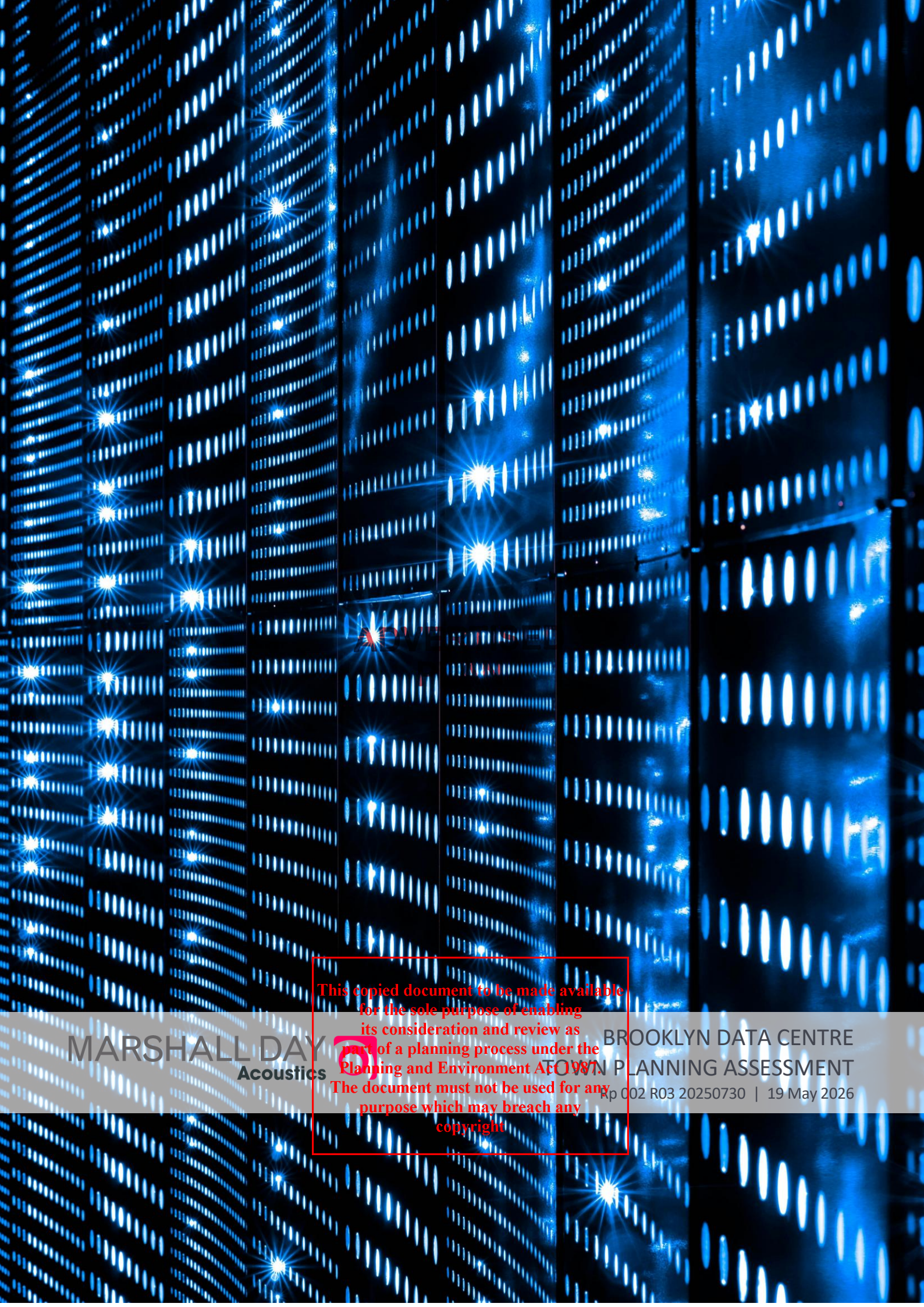

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Project: **BROOKLYN DATA CENTRE**

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Report No.: **Rp 002 R03 20250730**

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Cover image: Krzysztof Kowalik

SUMMARY

This report has been prepared on behalf of Stockland Development Pty Ltd to support the planning permit application relating to the land at 413 Francis Street, Brooklyn (the site). This application seeks approval for the use and development of the land for a data centre (the project).

The assessment investigates potential noise levels associated with outdoor equipment operating at the data centre, primarily focusing on noise from chillers on the roof, and generators on the outer side of the buildings. We have assumed that noise from other assessable sources at site including the substation, administration building mechanical plant and commercial vehicles at loading docks would be negligible relative to noise from the chillers and generators.

The assessment has identified the nearest noise sensitive receivers to the site. An unattended noise survey was undertaken on Millers Road to quantify background noise levels that inform legislated noise limits.

The assessment found:

- Noise mitigation measures have been nominated to allow noise from the operation of all chillers to meet the project design targets and legislative noise limits. Key mitigation measures include:
  - Enclosing chillers in a plant room with acoustically absorptive internal lining
  - Provision of and acoustically-lined 'labyrinth' air intake path at the perimeter of the rooftop plant enclosures
  - Provision of internally lined discharge air stacks between chillers and the roof structure above
- Estimated noise from the routine testing of generators would be below the day period noise limits applicable to the testing of equipment used in an emergency. Generator testing should only occur during the day period.
- Noise from emergency equipment is assessable against the qualitative factors of unreasonable noise listed by the EP Act. This report provides commentary on key factors that may be considered unreasonable.
- Noise generated by the continuous operation of the chillers is not expected to pose any concerns at the nearest neighbouring commercial properties, as it aligns with the typical activities and land use in the area. Noise from the routine 3 monthly testing of generators may reach up to 80 - 85 dB L_{Aeq} at the site boundary for limited periods.
- Recommendations have been made for the preparation of a noise management plan to review and manage noise from the proposed site.

TABLE OF CONTENTS

1.0 INTRODUCTION

This report has been prepared on behalf of Stockland Development Pty Ltd to support the planning permit application relating to the land at 413 Francis Street, Brooklyn (the site). This application seeks approval for the use and development of the land for a data centre (the project).

This report documents background noise measurements, a quantitative noise assessment of the proposal, and discussion of noise control measures.

The inputs for this study are based on:

- a review of publicly available aerial imagery
- data centre masterplan drawings (draft issued on 13 May 2026)
- equipment noise data provided by the client, supplemented with data from the MDA library
- noise survey data undertaken by MDA.

