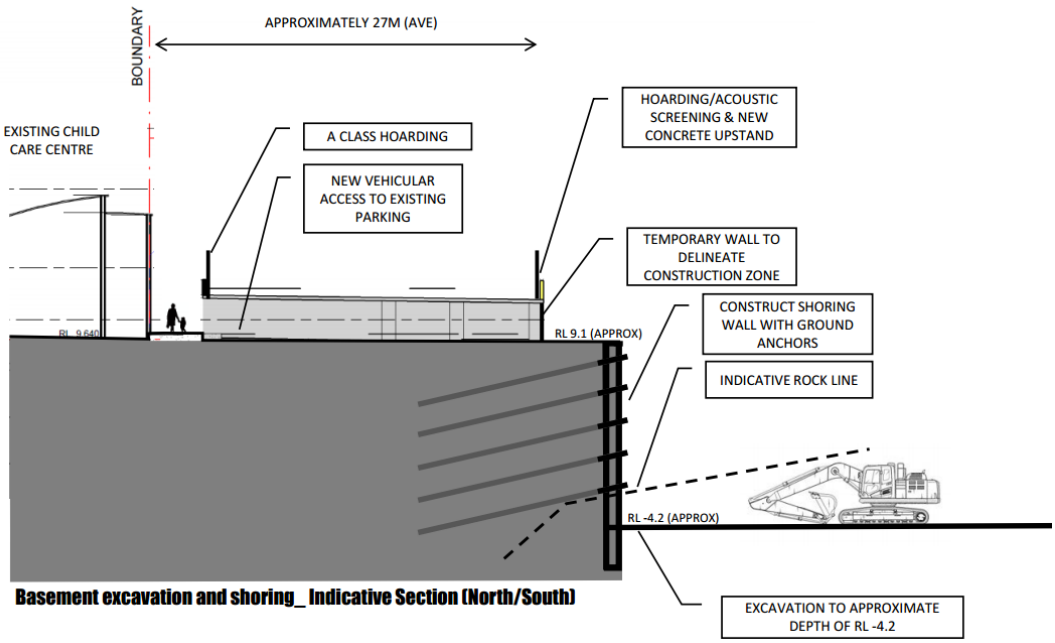
Scenario B – Diaphragm Wall Construction

The scenario includes construction of a shoring wall around the site. Excavation will be in sand with rock at lower levels. Equipment includes an excavator with clamshell attachment or piling rig, trucks along with concrete and bentonite pumps.



Scenario C – Excavation

The scenario includes site excavation with excavators, heavy rock breaker (to remove rock), trucks and a bulldozer for ripping of rock at lower levels.



Scenario D – Structure

The scenario includes construction of the carpark and building structure using concrete pumps and trucks along with a tower crane for materials handling.

4.9 Construction Noise Predictions

Noise modelling has been conducted for each of the above scenarios based on equipment as detailed in Table 4-6. The equipment is located across the construction site as follows:

- **Area Noise Sources** – General construction equipment that is distributed across the work sites has been modelled as an area source based on proposed equipment numbers and total noise levels.
- **Line Noise Source** – Truck haulage routes are modelled as line noise sources with the number of trucks on the haulage route in a 15-minute period applied to these sources.
- **Point Noise Sources** – Fixed plant and equipment that is located in one place (pumps or batching plant) or which has particular characteristics (excavator with rock-breakers or clam shell attachment) are modelled as point sources.

The *ICNG* requires predicted noise levels at receivers to be based on 15-minute periods. The modelling assumes a "typical worst-case" scenario whereby all the plant is running continuously. As such, the modelling represents likely noise levels that would occur during intensive periods of construction. Therefore, the presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction scenarios occur. That is predicted noise levels will be lower for much of the time when it is located further away from receivers or when it not operating continuously.

Once noise sources have been applied to the model, the resultant noise levels at identified surrounding receivers are predicted. These results are then compared with established site specific noise management levels.

4.9.1 Predicted Noise Levels at Residences

Table 4-8 and Table 4-9 present predicted levels at residences. It should be noted that the noise level will depend upon the exact position that the equipment will be in at any time, and so the results are given as a range. The predicted levels are above the NML, however it should be noted, that the predicted levels are typical for construction sites, extending from small house construction sites to large infrastructure construction sites.

Table 4-8 Predicted Construction Noise Levels at Oceangrove Residences – dBA $L_{Aeq,15min}$

Area	Predicted Level	Noise Management Level	Exceedance
Demolition	80-85	64	16-21
Piling	69-71	64	5-7
Excavation	76-78	64	12-14
Structure	68-70	64	4-6

Table 4-9 Predicted Construction Noise Levels at Clarence Avenue Residences – dBA $L_{Aeq,15min}$

Area	Predicted Level	Noise Management Level	Exceedance
Demolition*	79-81	62	17-19
Piling	66-67	62	4-5
Excavation*	64-65	62	2-3
Structure	68-70	62	6-8

* It is also noted that the impulsive nature of rock breaking can also be perceived as more annoying than other construction activities and no allowance is included in the predicted levels to allow for this.

A review of the noise predictions indicates that the highest potential levels with respect to construction noise will occur at surrounding multilevel residences at the Oceangrove residential development. Construction noise levels at residences will be the greatest at these residences when demolition of the carpark occurs due to the use of rock breakers located on the western side of the site. The following has been determined:

- Mostly, construction noise levels will comply with the NML at residences;
- A potential exceedance of the NML by up to 21dBA will occur during demolition at the upper levels of the Oceangrove building that face the site; and
- A potential exceedance of the NML by up to 19dBA will occur during demolition at the upper levels of the Clarence Avenue residences that face the site.

Such exceedances of NMLs at residences are typical of construction sites in NSW, particularly during demolition and excavation stages of major developments in residential areas. In this case, the exceedances will occur, without special measures being put in place, from time to time over a 30 week period.

In accordance with the Interim Construction Noise Guideline measures to mitigate noise impacts from heavy rock breakers, should be considered where reasonable and feasible as follows:

- Use of quieter "city hammers" rather than standard rockbreakers. This can reduce airborne noise by approximately 6 dBA;
- Use of saw cutting and shears during demolition, where practicable;
- Use of saw cutting and ripping of rock during excavation, if practicable; and
- Use of smaller medium rock breakers noting that this may extend the construction period.

The practicality of these measures will be addressed by the contractor during development of a Construction Noise & Vibration Management Plan.

4.9.2 Predicted Noise Levels at the Childcare Building and Outside Areas

Table 4-10 to Table 4-13 present predicted levels at the childcare building and outdoor areas, without special measures being implemented.

Table 4-10 Predicted Construction Noise Levels during Demolition – dBA $L_{Aeq,15min}$

Area	Predicted Level	Noise Management Level	Comments
Upper Level Office Facade	65-66	70	Complies
Ground Level Childcare Facade	62-63	60-65	Complies with windows open for classrooms – windows to sleeping areas will need to be closed
Front Outdoor Play Area & Terrace Area	60-61	60-65	Complies for active recreation with marginal exceedance of 1dBA for passive recreation
Rear Outdoor Play Area	57-59	65	Complies

Table 4-11 Predicted Construction Noise Levels during Diaphragm Wall – dBA $L_{Aeq,15min}$

Area	Predicted Level	Noise Management Level	Comments
Upper Level Office Facade	53-54	70	Complies
Ground Level Childcare Facade	50-52	60-65	Complies with windows open
Front Outdoor Play Area	48-50	60-65	Complies
Rear Outdoor Play Area	45-46	65	Complies

Table 4-12 Predicted Construction Noise Levels during Excavation – dBA $L_{Aeq,15min}$

Area	Predicted Level	Noise Management Level	Comments
Upper Level Office Facade	51-52	70	Complies
Ground Level Childcare Facade	47-48	60-65	Complies with windows open
Front Outdoor Play Area	46-47	60-65	Complies
Rear Outdoor Play Area	45-46	65	Complies

Table 4-13 Predicted Construction Noise Levels during Structure – dBA $L_{Aeq,15\ min}$

Area	Predicted Level	Noise Management Level	Comments
Upper Level Office Facade	51-52	70	Complies
Ground Level Childcare Facade	50-51	60-65	Complies with windows open
Front Outdoor Play Area	44-46	60-65	Complies
Rear Outdoor Play Area	49-50	65	Complies

In the case of the childcare centre, the predicted noise levels with standard rock breakers will result in general compliance with established NMLs. This notes that at demolition a marginal 1dBA exceedance at the outdoor terrace or other outdoor areas where passive recreation will occur is predicted, such an exceedance is considered acoustically insignificant. In addition, it may be necessary to close any openable or louvre windows of sleeping areas when heavy rock breakers are used on the southern side of the site during demolition only.

However, it is noted that the adoption of recommendations for the use of "city hammers" or alternative demolition and excavation equipment to control noise levels at residences would eliminate any identified exceedances at the childcare centre. Further considerations such as ensuring personnel are aware of sensitive receptors and need for controlled work practices, ensuring equipment is correctly size for the work and no larger and selecting plant with lower noise output should be considered subject to review by the builder in terms of feasibility and viability.

4.10 Construction Vibration Predictions

Operation of large rock breakers can generate ground vibration and noise that has the potential to transmit to nearby buildings. Whilst the actual transmission of vibration is site specific and needs to be the subject of site testing, a review of likely levels associated with the use of heavy rock breakers has been determined based on past vibration measurement of heavy rock breakers.

A review of the geotechnical sections provided by Douglas Partners indicates that the nearest rock breaker will operate at distances as below:

- Oceangrove Building and — Approximately 19 m to foundation in low strength sandstone;
- Childcare — Approximately 33m to footing in sand and sandy clay

4.10.1 Oceangrove Residence

As a result of the reduced basement excavation vibration levels associated with the use of heavy rock breakers are predicted to be in the order of 1.4 mm/s Peak Component Particle Velocity (PCPV) at Oceangrove residences. Assuming that rock breaking occurs in the vicinity of the building for half a day with heavy rock breakers, a Vibration Dose Value (VDV) of 0.28 has been calculated. This level is within the VDV objectives of 0.2 to 0.4.

In order to mitigate the predicted vibration levels at residences and meet established VDV objectives, it is recommended that saw cuts be made at the boundary of the site, to separate the rock being excavated from the rock external to the excavation which is connected to the footings of the building. Further the pick on the hammer should be used so that it points away to the east of the site (i.e. away from residences).

Rock breaking operational trials should be conducted to determine actual impacts on site so that modification to excavation procedures can be considered.

At residences on Clarence Avenue compliance with Human Comfort criteria is predicted due to the increase distance between the construction site and residences.

Compliance with structural damage criteria, which is much higher than human comfort criteria, is predicted at all surrounding residences.

4.10.2 Childcare Centre

It is noted that the childcare centre is located on screw piles in sand / clayey sand. Therefore, the transmission of vibration from any rock excavation by rock breakers will be lower than that which could be expected in solid sandstone.

