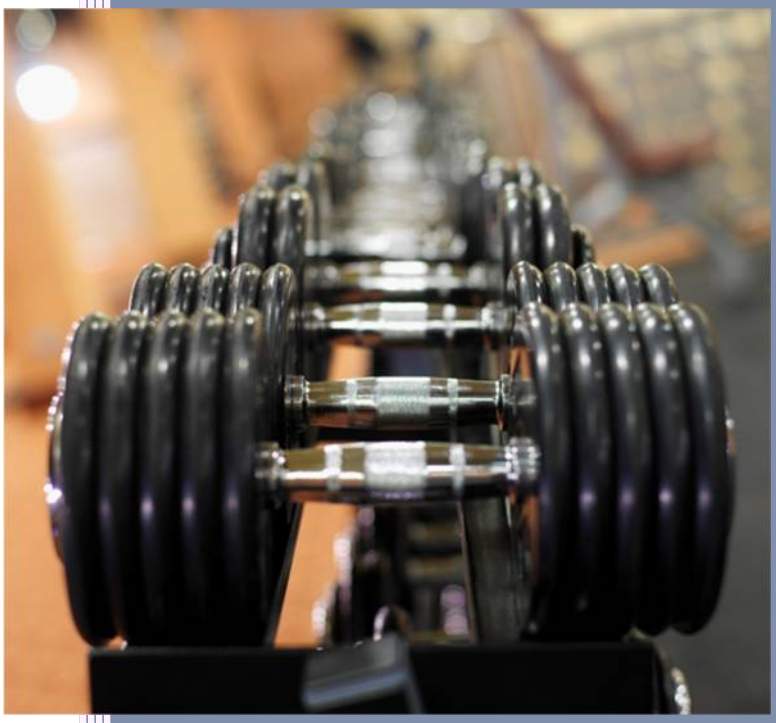
acousticdynamics

Noise Emission Assessment

Orangetheory Brookvale
Warringah Mall, NSW



Client:
Orangetheory
Brookvale

Association of Australasian Acoustical Consultants

25 June 2019

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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 Bel 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 Bel. 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.

$\mathbf{L_{Aeq}}$ – 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.

$\mathbf{L_{Amax}}$ – 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 **Orangetheory Fitness Brookvale** to assess noise emission resulting from operation of the proposed gymnasium located at Westfield Warringah Mall at 145 Old Pittwater Rd Brookvale, New South Wales in accordance with the requirements of Northern Beaches Council.

This document provides an assessment of noise emission levels at nearby sensitive receivers resulting from various noise sources associated with the gym. This assessment is prepared in accordance with the various acoustic assessment requirements of Northern Beaches Council, New South Wales Environment Protection Authority (EPA) and relevant Australian Standards.

1.2 LOCATION & DESCRIPTION OF DEVELOPMENT

The proposed gym is to be located on the ground level of the existing Westfield Warringah Mall at 145 Old Pittwater Rd in Brookvale and is zoned B3 Commercial Core 1. Westfield has road frontages to Old Pittwater Rd to the west, Condamine St & Pittwater Rd to the east, and Cross St & Green St to the north-east.

The local noise environment is dominated by traffic along Condamine St, noise from utilisation of the carpark, and mechanical noise from the shopping centre. A multi-storey parking garage is located along the eastern boundary, servicing the shopping centre.

The various noise sources associated with the gym include items of exercise equipment which will be located within the gym, such as cardio equipment, weight machines and a free weights area. Further, Acoustic Dynamics understands that it is expected that the gym has a capacity for 38 patrons, with the expected usage during peak hours to be 26 patrons. Group classes will be conducted and light music will be provided within the internal areas of the gym.

Acoustic Dynamics understands that the subject gym is proposed to operate between the hours of 5:00am to 10:00pm Monday to Sunday including public holidays.

With regard to acoustical assessment, the most affected sensitive receivers are the adjacent tenancies within Westfield:

- Woolworths (adjacent); and
- BIG W (above).

The nearest residential receivers to the proposed gym are 250m to the north of the Westfield.

The noise emission from the subject premises is assessed to the nearest sensitive receivers which are considered to be the most-affected premises. Compliance at the assessed locations will ensure compliance at all other sensitive receivers.

Acoustic Dynamics understands that patrons will either utilise the parking within the existing Westfield car park or arrive at the gym by foot or public transport. It is expected to be rare that patrons arriving by car will pass through the residential area to the north of the site. Accordingly, noise emission due to vehicle activity is not assessed within this document.

The proposed gym will be utilising existing mechanical plant previously approved for Westfield, and no further mechanical equipment is proposed to be installed to service the subject tenancy. Accordingly, noise emission due to the operation of mechanical plant is not assessed within this document.