Acoustic terminology used in this report is contained in Appendix A.

2.0 PROJECT DESCRIPTION

2.1 Site location and noise-sensitive areas

The project seeks the staged use and development of a 2-storey data centre (250 MVA ultimate capacity) at the Stage 1 site, shown in Figure 1, pursuant to the Industrial 1 Zone and Special Building Overlay.

Separate planning approval will be sought for the subdivision of the site to allow for the data centre to be individually titled on Stage 1.

The existing warehouse buildings and associated hard stand/car parking area are to be removed in Stage 1. The use and development associated with a new substation will be subject to a separate approval by AusNet.

Key features of the proposed plans relevant to this assessment include:

- Two 2-storey data centre buildings, each with data halls and ancillary office, with a building height of 18.3 m, with additional 7.2 m of building services for plant and chiller equipment
- Vehicle ingress and egress is proposed to the east of the site's frontage to Francis Street
- Provision of required utilities, including diesel generator back up power system and associated fuel storage systems

The subject site is bounded by commercial uses to the immediate south, east and west, with Francis Street and commercial uses to the north.

The nearest noise-sensitive areas (receivers) in each direction from the subject site are approximately:

- 170 m to the west on Millers Road
- 675 m to the east on Francis Street, with future Bradmill Estate dwellings 770 m to the east.

Figure 1 shows the locations of key nearest receivers that have been considered for this assessment:

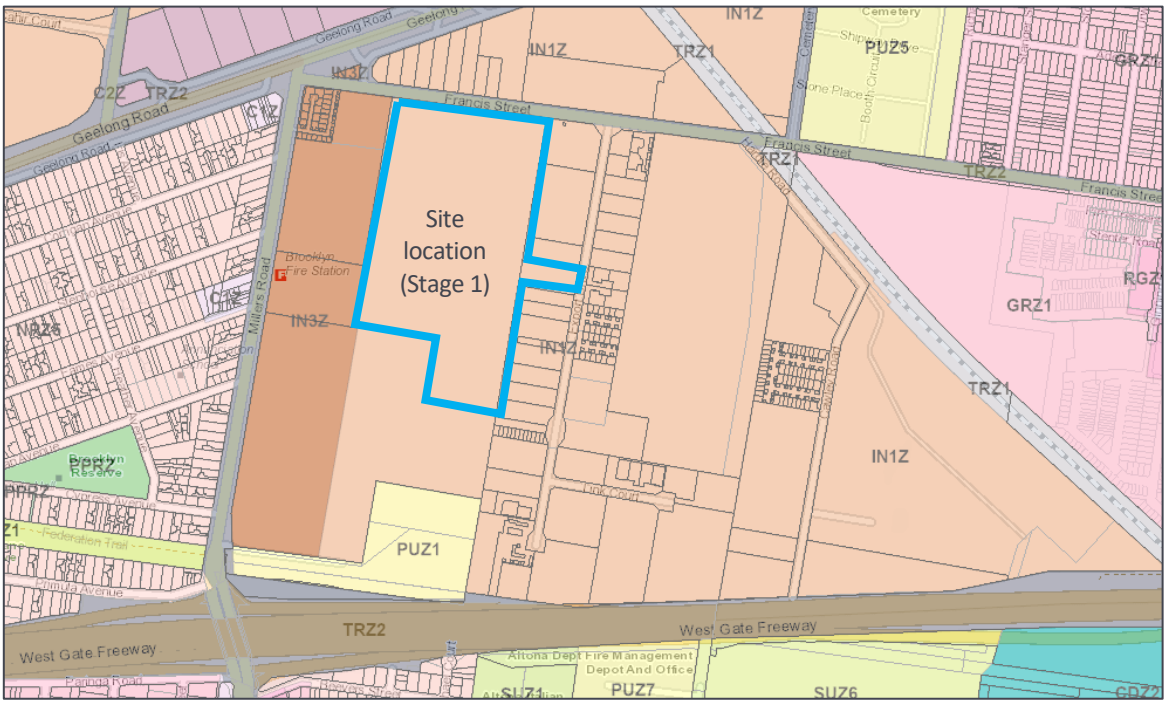
- 12 Millers Road, opposite the middle of the Stage 1 site
- 1A Eames Road, opposite a gap between existing commercial buildings that are shielding Millers Road residences from the site
- 394 Francis Street

Receivers south of the West Gate Freeway have not been considered as the prominence of traffic noise is expected to mask any noise from the site that is compliant with environmental noise legislation at residences on Millers Road.

Figure 1: Site and key receiver locations (image source: Metromap)

The subject site is zoned Industrial 1 (IN1Z), as shown in the zoning map in Figure 2.

Figure 2: Zoning map (source: Vicplan)



2.2 Proposed operations

The data centre layout broadly comprises 2 main warehouse buildings each with 2 large data halls and an area designated for a substation. Each data hall includes external chillers on the rooftop, and generators on the outside. The buildings would be 18.3 m high, with a further 7.2 m high enclosures around rooftop plant (total height of approximately 25.5 m).

Key noise-producing equipment is identified as follows:

- Chillers and other mechanical plant located on the roof of each building (96 chillers in total/ 48 chillers per rooftop)
- A total of 112 generators, with 56 located at ground level and 56 stacked above those generators around the warehouse buildings.

Noise source data for the identified sources above is contained in Section 7.2.2.

