

Figgs & Jefferson TEPA

Wingecarribee Animal Shelter

Acoustic Design Report

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Document Reference:	SYD2021-1199-R001C
Date	12/09/2022
Comments:	Noise monitoring (Section 2.2). Section 3.5 & 3.6 – Animal noise

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1 Introduction

The following report has been prepared by Acouras Consultancy on behalf of Figgs & Jefferson TEPA to assess the potential for noise impact associated with the new Wingecarribee Animal Shelter located at 1 Bowmand Road, which is at the corner of Berrima Road and Bowman Road. The animal shelter will include:

- Office, meeting rooms, training room, toilets, change rooms, cat and dog impound yards.
- Open air carpark, outdoor landscape area and seating.

The proposed animal shelter is surrounded by other existing commercial, light industry buildings, and concrete batch facility. The nearest potentially affected residential receivers are more than 670m to the east along Lyons and Gibbons Rd (R1). The site location is shown in Figure 1.



Figure 1 – Site Location, Nearest Residents and Noise Logger Position

2 Noise Criteria

The following standards and guidelines are applicable to this project:

- Wingecarribee Shire Council 'Moss Vale Enterprise Corridor Development Control Plan (2008)'.
- NSW EPA "Noise Policy for Industry" (NPfI).
- Australian standard AS/NZS 2107-2016: Acoustics – Recommended design sound levels and reverberation times for building interiors.
- Australian standard AS 1055.1-1997: Acoustics – Description and measurement of environmental noise - General procedures.

2.1 Internal Noise Levels

Australian Standard AS 2107. Australian Standard AS 2107 – 2016 'Acoustic – Recommended Design Sound Levels and Reverberation Times for Building Interiors' provides the recommended design sound levels for different areas of occupancy in buildings. Table 1 presents the recommended internal design noise levels in accordance with AS 2107 – 2016.

Table 1— Recommended Internal Design Noise Levels (AS/NZS 2107)

Type of occupancy/activity	Design sound level ($L_{Aeq,t}$) range
Corridors and lobbies	45 to 50
Reception areas	40 to 45
Open plan office	40 to 45
Meeting room (small) & Multi-purpose space	40 to 45
General office	40 to 45
Training Room	30 to 40
Staff common rooms	40 to 45
Toilets and change rooms	45 to 55
Enclosed/Undercover Carparks	< 65

2.2 Noise Survey and Project Specific Limits

An unattended noise survey was carried out at the site to measure the background and ambient noise levels. Noise monitoring was conducted between Friday 2nd to Friday 9th September 2022. The noise monitor located on the ground level of the site as shown in Figure 1:

Measurements were conducted using the following equipment:

- SVAN 977 Type 1 Real time Analyser/Noise Logger. Serial No. 34892.
- SVAN 977C Type 1 Real time Analyser/Noise Logger. Serial No. 97497.
- SVAN SV30A Type 1 Sound Level Calibrator. Serial No. 31830.

Noise monitoring was conducted in general accordance with Australian standard AS 1055.1-1997: Acoustics-Description and measurement of environmental noise-General procedures.

The noise analyser was calibrated immediately before and after measurements were taken with no discernible differences between these two recorded levels. The sound analyser is Type 1 and complies with Australian standard AS1259.2: 1990.

During the monitoring period any adverse weather condition have been excluded. The noise logger results are presented in Appendix E.

2.2.1 Wingecarribee Shire Council Requirements

According to the Moss Vale Enterprise Corridor Development Control Plan (2008), noise emissions from any new development is to comply with the following:

3.14 Noise Objectives Rules

- 1. Development must comply with the requirements of the NSW Industrial Noise Policy and Environmental Protection Authority (EPA) requirements.*
- 2. A noise impact statement prepared by a suitably qualified person must be prepared for development proposals within 500 metres of a rural or residential zone boundary. The noise impact statement must demonstrate that noise from the proposed development will not result in a significant adverse impact on the amenity of surrounding rural or residential properties based on accepted noise criteria.*

2.2.2 EPA Project Specific Limits

Table 2 presents a summary of the measured background noise level and the allowable intrusive noise limit for the operation of the facility. The amenity criteria are based on a rural receiver.