The subject building and surrounding area is shown in the Location Map, Aerial Photo and Planning Map 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 proposed development;
- Travel to site to conduct inspections and testing;
- Conduct noise monitoring to establish background noise levels within the development site;
- Examination of architectural drawings; and
- Prediction of likely noise emission associated with the development.

2 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 proposed development. The relevant sections of the legislation are presented below. The most stringent criteria which have been used in the assessment of the proposed development are summarised below.

2.1 NORTHERN BEACHES COUNCIL CRITERIA

Acoustic Dynamics understands that the new Northern Beaches Council area of Sydney is temporarily being maintained under the DCP provisions of the previous local government areas, the relevant area for this address being Warringah LGA.

2.1.1 LOCAL ENVIRONMENT PLAN

A review of the Warringah Local Environment Plan (LEP) 2011 was conducted. No relevant acoustic requirements or noise criteria were presented within the LEP.

2.1.2 DEVELOPMENT CONTROL PLANS

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

D3 Noise

Objectives

- *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.*

2.2 NSW EPA'S ENVIRONMENTAL NOISE CRITERIA

2.2.1 NOISE POLICY FOR INDUSTRY (2017)

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.

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.

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)

In accordance with the guidelines of the NSW EPA's NPFI, a "minimum assumed" background noise level of 30 dBA has been assumed for the nearest residential receivers to the proposed development.

Acoustic Dynamics advises that the assessment of the proposed gym has been based on the **lowest** background noise level ("minimum assumed" in the NPFI) during typical **maximum** operations of the proposed development. Acoustic Dynamics advises that such an assessment is conservative and will ensure no loss of amenity to the nearby residential and commercial receivers.

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 Summary of External Measured Noise Levels & Most Stringent Criteria

Location	Time of Day	L_{A90} Rating Background Noise Level (RBL) [dB]	Project Intrusive Noise Level [dB]	Project Amenity Noise Level L_{Aeq} [dB]	Project Noise Trigger Level L_{Aeq} [dB]
Nearest residential receiver(s)	Morning Shoulder (5am to 7am)[1]	30[2]	35	38[3]	**35**

Note: 1) Acoustic Dynamics advises that the proposed gym is proposed to operate 5am to 10pm every day.
2) A "minimum assumed" background noise level of 30 has been adopted as per the provisions of the NPFI.
3) Amenity adjustment based on "Suburban" receiver type (Table 2.3 of the NPFI). 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 decibels (dB).

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 Internal L_{Aeq} Noise Levels – Commercial

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq(period)}$ Noise Level [dB]
Commercial premises	All	When in use	65

Acoustic Dynamics advises that achieving compliance with the NPFI intrusive noise emission objectives applicable at the boundaries of the nearest non-residential premises will adequately protect the acoustic amenity of these receivers.

2.3 AUSTRALIAN STANDARDS

Acoustic Dynamics has conducted a review of relevant Australian Standards in relation to the subject development. The following details this review.

2.3.1 AS2107 "ACOUSTICS – RECOMMENDED DESIGN SOUND LEVELS"

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 for the various types of occupancies and areas within the proposed development.

Table 2.3 Recommended Design Sound Levels for Different Areas of Occupancy in Buildings (Extract from Australian Standard 2107 Table 1)

Type of Occupancy / Activity	Recommended L_{Aeq} Design Sound Level Range[dB]
8 SHOP BUILDINGS	
Shopping Malls	< 50
Supermarkets	< 50

2.4 INSTRUMENTATION & MEASUREMENT 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 61672-2002 *"Electroacoustics: Sound Level Meters – Part 1: Specifications"*. The survey instrumentation used during the survey is set out in **Table 2.4**.

Table 2.4 Noise Survey Instrumentation

Type	Serial Number	Instrument Description
2250	2679541	Brüel & Kjaer Modular Precision Sound Level Meter
4189	2670479	Brüel & Kjaer 12.5 mm Prepolarised Condenser Microphone
4230	782154	Brüel & Kjaer Acoustic Calibrator

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

3 ASSESSMENT

The following subsections provide an assessment of the proposed gym against the various noise emission criteria and objectives outlined in **Section 2** above.

