



S4.55 Noise Emission Assessment Swim School

Warehouse 1 / 100 South Creek Rd, Cromer, NSW

Client:
Aquatic Achievers



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GLOSSARY

NOISE

Noise is produced through rapid variations in air pressure at audible frequencies (20 Hz – 20 kHz). Most noise sources vary with time. The measurement of a variable noise source requires the ability to describe the sound over a particular duration of time. A series of industry standard statistical descriptors have been developed to describe variable noise, as outlined in Section 2 below.

NOISE DESCRIPTORS

dB – Decibels. The fundamental unit of sound, a Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell. Probably the most common usage of the Decibel in reference to sound loudness is dB sound pressure level (SPL), referenced to the nominal threshold of human hearing. For sound in air and other gases, dB(SPL) is relative to 20 micropascals (μPa) = 2×10^{-5} Pa, the quietest sound a human can hear.

L_{Aeq} – The A-weighted sound pressure level averaged over the measurement period. It can be considered as the equivalent continuous steady-state sound pressure level, which would have the same total acoustic energy as the real fluctuating noise over the same time period. Measured in dB.

L_{Amax} – The maximum or peak A-weighted noise level that occurs over the measurement period. Measured in dB.

Indoor Design Level – The recommended maximum level in dB(A) inside a building from external noise sources.

A-WEIGHTING

"A-weighting" refers to a prescribed amplitude versus frequency curve used to "weight" noise measurements in order to represent the frequency response of the human ear. Simply, the human ear is less sensitive to noise at some frequencies and more sensitive to noise at other frequencies. The A-weighting is a method to present a measurement or calculation result with a number representing how humans subjectively hear different frequencies at different levels.

NOISE CHARACTER, NOISE LEVEL AND ANNOYANCE

The perception of a given sound to be deemed annoying or acceptable is greatly influenced by the character of the sound and how it contrasts with the character of the background noise. A noise source may be measured to have only a marginal difference to the background noise level, but may be perceived as annoying due to the character of the noise.

Acoustic Dynamics' analysis of noise considers both the noise level and sound character in the assessment of annoyance and impact on amenity.

1 INTRODUCTION

1.1 SUMMARY

Acoustic Dynamics is engaged by **Aquatic Achievers** to assess noise emission resulting from the proposed design modification to the approved swim school centre, located at Warehouse 1, 100 South Creek Road, Cromer, NSW.

The development has approval by way of Development Application 2021/2608 however the applicant is seeking approval for a change to the design of the development (i.e. relocation of the mezzanine plant room to ground floor and removal of one swimming pool).

This document provides an assessment of noise impacts at nearby sensitive receivers resulting from the proposed modification. This assessment is prepared in accordance with the various acoustic assessment requirements of Northern Beaches Council, the NSW Environmental Protection Authority (EPA) and relevant Australian Standards.

1.2 LOCATION & DESCRIPTION OF SUBJECT SITE

The swim school centre has approval to operate within Warehouse 1 of the commercial/industrial facility located at 100 South Creek Road, Cromer, NSW, and has approval to operate during the following hours:

- 6:30am to 9pm, 7 days a week.

In terms of usage and member capacity, Acoustic Dynamics advises that there is no proposed increase associated with the modification. The usage of the facility will be no greater than that already assessed in Acoustic Dynamics report 5319R001.LB.211213, dated 22 December 2021 and approved by way of DA 2021/2608.

Acoustic Dynamics advise that for the purpose of the acoustical assessment, the nearest sensitive receivers are:

- **[R1]** Residential receivers located at 30 Orlando Road (NNE);
- **[R2]** Residential receivers located at 28 Orlando Road (NNE);
- **[R3]** Residential receivers located at 26 Orlando Road (NNE); and
- **[R4]** Residential receivers located at 55 Campbell Avenue (E).

For the purposed of the acoustic assessment the residential receivers located at 30 Orlando Road and 55 Campbell Avenue are considered the most affected and will provide an indicative noise emission impact at the other sensitive receivers detailed above.

The closest potentially affected commercial receivers are:

- **[C1]** Commercial receivers located at Warehouse 2 directly adjacent, within the same building;

The subject facility and the surrounding area are shown in the location map, aerial image and drawings presented within **Appendix A**.

1.3 SCOPE

Acoustic Dynamics has been engaged to provide an acoustic assessment suitable for submission to Northern Beaches Council. The scope of the assessment is to include the following:

- Review of legislation, Council criteria and Australian Standards relevant to the internal noise emission at the subject site;
- Utilise recently collected unattended noise monitoring data to determine existing noise emission levels;
- Establish relevant project specific noise emission criteria;
- Examination of architectural drawings; and
- Prediction of likely noise emission associated with the subject site.

2 RELEVANT ASSESSMENT CRITERIA AND STANDARDS

Acoustic Dynamics has conducted a review of the local council, state government and federal legislation that is applicable to noise assessment for the subject site. The relevant sections of the legislation are presented below.

2.1 NORTHERN BEACHES COUNCIL CRITERIA

2.1.1 DEVELOPMENT APPLICATION 2021/2608

Acoustic Dynamics has review Development Application 2021/2608 with the following relevant information contained within:

"7. Acoustic Design Recommendations

Prior to the issuing of any Construction Certificate, documentation is to be submitted to the satisfaction of the Principal Certifier that design recommendations within Section 5 of the document "Operational Noise Emission Assessment - Proposed Swim School - Warehouse 1 /100 South Creek Rd, Cromer, NSW" by Acoustic Dynamics dated 22 December 2021 (Reference 5319R001.LB.211213) have been implemented / incorporated into the design of the premises.

Reason: To prevent noise nuisance by using mitigation measures in design.

19. Acoustic Assessment of Design Construction

Prior to the issuing of any Occupation Certificate, documentation is to be submitted to the satisfaction of the Principal Certifier that all items within Section 5 of the document "Operational Noise Emission Assessment - Proposed Swim School - Warehouse 1 / 100 South Creek Rd, Cromer, NSW" by Acoustic Dynamics dated 22 December 2021 (Reference 5319R001.LB.211213) have been completed.

Reason: To prevent noise nuisance by using mitigation measures in design.

24. Swimming Pool/Spa Motor Noise

The swimming pool / spa motor shall not produce noise levels that exceed 5dBA above the background noise when measured from the nearest property boundary.

Reason: To ensure that the development does not impact on the acoustic privacy of surrounding residential properties.

26. Hours of Operation

The hours of operation are to be restricted to:

- *6:30am to 9pm, 7 days a week.*

Upon expiration of the permitted hours, operation shall immediately cease, no patrons shall be permitted entry and all customers on the premises shall be required to leave within the following 30 minutes.

Reason: Information to ensure that amenity of the surrounding locality is maintained.

2.1.2 LOCAL ENVIRONMENT PLAN

A review of Warringah *Local Environment Plan* (LEP) 2011 was conducted yet did not yield specific acoustic information or criteria relating to this development.

2.1.3 DEVELOPMENT CONTROL PLAN

A review of Warringah *Development Control Plan* (DCP) 2011 was conducted. References to acoustic requirements and relevant noise criteria are reproduced below:

“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.*
See also NSW Industrial Noise Policy Appendices
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 10pm and 6am.*
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."*

2.1.4 PROTECTION OF THE ENVIRONMENT OPERATIONS (POEO) ACT

In accordance with the noise emission requirements of Northern Beaches Council, we advise that noise emission from the proposed swim school centre must also comply with the requirements of the relevant legislation, being the *Protection of the Environment Operations (POEO) Act 1997*. The POEO Act 1997 requires that the subject plant and equipment must not generate "offensive noise". Offensive noise is defined as follows:

"offensive noise" means noise:

- (a) *that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:*
 - (i) *is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
 - (ii) *interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
- (b) *that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations."*

Council can enforce the above planning controls under the Environmental Planning and Assessment Act of 1979.

2.2 NSW ENVIRONMENT PROTECTION AUTHORITY (EPA)

2.2.1 NOISE POLICY FOR INDUSTRY (NPFI)

The EPA, in its Noise Policy for Industry (NPFI) document published in October 2017, outlines and establishes noise criteria for industrial or other noise sources in various zoning areas.

Acoustic Dynamics advise that the following criteria have been applied for the assessment of the operational noise associated with the subject commercial development.

2.2.1.1 PROJECT NOISE TRIGGER LEVEL

The *project noise trigger level* provides a benchmark or objective for assessing a proposal or site. It takes into account (amongst other factors):

- The receiver's background noise environment;
- The time of day of the activity
- The character of the noise; and
- The type of receiver and nature of the area.

Put simply, the *project noise trigger level* is the lower (that is, more stringent) value of the *project intrusiveness noise level* and the *project amenity noise level*.

2.2.1.2 PROJECT INTRUSIVENESS NOISE LEVEL

The intrusiveness noise level is determined as follows:

$L_{Aeq, 15min}$ = rating background noise level + 5 dB	
where:	
$L_{Aeq, 15min}$	represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes.
and	
Rating background noise level	represents the background level to be used for assessment purposes, as determined by the method outlined in Fact Sheets A and B.