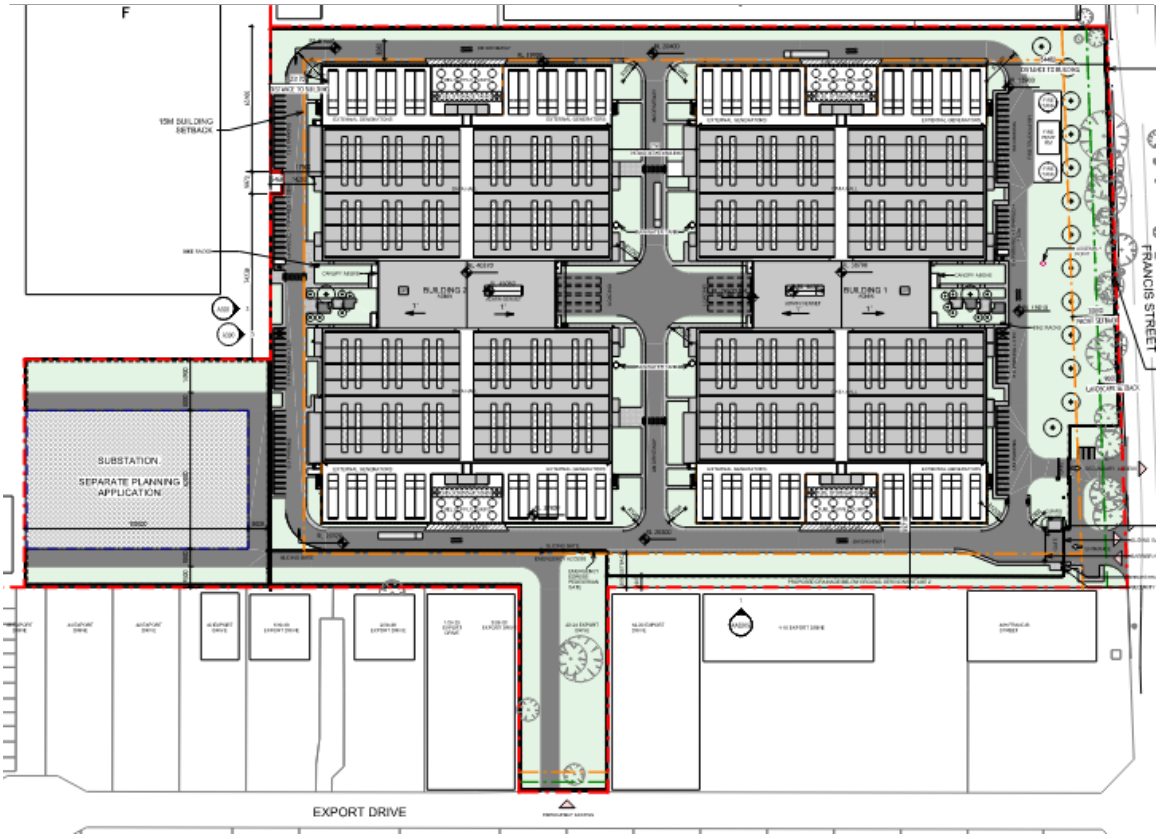
We have assumed that all chillers may operate simultaneously in high temperature conditions.

The generators would be used only when mains power fails (i.e. an emergency power failure) and 6 generators would be run simultaneously as part of routine testing and maintenance.

We expect noise from other assessable sources at site including the substation, administration building mechanical plant and commercial vehicles at loading docks would be negligible relative to noise from the chillers and generators. Noise from sources other than the chillers and generators have therefore not been considered further in this assessment.

A site plan is included at Figure 3.

Figure 3: Brooklyn data centre masterplan



3.0 LEGISLATION, STANDARDS AND GUIDELINES

The following sections outline key noise legislation in Victoria and related guidelines and standards relating to noise from the proposed data centre.

3.1 Victorian environmental noise framework

In Victoria, environmental noise is regulated by several different requirements, including various legislation, local laws, and Victoria's planning system.

The primary legislative instrument is the *Environment Protection Act 2017* (EP Act) and its subordinate legislation, including:

- *Environment Protection Regulation*s *2021* (EP Regulations)
- *Environment Reference Standard* published 25 May 2021, and as amended by Environment Reference Standard No. S158 Gazette 29 March 2022 (ERS)
- EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* published May 2021 (Noise Protocol).

Under the EP Act, operators of commercial, industrial or trade premises (CIT premises) must:

- fulfil a general environmental duty (GED) to implement all reasonably practicable measures to minimise the risk of harm from noise, including health and amenity related impacts and
- not emit unreasonable noise.

Harm is defined by the EP Act as:

> *an adverse effect on human health or the environment (of whatever degree or duration) and includes—*
>
> > *(a) an adverse effect on the amenity of a place or premises that unreasonably interferes with or is likely to unreasonably interfere with enjoyment of the place or premises; or*
> >
> > *(b) a change to the condition of the environment so as to make it offensive to the senses of human beings; or*
> >
> > *(c) anything prescribed to be harmful for the purposes of this Act or the regulations.*

Noise is defined by the EP Act as unreasonable if it is:

- prescribed to be unreasonable from an assessment against mandatory noise limits or
- assessed to be unreasonable according to the following factors defined in the EP Act:
  - noise volume, intensity or duration
  - noise character
  - the time, place and other circumstances in which it the noise is emitted
  - how often the noise is emitted and
  - any prescribed factors relating to the noise (frequency spectrum being a prescribed factor).

An assessment of compliance with the EP Act must therefore demonstrate that:

- all reasonably practicable measures would be implemented to reduce the risk of harm from noise
- the project could achieve noise levels below the prescribed noise limits to be unreasonable
- the project would not result in unreasonable noise according to the listed factors of the EP Act.

3.2 Victoria planning provisions

In addition to the EP Act requirements, the objective of Clause 13.05-1S of the Victoria Planning Provisions is to assist with the management of noise effects on sensitive land uses, and directs that the following policy documents should be considered as relevant:

- *Environment Protection Regulations under the Environment Protection Act 2017*
- *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (Publication 1826.5, Environment Protection Authority, May 2021)
- *Environment Reference Standard* (Gazette No. S 245, 26 May 2021)
- *Passenger Rail Infrastructure Noise Policy* (Victorian Government, 2013)
- *VicTrack Rail Development Interface Guidelines* (VicTrack, 2019).

As the two rail documents listed above are not relevant for this project, the requirements of the planning scheme mirror those of the EP Act discussed above.

3.3 Hobsons Bay Planning Scheme

There are no known specific noise-related requirements for the subject site land, or for data centres more generally, that apply under the Hobsons Bay Planning Scheme.

4.0 ASSESSMENT METHOD

Based on the Victorian environmental noise framework described above and the Victorian EPA preferring a proactive approach to noise assessment, our approach to this assessment presented in Table 1.

As per EPA guidance[1], responses should be proportionate considering the scale of the project and overall risk profile of the project. It is also relevant to consider the stage of the project, when considering which potential measures are reasonably practicable at the current stage.