Table 2—Noise Survey Summary and Project Limits, dBA

Receiver	Time Period	Existing Noise Levels		NSW EPA NPfI			
		L_{eq} (period)	RBL	Recommended ANL	Project ANL ¹ $L_{eq}(15min)$	Intrusiveness Criteria, $L_{eq}(15min)$	Project Noise Trigger Level $L_{eq}(15min)$
Residential	Day	64	48	50	48	53	48
	Evening	60	41	45	43	46	43
	Night	57	36	40	38	41	38
Commercial	When in use	-	-	-	-	-	65
Industrial	When in use	-	-	-	-	-	70

2.2.3 Sleep disturbance

The EPA NPfI , uses the following sleep criterion guide to identify the likelihood of sleep disturbance.

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

- $L_{Aeq,15min}$ 40 dB(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 the greater,

a detailed maximum noise level event assessment should be undertaken.

Other factors that may be important in assessing the extent of impacts on sleep include:

- how often high noise events will occur.
- time of day (normally between 10pm and 7am).
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

¹ 2. Project ANL is recommended ANL minus 5 dB(A) and plus 3 dB(A), to convert from a period level to a 15-minute level.

Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under 'fast' time response. Table 2 presents the limits for sleep disturbance.

Table 3 – Sleep Disturbance Limits, dBA

Period	RBL	Sleep Disturbance Limits	
22:00 to -07:00	36	$L_{Aeq,15min}$ 41 dB(A)	L_{AFmax} 52 dB(A)

2.2.4 Measured Traffic Noise Levels

Table 4 presents a summary of the measured ambient noise level and traffic noise impacting the development. The measured ambient noise levels include operation noise from surround industrial facilities near the site.

Table 4 – Measured Ambient and Traffic Noise and Levels, dBA

Location	Period	Average L_{eq}	Highest L_{eq} 1hr
Berrima Rd	Day (07:00-22:00)	63	66
	Night (22:00-07:00)	57	65

3 Assessment and Recommendations

3.1 Façade Glazing Requirements

Acoustic glazing for the development is given in Table 5 are required to reduce noise impact on the internal occupants and should result in noise levels within such spaces in accordance with AS/NZS 2107.

Table 5 – Schedule of Window and Glazing (R_w)

Level	Space	Glazing Thickness	Minimum R_w (Glazing+Frame)
All	All	6.38mm laminated	32

All other non-habitable spaces, such as bathrooms and laundries require minimum 6mm monolithic glass (R_w 28).

All Windows/doors should be well sealed (air tight) when closed with good acoustic seals around the top and bottom sliders. Mohair seals are not considered to be acoustic seals.

3.2 Building Façade Construction

To provide sufficient acoustic attention of noise, the general external construction of the proposed building would need to be constructed as detailed in Table 6.

Table 6 – External Façade Construction (R_w)

Building Element	Proposed Construction	Minimum R_w
External Wall	TBA.	45
Roof and ceiling	Metal deck roof with a suspended plasterboard or mineral tile cavity ceiling. Insulation in cavity as per thermal requirements.	45

3.3 Building Acoustic Design

3.3.1 Internal Partitions Between Offices

The following is a review of the acoustic performance and construction for the internal walls around offices and meetings rooms. Refer to Appendix C for markup.

Description	Illustration
• Single row of 92mm steel stud. • 1x16mm fire-rated plasterboard on both sides. • 50mm thick, density of approximately 11kg/m³ in cavity. • Rw 45	

Figure 2 –Office/Meeting Room Wall

3.3.2 Internal Partitions Between Impound Areas

The following is a review of the acoustic performance and construction for the internal walls around the impound areas. Refer to Appendix C for markup.