2.2.1.3 PROJECT AMENITY NOISE LEVEL

The recommended amenity noise levels represent the objective for **total** industrial noise at a receiver location, whereas the **project amenity noise level** represents the objective for a noise from a **single** industrial development at a receiver location.

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

**Project Amenity Noise Level for Industrial Developments =
Recommended Amenity Noise Level (Table 2.2) minus 5 dB(A)**

2.2.1.4 PROJECT NOISE TRIGGER LEVEL

To establish the acoustic environment at the subject site in accordance with the guidelines of the NSW EPA's NPfI, an unattended noise logging was deployed at the subject development site between Friday 29 June 2018 and Friday 6 July 2018. The selected location, within the north eastern corner of the lot, shown in **Appendix A**, is likely to be representative of the existing noise environment of the nearest residential receivers. The prevailing weather conditions during the unattended noise monitoring were generally calm and did not influence the noise measurements taken.

Following the general procedures outlined in the EPA's NPfI, a summary of the established noise environment, and relevant environmental noise criteria is presented in **Table 2.1**.

Table 2.1 Measured Noise Levels and Project Noise Objectives – External Residential Receiver

Location	Assessment Period	Rating Background Noise Level (RBL) L _{A90} [dB]	Measured L _{Aeq} [dB]	Project Intrusiveness Noise Level L _{Aeq} [dB]	Project Amenity Noise Level L _{Aeq} [dB] ¹	Project Noise Trigger Level L _{Aeq} [dB]
Nearest residential receiver(s)	Day (7am – 6pm)	40	58	45	53	45
	Evening (6pm – 10pm)	35	55	40	43	40
	Night (7am – 8am)	30	48	35	38	35
	Morning Shoulder (6am – 7am) ²	39	56	44	N/A	44

Note: 1) Amenity adjustment based on “Suburban” receiver type. The noise emission objective has been modified in accordance with the recommendations detailed within the NPfI Section 2.2, for time period standardising of the intrusiveness and amenity noise levels (L_{Aeq,15min} will be taken to be equal to the L_{Aeq,period} + 3 dB).

2) A morning shoulder measured L_{A90}, measured L_{Aeq} and derived Project Intrusiveness L_{Aeq}, have been determined in accordance the methodology detailed with the NPfI Section A3 Dealing with ‘shoulder’ periods.

The EPA's NPfI specifies additional noise emission level corrections that should be applied when a noise source is determined to include “modifying factors” that can vary the perceived intrusiveness of a noise source. Such modifying factors include tonal, low frequency, or intermittent noise. Acoustic Dynamics advise that a 5 dB modifying factor has been applied to the mechanical equipment as a conservative approach.

For premises to which it applies, the NPfI noise criteria for the assessment of noise emission from industrial noise sources at the boundaries of nearby commercial premises are reproduced from Table 2.1 of the NPfI and presented as **Table 2.2**.

Table 2.2 Recommended L_{Aeq} Noise Levels – Commercial

Type of Receiver	Noise Amenity Area	Time of Day	Recommended Amenity Noise Level L_{Aeq} [dB] ¹
Commercial premises	All	When in use	63

Note 1) Amenity adjustment based on “Commercial” receiver type (Table 2.3 of the NPfl). The noise emission objective has been modified in accordance with the recommendations detailed within the NPfl Section 2.2, for time period standardising of the intrusiveness and amenity noise levels ($L_{Aeq,15min}$ will be taken to be equal to the $L_{Aeq, period} + 3$ decibels (dB)).

The EPA’s NPfl specifies additional noise emission level corrections that should be applied when a noise source is determined to include “modifying factors” that can vary the perceived intrusiveness of a noise source. Such modifying factors include tonal, low frequency, impulsive, or intermittent noise.

Although the NPfl does not apply for the assessment of noise emission from the subject development, Acoustic Dynamics advises that achieving compliance with the NPfl intrusive noise emission objectives applicable at the boundaries of the nearest non-residential premises will adequately protect the acoustic amenity of these receivers.

2.2.2 SLEEP DISTURBANCE CRITERION

Acoustic Dynamics advises that sleep disturbance is a complex issue and the potential for sleep disturbance to occur depends on both the level of noise at a residential receiver and the number of events that occur.

The EPA has in the past investigated overseas and Australian research on sleep disturbance. The method of assessing noise for sleep disturbance relies on the application of a screening that indicates the potential for this to occur. The EPA’s Noise Guide for Local Government, provides the following guidance for such a screening test:

“Currently, there is no definitive guideline to indicate a noise level that causes sleep disturbance and more research is needed to better define this relationship. Where likely disturbance to sleep is being assessed, a screening test can be applied that indicates the potential for this to occur. For example, this could be where the subject noise exceeds the background noise level by more than 15 dB(A). The most appropriate descriptors for a source relating to sleep disturbance would be $L_{A1(1\text{ minute})}$ (the level exceeded for 1% of the specified time period of 1 minute) or L_{Amax} (the maximum level during the specified time period) with measurement outside the bedroom window.”

Additionally, the guidelines of the NSW EPA’s NPfl provide the following additional information:

“Where the subject development/premises night-time noise levels at a residential location exceed:

- *$L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater”*

Further to the above information, the following summarizes the sleep disturbance criteria:

$$L_{Aeq,15min} \leq 40 \text{ dB or } L_{Aeq,15min} \leq (RBL + 5 \text{ dB}), \text{ whichever is greater}$$

AND

$$L_{Amax} \text{ or } L_{A1(1 \text{ minute})} \leq L_{A90} + 15 \text{ dB or } 52 \text{ dB(A)}, \text{ whichever is greater}$$

In addition to the above, the EPA has published the following additional information relating to findings of significant research carried out for sleep disturbance:

“Maximum internal noise levels below 50-55 dBA are unlikely to cause awakening reactions... One or more noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect health and wellbeing significantly.”

Therefore, in accordance with the EPA guidelines detailed above, the following sleep disturbance screening criterion has been applied for this project:

Sleep Disturbance Criteria:

$$L_{Aeq,15min} \leq 40 \text{ dB(A)}$$

AND

$$L_{Amax} \text{ or } L_{A1(1 \text{ minute})} \leq 52 \text{ dB(A)}$$

2.3 THE EPA'S ROAD NOISE POLICY

The NSW Environmental Protection Authority (EPA) presents guidelines for assessment of road traffic noise in its Road Noise Policy (RNP). The document provides road traffic noise criteria for proposed roads, as well as other developments, with the potential to have an impact in relation to traffic noise generation. **Table 2.3** presents the relevant RNP noise criteria for the subject development site.

Table 2.3 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Type of project / land use	Assessment Criteria [dB]	
		Day (7am – 10pm)	Night (10pm – 7am)
Local Roads	6. Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq, (1 \text{ hour})}$ 55 (external)	$L_{Aeq, (1 \text{ hour})}$ 50 (external)

2.4 RELEVANT AUSTRALIAN STANDARDS

2.4.1 AS 2107 – “ACOUSTICS – RECOMMENDED DESIGN SOUND LEVELS ...FOR BUILDINGS”

Australian Standard 2107-2016 recommends satisfactory and maximum design sound levels for various types of occupancy within buildings. AS 2107 recommends the following satisfactory and maximum design sound levels, detailed in **Table 2.4**, for the relevant types of occupancies and areas which are likely to be located adjacent to the swim school.

Table 2.4 Recommended Design Sound Levels for Different Areas of Occupancy in Buildings
(Extract from Australian Standard 2107:2016 Table 1)

Type of Occupancy / Activity	Design Sound Level ($L_{Aeq,t}$) range
3 INDUSTRIAL BUILDINGS	
Packing and delivery	<60
Foremen's offices	45 to 50
Precision assemblies	40 to 50
5 OFFICE BUILDINGS	
General office areas	40 to 45
Meeting room (small)	40 to 45

Acoustic Dynamics advises that any levels of airborne noise or regenerated noise transmitted into the tenancies adjacent to the proposed swim school should not exceed the relevant maximum design sound levels presented in **Table 2.4** above. By ensuring the noise levels from the swim school received within the adjacent tenancies do not exceed the above recommended maximum internal design level, it is likely to ensure occupants of the adjacent tenancies are not adversely affected by the use and operation of the proposed swim school.

3 NOISE MEASUREMENT EQUIPMENT & STANDARDS

All measurements were conducted in general accordance with Australian Standard 1055.1-1997, “Acoustics - Description and Measurement of Environmental Noise Part 1: General Procedures”. Acoustic Dynamics’ sound measurements were carried out using precision sound level meters conforming to the requirements of IEC 61672-2019 “Electroacoustics: Sound Level Meters – Part 1: Specifications”. The survey instrumentation used during the survey is set out in **Table 3.1**.