Table 1: Assessment method

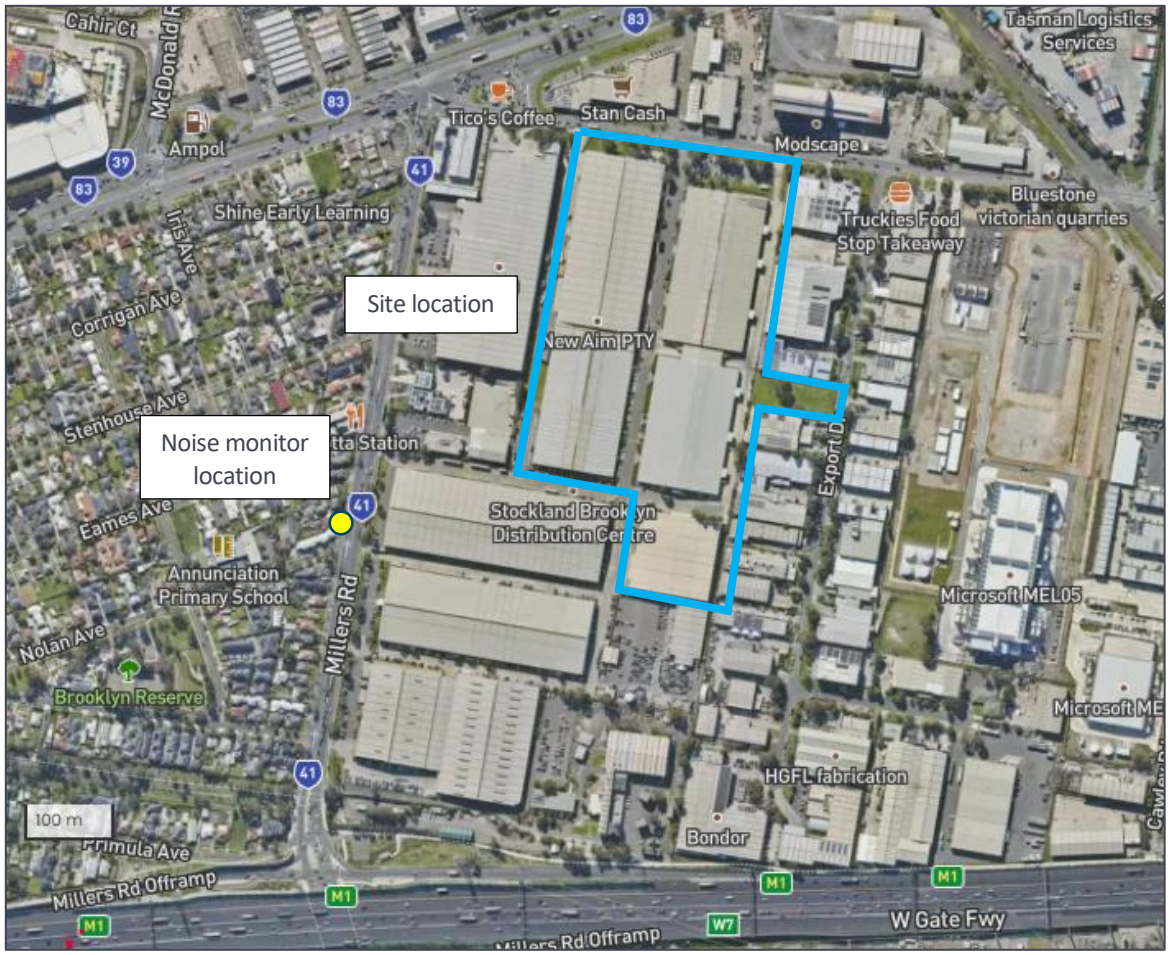
Step	General method
Consider risks	Consider the site context and existing noise environment. Identify potentially affected areas.
Reasonably practicable	In consultation with the project team, investigate noise mitigation measures which could reduce the risk of harm, and determine if they are reasonably practicable.
Unreasonable noise	Measures deemed reasonably practicable are incorporated into the assessment. Noise levels are predicted with measures in place to determine residual noise impacts. Predicted noise levels are assessed against the prescribed noise limits and, if required, further measures are incorporated. Reconsider whether noise from the site could be considered unreasonable with respect to the listed factors of the EP Act.
Check controls (Post approval)	GED obligations are ongoing over the life of the project. Ways to effectively monitor and maintain compliance with the GED are recommended.

[1] EPA Publication *Reasonably practicable*, dated September 2020

5.0 EXISTING NOISE ENVIRONMENT

A noise monitor was placed in the front yard of 40 Millers Road Brooklyn from 25 November to 1 December 2025. Figure 4 shows the location of the noise monitor relative to the subject site and the nearest western residences. Further details on the monitor installation are provided in Appendix C.

Figure 4: Noise monitor location (image source: Metromap)



The key ambient noise source at the monitoring location during deployment and retrieval was observed to be traffic on Millers Road. During lulls in local traffic, key noise sources were distant traffic noise from the West Gate Freeway and Princes Highway.

Observations were made near the monitoring location at approximately midnight on the nights of 25 November 2025 and 20 January 2026. There were periods of no local traffic on Millers Road and Francis Street, with the dominant noise source being traffic on the Westgate Freeway. Noise from existing commercial premises was not observed.

Typical average (equivalent or L_{Aeq}) measured noise levels were 64 dB L_{Aeq} during the day and 59 dB L_{Aeq} during the night.

Table 2 presents the background noise levels measured by the monitor. The lowest day, evening and night period values have been used to inform the noise limits.

Table 2: Measured background noise levels, dB L_{A90}

Date	Day	Evening	Night
Tuesday, 25 November	Incomplete period	49	43
Wednesday, 26 November	56	49	44
Thursday, 27 November	55	49	44
Friday, 28 November	55	53	46
Saturday, 29 November	53	47	39
Sunday, 30 November	n/a	50	45
Lowest	53	47	39

6.0 NOISE LIMITS AND DESIGN TARGETS

6.1 Noise limits for operational noise

The noise limits apply externally, within 10 m of a dwelling, but within the property boundary.

The noise limits are provided in terms of an effective noise level (dB ENL) which is based on the 30-minute equivalent noise level (dB L_{Aeq}), adjusted if required for specific characteristics.

The noise limits apply to the cumulative noise from all commercial, industrial and trade premises.

Noise limits have been determined for the key receivers identified in Section 2.1. Table 3 presents a summary of the noise limits for the different periods at the 3 receiver locations. A summary of the derivation of these limits is presented in Appendix B3.