3.1 OPERATIONAL NOISE EMISSION TO RECEIVERS

Based on previous experience and the drawings and information provided by the proponent, Acoustic Dynamics has conservatively undertaken modelling and calculations to predict the likely **maximum** $L_{Aeq,15min}$ noise emission levels at the nearest receiver locations during the **quietest time** of the operation being the night-time period, resulting from the following noise sources and activities:

- The provision of background music within the studio and maximum capacity use of the various items of fitness equipment (including exercise machines, weight machines and free weights);
- The ingress and egress of patrons through the carpark or via the shopping centre;

- A typical maximum number of 24 patrons concurrently using the proposed gym and its equipment within any 15-minute assessment period;

- Acoustic Dynamics understands that the tenancy will be serviced by the existing shopping centre mechanical plant. Therefore, it is assumed in this noise emission assessment that there will be no need for additional air-conditioning to service the proposed gym; and

- The arrival and departure of patron vehicles along Cross Street or Green Street utilising the Westfield public car park. As the carpark is previously approved, there will be no need for further assessment of vehicle movements for the proposed gym.

We advise that the above scenario is very unlikely to occur. However, we assess the above scenario to ensure the **worst-case** scenario achieves compliance during the most-sensitive time of operation, being the early morning period.

The calculated maximum noise emission levels at the nearest external receiver locations and the relevant noise emission criteria are presented for commercial and residential receivers in **Table 3.1** and **Table 3.2** below, respectively. 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.

Acoustic Dynamics advises that compliance with the night-time criteria during worst-case operations will ensure compliance during all the periods of the day.

Table 3.1 Maximum Noise Emission Levels & Relevant Criteria – Nearest Commercial Receivers (Internal)

Receiver Location	Assessment Period	Maximum $L_{Aeq(15min)}$ Internal Noise Contribution [dB]	AS2017 Noise Goal (Internal) $L_{Aeq(15min)}$ [dB]	Complies
Sensitive Receivers Adjacent and Above (Woolworths & BIG W)	When in use	< 35	50[1]	**Yes**

Note: 1) Acoustic Dynamics has undertaken noise measurements in similar commercial receivers to verify that this noise goal is appropriate for the subject sensitive receivers.

Table 3.2 Maximum Noise Emission Levels & Relevant Criteria – Nearest Residential Receivers

Receiver Location	Assessment Period	Maximum $L_{Aeq(15min)}$ Noise Contribution [dB]	NPFI Noise Criterion $L_{Aeq(15min)}$ [dB]	Complies
Nearest Residential Receivers (North)	Night-time (5am to 7am)	< 15[1]	35	**Yes**

Note: 1) Acoustic Dynamics advises that the noise level contribution from the use and operation of the gym to the nearest residential receivers will be inaudible.

The predicted noise emission levels presented above in **Tables 3.1** & **3.2** include allowances for relevant distance, direction and shielding losses, along with the incorporation of the acoustic mitigation provided by the recommendations presented in **Section 4** of this report.

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 gym. Acoustic Dynamics advises that such a scenario is unlikely to occur for the majority of the time.

4 RECOMMENDATIONS

4.1 RECOMMENDED MANAGEMENT PLAN

Acoustic Dynamics' calculations and analysis indicate that the predicted noise emission associated with the use and operation of the proposed gym will achieve compliance with the various relevant noise emission criteria. We provide the following recommendations to be incorporated into the proposed gym to ensure noise emission is adequately managed and minimised during operation of the gym.

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 patrons at the proposed gym are kept to a minimum, including:

1. Ensuring the glass doors of the proposed gym are kept closed at all times (other than when patrons enter and exit the premises);

2. The erection of clear signage at all studio entries and exits advising patrons that they must not generate excessive noise when entering and leaving the premises;

3. Staff monitoring the behaviour of patrons within the subject premises and as patron's egress to ensure noise emission of patrons is kept to a minimum when entering and leaving the premises;

4. Restricting the use of low frequency speakers (sub-woofers) and ensuring any full range speakers are isolated from building services;

5. The background music within the gym should be kept to level low enough to enable speech intelligibility within the gym and to ensure patrons are not required to raise their voices while in the gym. 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 subject gym, following the fit-out of the premises and installation of the speaker system;

6. The installation of impact sound absorbing flooring to reduce the regenerated noise and vibration throughout the building; and

7. The implementation of an appropriate management policy regarding the dropping of weights, including:

    - Education of staff and all patrons instructing how to place weights without dropping;
    - Erection of clearly visible signage throughout the gym advising patrons they must not drop weights or allow weights to drop on the floor, or use weights outside the designated weight areas; and
    - Imposition of penalties (patron warnings, suspensions or lockout warnings) on patrons identified dropping weights.

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

4.2 RECOMMENDED FLOORING SYSTEMS

Acoustic Dynamics recommends installation of the following flooring products/systems in the weights areas and under cardio equipment within the gym. Installation of the flooring will reduce vibration emission and associated regenerated noise to compliant levels within the adjacent and surrounding occupancies.