Table 3.1 Noise Survey Instrumentation

Type	Serial Number	Instrument Description
2270	2664115	Brüel & Kjaer Modular Precision Sound Level Meter
4189	2650956	Brüel & Kjaer 12.5 mm Pre-polarised Condenser Microphone
4230	1730737	Brüel & Kjaer Acoustic Calibrator
XL2	A2A-06816-E0	NTi Environmental Noise Logger

The reference sound pressure level was checked prior to and after the measurements using the acoustic calibrator and remained within acceptable limits.

4 ASSESSMENT

The following subsections provide an assessment of the maximum cumulative noise impacts from noise sources associated with the use of the swim school (inclusive of the proposed design modifications) at nearby sensitive receivers, against the various noise emission criteria and objectives outlined in **Section 2** above. The assessment location is defined as the most affected point on or within any sensitive receiver property boundary. Examples of this location may be:

- 1.5m above ground level;
- On a balcony at 1.5m above floor level; and
- Outside a window on the ground or higher floors, at a height of 300mm below the head of the window.

The cumulative noise impact has been assessed to the potentially most affected point at the adjacent sensitive receiver properties. This would generally be at a height of 1.5 metres above the relative ground level or 300mm below the head of the ground floor or second floor window.

The calculated cumulative noise emission levels at the nearest sensitive receiver locations and the relevant noise emission criteria and objectives are presented below. Acoustic Dynamics advises that although the maximum operational capacity scenario is unlikely to occur for the majority of the time, the assessment is conducted conservatively in this way to demonstrate compliance.

It is advised that by achieving compliance with the nearest sensitive receiver locations, compliance will also be achieved at all other sensitive receiver locations further away.

4.1 METHODOLOGY

4.1.1 CALCULATION SCENARIO

Acoustic Dynamics has conducted modelling for the worst-case scenario, relating to the time of day, as follows:

Night-time Period (6:00am to 7:00am)

- Maximum 12 staff, 48 students (under 11-year-olds) and 72 parents all talking at normal talking sound level;
- Mechanical plant operating within the internal ground floor enclosure, including heat pumps, air change unit, compressor and condensers, running at maximum capacity, venting to the southern facade (L_{PI} of 92 dB(A) of the ground floor plant area);
- Extraction fans servicing the toilet and amenities areas, venting to the rooftop;
- Mechanical plant operating within the pool pump room (L_{PI} of 82 dB(A) within the pump room) and venting to the southern facade via a roller door and a supply fan venting to the southern facade via louvres; and

- Arrival of 84 vehicles and departure of 72 vehicles within the first session between 6:30am and 7:00am driving at 10km/hr onsite.

4.2 OPERATIONAL NOISE EMISSION PREDICTIONS

4.2.1 EXTERNAL RECEIVERS

The calculated maximum noise emission levels at the nearest affected receivers neighbouring the swim school, resulting from the proposed operation of the swim school are presented against the most stringent noise criteria in **Table 4.1** are presented below.

Table 4.1 Predicted Noise Emission & Relevant Criteria – External Receivers

Sensitive Receiver Location	Activity / Noise Source ²	Relevant Assessment Period	Calculated L _{Aeq} Noise Level [dB]	Project Noise Trigger Level L _{Aeq} [dB]	Complies?
Residential [R1] 30 Orlando Rd [NNE]	Use & Operation of the Swim School ²	Night-time (10pm – 7am)	35	40	Yes
Residential [R4] 55 Campbell Ave [E]			37	40	Yes
Commercial [R5] Warehouse 2 (adjacent)		When in Use	58	63	Yes

Notes: 1) Acoustic Dynamics advises that by achieving compliance with the more stringent night-time criterion, compliance will also be achieved with the less stringent daytime and evening period criteria.

2) Includes the sound sources detailed in **Section 4.1.1** and the scenarios detailed in **Section 4.1.2**.

The predicted external L_{Aeq} levels at the surrounding sensitive residential receivers achieve compliance with the determined criteria derived in accordance with the EPA Noise Policy for Industry (NPfI 2017).

4.2.2 INTERNAL RECEIVERS

Acoustic Dynamics has conservatively undertaken modelling and calculations to predict the potential **maximum** L_{Aeq} Internal Reverberant Sound Pressure Level (L_{PI}) within the commercial receiver (Warehouse 2) directly adjacent resulting from the following noise assumed cumulative noise from within the subject swim school:

- L_{PI} of 75 dB(A) for the general area; and
- L_{PI} of 82 dB(A) for the pump room on the first floor.

The noise levels within the commercial receiver (Warehouse 2) directly adjacent, due to the swim school activities are presented below in **Table 4.2**.

Table 4.2 Maximum Noise Emission Levels & Relevant Objectives – Internal Receivers

Location	Location ³	Calculated Maximum $L_{Aeq(15min)}$ Noise Level [dB]	Relevant $L_{Aeq(15min)}$ Objective [dB] ¹	Complies?
Commercial [R4] Warehouse 2 (directly adjacent)	Ground Floor Warehouse Area	33	45 ¹	Yes
	Mezzanine Office Area	< 40	40 ²	Yes

- Note
- 1) Based on the assumption that the ground floor warehouse area is used for precision assembly, as per **Table 2.4** design level ranges' median value.
 - 2) Based on the assumption that the mezzanine office receiver is a general office, as per **Table 2.4** design level value.
 - 3) Warehouse 2 internal space are unknown and a typical use has been assumed for assessment purposes.

4.3 SLEEP DISTURBANCE ASSESSMENT

Acoustic Dynamics has determined the potential maximum $L_{A1(60\text{ Sec})}$ noise emission from the proposed development to be **36 dB** from the activities commonly associated with the swim school operating during the early morning shoulder period (i.e., 6.30am to 7.00am.) These activities assessed assume the scenario detailed in **Section 4.1.1** and **Section 2**. If assessed assuming closing car doors within the carpark at the closest parking space, during the morning shoulder period, then a potential maximum $L_{A1(60\text{ Sec})}$ noise emission of **36 dB** is predicted. These activities achieve compliance with the EPA's sleep disturbance screening criterion of $L_{A1(60\text{ Sec})} \leq 52 \text{ dB}$ during night-time/morning shoulder hour.

Acoustic Dynamics advises that the above calculated noise emission levels are conservatively based on the maximum source noise levels and maximum capacity operations (i.e., worst-case scenario) at the proposed swim school. Acoustic Dynamics advises that such a scenario is unlikely to occur for the majority of the time and the predicted maximum noise emission associated with the operation of the proposed swim centre complies with the relevant noise emission criteria.

It is advised that by achieving compliance with the nearest residential receiver locations, compliance has also been achieved at all other residential receiver locations further away.

4.4 ROAD TRAFFIC NOISE ASSESSMENT

The calculated maximum noise emission levels due to the vehicle movements by patrons utilising the subject swim school on South Creek Road and Inman Road are presented in **Table 4.3** below. It is advised that by achieving compliance with the nearest residential locations, compliance will also be achieved at all other residential and receiver locations further away.

Acoustic Dynamics has conducted an analysis of road traffic noise due to off-site car movements resulting from the proposed swim school. The results are attached below in **Table 4.3**.

Table 4.3 Maximum Road Traffic Noise Emission Levels & Criteria for Residential Receivers

Residential Receiver Location	Noise Source	Quietest Period Source Operates	Calculated Maximum $L_{Aeq}(1 \text{ hour})$ Noise Level [dB]	Relevant Noise Criterion $L_{Aeq}(1 \text{ hour})$ [dB]	Complies With Criteria?
Along South Creek Road or Inman Road	Off-site car movements	Night (10pm to 7am)	<35	50	Yes

Note: 1) Acoustic Dynamics advises that by achieving compliance with the more stringent night time criteria, compliance will also be achieved with the less stringent daytime criterion.

Based on the results of Acoustic Dynamics' noise modelling and calculations, we advise that the predicted maximum road traffic noise associated with the use and operation of the proposed development will comply with the relevant noise emission criteria.

5 ASSESSMENT FINDINGS & RECOMMENDATIONS

5.1 ASSESSMENT FINDINGS

Acoustic Dynamics advises that the above calculated noise emission levels in **Table 4.1**, **Table 4.2**, **Section 4.3** and **Table 4.3** indicate:

- External noise emission from the use and operation of the proposed swim school **will achieve compliance** with Northern Beaches Council and the EPA NSW NPfI criteria with the incorporation of the recommendations provided in **Section 4.2**;
- Internal noise emission from the use and operation of the proposed swim school **will achieve compliance** with Northern Beaches Council and Australian Standard 2107-2016 with the incorporation of the recommendations provided in **Section 4.2**;
- Sleep Disturbance from the use and operation of the proposed swim school **will achieve compliance** with Northern Beaches Council and the EPA NSW criteria;
- Road traffic noise emission from the use and operation of the proposed swim school **will achieve compliance** with Northern Beaches Council and the EPA NSW RNP criteria; and
- Acoustic Dynamics has determined that the noise emission from the proposed swim school **will achieve compliance** with Offensive noise component of the NSW POEO act with the incorporation of the recommendations provided in **Section 4.2**.