Table 3: Noise limit summary, dB ENL

Period	Day of week	Time	12 Millers Rd	1A Eames Ave	394 Francis St
Day	Monday-Saturday	0700 – 1800 hrs	59	59	52
Evening	Monday-Saturday	1800 – 2200 hrs	51	50	46
	Sunday, Public holidays	0700 – 2200 hrs			
Night	Monday-Sunday	2200 – 0700 hrs	46	45	41

6.2 Target noise levels

The subject site is located within an industrial area surrounded by numerous other commercial, industrial and trade premises.

The noise limits provided in Table 3 apply to the cumulation of noise from all commercial, industrial and trade premises. Therefore, a design target noise level for the site must be set that is below the noise limits to allow for noise from surrounding industry. A nominal quantity of CIT premises that may generate moderate levels of environmental noise at various times of the day have been estimated.

Table 4 presents the derivation of the design target at 1A Eames Road. The design target at 12 Millers Road would be the same for the day period, and 1 dB less stringent for the evening and night period.

Table 4: Derivation of design target for site noise – 1A Eames Road

Description	Day	Evening	Night
Noise limit, dB ENL	59	50	45
Allowance for cumulative noise from other premises, dB	-7 (total of 5 CIT premises)	-5 (total of 3 CIT premises)	-3 (total of 2 CIT premises)
Total site noise level design target, dB L_{Aeq}	52	45	42

Table 5 presents the derivation of the design target at 394 Francis Street.

Table 5: Derivation of design target for site noise – 394 Francis Street

Description	Day	Evening	Night
Noise limit, dB ENL	52	46	41
Allowance for cumulative noise from other premises, dB	-5 (total of 3 CIT premises)	-3 (total of 2 CIT premises)	-3 (total of 2 CIT premises)
Total site noise level design target, dB L_{Aeq}	47	43	38

Given the data centre will operate at reduced load during night time, this assessment focuses on the evening and night period design targets as they are the most stringent.

6.3 Emergency Equipment

Power supply to the site is from the future substation which is planned to be located on the eastern boundary. The back-up generators have been considered as emergency equipment for the purposes of this assessment.

In accordance with the EP Regulations, noise generated by equipment used in response to an emergency is not evaluated under the Noise Protocol but it is subject to consideration under the qualitative factors of unreasonable noise outlined in the EP Act.

The Noise Protocol provides a 10 dB increased allowance to the noise limit for the testing and maintenance of a standby generator during the day and a 5 dB increased allowance during the evening and night.

On the basis that testing of generators only occurs during the day, the adjusted noise limits would be as derived as shown in Table 6.

Table 6: Derivation of day limit for generator testing, dB ENL

Description	Day and time	12 Millers Rd	1A Eames Ave	394 Francis St
Day noise limit	Monday - Saturday 0700 - 1800 hrs	59	59	52
Emergency equipment allowance		+10	+10	+10
Generator testing limits	Monday - Saturday 0700 - 1800 hrs	69	69	62

7.0 OPERATIONAL NOISE ASSESSMENT

7.1 Qualitative assessment

7.1.1 Reasonably practicable measures

In accordance with the GED, all reasonably practicable measures must be implemented to reduce the risk of harm from noise.

The following measures have been identified as being reasonably practicable and have been incorporated into the proposal:

- Testing and maintenance of generators to occur during the day period only
- Generators are located in individual enclosures with treated exhaust and cooling air paths
- Selection of quieter equipment where feasible
- Enclosing chillers in a plant room with acoustically absorptive internal lining
- Provision of acoustically-lined 'labyrinth' air intake path at the perimeter of the rooftop plant enclosures
- Provision of internally lined discharge air stacks between chillers and the roof structure above
- Development of a noise management plan for operation of the site, including, for example:
  - Identification and assessment of all relevant noise sources
  - A schedule for routine inspections of subject site operations and equipment to consider noise emissions.
  - Complaint handling procedures.

Further information regarding a noise management plan is provided in Appendix D.

The following measures have been discussed with the project team but were ultimately not deemed reasonably practicable:

- Application of attenuators directly to the chiller faces. The attenuators restrict airflow, result in chiller fans operating at higher loads, limit the ultimate cooling capacity, generate higher intake air velocities and are prohibitively bulky
- Installation of noise barriers. Preliminary testing of barrier treatments indicated that, due to the scale and geometry of the site, such barriers would not provide a meaningful reduction in noise levels.
- Provision of acoustic louvres to the sides of enclosures. Due to the limited open area of the louvres, the height of the rooftop plant enclosure would need increase by approximately 2 m to allow sufficient airflow
- Reduction of number of plant items. This measure was considered but would adversely affect operational requirements and compromise the overall viability of the project.

The GED is an ongoing obligation and noise control measures must be continually reviewed and updated.

It is recommended that the noise management plan be developed as a "living" document and updated as the operations of the facility are better understood.

7.1.2 Assessment of unreasonable factors

The EP Regulations note that noise from equipment used in relation to an emergency are not assessable against the EP Regulations and the Noise Protocol. That is, noise from emergency equipment during an emergency are not assessed against noise limits.

However, the EP Regulations note that noise from emergency equipment is assessable against the qualitative factors of unreasonable listed by the EP Act.

Table 7 presents commentary on the factors that may be subjectively considered to be unreasonable by a compliance officer.

Table 7: Consideration of unreasonable factors

Unreasonable factors	MDA comments
Volume, intensity or duration	'Intensity' refers to how loud the noise is, while 'volume' refers to how far the noise spreads. Noise from chillers and generators has the potential to spread over a large area of residential and industrial land use. The noise would be continuously present. The quantitative assessment of noise levels in Section 7.2.5 overleaf identifies noise mitigation measures are required for the chillers to satisfy the noise limits at the nearest noise sensitive areas with a margin to allow for additional noise from other premises. Noise from chillers that is compliant with noise limits suggests the intensity of noise at residential areas is unlikely to be considered unreasonable. The same can be said for noise from the occasional testing of generators that is compliant with the applicable noise limits. The intensity of noise from unmitigated chillers and generators is estimated to be up to approximately 65 dB L_{Aeq} and 80 - 85 dB L_{Aeq} respectively at the nearest neighbouring commercial premises. The intensity of the chillers is unlikely to be considered unreasonable for the use of the land. Noise from the generators is approaching occupational health and safety thresholds for the protection of employee hearing at the subject site boundary, but is not expected to be sustained for a full 8 hour shift. Further, the scheduled maintenance is currently only expected to occur once every 3 months. The thresholds are therefore not expected to be exceeded.
Character	Chillers can exhibit a tonal noise character. The risk of tonality being perceived at the nearest noise sensitive areas is reduced when considering: • the noise spectrum provided does not suggest a clear tone is present • the attenuation required to achieve the design targets is expected to considerably reduce any mid to high frequency tones that may exist • road traffic noise may be more prominent than the residual tone The generators may feature a tone at lower frequencies when operating.
The time, place and other circumstances in which the noise is emitted	Noise from operations occurring during evening and night periods carries a higher risk of being considered unreasonable relative to the same operations occurring during the day period. Testing of generators during the day only reduces the risk of the noise being considered unreasonable. 'Place' refers to whether the noise would be expected to be heard within the context of nearby activities. Given the proximity and expanse of industrial land use, it should not be unexpected that industrial noise can be heard at the nearest noise sensitive areas.