In consideration of other receivers within Westfield Warringah Mall, the recommended flooring system for this gym is presented in **Table 4.1** below.

Table 4.1 - Recommended Floor Systems – All Areas

Areas	Floor System	Energy Absorbing Layer
All areas	8mm thick rubber gym floor topping	Nil

4.3 EXTERNAL DOORS

Acoustic Dynamics recommends that the doors facing the external mall (carpark) are designed such that they form an adequate acoustic (air-tight) seal when closed, in order to preserve the acoustic amenity of the surrounding area.

5 CONCLUSION

Acoustic Dynamics has conducted an acoustic assessment of the noise emission resulting from the use and operation of the proposed Orangetheory gym located at Westfield Warringah Mall, 145 Old Pittwater Rd, Brookvale NSW in accordance with the requirements of Northern Beaches Council.

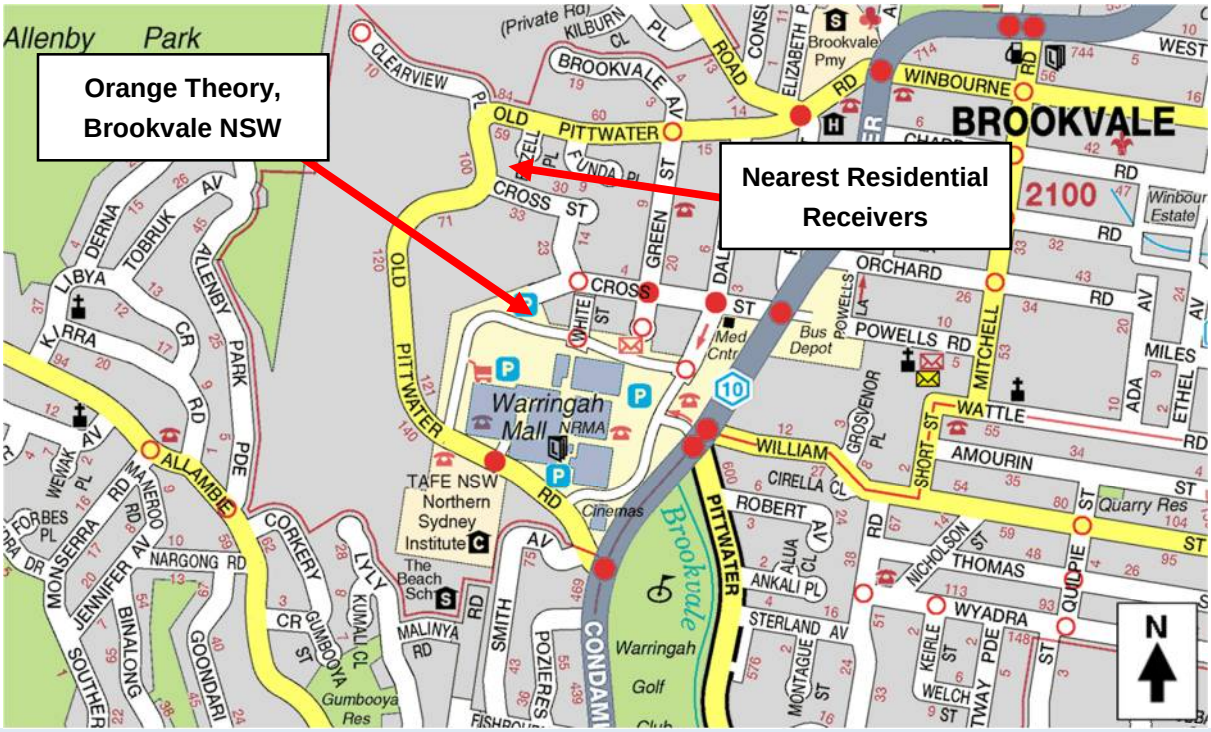
Acoustic Opinion

Further to the noise monitoring and measurements conducted, our review of the relevant acoustic criteria and requirements and our calculations, Acoustic Dynamics advises that the predicted noise emission associated with the proposed gym development will comply with the relevant noise emission criteria of Northern Beaches Council, NSW EPA and relevant Australian standards subsequent to the incorporation of the recommendations outlined within Section 4.