However, in the absence of any testing of the site conditions with respect to transmission of vibration through the existing ground structure, we have conducted a screening review based on an assumption that the childcare is located on sandstone. This approach has been adopted to manage any risks so that a zone of trial tests can be identified to ensure that the occupants of the childcare centre are not disturbed.

If the childcare centre were founded on sandstone, vibration levels would be in the order of 0.45mm/s PCPV. Assuming that rock breaking occurs in the vicinity of the building for half a day a VDV of 0.11 has been calculated. This is well below the dosage objectives of 0.2 to 0.4 and would be likely to be just perceptible to any occupants in the childcare centre.

In the case of groundborne noise, levels of between 45 and 50dBA have been estimated using the assumption of the childcare centre being founded on sandstone. These levels would be above internal objectives of 40 and 45dBA for sleeping and teaching rooms respectively. Preliminary predictions indicate that it would not be until the distance between the childcare centre and the sandstone is above 50m that a criterion of 40dBA would be complied with.

Given that sand does not transmit vibration as well as sandstone at the audible frequencies, the above predictions can be considered conservative and it is likely that, in practice, groundborne noise levels can be made to comply with the internal NMLs. As a result of the above screening review, it is recommended that trial noise and vibration monitoring be conducted when rock breakers are within 50m of the childcare centre to establish actual noise levels in the childcare centre. Where appropriate, alternative measures should be adopted, such as:

- use of saw cuts in sandstone; and
- use of medium sized rock breakers within any defined zone determined as a result of noise and vibration trials.

Recommendations to minimise the impact of these activities are discussed in the next section.

As with surrounding residences compliance with structural damage criteria is predicted at the childcare centre.

4.11 Construction Noise & Vibration Mitigation Measures

Without mitigation, noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines during some periods at surrounding receivers during construction. Therefore, noise control measures are recommended to ensure that noise is reduced where reasonable and feasible.

The following project-specific mitigation measures can be considered in the Construction Noise & Vibration Management Plan prepared by the successful builder.

Project-Specific Measures

- Notification of occupants adjacent to the site of when any vibration intensive activities occur.
- Use of quieter "city hammers" rather than standard rock breakers.
- Use of saw cutting and shears during demolition, where feasible instead of rock breaker.
- Use of saw cutting and ripping of rock during excavation, instead of rock breaking.
- Use of smaller medium rock breakers where deemed necessary as a result of trial noise and vibration testing at the childcare centre (noting that this may extend the construction period).
- An infill noise barrier on the northern side of the retained carpark and a 3m noise barrier on top the Level 1 carpark, with a minimum acoustic rating of R_W 30, should be constructed prior to demolition works.
- 2m hoarding around all other sides of the site.
- Selection of low noise equipment such as "quiet type" hammers and use of rock saws where reasonable and feasible,
- It is recommended that trial testing of vibration levels at Oceangrove residences be conducted where equipment identified as having the potential to exceed the human comfort criteria is proposed.
- It is recommended that trial testing of groundborne noise be conducted at the childcare centre where heavy rock breaking is proposed within 50 metres of the childcare centre.

General Measures

Below are general control measures that may be employed by the contractor

- *Plant Noise Audit* – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor.
- *Operator Instruction* – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- *Equipment Selection* – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines.
- *Site Noise Planning* – Where practicable, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels.

4.12 Community Liaison & General Approaches to Mitigation

An effective community relations programme should be put in place to keep the community that has been identified as being potentially affected appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding tenants, etc.) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms.

Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

4.13 Noise & Vibration Management Plan

A Construction Noise and Vibration Management Plan should be prepared by the successful contractor referencing the findings of this assessment. Areas that should be addressed in the plan include:

- noise and vibration monitoring;
- response to complaints**;**
- responsibilities;
- monitoring of noise emissions from plant items;
- reporting and record keeping;
- non-compliance and corrective action; and
- Community consultation and complaint handling.

4.14 Conditions of Consent relating to Construction

As a result of the preceding construction noise and vibration assessment the following conditions have been applied in the current approval.

5. General Requirements

a) Unless authorised by Council:
Building construction and delivery of material hours are restricted to:

a. 7.00 am to 5.00 pm inclusive Monday to Friday,
b. 8.00 am to 1.00 pm inclusive on Saturday,
c. No work on Sundays and Public Holidays.

b) Demolition and excavation works are restricted to:
a. 8.00 am to 5.00 pm Monday to Friday only.

(Excavation work includes the use of any excavation machinery and the use of jackhammers, rock breakers, excavators, loaders and the like, regardless of whether the activities disturb or alter the natural state of the existing ground stratum or are breaking up/removing materials from the site).

11. Construction Management and Construction Traffic Management Plan

A Construction Management and Construction Traffic Management Plan (CMC & TMP) must be submitted to Council prior to issue of the relevant construction certificate detailing the construction phase of the development. The CMC & TMP shall include, but not be limited to the following:

- The CMC & TMP shall require all construction activities to comply with the following noise management levels:

Item	LAeq (15 minute)
Outdoor Play Area	65dBA
External Verandahs	60dBA
In Classrooms	45dBA
Sleeping Rooms	40dBA

- Incorporating the Construction Noise and Vibration Management Plan (CNVMP) as recommended by the Wilkinson Murray DA noise and vibration assessment report. This is to include continuous noise monitoring at the childcare centre boundary and nearest residential boundaries during demolition and excavation and must address all relevant noise and vibration issues associated with these works.

- Procedures for dealing with complaints from the general public about noise and vibration levels, which must include as a minimum:

  - The name and contact details of the person responsible for the management of site works; and

  - Arrangements for the recording of any complaints received about non-compliance with condition in this consent, specifying the time and date of the alleged breach and action taken in response.

- Incorporating Respite Periods in relation to noisy activities during demolition, excavation and construction to mitigate potential impacts of noise on the child care centre operation at Dee Why Kindergarten and other surrounding residential uses. In this regard, a minimum of 1 hour of respite (no high level noise activities) per day is to be provided which coincides with the quiet time for the children in the adjoining child care centre. The Applicant is to consult with the operators of the Dee Why Kindergarten to identify the most suitable time. In the event that no agreement can be reached, the 1 hour respite period is to be from 1.00pm to 2.00pm (Mon to Fri). The Applicant is to notify Council in writing as to the Respite Period determined as per this condition.

- Ensure suitable overhead protection and hoarding is erected adjoining the boundary of the child care centre to ensure the safety and security of this interface at all times.

- The proposed method of access to and egress from the site for demolition, excavation and construction vehicles, including access routes through the Council area and the location and type of temporary vehicular crossing for the purpose of minimising traffic congestion and noise in the area, with no access across public parks or reserves being allowed (unless permission is granted under a separate permit).

- The proposed method of loading and unloading, demolition, excavation and construction machinery, excavation and building materials, formwork and the erection of any part of the structure within the site. Wherever possible mobile cranes should be located wholly within the site; and

- The location and operation of any on site crane.

Details demonstrating compliance are to be submitted to the Principal Certifying Authority at quarterly intervals during the demolition and construction, or at the request of Council.

Reason: To ensure that the construction phase with a minimum of disruption to the surrounding area. (DACTRBOC2)

The above requirements are consistent with our findings and will form part of the construction contract which will then be developed and managed by the successful builder.

5 OPERATION NOISE ASSESSMENT

The following sections review potential noise emissions from the following operational noise sources:

- Mechanical Services;
- Patrons;
- Carpark Traffic; and,
- Loading Dock Operation.

5.1 General Noise Criteria

Until recently, Dee Why was within the Warringah Council area which now forms part of the Northern Beaches Council. However, reference is made to the Warringah Development Control Plan (2011) which states the following requirements with respect to acoustic amenity in Item D3.

D3 Noise

Applies to Land

This control applies to land to which Warringah Local Environmental Plan 2011 applies.

Objectives

- *To encourage innovative design solutions to improve the urban environment.*
- *To ensure that noise emission does not unreasonably diminish the amenity of the area or result in noise intrusion which would be unreasonable for occupants, users or visitors.*

Requirements

1. *Noise from combined operation of all mechanical plant and equipment must not generate noise levels that exceed the ambient background noise by more than 5dB(A) when measured in accordance with the NSW Industrial Noise Policy at the receiving boundary of residential and other noise sensitive land uses.*
2. *Development near existing noise generating activities, such as industry and roads, is to be designed to mitigate the effect of that noise.*
3. *Waste collection and delivery vehicles are not to operate in the vicinity of residential uses between 10.00pm and 6.00am.*
4. *Where possible, locate noise sensitive rooms such as bedrooms and private open space away from noise sources. For example, locate kitchens or service areas closer to busy road frontages and bedrooms away from road frontages.*
5. *Where possible, locate noise sources away from the bedroom areas of adjoining dwellings/properties to minimise impact.*

Table 5-1 presents the intrusiveness criteria for each surrounding residential receiver area. In addition, the same daytime intrusiveness noise criterion has been applied to the childcare centre. These were calculated by adding 5dB to the RBL of the nearest long-term monitoring locations, as discussed above.

Table 5-1 Site-Specific Intrusive Noise Criteria

Location	Daytime (7.00am–6.00 pm)	Evening (6.00pm–10.00 pm)	Night (10.00 pm–7.00am)
Dee Why Residences	57*	53	44
Oceangrove Residences	59	57	51
Clarence Avenue Residences	57	55	49

* Noise criterion is also to be applied to the Childcare Centre.

The above criteria are to be applied to mechanical service noise.

5.2 Patron Noise Criteria

In addition, as the RSL is a licensed premises, the club is also subject to the requirements of NSW Liquor and Gaming. NSW Liquor and Gaming requirements are more stringent than Council or EPA requirements in that assessment is required to address the frequency of sound. Therefore, the application of these noise requirements to noise emissions from outdoor patron activities will ensure the derived site-specific noise criteria meets the requirements of all responsible authorities.

Applicable noise criteria for assessment of noise emanating from the premises are:

- The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) by more than 5dB between 07.00 am and 12.00 midnight at the boundary of any affected residence.
- The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12.00 midnight and 07.00 am at the boundary of any affected residence.
- Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12.00 midnight and 07.00 am.

After midnight, the most stringent noise requirement is inaudibility within residences. This is a function of facade design, area of operable windows and internal noise levels. However, we have found that if external noise levels are 5 - 7dB below background noise levels then noise tends to be generally inaudible within internal spaces. Therefore, an after-midnight external noise criterion of background -7dB in each octave band has been established for the purpose of this assessment.

Based on a review of the above requirements the external noise criteria for the surrounding residences opposite the smoker's terrace are presented in Table 5-2.