Description	Illustration
• Single row of 92mm steel stud. • 2x16mm fire-rated plasterboard on both sides. • 50mm thick, density of approximately 11kg/m³ in cavity. • Rw 50	

Figure 3 –Impound Area Wall

3.3.3 Internal Partitions for Toilets

The following is a review of the acoustic performance and construction for the toilet and change room walls. Refer to Appendix C for markup.

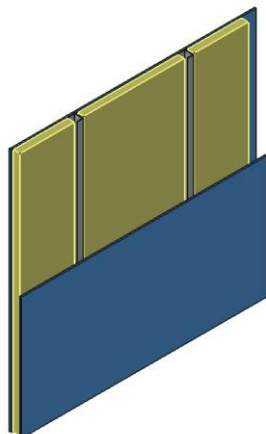
Description	Illustration
• Single row of 92mm steel stud. • 13mm moisture resistant plasterboard or 6mm FC on both sides. • 50mm thick, density of approximately 11kg/m³ in cavity. • Rw 45	

Figure 4 – Wall for Toilets

3.3.4 Entry Doors

For acoustic rated doors, we recommend:

- 35/40mm solid core door.
- Raven RP10 perimeter seals or similar.
- Raven RP38 drop seal. Threshold plate for carpet or soft floor surface.
- Excluding toilet doors.

3.3.5 Internal Glass Panels

For glass panels located in internal stud walls, the following is recommended:

- 10.5mm laminated (VLam Hush) glass, expected acoustic performance Rw 39 (glass only).
- OR
- 12.38mm laminated glass, expected acoustic performance Rw 38 (glass only).

3.3.6 Acoustic Sealants

Where acoustic constructions are provided, all joints should be overlapped and penetrations and gaps are to be fully sealed with a polyurethane acoustic sealant that is non-hardening. Any acoustic sealant that is polyurethane (non-hardening) similar to Bostik Fireban 1 or Seal'n'Flex.

3.4 Mechanical Services

At the stage, the design and selection of mechanical equipment has not been selected or finalised. Typically, based on similar sized residential projects we would expect the following noise control measures to be implemented. Refer to Appendix D for the list of equipment.

3.4.1 Indoor Fan Coil Units

The proposed Daikin Indoor Unit indoor A/C units are:

- Ceiling Mounted Cassette: Daikin FXFQ Models.
- Ceiling Mounted Duct : Daikin FXMQ Models.

For the indoor units, we recommended that:

- All flex duct be externally wrapped with 25mm foil faced insulation.
- All return air grilles are to have acoustic plenums with 25mm internal insulation.

3.4.2 Outdoor A/C Condenser

Residential Outdoor Condensers located on the roof:

- Sound power of the condensers are based on Daikin RXYM models
- Sound pressure level of the condensers are 54-58dBA @ 1m.
- No acoustic treatment needed.

3.4.3 Exhaust and Supply Fans

For any roof mount exhaust/supply fans:

- Provide acoustic attenuators to the supply and discharge of the fans.
- Electrically inter-locked with the light switch or have manual switch for the room served.
- Internally lined ducts and acoustic flex ducts to be fitted to the fans.
- Fans should not operate during the night time periods

3.5 Animal Shelter Noise

During our site inspection, we visited the existing animal shelter on Friday 2nd September 2022 to conduct attended noise measurement of dog noise. Table 7 below provide measured maximum and average sound pressure level dog noise taken at the existing animal shelter.

Table 7 – Equipment Sound Pressure Noise Level, dBA

Source	SPL dBA @ 1m	Sound Pressure Levels, Octave Band Hz, dB								
		31.5	63	125	250	500	1k	2k	4k	8k
Large dog	L _{max} 85	60	57	49	44	63	82	80	76	58
	L _{eq} 67	62	60	52	57	63	63	60	59	40
Small Dog	L _{max} 81	65	62	57	46	64	80	75	56	50
	L _{eq} 72	65	57	48	42	59	69	67	58	44

Sound propagation of the noise sources through atmosphere has been determined using the CadnaA (version 4.5.149) software based on the CONCAWE method. For the calculations we have assumed:

- The worst case scenario has been allowed for meteorological effects, such as wind direction and temperature inversion.
- Calculations have allowed for distance attenuation and air absorption.
- All dogs are located outside in the holding yards.
- No shielding from topography, building or barriers have been allowed for.
- The nearest residents are located along Lyons and Gibbons Road.