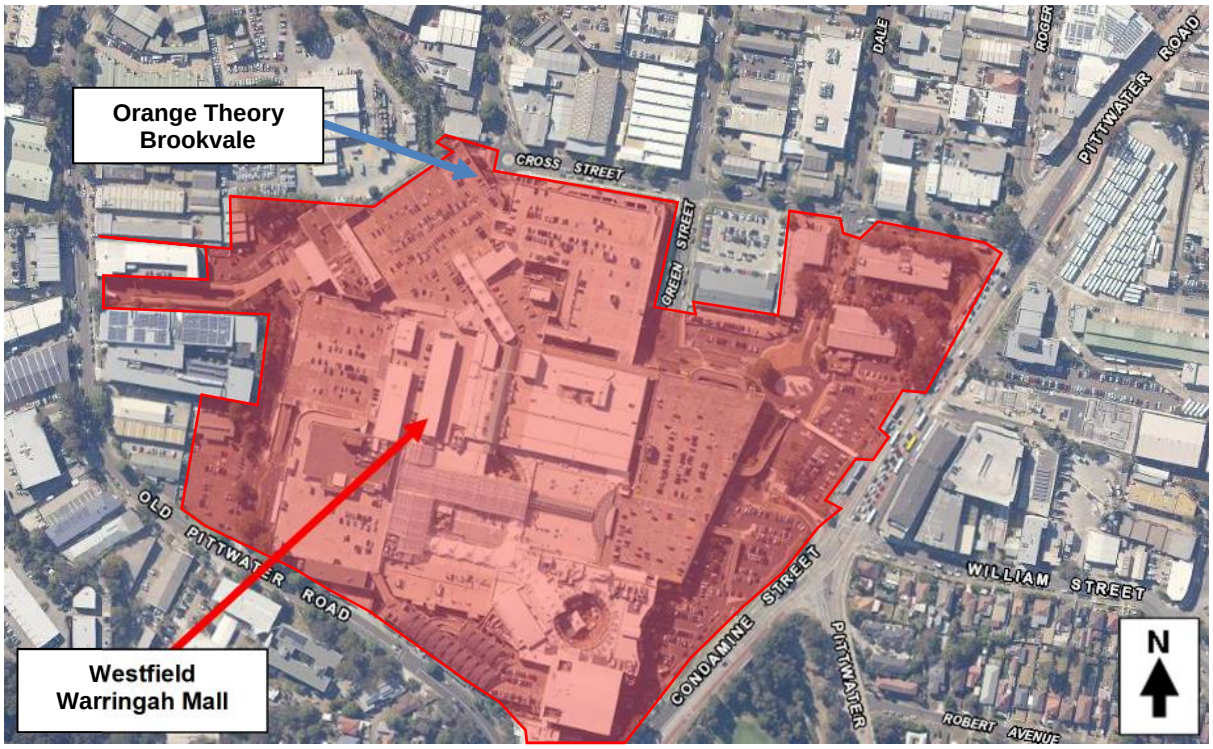
We trust that the above information meets with your requirements and expectations. Please do not hesitate to contact us on 02 9908 1270 should you require more information.