Table 5-2 External Patron L_{10} Octave Band Noise Criteria after Midnight

Residences	Frequency (Hz)									A
	32	63	125	250	500	1K	2K	4K	8K	
Clarence Avenue*	43	40	37	37	35	32	26	17	8	37
Ocean grove Residences**	45	42	39	39	37	34	28	19	10	39

* Based on a night background level of 44 dBA – May 2017 Measurements

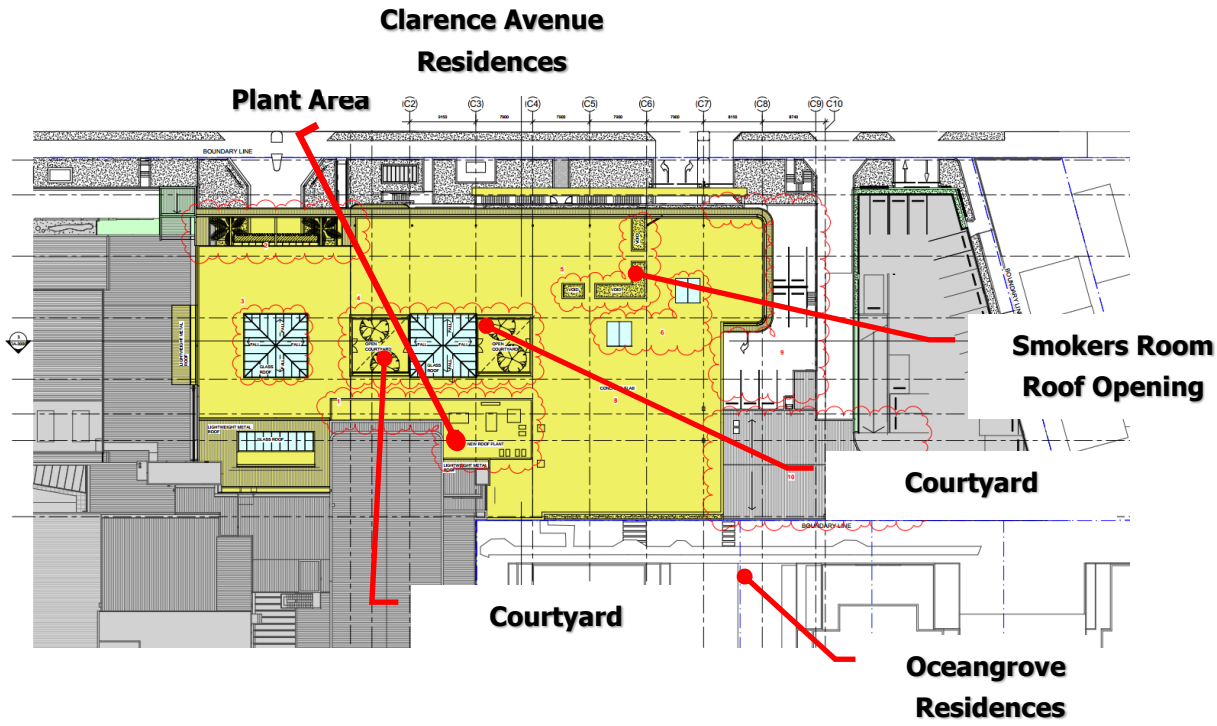
** Based on a night background level of 46 dBA – May 2016 Measurments

The above after-midnight noise assessment goals are 12dBA lower than council noise requirements for noise emissions.

5.3 Mechanical Services Noise Emissions

The major mechanical noise sources associated with the development will be carpark exhaust fans and plant that will be located in a plantroom above the refurbished sports bar. The plantroom is located on the north-eastern side of the proposed works as shown in Figure 5-1.

Figure 5-1 Level 2 showing New Plant Area & Smokers Room



Detailed specifications of mechanical services equipment that would otherwise allow an acoustic assessment of noise emissions from the site are not available at this stage of the project as selection and design is conducted after project approval. In line with the approvals for other developments, detailed assessment of operational noise emission should form a conditional

requirement of the development, to be satisfied to the PCA prior to the issue of the construction certificate.

To mitigate noise from mechanical plant it is likely the some or all of the following noise control measures may need to be adopted at the design stage to meet noise objectives:

- Silencers on carpark and other fans,
- Acoustic louvres,
- Noise barriers, and;
- Variable speed controls or carbon monoxide monitors.

The mechanical plant will be designed to meet the criteria presented in Table 3-4 at the identified nearby receivers.

5.4 Noise Emissions from Patrons

Noise associated with patrons within the enclosed club areas of the extension will be contained by the building facade and roof which will be sealed, air conditioned and likely to include thick single glazing or double glazing. This will adequately contain noise within the premises.

In the case of potential noise emissions from the smokers' terrace and eastern courtyard calculations of noise levels at the nearest residences on Clarence Avenue have been predicted based on the following factors:

- A smokers area opening of approximately 38 m^2 (see Figure 5-1);
- 20 patrons speaking in a raised voice in the smoking area and 50 patrons speaking in the courtyard areas (25 in each speaking) (see Table 5-1);i.e. both areas full of patrons after midnight which is considered as a worst case scenario.
- Distance to upper level residences on Clarence Avenue and Ocean Grove Residences;
- Directivity of the roof opening; and
- Internal sound absorption treatment on the terrace areas.

Table 5-3 presents typical L_{Aeq} noise emission levels associated with one individual person speaking.

Table 5-3 Typical Sound Power Levels of One Person Talking – dB

Voice Effort	Octave Band Centre Frequency - Hertz								A
	63	125	250	500	1000	2000	4000	8000	
Normal	58	62	63	65	66	63	54	47	69
Raised	60	63	68	72	73	68	61	54	76

These noise levels can be increased or decreased to account for patron numbers, for example the noise levels in the larger tenancy will be increased by adding 10 x log(number of patrons) to the values in Table 5-3.

Based on the factors detailed above, resultant noise levels have been predicted and compared to after midnight noise criteria at Clarence Avenue residences. The results are in Table 5-4 and Table 5-5. The following two tables present resultant noise level at receivers as compared to established noise criteria which has been established based on previous noise logging at residences.

Table 5-4 External Patron L_{10} Octave Band Noise Level at Clarence Avenue Residences

Residences	Frequency (Hz)									A
	32	63	125	250	500	1K	2K	4K	8K	
After midnight criteria	43	40	37	37	35	32	26	17	8	37
Predicted Levels	19	29	30	34	36	34	27	16	4	33

Table 5-5 External Patron L_{10} Octave Band Noise Level at Oceangrove Residences

Residences	Frequency (Hz)									A
	32	63	125	250	500	1K	2K	4K	8K	
After midnight criteria	45	42	39	39	37	34	28	19	10	39
Predicted Levels	15	29	30	34	37	36	30	22	10	37

A review of results indicates that general compliance with established noise criteria will be achieved for proposed operation of the courtyards and smokers terrace. It is noted that small exceedance of 1-2 dB in a couple of octaves are indicated however these exceedances are within prediction tolerances and acoustically insignificant given the "worst case" scenario that all areas are fully occupied.

Should amplified music be played in the RSL adjacent to these spaces then the glass doors and windows to the courtyards will need to be closed regardless of time of the day.

5.5 Carpark Noise

Noise from the carpark is not expected to change in any appreciable measure as a result of the development as the new design is consistent with the existing parking at ground level and above. In the case of lower levels, noise will be contained within the building structure.

In the case of the childcare centre, noise is not expected to increase as the adjacent carpark is to be retained for club and Dee Why Kindergarten use.

5.6 Loading Dock Operation

The loading dock is proposed to be operated during daytime between 7 am and 3 pm. In this period small delivery vans and garbage trucks will use the dock. It is proposed to have a roof and door on the loading dock to contain noise within the dock area. As such the only noise emanating from the dock operations will be the occasional van or garbage truck on the access ramp.

Therefore, given the hours of operation, noise from loading dock operation will be contained within the proposed dock area without adversely impacting of the acoustic amenity of residence near the dock.

In the case of the childcare centre noise levels from garbage trucks on the ramp are expected to be shielded by the ramp and intervening existing carpark which will form a noise buffer between the access ramps and the childcare centre.

The following measures are recommended:

- No speed humps are to be installed on the access ramp.
- The loading dock area is to be covered by a roof.
- A door to the loading dock is to be installed at the entrance so that noise can be contained within the dock facility.
- Operation of the dock should occur in the daytime period only where the proposed hours are in compliance with conditions 52, 53 and 54 as follows;

52. Commercial Waste Collection

Waste and recyclable material, generated by this premises, must not be collected between the hours of 10pm and 6am on any day.

Reason: To protect the acoustic amenity of surrounding properties.(DACPLG18)

53. Loading Within Site

All loading and unloading operations shall be carried out wholly within the confines of the site and within the approved loading areas, at all times.

Reason: To ensure that deliveries can occur safely within the site and does not adversely affect traffic or pedestrian safety and amenity. (DACPLG20)

54. Delivery Hours

No deliveries, loading or unloading associated with the premises are to take place between the hours of 10pm and 6am on any day.

6 SUMMARY OF FINDINGS

A summary of findings and recommendations for the S96 application are provided as follows;

Construction Noise and Vibration

The use of heavy rock breakers has been identified as requiring management to control potential noise and vibration levels that may result from their use. The following is concluded:

- Noise from construction is predicted to exceed noise management levels at nearby residences, without special measures being implemented. This is typical of major developments in residential areas. Measures for control of noise, predominately that generated by heavy rock breakers, should be considered as part of the Construction Noise & Vibration Management Plan.
- Condition 11 of the Development Approval (see section 4.14) requires the preparation of a Construction Management and Traffic Management Plan. This plan, to be prepared by the successful contractor, includes management of noise and vibration associated with construction including monitoring, respite, complaint procedures and physical hoarding around the site.
- Without mitigation, vibration and regenerated noise is likely to be perceptible at residences in Oceangrove when heavy rock breaking occurs during excavation in locations closest to their dwellings. Possible mitigation consisting of saw cutting followed by use of hammers has been identified. In addition, trial vibration and noise testing where heavy rock breakers are proposed to be used is recommended. It is noted that the reduction in the size of the basement means that the distance from the site and Oceangrove residences has been increased. This means that vibration levels at these residences will also be decreased.
- At the childcare centre, noise and vibration levels can be made to comply with all appropriate criteria. It is possible that some mitigation measures will be required, and these will be determined by the contractor in preparing the Construction Noise & Vibration Management Plan in accordance with Condition 11 of the development approval. It is specifically recommended that ground-borne noise tests be conducted during close operation of a large rock breaker to determine any required measures to comply with the internal noise criteria.
- Mitigation, by way of saw cutting, ripping or use of smaller rock breakers should be adopted where appropriate in response to the results of noise and vibration testing.
- Reduction of approximately 8000m^3 of excavation and increased basement setback from Oceangrove will assist in management of construction noise and vibration.

Operational Noise

- Mechanical services will be designed to meet the detailed site specific noise criteria as conditioned in item 51 of the existing conditions of consent. Any necessary noise control measures should be determined at detailed design stage when equipment design and selection are known.