5.2 RECOMMENDATIONS & ADVICE

Acoustic Dynamics' calculations and analysis indicate that all noise emission associated with the use and operation of the swim school (inclusive of the proposed modifications) will achieve compliance with the various relevant noise emission criteria. Never-the-less, we provide the following recommendations that should be incorporated into the proposed swim school to ensure noise emission is adequately managed and minimised during operation of the swim school.

5.2.1 GENERAL MANAGEMENT MEASURES

We recommend a management plan incorporating measures to protect the acoustic amenity of the surrounding area be implemented by the proprietor. Such a management plan should outline policies and procedures to ensure noise emission from students and patrons at the proposed swim school are kept to a minimum, including:

1. The erection of clear signage at all entries and exits advising students and patrons that they must not generate excessive noise when entering and leaving the premises;
2. Staff monitoring the behaviour of students and patrons within the subject premises and as students/guardians' egress to ensure noise emission of students/guardians is kept to a minimum when entering and leaving the premises; and
3. Restricting the use of low frequency speakers (sub-woofers) and ensuring any full range speakers are isolated from building structure. Furthermore, if any full range speakers are to be installed and used, ensure that the internal noise level from music does not exceed $L_{Aeq(15min)}$ **75 dB**. Note is made that the maximum internal reverberant sound pressure level can be set to ensure the adjacent receivers are not adversely affected by the operation of the swim school, following the fit-out of the premises and the installation of a speaker system.

5.2.2 PLANT AND PUMP ROOM CONSTRUCTION

Acoustic Dynamics advises that the existing ceiling/roof construction direct to the proposed plant room and pump room, is likely to required additional acoustic treatment to ensure noise transmission is minimised through to the adjoining tenancy (Warehouse 2) and to the various office spaces/staff rooms associated with the swim school. This is based on our predictions and not on measurements at this site.

In light of the above, Acoustic Dynamics provides the following recommendations to achieve an adequate level of acoustic isolation:

5.2.2.1 INTERNAL FIT OUT FOR PROPOSED PUMP ROOM

Based on our desktop predictions, the following construction is recommended:

1. Where the pump room ceiling is constructed using a precast 150mm thick concrete panel, no further acoustic treatment will be required to the ceiling. All junctions between the precast panel and the adjoining wall partition must be sealed airtight;
2. Should alternate lightweight construction be used for the ceiling, the following construction is recommended:

Table 4.1 Recommended Lightweight Internal Ceiling Construction with Plasterboard

Floor Above
1. 2 layers of 9mm fibre cement sheeting; to
Ceiling Construction
2. Clips direct fixed to purlin at 1200mm centres; with
3. Rondo furring channel No. 129 at 600mm maximum centres; to
4. 1 layer of 13mm Gyprock plasterboard; with
Cavity Infill
5. 50mm GW Acoustigard minimum density of 11kg/m ³ (or equivalent).

3. The gaps to the adjoining wall are to be treated with an acoustically rated flexible mastic sealant;
4. The following construction is recommended for the walls of the pump room:
 - i. 2 layers of 6mm thick fibre cement sheet; to
 - ii. 92mm thick timber or steel stud frame; with
 - iii. 75mm thick insulation in the cavity (11kg/m³); with
 - iv. 2 layers of 13mm thick moisture resistant plasterboard (to staffroom only) or 1 layer of 6mm thick fibre cement sheet;
 - v. All penetrations sealed with flexible mastic sealant; and
 - vi. The walls and ceiling of the pump room should be lined with an moisture resistant absorptive material (Stratocell Whisper, CSR Martini or equivalent, or equivalent).

Acoustic Dynamics advises that the recommended mitigation measures will improve the acoustic performance of the existing ceiling and will achieve an adequate level of acoustic amenity for the adjacent tenancy (Warehouse 2).

5.2.2.2 INTERNAL FIT OUT FOR PROPOSED GROUND FLOOR PLANT PLATFORM

Based on our desktop predictions, the following construction is recommended for the ground floor plant platform:

1. The ceiling is required to be enclosed to the following minimum specifications:

Table 4.2 Recommended Internal Ceiling Construction with Plasterboard

Ceiling
1. 2 layers of 9mm fibre cement sheeting; to
Ceiling Construction
2. Clips direct fixed to purlin at 1200mm centres; with
3. Rondo furring channel No. 129 at 600mm maximum centres; to
4. 1 layer of 13mm Gyprock plasterboard; with
Cavity Infill
5. 50mm GW Acoustigard minimum density of 11kg/m ³ (or equivalent).

2. The internal walls of the mechanical plant room should be constructed using a stud frame to the following specification:
 - i. 2 layers of 9mm fibre cement sheeting; to
 - ii. 92mm thick timber of steel stud frame; with
 - iii. 75mm thick insulation in the cavity (11kg/m³); with
 - iv. 2 layers of 13mm thick moisture resistant plasterboard or 2 layers of 6mm fibre cement sheeting; and
 - v. All penetrations sealed with flexible mastic sealant;
3. The facade wall of the plant room should be upgraded to ensure noise is not emitted from the facade. The upgrades should include:
 - i. Lining the existing sheet metal facade frame with insulation with minimum density 14kg/m³;
 - ii. Fixing 2 layers of 13mm moisture resistant plasterboard to the facade frame or 2 layers of 9mm fibre cement sheeting;
4. All gaps to the adjoining facade wall and ceiling are to be treated with an acoustically rated flexible mastic sealant;
5. The walls and ceiling of the plant room should be lined with an moisture resistant absorptive material (Stratocell Whisper, CSR Martini or equivalent, or equivalent);
6. The weather louvres on the southern facade wall must be upgraded to FanTech SBL1 Acoustic Louvres, or achieves the same minimum insertion losses as a Fantech SBL1. Acoustic Dynamics advises that a Mechanical Engineer must be consulted to confirm that the above recommendations meet the air flow requirements for the specified pumps;

Table 4.3 Recommended Insertion Loss for Facade Louvre

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

7. All items of mechanical plant and associated ductwork should be isolated from the building structure through the use of resilient mounts, resilient sleeves and or spring hangers; and

8. Following development approval, an acoustic consultant is to be engaged to assess the proposed mechanical design to ensure compliance with the requirements of Council.

5.2.3 WINDOWS & DOORS

Acoustic Dynamics advises that all windows and glass doors must ensure an adequate acoustic (air tight) seal when closed. Any sound flanking paths around the windows and doors must be sealed to provide adequate acoustic insulation.

All gaps between the window frame and the wall structure should be sealed using polystyrene rods and silicone mastic sealant.

5.2.4 ABSORPTION

Acoustic Dynamics advise that due to the space being highly reverberant, consideration may be given to installing absorptive panels to the walls and underside of the mezzanine area of the ground floor, to reduce the reverberant build-up of sound energy. The incorporation of absorptive panels, such as 24mm thick Zintra Acoustic Panel (NRC \approx 0.75) (or equivalent product), will also help with managing the sound level at which instructors and students are likely to speak at and also the acoustic quality for all present.

Acoustic Dynamics advises that incorporation of the above recommendations will ensure that noise emission associated from the use and operation of the proposed swim school centre is likely to comply with the relevant noise emission criteria and not adversely impact nearby receivers.

6 CONCLUSION & ACOUSTIC OPINION

Acoustic Dynamics has conducted an acoustic assessment of the noise emission resulting from the operation of the swim school located at Warehouse 1, 100 South Creek Road, Cromer, NSW, in accordance with the requirements of:

1. Northern Beaches Council;
2. NSW EPA; and
3. Australian Standards.

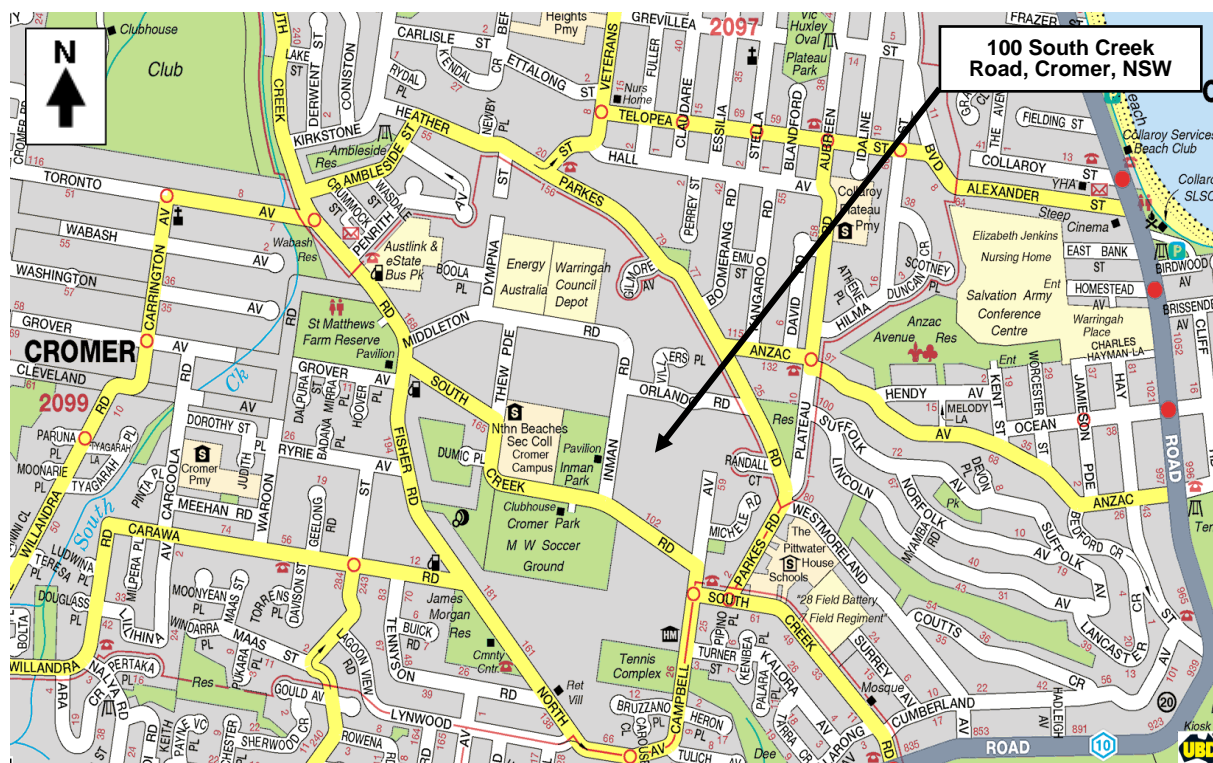
Acoustic Opinion

Further to the noise monitoring and measurements conducted, our review of the relevant acoustic criteria, requirements and our calculations, the proposed operation is predicted to achieve compliance with relevant noise emission criteria of the Northern Beaches Council, NSW EPA and the POEO Act 1997, when recommendations in Section 5 are incorporated.

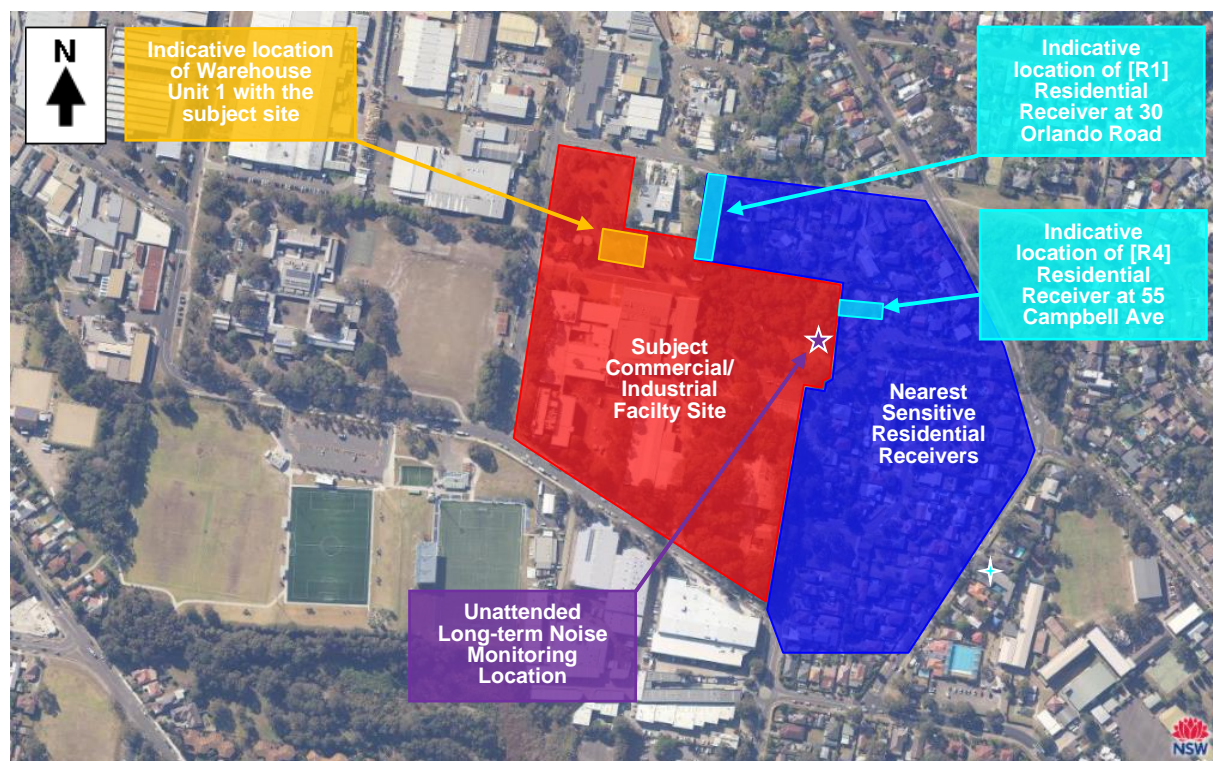
We trust that the above information meets with your requirements and expectations. Please do not hesitate to contact us on 02 9908 1270 should you require more information.

APPENDIX A – LOCATION MAP, AERIAL IMAGE AND DRAWINGS

A.1 LOCATION MAP

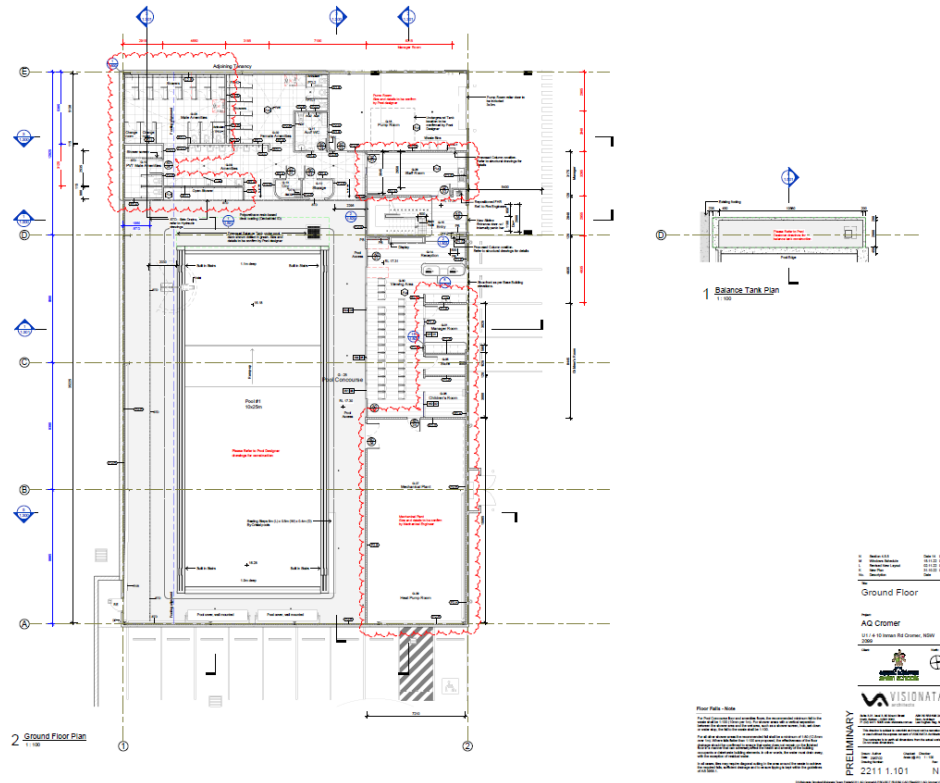


A.2 AERIAL IMAGE (COURTESY OF NSW SPATIAL SERVICES)