APPENDIX A – LOCATION MAP & AERIAL PHOTO

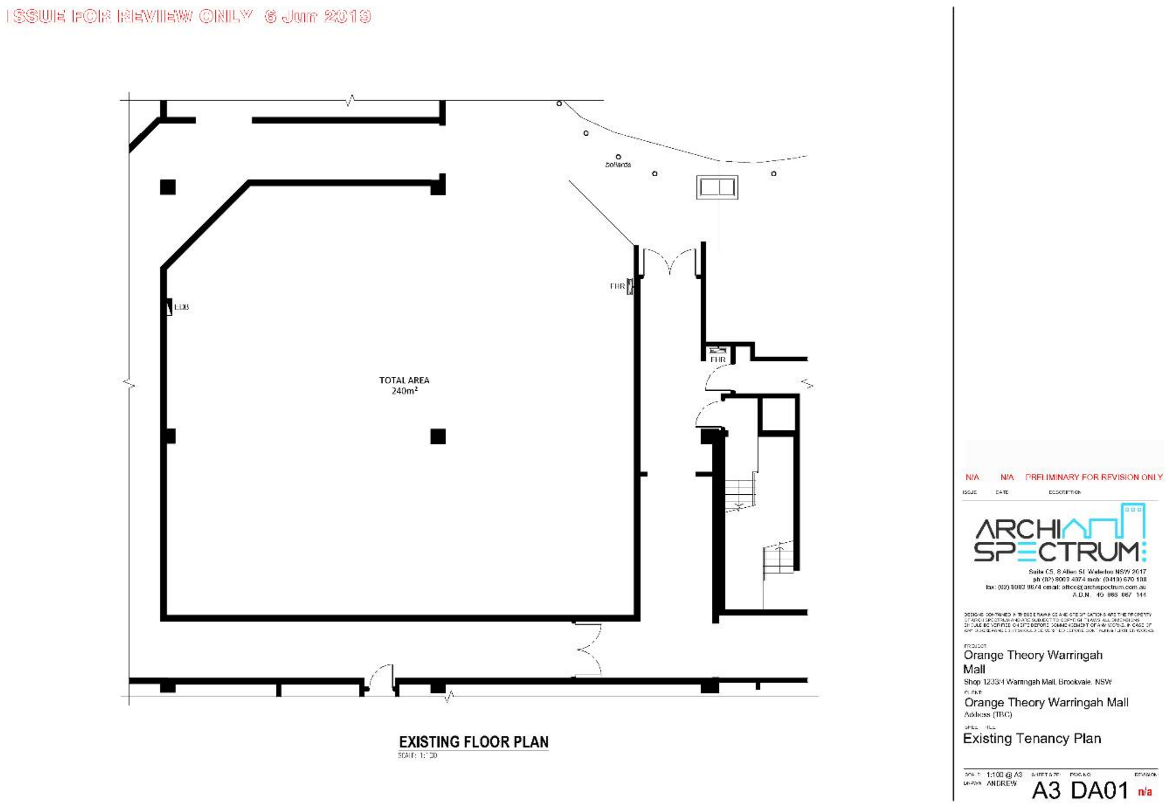
A.1 LOCATION MAP

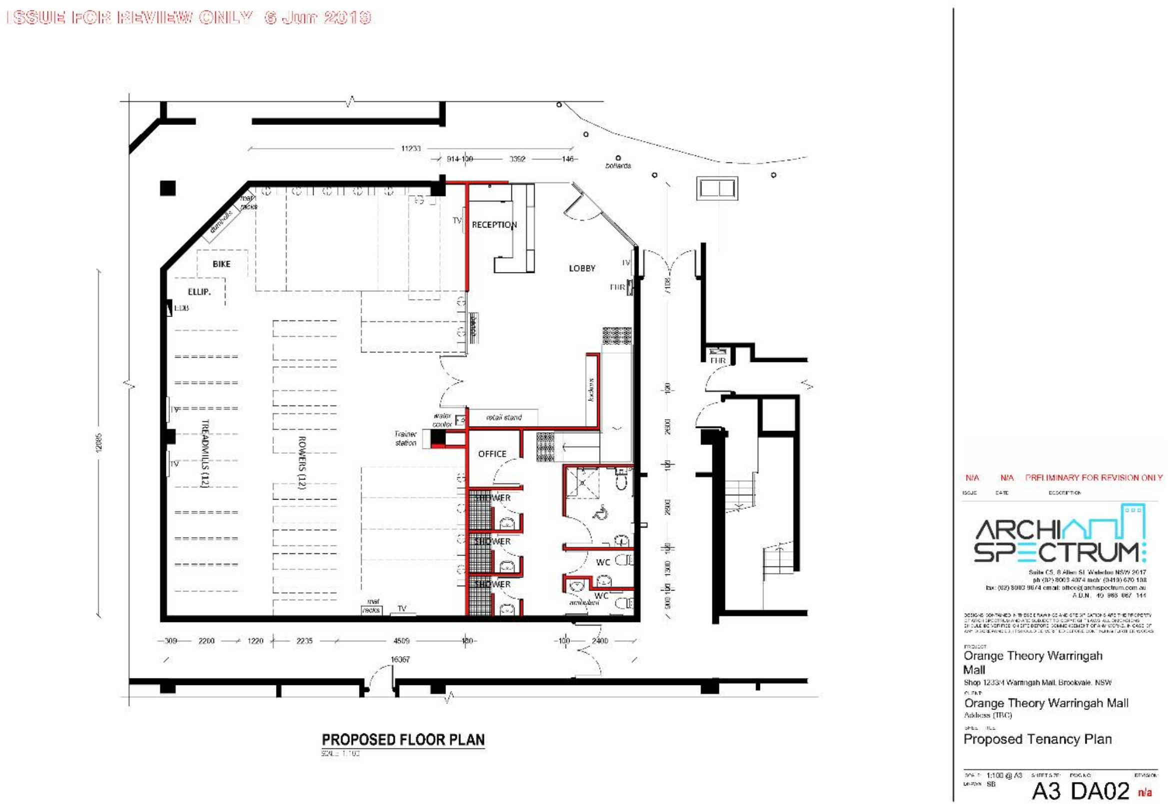


A.2 AERIAL PHOTO

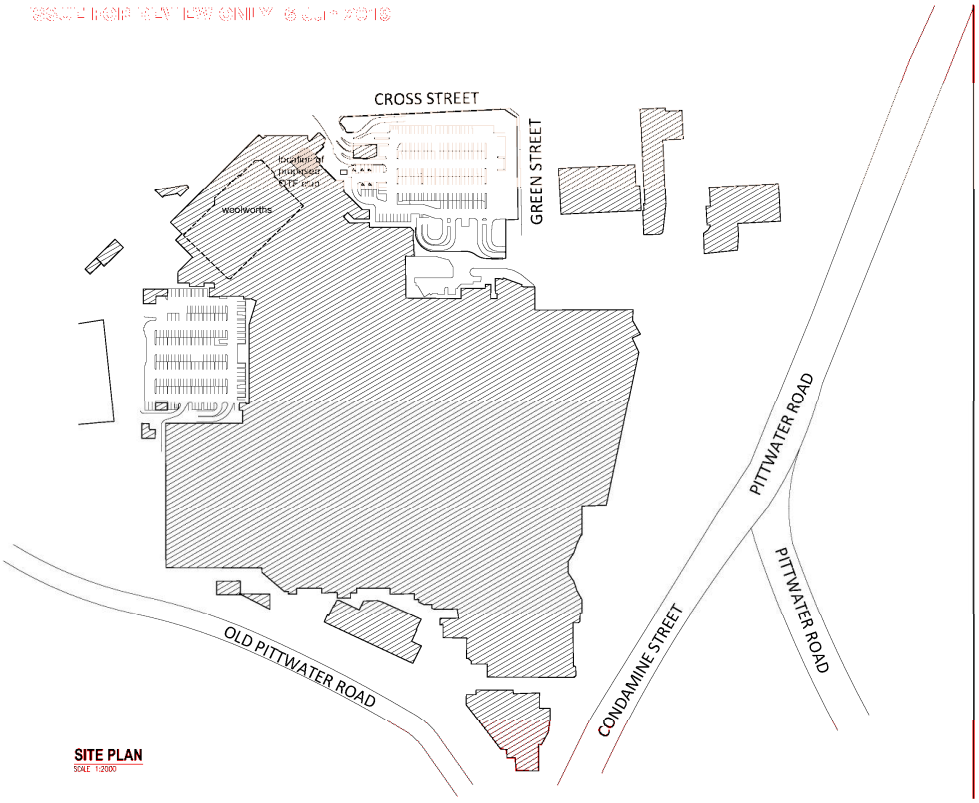


A.3 DRAWINGS


ISSUE FOR REVIEW ONLY 6 Jun 2019
TOTAL AREA
240m²
EXISTING FLOOR PLAN
N/A N/A PRELIMINARY FOR REVISION ONLY
ARCHI SPECTRUM
Orange Theory Warringah Mall
Shop 1233/4 Warringah Mall, Brookvale, NSW
Orange Theory Warringah Mall
Address (TBC)
Existing Tenancy Plan
1:100 @ A3
ANDREW
A3 DA01 n/a


ISSUE FOR REVIEW ONLY 6 Jun 2019
RECEPTION
LOBBY
BIKE
ELLIP.
TREADMILLS (12)
ROWERS (12)
OFFICE
SHOWER
SHOWER
SHOWER
WC
WC
PROPOSED FLOOR PLAN
N/A N/A PRELIMINARY FOR REVISION ONLY