51. Noise Impact on Surrounding Areas

Any noise from the premises shall not exceed more than 5dB(A) above the background level when measured from within any property boundary and will comply with the Environment Protection Authority's NSW Industrial Noise Policy and any appropriate legislation to prevent offensive noise.
Reason: To ensure that noise generated from the premise does not create offensive noise (DACHPGOG5)

- Noise emissions from within the extension will be contained within the premises. A review of the smoker's area and open central courtyards indicates compliance with the criteria when occupied by patrons only.
- The doors to the central courtyards should be closed when amplified music is played in areas adjacent to the courtyards. This applies at any time of day.
- Noise from carpark operation is not expected to change from existing operations on the site.
- Noise from the loading dock is to be contained within the loading dock by the used of a roof and door to the loading dock. In addition, the use of the dock in the evening and night periods should not be permitted.

7 CONCLUSION

A review of the potential noise and vibration impacts of the construction and operation associated with the development at Dee Why RSL has been conducted for the revised design of Stage 5 which is the subject of the S96 application. These changes, from a noise perspective consist of a reduced basement carpark, relocated loading dock and the inclusion of two central outdoor courtyards.

The initial assessment has been updated to reflect any potential impacts associated with these changes as follows:

Construction Noise and Vibration

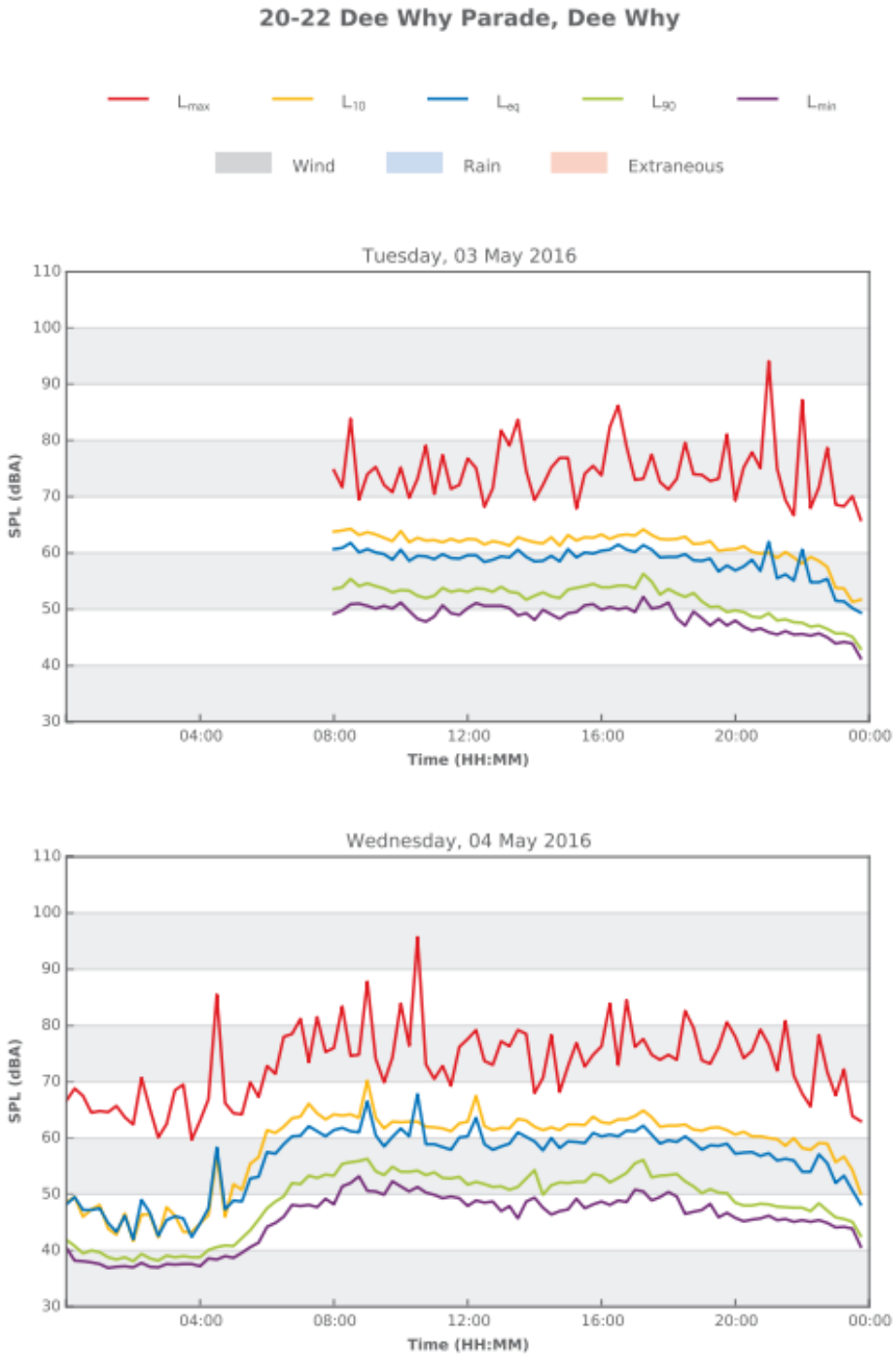
- No increases in predicted construction noise and vibration can be expected as a result of the S96 changes. In fact the reduction in size of the basement carpark will mean a reduced duration of higher noise and vibration levels for Oceangrove residents.
- Accordingly the approved condition of consent Item 11 is applicable to the revised development design.

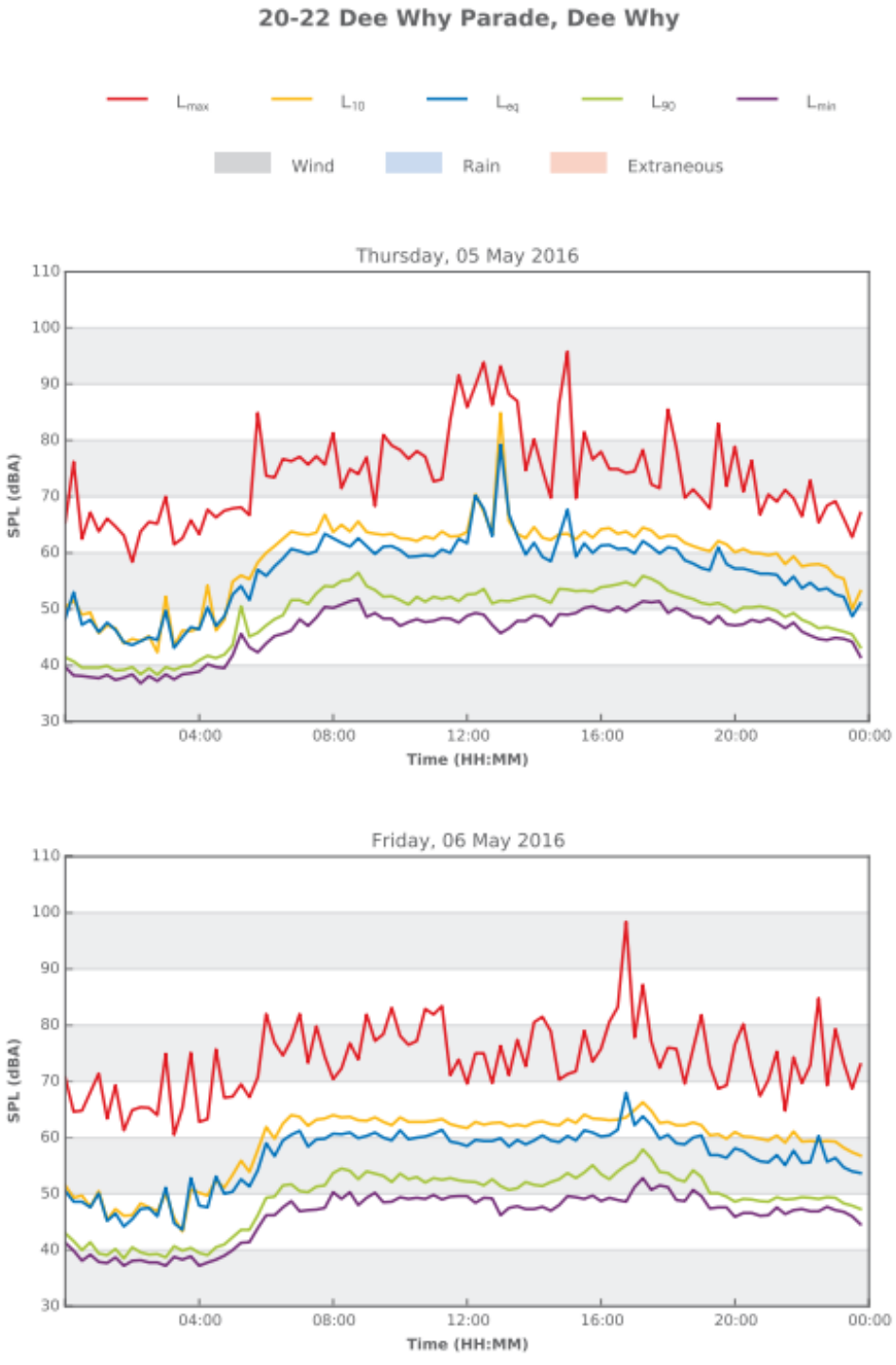
Operational Noise

- Operational noise levels due to mechanical services are adequately address by council condition 51 whereby there a no proposed changes to the services design.
- In the case of noise from the smokers terrace, assessment of noise has been conducted based on more recent noise logging whereby general compliance is indicated for operation of the courtyards and smokers terrace area.
- Where amplified music is played, adjunct to the courtyards the closing of doors between the club and the courtyard is required. This measure should be included in the club operational management plan.
- Operational noise from the relocated loading dock will not cause an adverse impact at surrounding residences and other receivers

APPENDIX A

NOISE MEASUREMENT RESULTS


20-22 Dee Why Parade, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Tuesday, 03 May 2016
SPL (dBA)
110
100
90
80
70
60
50
40
30
04:00
08:00
12:00
16:00
20:00
00:00
Time (HH:MM)
Wednesday, 04 May 2016
SPL (dBA)
110
100
90
80
70
60
50
40
30
04:00
08:00
12:00
16:00
20:00
00:00
Time (HH:MM)