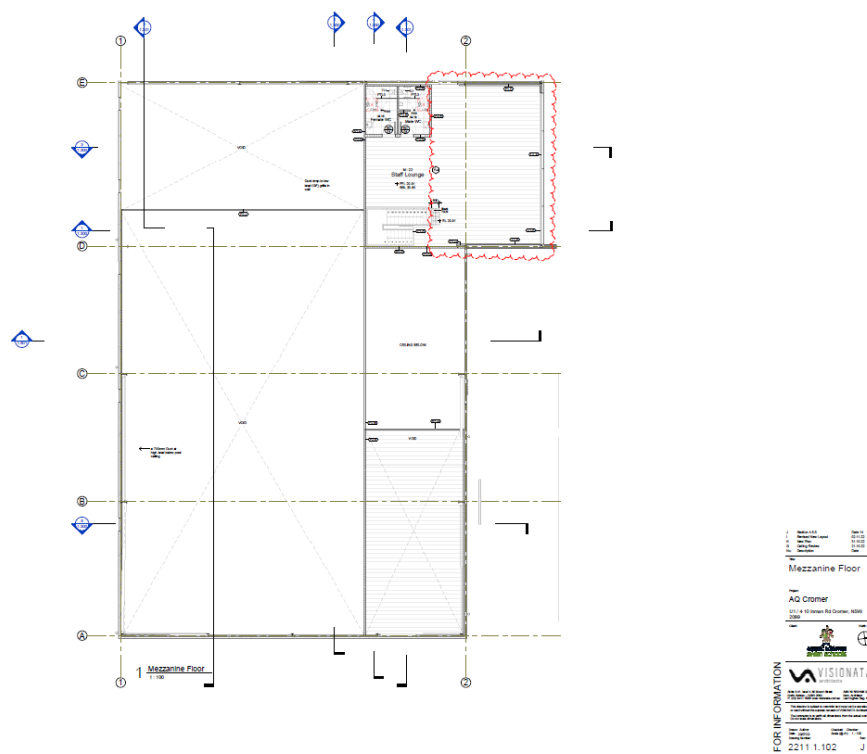


A.3 DRAWINGS – PROPOSED SWIM SCHOOL

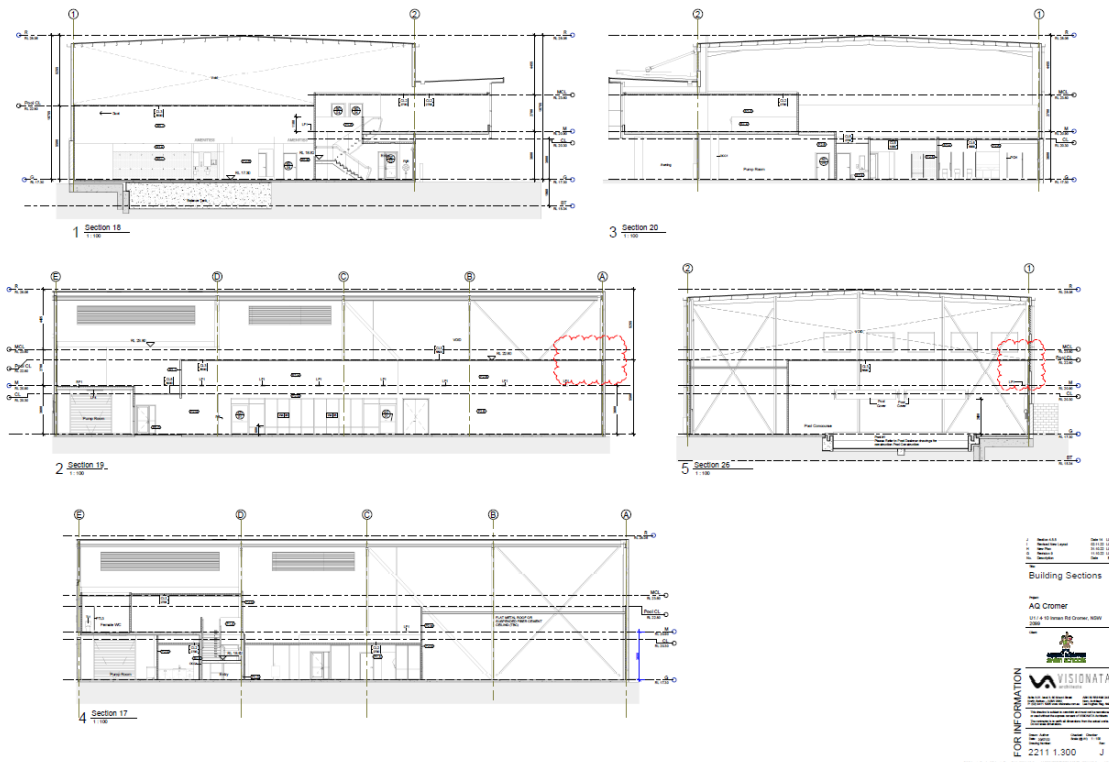
A.3.1. GROUND FLOOR PLAN



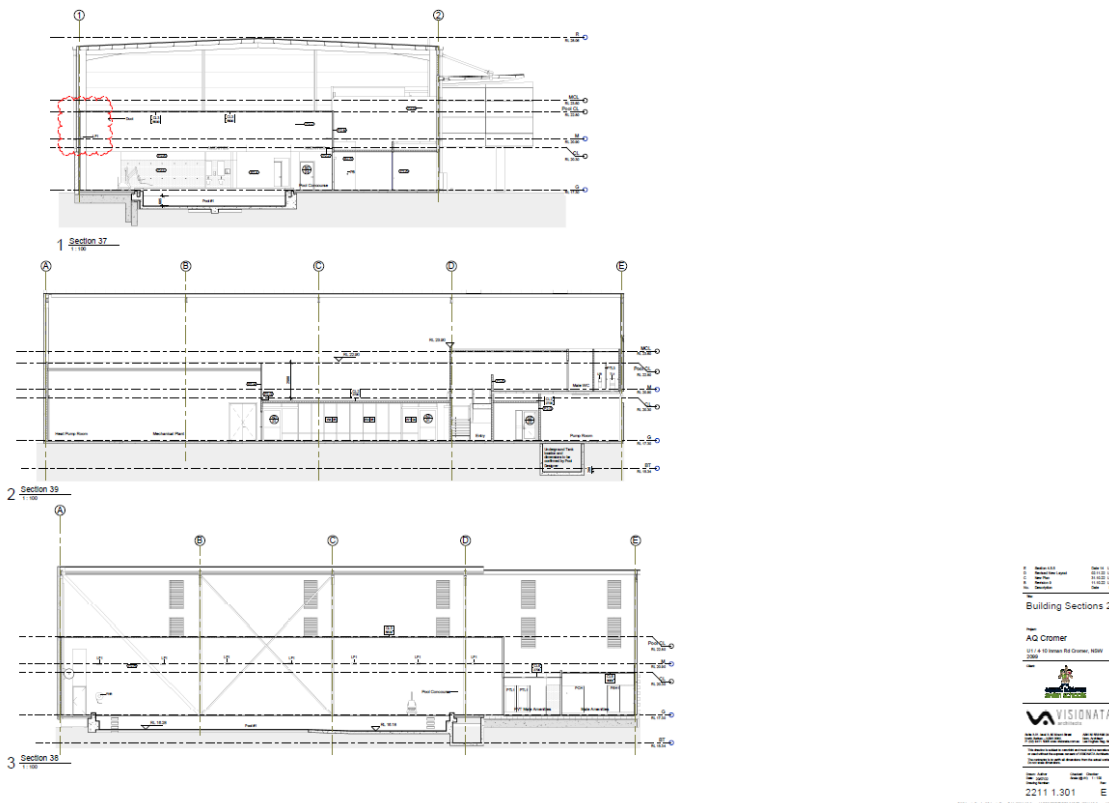
A.3.2. MEZZANINE PLAN (DRW DA 200(C), 8/12/2021)