ARCHI SPECTRUM
Orange Theory Warringah Mall
Shop 1233/4 Warringah Mall, Brookvale, NSW
Orange Theory Warringah Mall
Address (TBC)
Proposed Tenancy Plan
1:100 @ A3
SB
A3 DA02 n/a

ISSUE FOR REVIEW ONLY 6 Jun 2019



SITE PLAN
SCALE 1:2000

N/A N/A PRELIMINARY FOR REVISION ONLY
ISSUE DATE DESCRIPTION

ARCHI SPECTRUM

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PROJECT
Orange Theory Warringah Mall
Shop 1233/4 Warringah Mall, Brookvale, NSW

CLIENT
Orange Theory Warringah Mall
Address (TBC)

SHEET TITLE
Site Plan

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DRAWN SB

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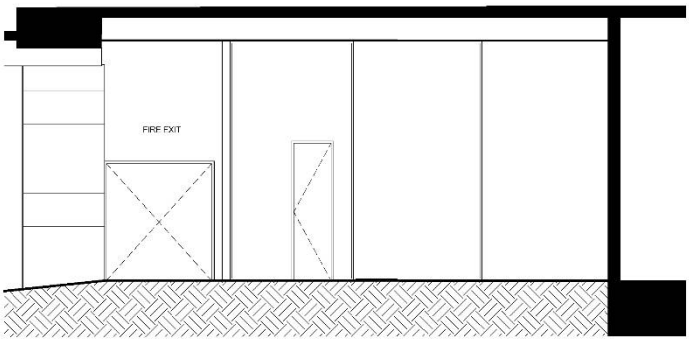