20-22 Dee Why Parade, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Thursday, 05 May 2016
SPL (dBA)
110
100
90
80
70
60
50
40
30
04:00
08:00
12:00
16:00
20:00
00:00
Time (HH:MM)
Friday, 06 May 2016
SPL (dBA)
110
100
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80
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40
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04:00
08:00
12:00
16:00
20:00
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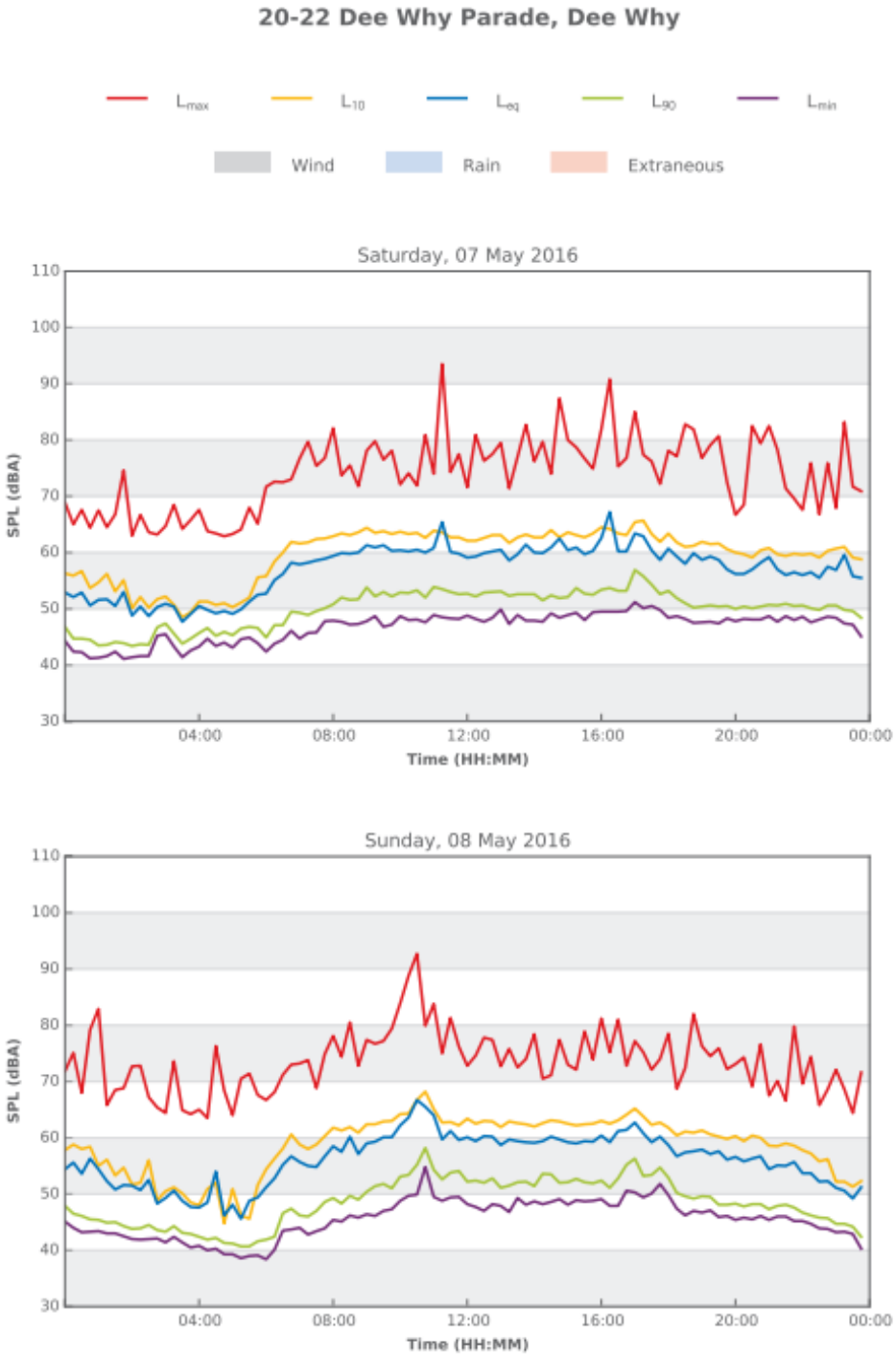
Time (HH:MM)


20-22 Dee Why Parade, Dee Why
Lmax
L10
Leq
L90
Lmin
Wind
Rain
Extraneous
Saturday, 07 May 2016
SPL (dBA)
110
100
90
80
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60
50
40
30
04:00
08:00
12:00
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20:00
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Time (HH:MM)
Sunday, 08 May 2016
SPL (dBA)
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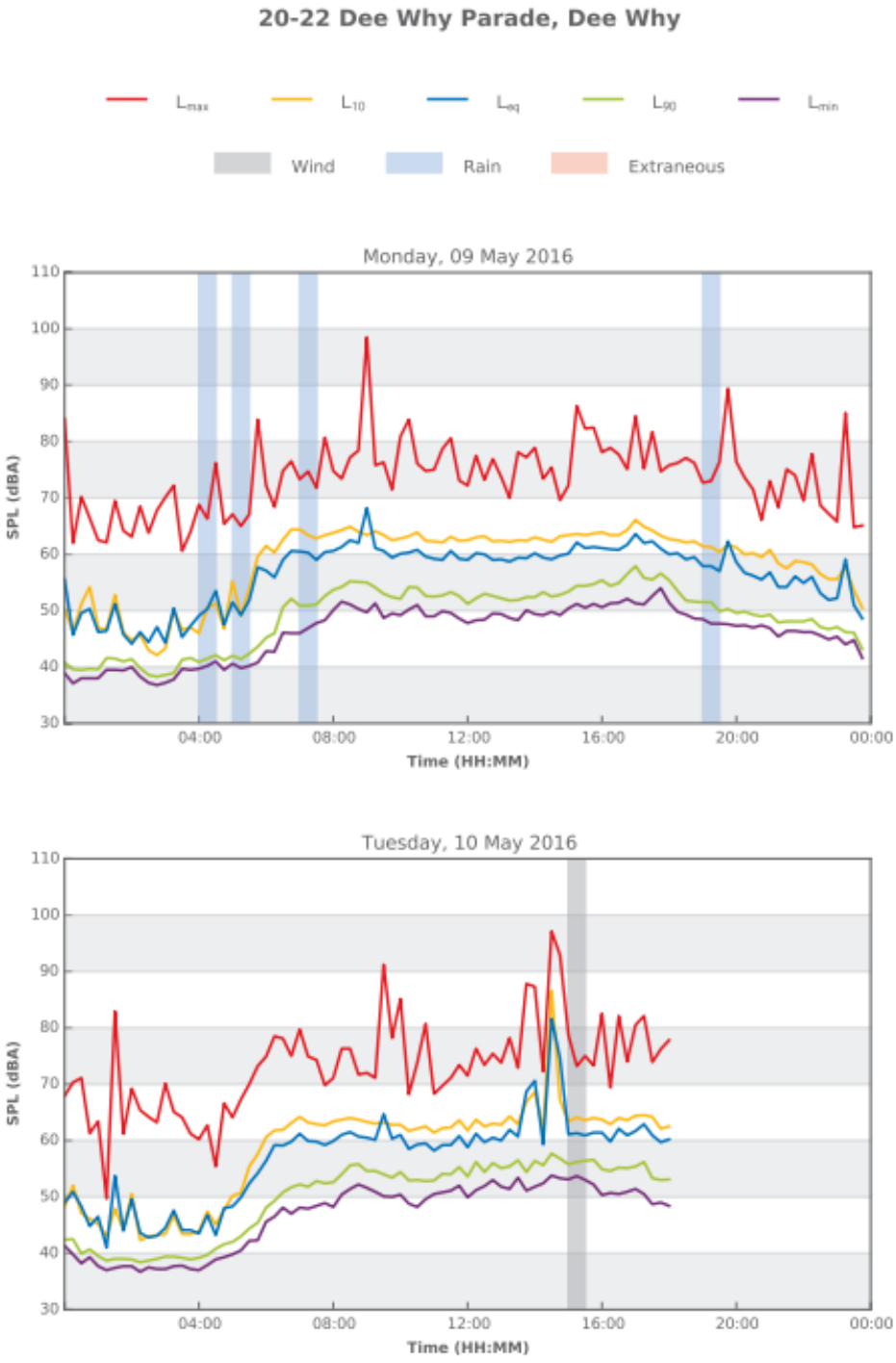
Time (HH:MM)


20-22 Dee Why Parade, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Monday, 09 May 2016
SPL (dBA)
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Time (HH:MM)
Tuesday, 10 May 2016
SPL (dBA)
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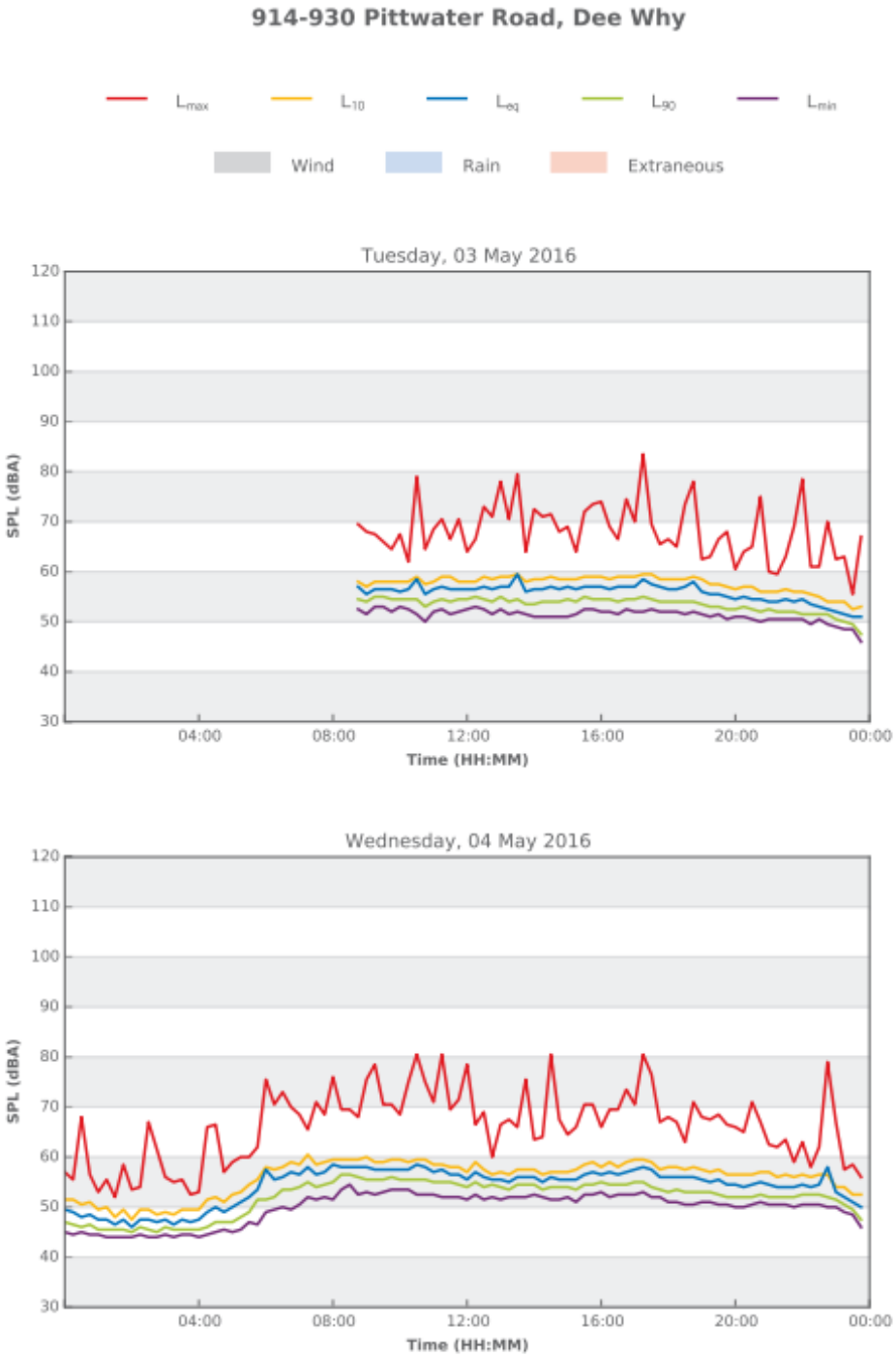
Time (HH:MM)