A.3.3. SECTIONS 1

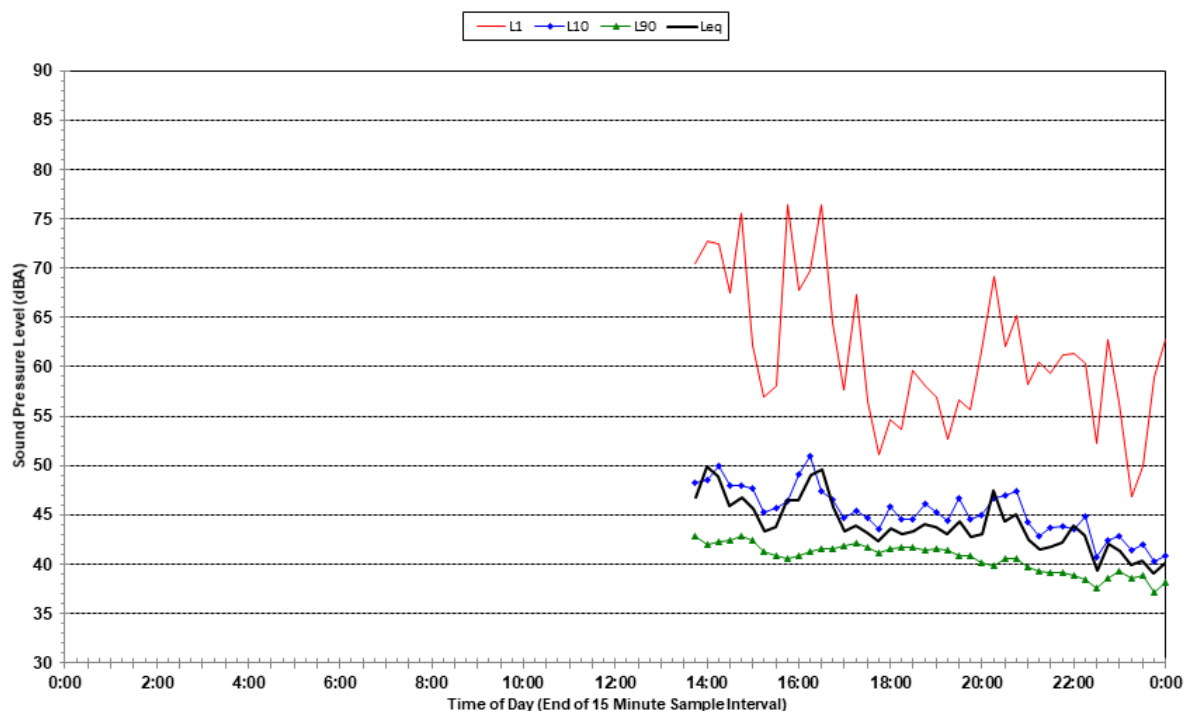


A.3.4. SECTIONS 2

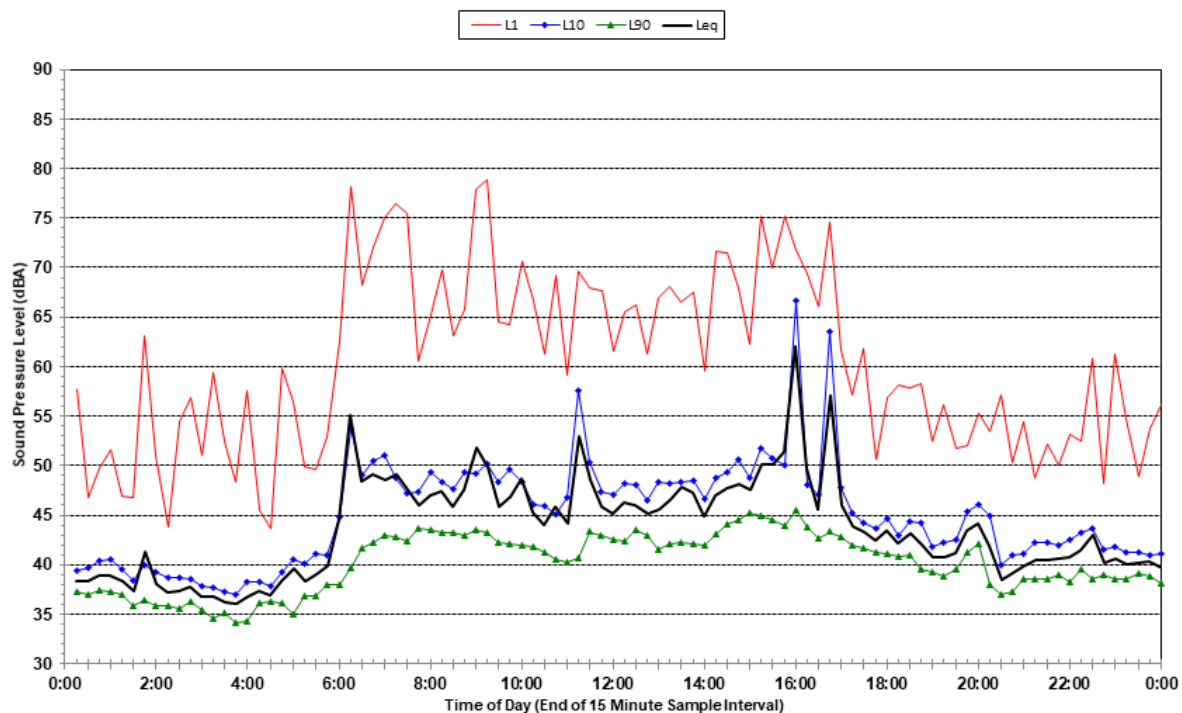


APPENDIX B – UNATTENDED NOISE LOGGING STATISTICAL GRAPHS

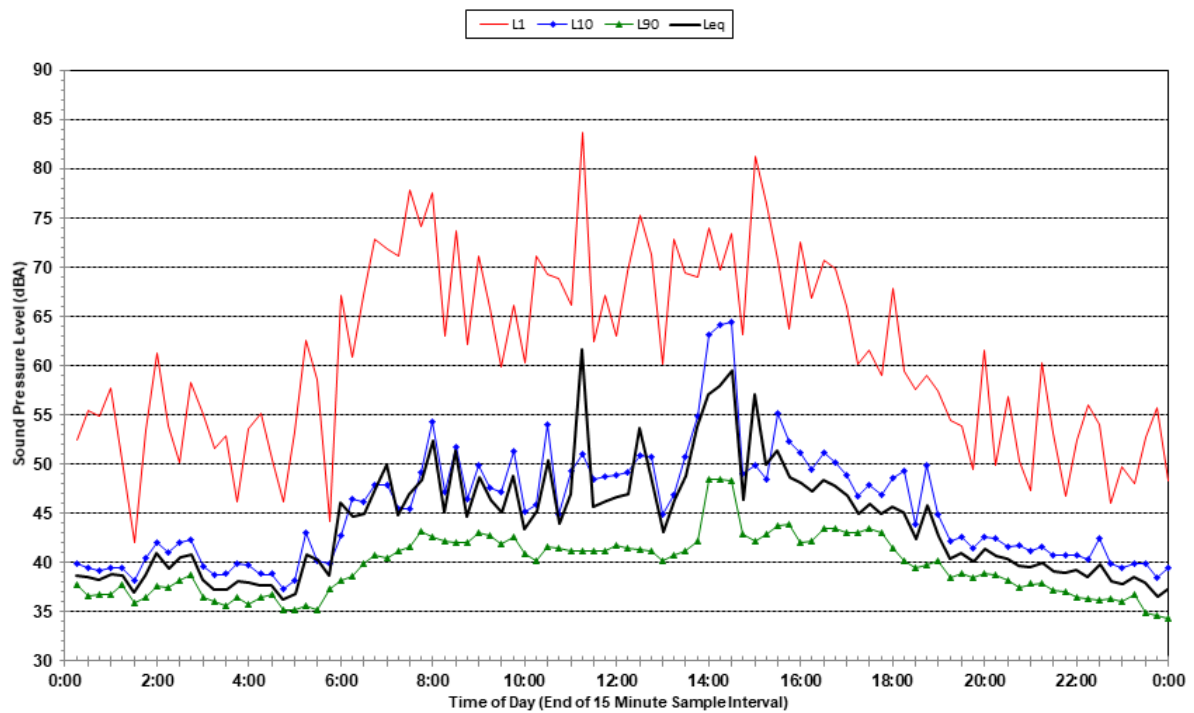
Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Friday 29 June 2018



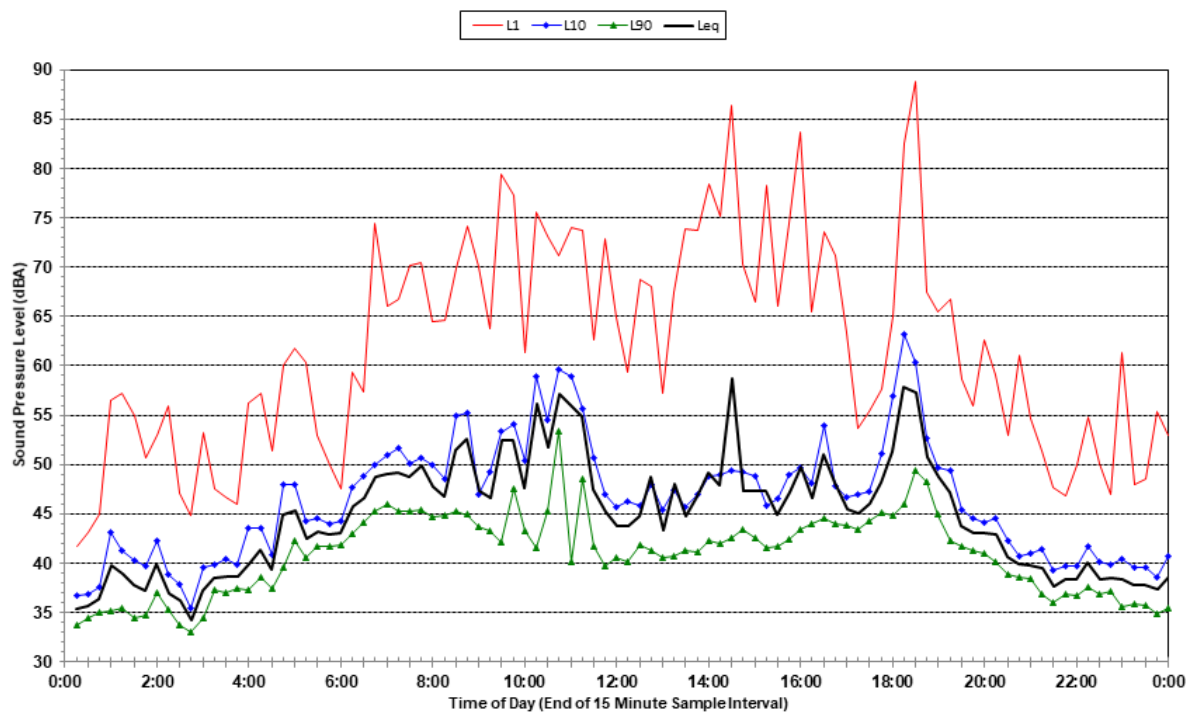
Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Saturday 30 June 2018