Based on the sound power the proposed equipment, Table 8 on the following page summaries the predicted noise emissions at the receiver locations (R1). The predictions indicate noise would be inaudible and not cause a noise impact, and therefore no further acoustic treatment is required.

Table 8 – Predicted Noise Level at Receiver Location

Noise Source	Total Internal Noise Level (SPL), dBA	Predicted Noise Level, dBA	EPA Night-time Noise Limit, dBA	Sleep Disturbance Limits
Dogs Barking	L _{max} 85	R1 (L _{eq} /L _{max}): < 20 (inaudible)	L _{Aeq(T)} 38	L _{Aeq,15min} 41
	L _{eq} 67			L _{AFmax} 52

3.6 Noise Management Plan

To manage noise from the animal centre, the following are the managerial practices used at the existing animal shelter that can be implemented to further limit the impact of any excessive animal noise:

- Taking them down to the off-leash area for some exercise and/or for a walk.
- Enrichment toys, such as; Kongs, Snuffle mats, wobblers.
- Putting them in their indoor pens as some dogs prefer it due to stress.

In addition to the above procedures, the following can be implemented:

- All staff are to be appropriately trained and made aware of the noise management plan.
- Any nearby noise sensitive receives should be able to refer complaints directly to management by email or calling the telephone number posted on the outside of the premises or on a web site.
- The operator is to maintain a complaints register to record any noise complaints received by neighbours.
- Any complaints will be thoroughly investigated and where such complaints are justified, appropriate measures will be put in place to ensure that the offence is not repeated.

4 Conclusion

An acoustic assessment of the proposed Wingecarribee Animal Shelter has been carried out in accordance with the requirements of Wingecarribee Shire Council DCP, EPA noise guidelines and Australian Standards.

An environmental noise survey of the site has been conducted and the noise limiting criteria for operational noise and sleep disturbance has been determined based on the EPA NPfI. Table 2 and Table 3 presents the allowable EPA noise limits for this project.

Construction for glazing, external walls and the roof/ceiling systems have been provided to achieve the internal noise criteria and are detailed in Section 3.1 and Section 3.2 based on the impact of road traffic noise.

To meet the clients requirements, Section 3.3 the review of recommended acoustic construction for wall systems, internal glazing and doors between the various spaces with the development.

Section 3.5 provides an assessment of the predicted noise from dogs barking when located outind in the holding yards. Based the predictions, the noise from dogs barking at the nearest receiver location (along Lyons and Gibbons Rd) would be inaudible and no further acoustic treatment is required. Section 3.6 outlines the recommended noise management to minimise any excessive noise and complaints handling.

Providing the recommendations in this report are implemented, the noise from the proposed development is predicted to comply with acoustic requirements of the Wingecarribee Shire Council DCP, EPA noise guidelines and Australian Standards.

Appendix A – Acoustic Terminology

Decibel, dB: A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 micro Pascals.

A-WEIGHTING: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA). The A-weighted sound level is also called the noise level.

Sound Pressure Level, L_p (dB), of a sound: 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Ambient Noise/Sound: All noise level present in a given environment, usually being a composite of sounds from many sources far and near. Traffic, HVAC, masking sound or even low-level background music can contribute to ambient level of noise or sound.

Percentile Level - L_{90} , L_{10} , etc: A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L_{90} is the level which is exceeded for 90% of a measurement period. L_{90} is commonly referred to as the "background" sound level.

Background Noise (L_{90}): The sum total of all unwanted residual noise generated from all direct and reflected sound sources in a space that can represent an interface to, or interfere with good listening and speech intelligibility.