Unreasonable factors	MDA comments
How often the noise is emitted	Noise from the chillers would occur continually at all times, presenting as a higher risk of noise being considered unreasonable (in combination with other factors) relative to irregular noise events occurring infrequently, such as the scheduled testing of generators.
Prescribed factors – frequency spectrum	Noise from generators have the potential to exhibit low frequency (10 to 160 Hz) character relative to mid or high frequencies. A numerical assessment against EPA Publication 1996 *Assessing low frequency noise* has not been undertaken.

7.2 Quantitative assessment

7.2.1 Noise calculation method

Indicative operational noise levels from the project are predicted using:

- noise emission data for the relevant equipment. This has been obtained directly from equipment manufacturers for the candidate equipment, and noise data from the MDA Library for similar equipment.
- a 3D digital model of the site and the surrounding environment.
- a digital noise model of the project and the surrounding environment using proprietary noise modelling software SoundPLANnoise (version 9.1).
- implementation of the environmental sound propagation method specified in ISO 9613-2.[2]

The implementation of ISO 9613-2 within proprietary noise modelling software enables multiple sound transmission paths, including reflected and screened paths, to be accounted for in the calculated noise levels. ISO 9613-2 was designed to assume conditions that favour the propagation of noise from meteorological effects, described as a slight wind (1 to 5 m/s) blowing from source to receiver, or a well-developed moderate ground-based temperature inversion.

Hard, reflective ground (G = 0.0) has been assumed in all areas from the subject site to residential areas.

The noise model includes any beneficial shielding and noise reflections from surrounding commercial buildings.

Publicly available 5 m resolution terrain data was used to inform the calculations, encompassing all sensitive receptors and intervening noise propagation paths.[3]

[2] International Standard ISO 9613-2: 2024 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors* (ISO-9613-2)

[3] Sourced from Spatial Services via Elvis – Elevation and Depth – Foundation Spatial Data - https://elevation.fsdf.org.au/

7.2.2 Noise data

Noise data for the chillers (sound power data per unit) is summarised in Table 8.

Table 8: Noise data used for noise modelling, sound power levels per chiller, dB $L_{W,eq}$ re 10^{-12} W

	Octave Band Centre Frequency (Hz)							
Source	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A**
Full load, maximum ambient temperature (used for evening limit assessment)	102	97	93	93	89	87	81	98
Evening design load, 35°C ambient temperature (used for night limit assessment)	95	95	92	90	86	82	78	95

Noise from the generators has been estimated as 85 dB L_{Aeq} at 1 m distance.

7.2.3 Noise character

There is a risk of tonal character from the chillers. The risk of tonality being perceived at the nearest noise sensitive areas is reduced when considering:

- the noise spectrum provided does not suggest a clear tone is present.
- the attenuation required to achieve the design targets is expected to considerably reduce any mid to high frequency tones that may exist
- road traffic noise may be more prominent than the residual tone.

This assessment has therefore not included a correction for tonal character for chillers.

There is a risk that the character of the generator noise may be audibly tonal at receivers, as the estimated noise levels presented below are comparable to the measured day period average noise levels. A maximum +5 dB correction for tonality may therefore apply.

7.2.4 Operational scenario for noise estimates

Calculations have been undertaken to estimate noise from all chillers operating simultaneously. Noise during the evening period (including

A second scenario considers noise from simultaneous testing of generators. While we understand that up to 6 generators may be tested simultaneously during maintenance, the noise model conservatively assumes all generators would be operating simultaneously.

7.2.5 Estimated noise levels – effective noise levels

Chillers

Table 9 presents the predicted noise levels from the operation of all chillers without the rooftop enclosure and physical noise attenuation measures. The predicted noise levels are also compared to the design targets.

Table 9: Predicted noise level of chillers without physical mitigation and comparison to design target, dB L_{Aeq}

Description	12 Millers Rd	1A Eames Ave	394 Francis St
Operation of all chillers (evening)	54	56	49
Design level (evening)	46	45	43
Attenuation required	-8	-11	-6
Operation of all chillers (night)	51	53	46
Design level (night)	43	42	38
Attenuation required	-8	-11	-8

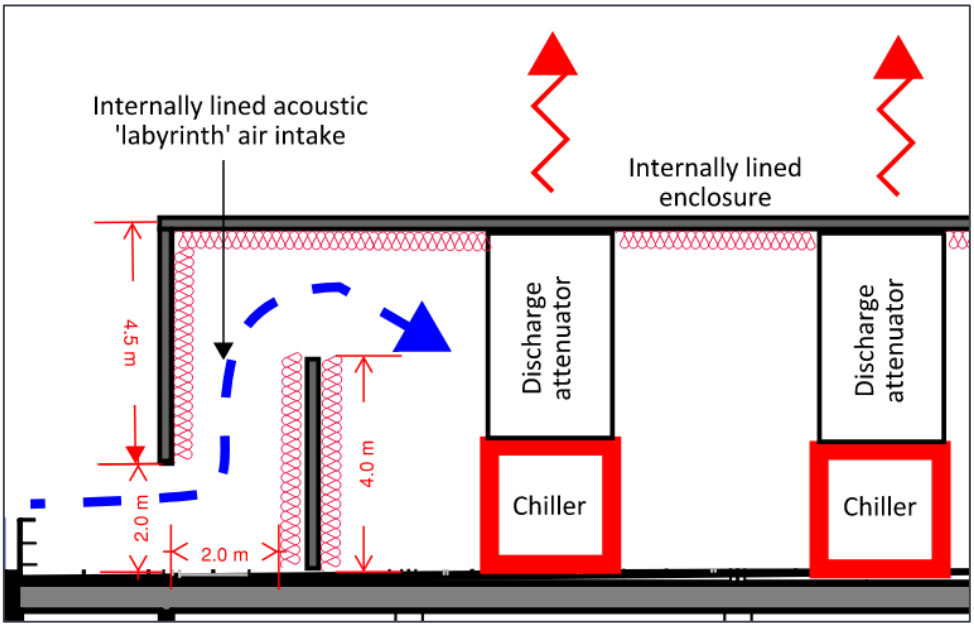
Noise from the chillers required attenuation of 11 dB to satisfy the project design targets and allow for compliance with the evening and night period noise limit at 1A Eames Avenue. This reduction will allow compliance at other receivers to be achieved.