914-930 Pittwater Road, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Tuesday, 03 May 2016
SPL (dBA)
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Time (HH:MM)
Wednesday, 04 May 2016
SPL (dBA)
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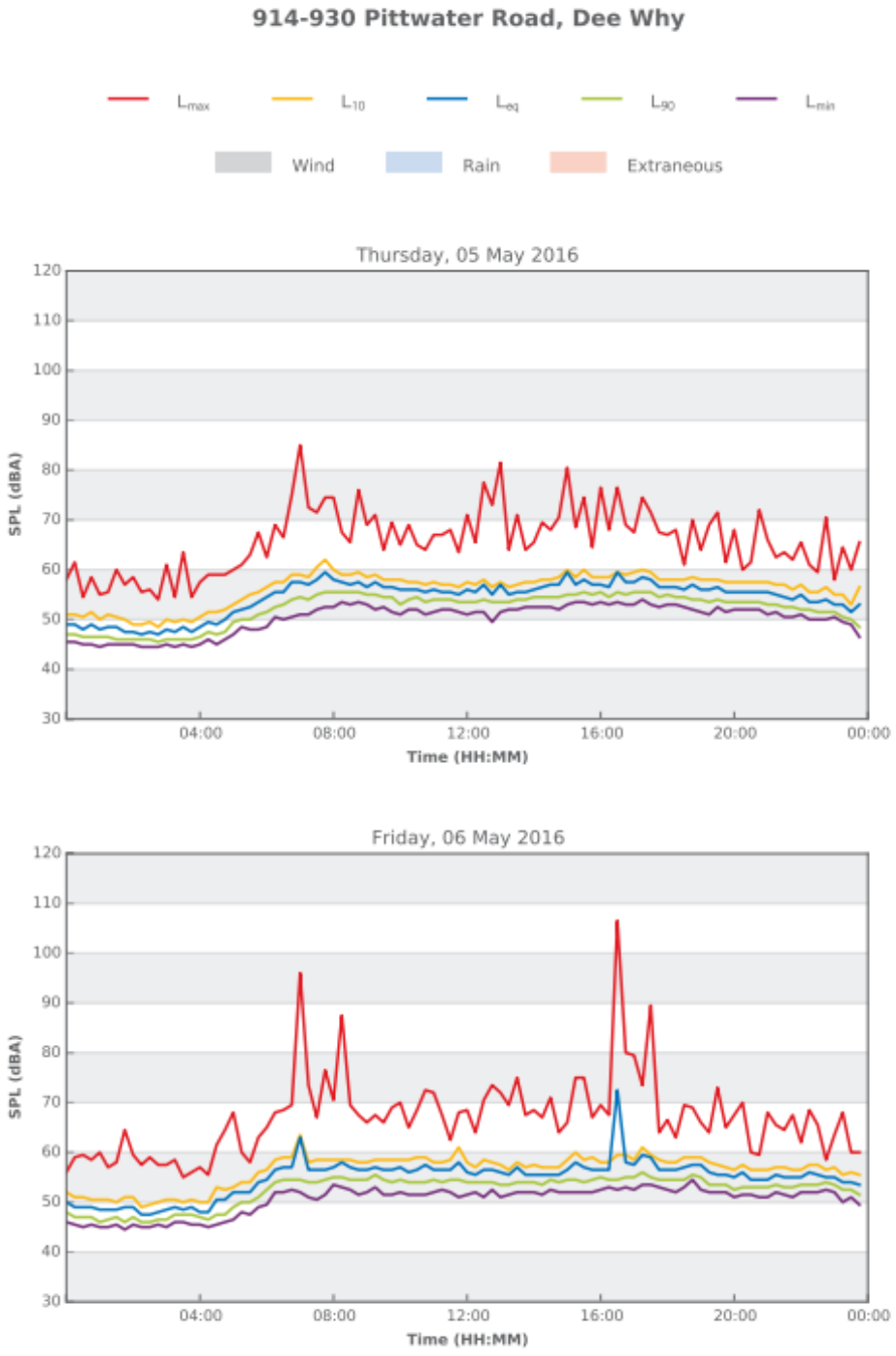
Time (HH:MM)


914-930 Pittwater Road, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Thursday, 05 May 2016
SPL (dBA)
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Time (HH:MM)
Friday, 06 May 2016
SPL (dBA)
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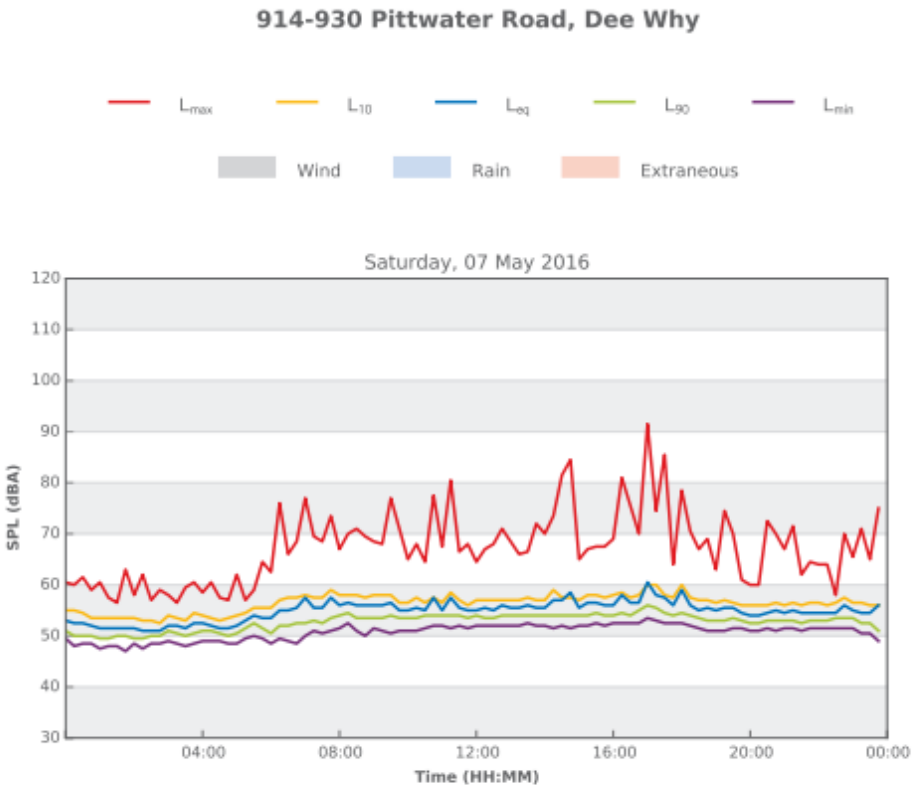
Time (HH:MM)


914-930 Pittwater Road, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Saturday, 07 May 2016
SPL (dBA)
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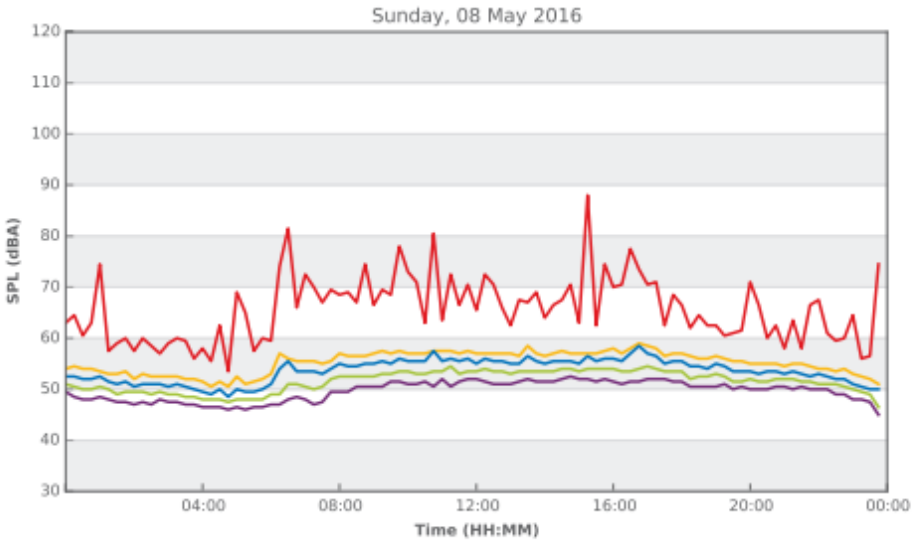
Time (HH:MM)