Rating Background Level – RBL: Method for determining the existing background noise level which involves calculating the tenth percentile from the L_{A90} measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

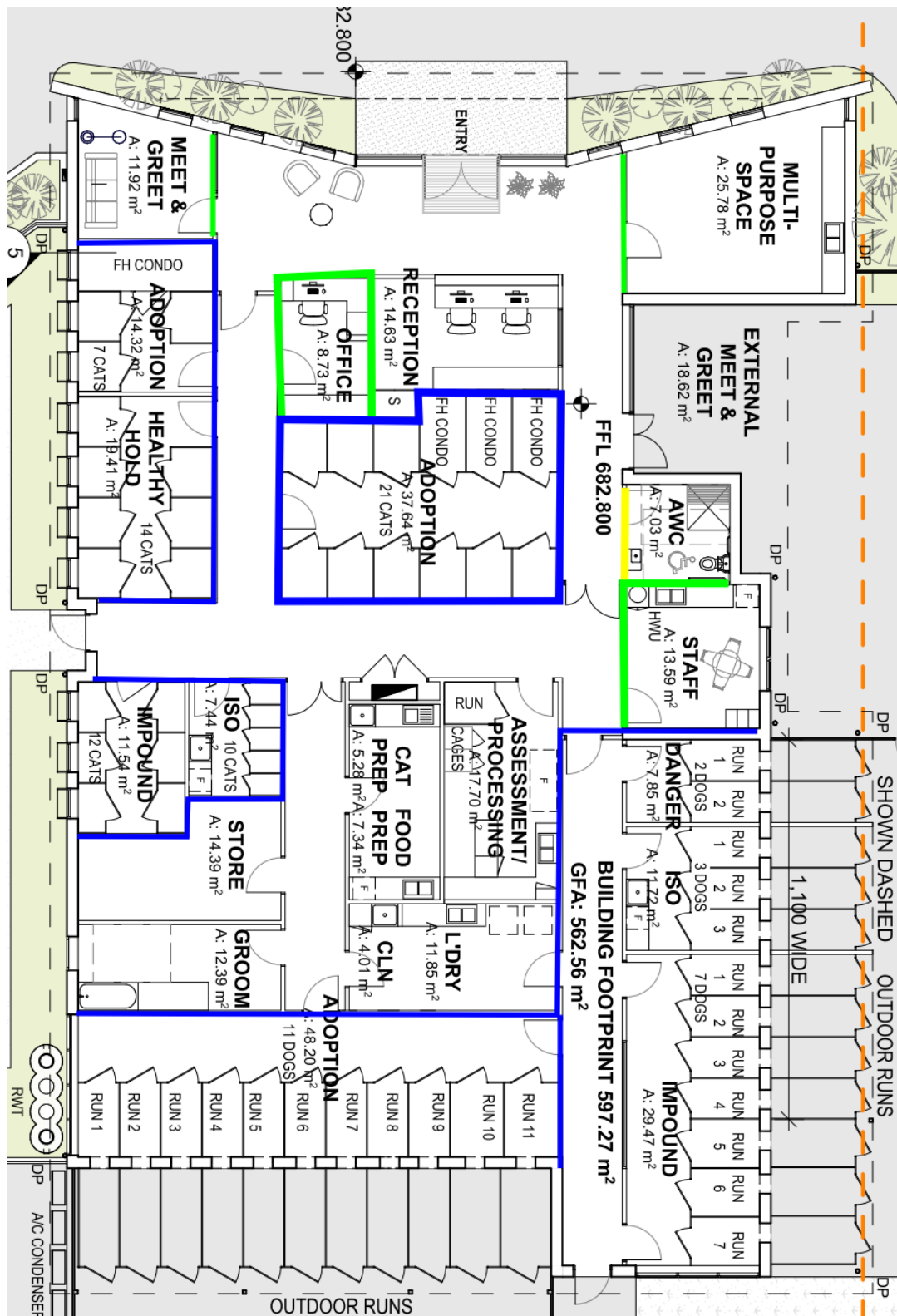
$L_{AEQ,T}$: Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