The following noise mitigation measures have been nominated for the project to achieve the 11 dB of noise attenuation required of chillers:

- Enclosing chillers in a plant room with 75 mm thick acoustically absorptive internal lining on 6 mm thick fibre cement or equivalent mass lining
- Provision of 75 mm thick acoustically-lined 'labyrinth' air intake path to the full perimeter of the rooftop plant enclosures
- Minimum 2.0 m long/high discharge air silencers/attenuators/internally lined stacks between the chiller fans and roof structure

A sketch of these measures is shown in Figure 5.

Figure 5: Acoustic treatment for chillers, section view. Dimensions are indicative only. Figure is not to scale



With these measures integrated, the predicted operational noise levels allow the required project design targets to be achieved, allowing environmental noise limits to be satisfied. Table 10 presents the predicted noise levels from the operation of all chillers after the adoption of the nominated mitigation measures. The predicted noise levels are also compared to the design targets.

Table 10: Predicted noise level of chillers with mitigation measures and comparison to design target, dB L_{Aeq}

Description	12 Millers Rd	1A Eames Ave	394 Francis St
Operation of all chillers (evening)	45	45	41
Design level (evening)	46	45	43
Design margin	1	0	2
Operation of all chillers (night)	40	41	36
Design level (night)	43	42	38
Design margin	3	1	2

The table above demonstrates the evening and night design targets are satisfied. The less stringent day period design target is also be satisfied.

There is minimal, if any margin between predicted noise levels and design target at some locations. However, the underlying assumptions in the assessment are generally conservative for the purpose of presenting a typical worst case scenario.

The project team will continue to explore opportunities to further reduce noise levels during detailed design of the facility.

One key example of an opportunity to further reduce noise is the discharge air stacks, which the noise modelling indicates is the key source of noise from the plant enclosure. The noise modelling assumes a minimum 2.0 m length/height attenuator, however with chillers being located closer to the ground there is an opportunity to provide longer attenuators that better attenuate noise. This would increase the margin between noise levels and the design target.

Another example would be selecting quitter models of chiller, subject to other design requirements being satisfied.

Generators

Estimated noise levels for the simultaneous maintenance and testing of 6 generators closest to the receivers are presented in Table 11. The estimates are compared to the day period limit for emergency equipment.

Table 11: Generator maintenance - estimated noise levels, day, dB ENL

Location	Day limit (emergency equipment)	Estimated	Tonality	Total ENL	Below limit?
12 Millers Rd	69	62	+5	67	✓
1A Eames Ave	69	59	+5	64	✓
394 Francis St	62	56	+5	61	✓

The estimated noise levels from the operation of all generators are below the day period noise limit for the testing of emergency equipment.

8.0 CONCLUSION

This report has summarised the assessment of noise from the proposed data centre at Brooklyn, Victoria.

Noise modelling has been carried out to inform the feasibility of compliance with the relevant noise limits.

Design targets for environmental noise have been derived with regard to mandatory noise limits at receiver locations, making allowances for cumulative noise from CIT premises in the broader area.

Predictive calculations indicate that chillers are a key noise source at the site that require acoustic treatment to satisfy project design targets and legislative noise limits. The provision of an acoustically lined rooftop plant enclosure, an acoustically lined air intake 'labyrinth' and internally lined discharge air stacks between the chiller fans and roof structure will enable the design targets and noise limits to be achieved. Opportunities to further reduce noise from mechanical plant will be explored during detailed design stages of the project.

Noise from the continual operation of the chillers at compliant noise levels is unlikely to be considered unreasonable at the nearest neighbouring commercial premises given the nature of the use of the land.

This assessment considers the generators as emergency equipment only. The EP Regulations note that noise from equipment used in relation to an emergency are not assessable against the EP Regulations and the Noise Protocol. That is, noise from emergency equipment during an emergency are not assessed against noise limits.

Noise from the routine testing of generators that only occurs during the day period is expected to comply with the applicable limit. The EP Regulations note that noise from emergency equipment is assessable against the qualitative factors of unreasonable listed by the EP Act. Commentary on key factors has been provided.

Recommendations have been made for preparation of a noise management plan to review and manage noise from the proposed site.

APPENDIX A GLOSSARY OF TERMINOLOGY

Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds.
dB	Decibel. The unit of sound level.
Frequency	Sound occurs over a range of frequencies, extending from the very low (e.g. thunder) to the very high (e.g. mosquito buzz). Measured in units of Hertz (Hz). Humans typically hear sounds between 20 Hz and 20 kHz. High frequency acuity naturally reduces with age most adults can hear up to 15 kHz.
L_{A90}	The A-weighted sound level exceeded for 90 % of the measurement period, measured in dB. Commonly referred to as the background noise level.
L_{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
L_w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L_{WA}.
Effective noise level (ENL)	The effective noise level from commercial, industrial or trade premises determined in accordance EPA Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industry and trade premises and entertainment venues*. This is the L_{Aeq} noise level over a 30-minute period, adjusted for the character of the noise. Adjustments are made for tonality, intermittency and impulsiveness.
Octave band	The interval between one frequency and its double. Sound is divided into octave bands for analysis. The typical octave band centre frequencies are 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz and 4 kHz.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to ability of a material to stop sound travelling through it.
SPL or L_P	Sound Pressure Level, a logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
L_w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L_{WA}.

APPENDIX B LEGISLATION AND GUIDELINES

B1 Environment Protection Act 2017

The *Environment Protection Act 2017* (EP Act) came into effect on 1 July 2021 and incorporates several subordinate documents relating to assessment of noise.