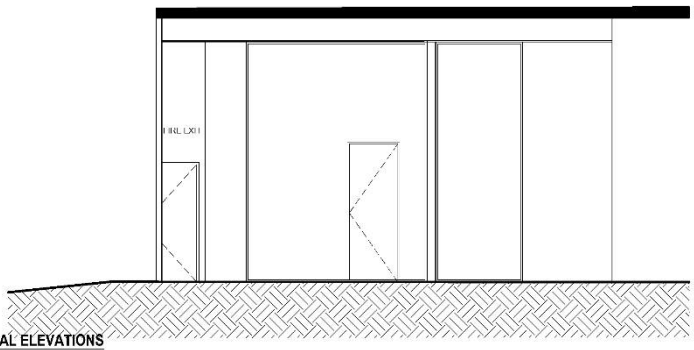

EXTERNAL ELEVATIONS
SCALE 1:50

N/A N/A PRELIMINARY FOR REVISION ONLY
ISSUE DATE DESCRIPTION

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PROJECT
Orange Theory Warringah Mall
Shop 1233/4 Warringah Mall, Brookvale, NSW

CLIENT
Orange Theory Warringah Mall
Address (TBC)

SHEET TITLE
External Elevation & Signage Details

SCALE 1:50 @ A3 SHEET SIZE A3 DWG NO DA04 REVISION n/a
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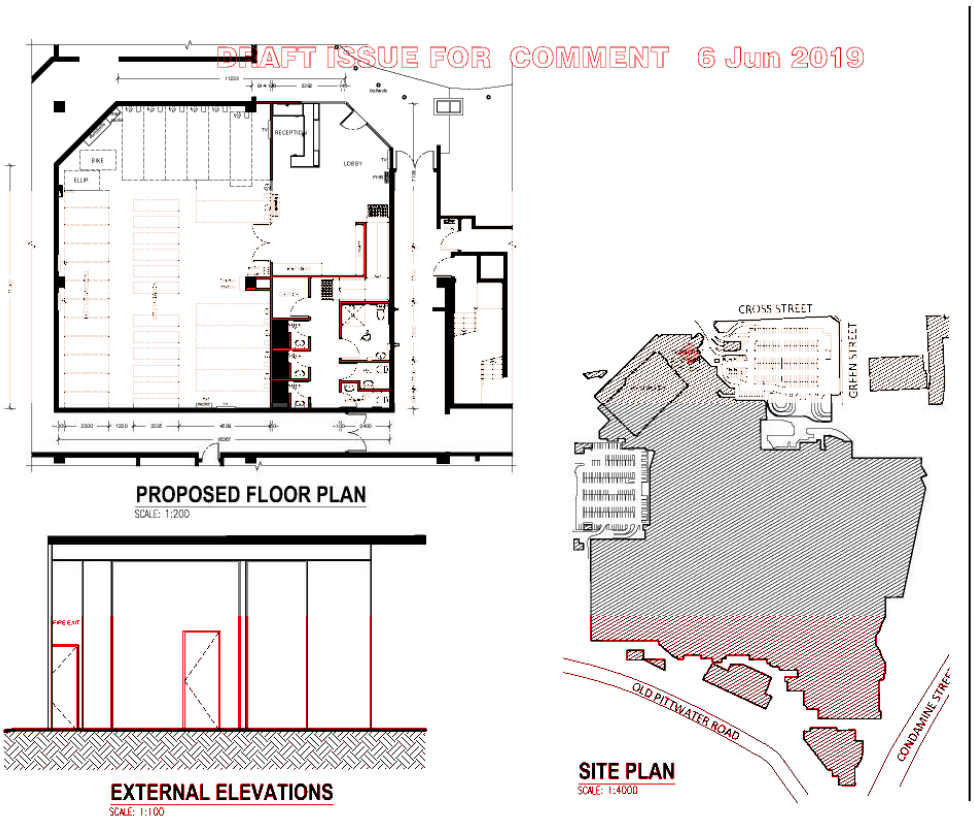
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SCALE: 1:200
EXTERNAL ELEVATIONS
SCALE: 1:100
CROSS STREET
GREEN STREET
OLD PITTWATER ROAD
CONDAMINE STREET
SITE PLAN
SCALE: 1:4000
N/A N/A PRELIMINARY FOR REVISION ONLY
ARCHI SPECTRUM
Orange Theory Warringah Mall
Orange Theory Warringah Mall
Notification Drawing
A4 N01 a n/a