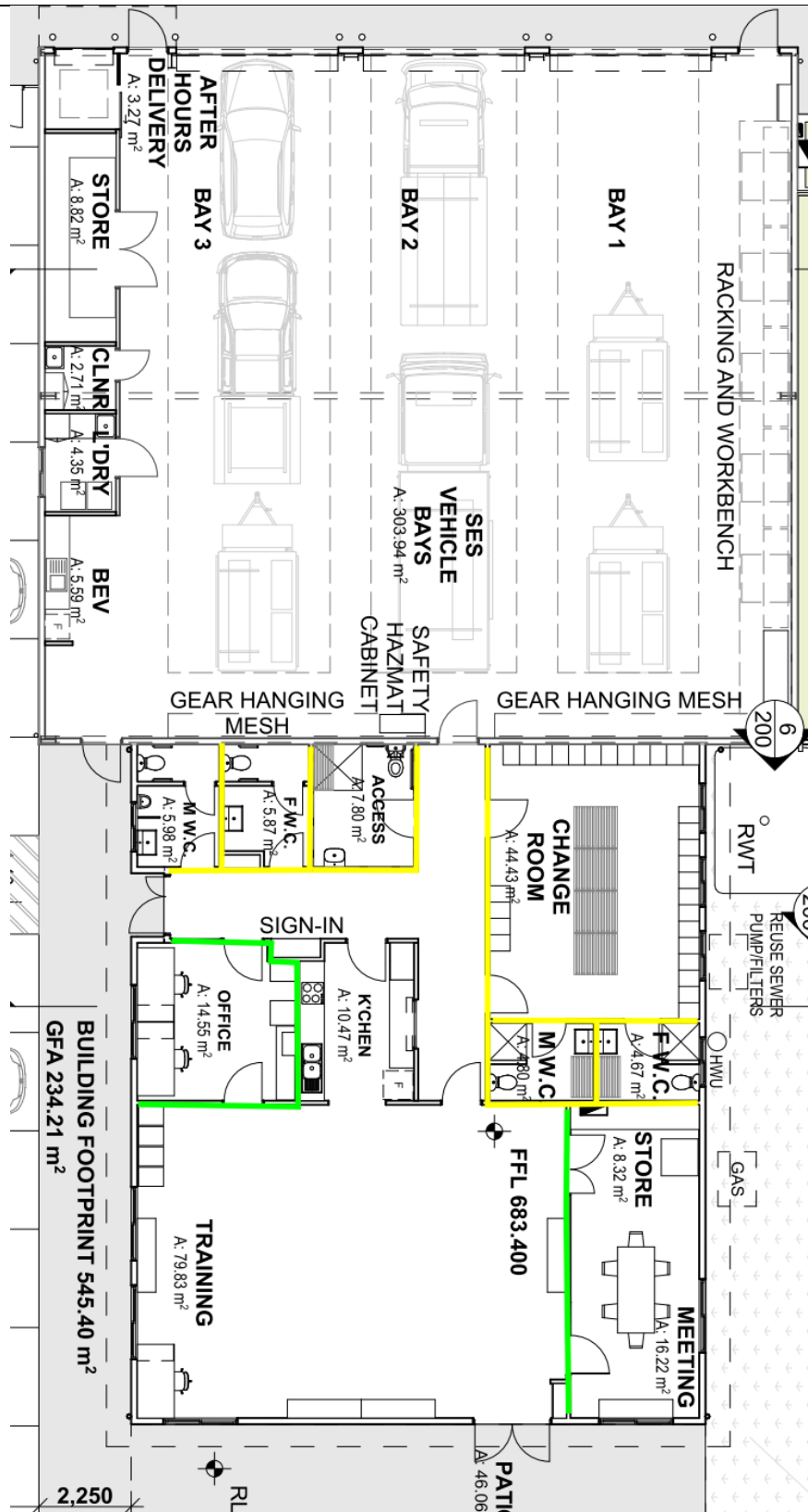
Appendix B – List of Drawings

This assessment was based on the following architectural drawings provided by Figgis+Jefferson TEPA.