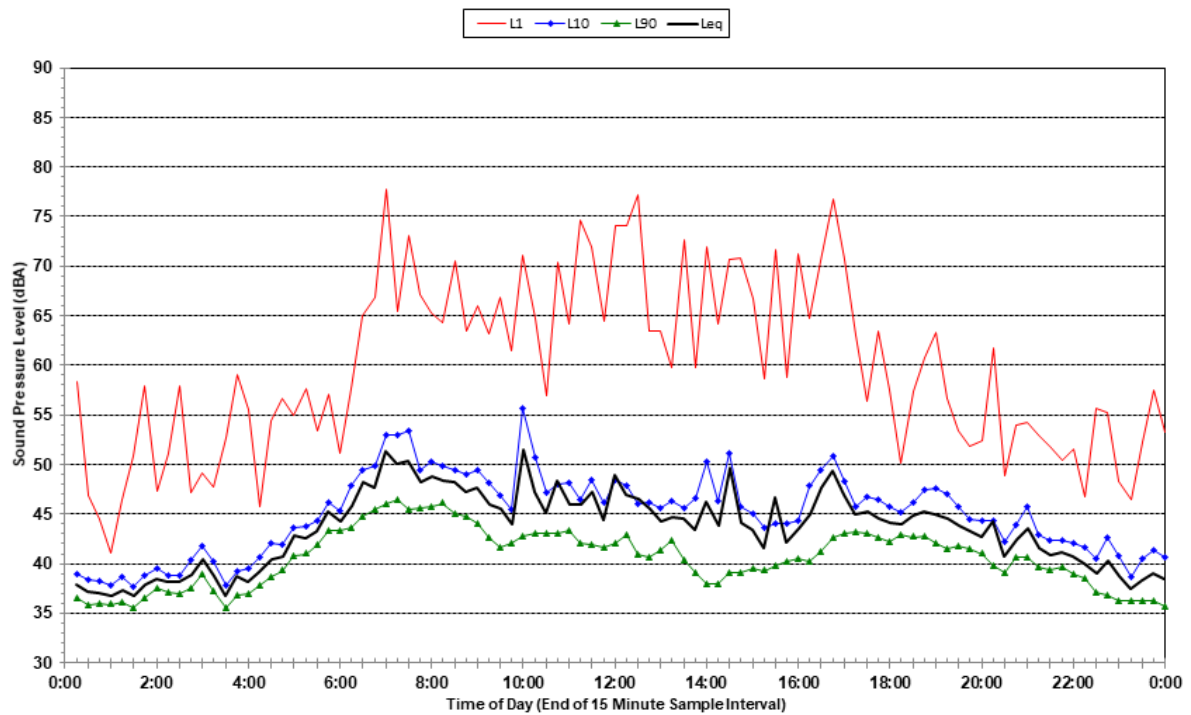
Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Sunday 1 July 2018



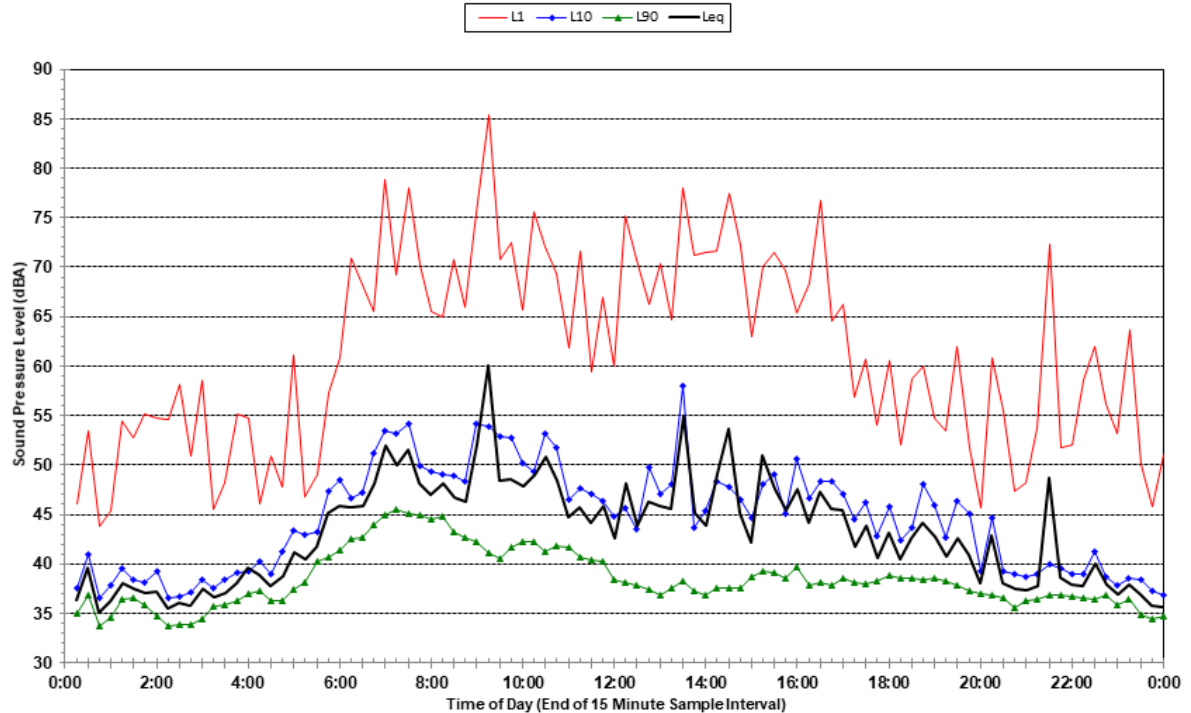
Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Monday 2 July 2018



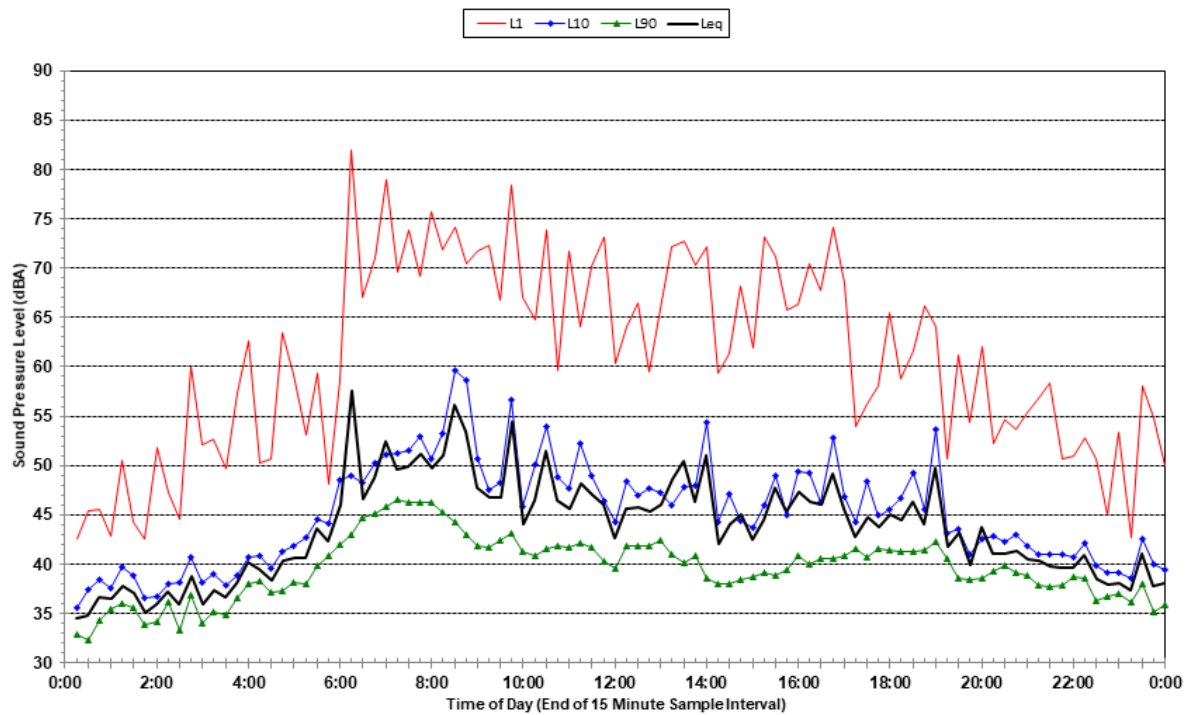
Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Tuesday 3 July 2018



Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Wednesday 4 July 2018



Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Thursday 5 July 2018



Statistical Ambient Noise Levels
100 South Creek Rd Cromer - Friday 6 July 2018