Sunday, 08 May 2016
SPL (dBA)
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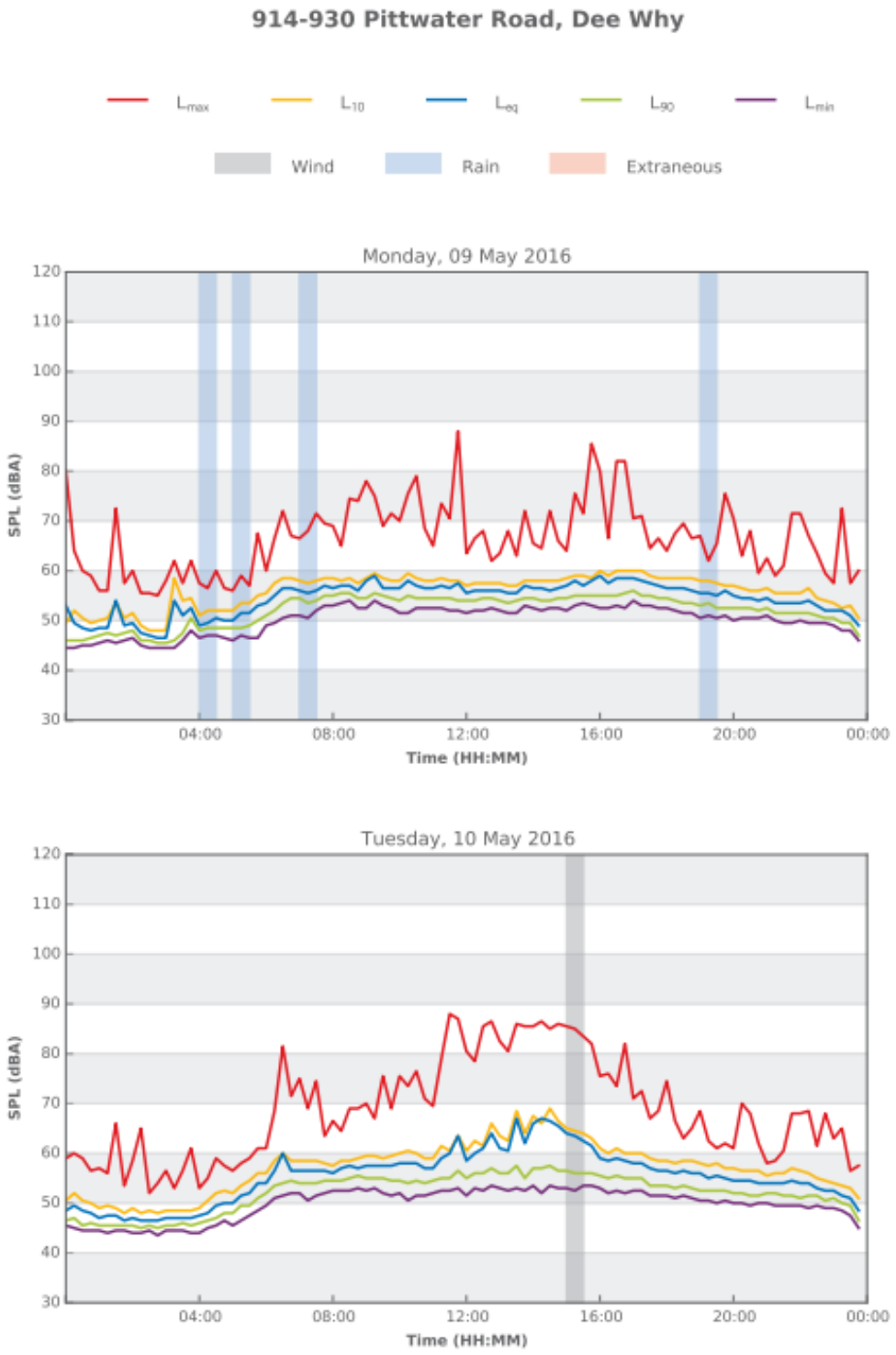
Time (HH:MM)


914-930 Pittwater Road, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Monday, 09 May 2016
SPL (dBA)
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Time (HH:MM)
Tuesday, 10 May 2016
SPL (dBA)
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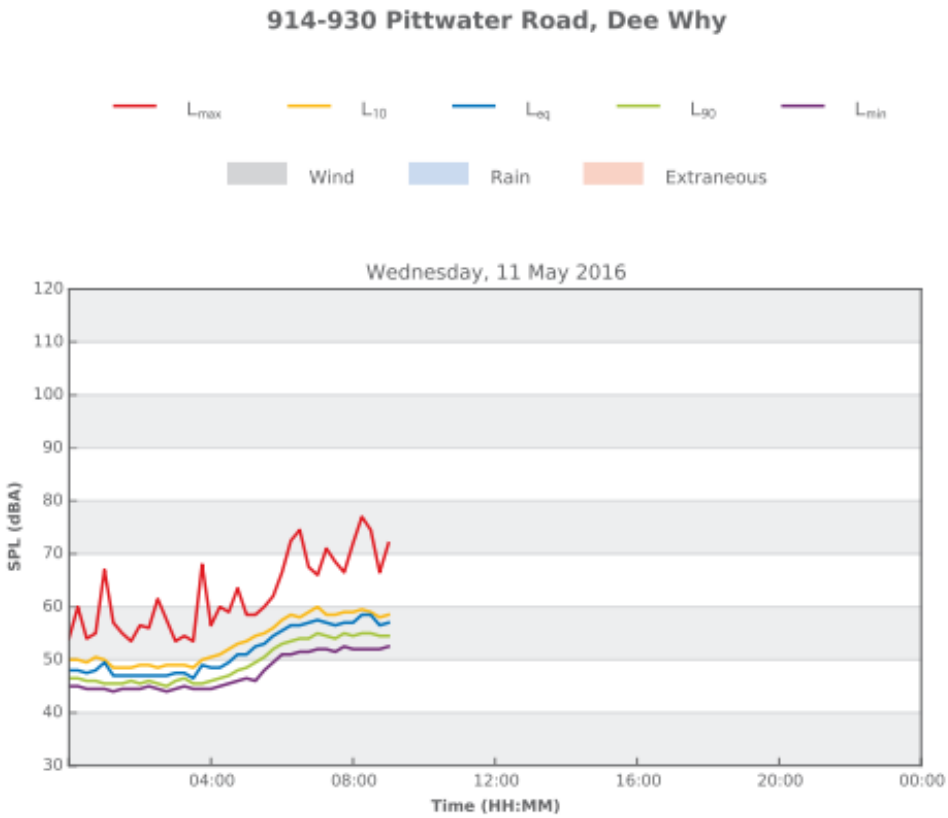
914-930 Pittwater Road, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Wednesday, 11 May 2016
SPL (dBA)
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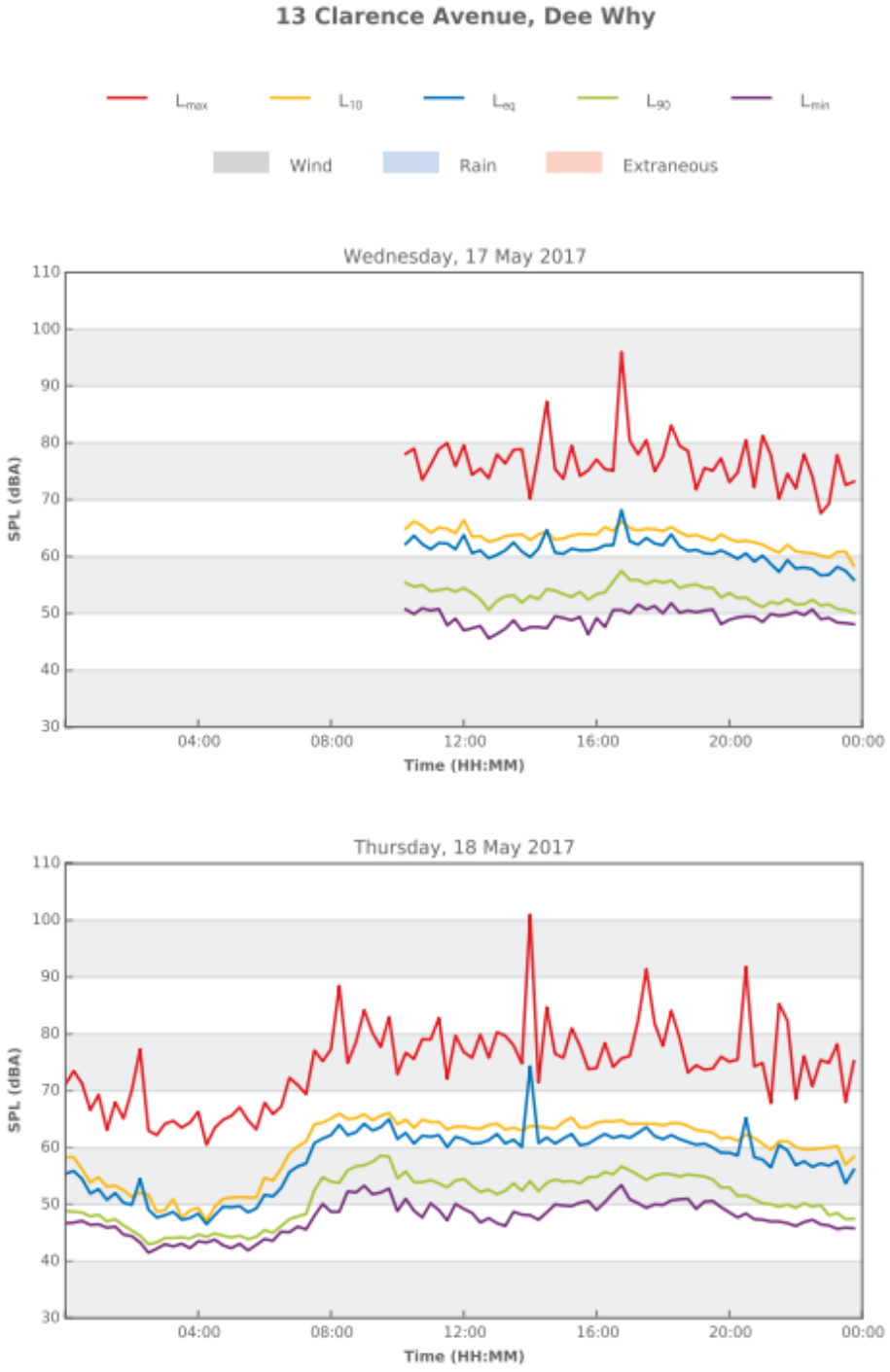
Time (HH:MM)