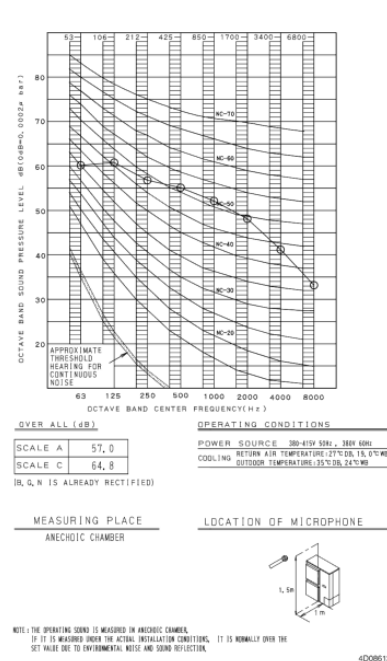
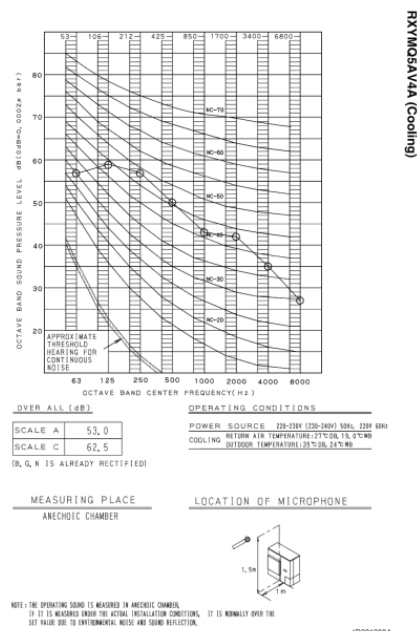
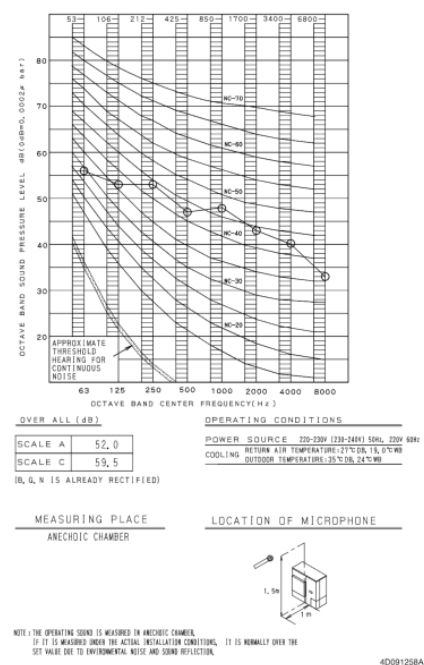
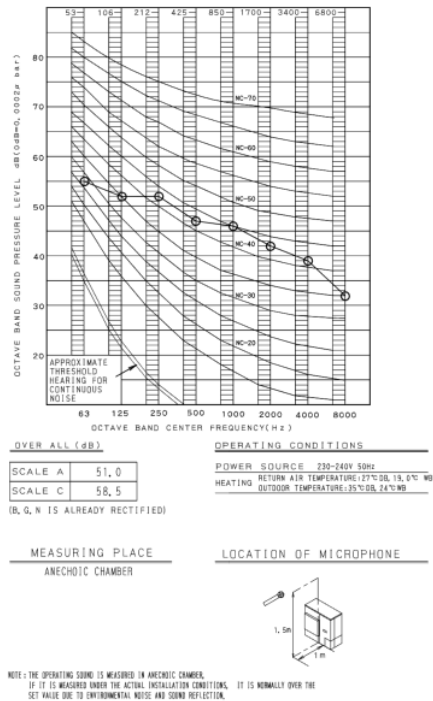
Drawing	Issue	Date	Description
SK100	K	30/03/2022	Site Plan
SK101	B	06/04/2022	Roof Plan
SK110	L	06/04/2022	Ground Floor Plan
SK200	B	06/04/2022	Animal Shelter Elevations & Sections

Appendix C – Wall Markup





Appendix D – List of Equipment



Appendix E – Noise Logger Results