13 Clarence Avenue, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Wednesday, 17 May 2017
SPL (dBA)
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Time (HH:MM)
Thursday, 18 May 2017
SPL (dBA)
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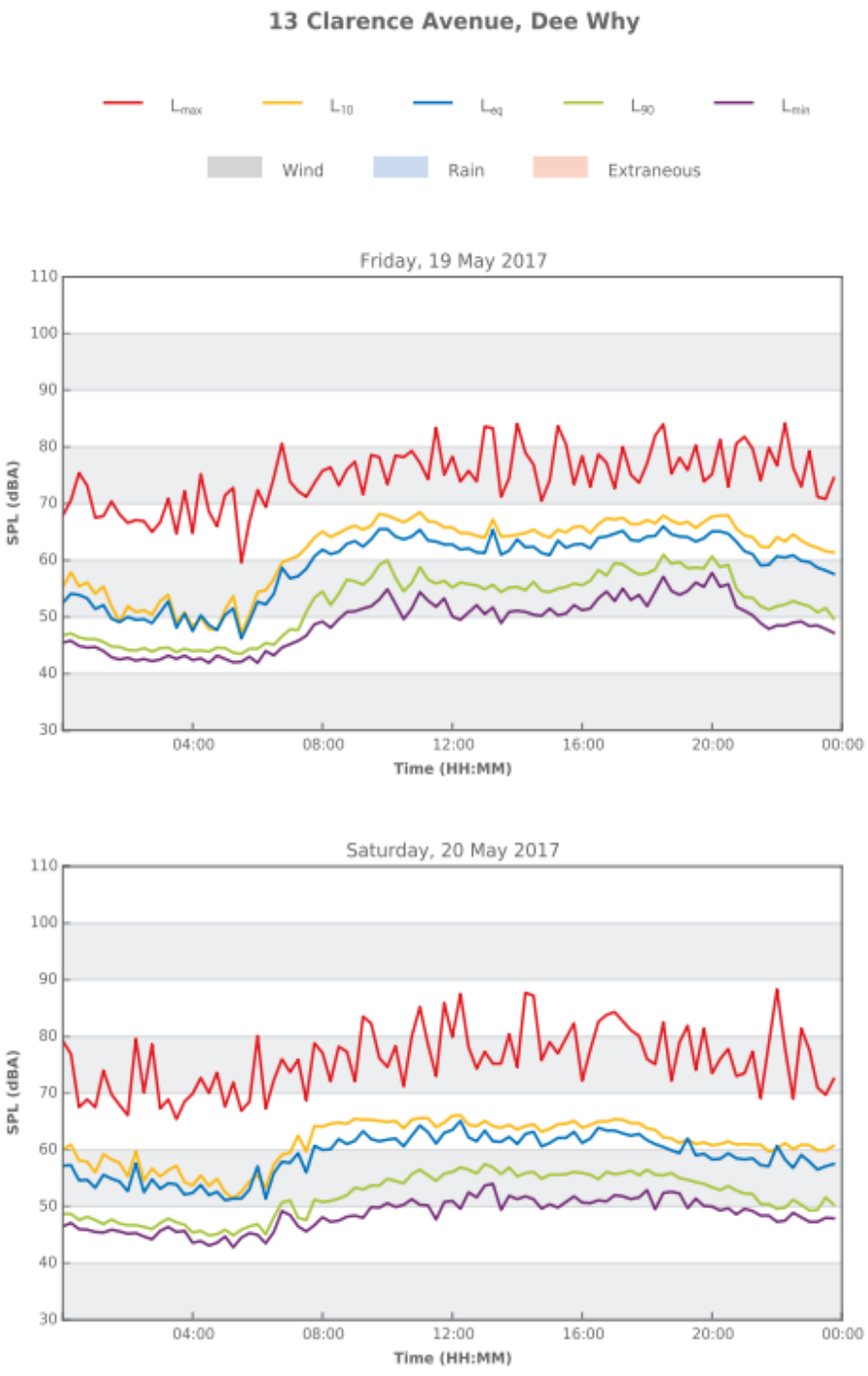
Time (HH:MM)


13 Clarence Avenue, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Friday, 19 May 2017
SPL (dBA)
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Time (HH:MM)
Saturday, 20 May 2017
SPL (dBA)
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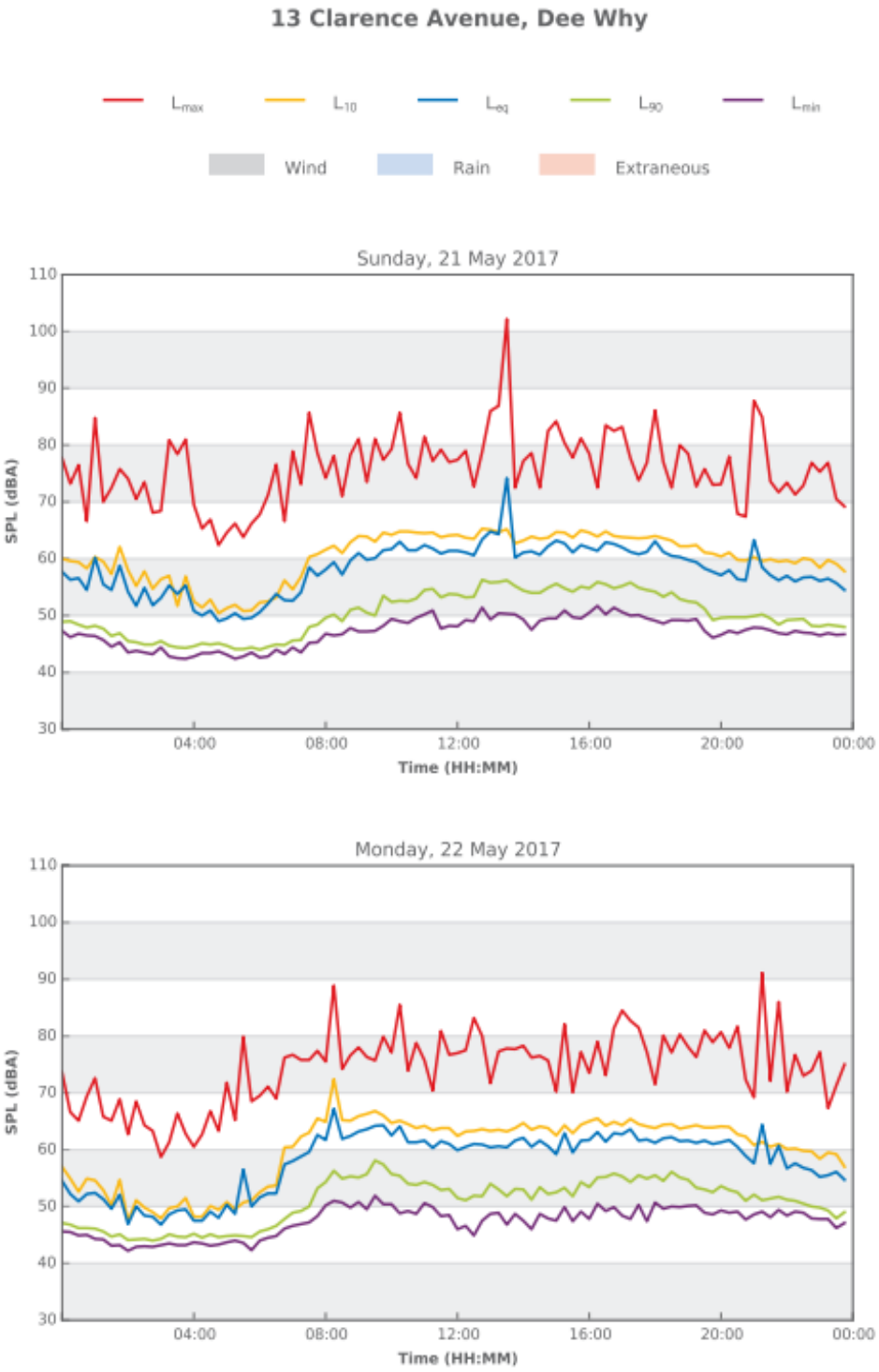
Time (HH:MM)


13 Clarence Avenue, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Sunday, 21 May 2017
SPL (dBA)
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Time (HH:MM)
Monday, 22 May 2017
SPL (dBA)
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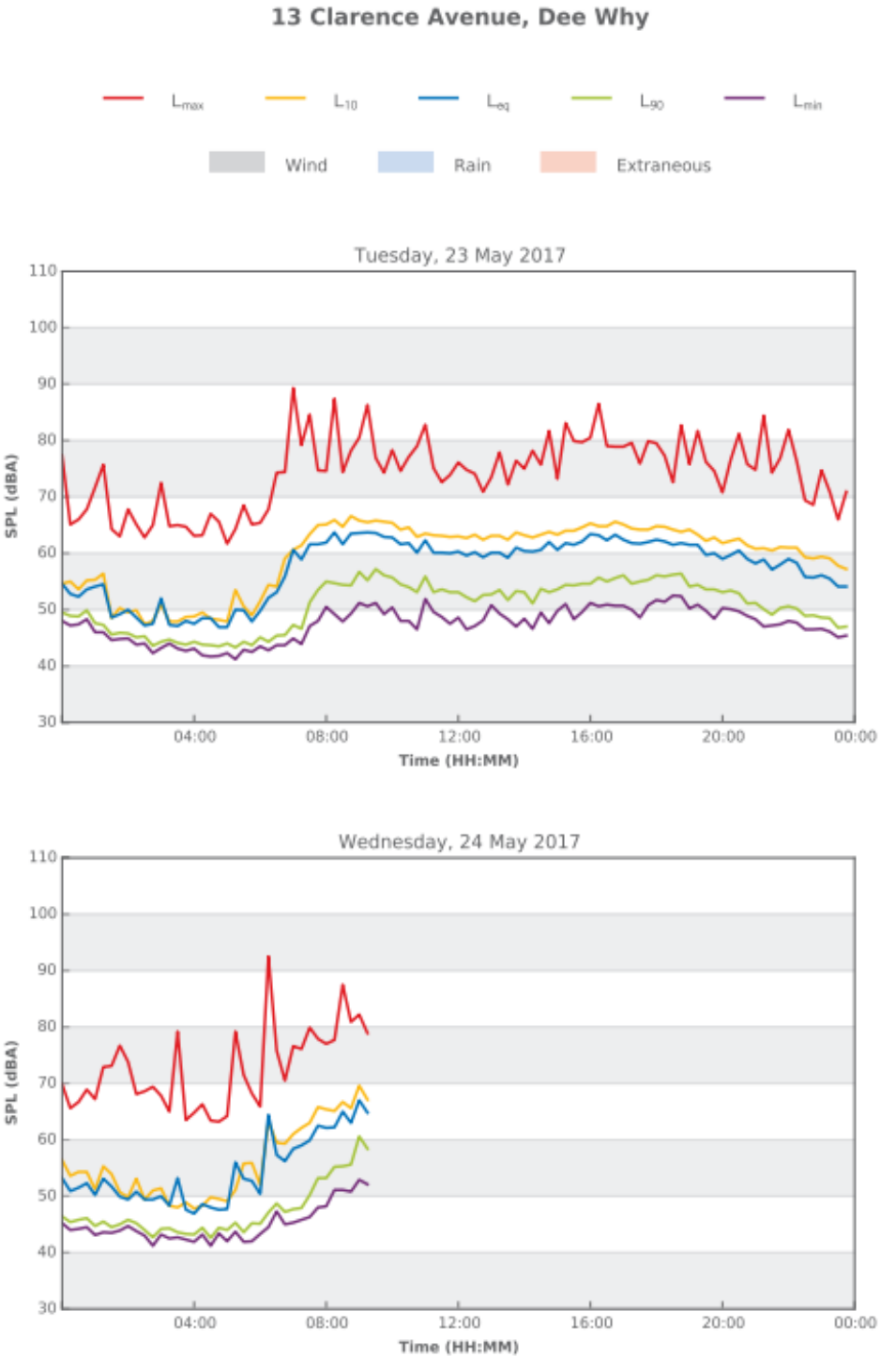
Time (HH:MM)


13 Clarence Avenue, Dee Why
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Tuesday, 23 May 2017
SPL (dBA)
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Time (HH:MM)
Wednesday, 24 May 2017
SPL (dBA)
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Time (HH:MM)