The EP Act also introduces a general environmental duty (GED), which requires anyone engaging in an activity posing a risk of harm to human health and/or the environment from pollution (including noise) and waste, to minimise those risks to prevent harm as far as reasonably practicable.

The legislative documents that prescribe noise limits are the *Environment Protection Regulations 2021* (EP Regulations) and EPA Publication 1826.4 N*oise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol).

B2 Environment Protection Regulations 2021

The EP Act does not specify noise limit values or technical aspects of environmental noise but sets out legal requirements to comply with the EP Regulations described below. Clause 166 of the EP Act essentially places the onus of achieving compliance with noise limits on the commercial premises.

The EP Regulations are made under section 465 of the EP Act and impose obligations in relation to environmental protection, including noise. The EP Regulations state that a person who conducts a prediction, measurement, assessment, or analysis of noise within a noise sensitive area must do so in accordance with the Noise Protocol. In particular, noise from industrial, commercial and trade premises or entertainment venues or events is prescribed as unreasonable if it exceeds a noise limit or alternative criterion determined in accordance with the Noise Protocol.

Key matters addressed in the EP Regulations include:

- Definition of commercial, industrial and trade premises, which is essentially any premises that is not a residential premises, a road or a railway. It is noted that noise from common building services equipment (such as shared condensing units and kitchen exhaust fans) is assessable
- Definition of an indoor music entertainment venue
- Definition of noise sensitive areas where the noise limits are assessed, which broadly include:
  - a residential building
  - temporary accommodation
  - hospital corrective institution
  - retirement or residential village
  - A room for learning in a child care centre, kindergarten or school
  - A tourist establishment, campground or caravan park
- Assessment time periods
- Noise sources that must not be taken into account
- Minimum noise limit values
- Management of cumulative noise from multiple premises.

Table 12 presents a summary of the relevant Divisions and Regulations from Part 5.3 *Noise*.

Table 12: Summary of Part 5.3 - Noise

Section	Description
Division 1 Regulation 113	States that *a person who conducts a prediction, measurement, assessment or analysis of noise within a noise sensitive area for the purposes of the Act or these Regulations, must conduct the prediction, measurement, assessment or analysis in accordance with the Noise Protocol.*
Division 2	Applies to noise from residential premises
Division 3	Applies to noise from commercial, industrial and trade premises
Regulation 116	Defines the day, evening and night period as follows: Day: 0700 to 1800 hrs, Monday – Saturday Evening: 1800 to 2200 hrs, Monday – Saturday 0700 to 2200 hrs, Sunday and Public Holidays Night: 2200 to 0700 hrs the next day, Monday – Sunday
Regulation 117	In this Division, when the level of noise emitted from commercial, industrial and trade premises is assessed, the following sources of noise that could be expected at the proposed facility must not be taken into account: – Voices – Construction or demolition activity on building sites – Intruder, emergency or safety alarms or sirens – Equipment used in relation to an emergency – Non-commercial vehicles (except for maintenance activities).
Regulation 118	Defines noise as being unreasonable if it exceeds the Noise Protocol limits or the alternative assessment criteria that apply at an alternative assessment location. Defines the lowest base noise limits as follows: Major urban area: Day: 45 dB L_{eff}; Evening: 40 dB L_{eff}; Night: 35 dB L_{eff} Rural area: Day: 45 dB L_{eff}; Evening: 37 dB L_{eff}; Night: 32 dB L_{eff} The noise limit for commercial, industrial and trade premises for the night period must not exceed 55 dB L_{eff}.
Regulation 119	If multiple existing or proposed premises emit noise that contributes to the effective noise level at a noise sensitive receiver, all reasonable steps must be taken by the premises' management to ensure the combined noise level does not exceed the noise limit.
Regulation 120	This regulation essentially identifies that tonal aspects of noise must be considered when considering unreasonable noise for section 3(1)(a)(v) of the EP Act. The Noise Protocol provides a method of assessing tonal characteristics of noise from commercial, industrial and trade premises, with additional guidance on low frequency noise available in EPA Victoria Publication 1996 *Noise guideline – assessing low frequency noise.*

Section	Description
Regulation 121	Noise emitted from commercial, industrial and trade premises is prescribed to be aggravated noise if it exceeds the noise limits by more than 15 dB, or the following if lower: - 75 dB L_{eff} during the day, - 70 dB L_{eff} during the evening, or - 65 dB L_{eff} during the night.
Division 4	Applies to noise from entertainment venues and outdoor entertainment events, including music noise from entertainment venues or events.
Division 5	Applies to noise from wind turbines.

B3 EPA Publication 1826 – Noise Protocol

The regulatory framework includes a reference document EPA Victoria Publication 1826 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (the Noise Protocol). The Noise Protocol outlines the EPA's required approach to the determination of noise limits and to the measurement, prediction and analysis of noise.

B3.1 Part I Section A – Determining noise limits for commercial, industrial and trade premises

The Noise Protocol provides two methods for deriving the relevant noise limits, the Urban area method and the Rural area method. The Urban area method is applicable to the current study.

Using the Urban area method, noise limits are calculated taking into account land 'zoning types' within a 70 m and 200 m radius of a noise sensitive building. Zoning types are categorised as type 1, 2 or 3 as defined in Annex A of the noise protocol. A prescribed formula is used to calculate a corresponding Zoning Level. In general, zone type designations are as follows:

- Type 1 for residential, rural, open space or similar zones;
- Type 2 for commercial, business, office and industrial 3 [light industry] zones; or
- Type 3 for industrial 1 and 2 [general industry] and similar zones.

Greater areas of type 2 and 3 land within a 200 m radius of a noise sensitive site result in higher Zoning Levels than a site with respectively larger areas of type 1 land.

The Noise Limit is equal to the 'zoning level' unless the background level at the noise sensitive site is categorised as low or high according to the Noise Protocol. If the background level is low or high, the Noise Limit is calculated from a formula taking into account the Zoning Level and the Background Level.

The limits are separately defined for the day, evening and night periods. The time periods are defined in the EP Regulations and summarised in Table 13.

Table 13: EP Regulations time periods

Period	Day of week	Start time	End time
Day	Monday-Saturday	0700 hrs	1800 hrs
Evening	Monday-Saturday	1800 hrs	2200 hrs
	Sunday, Public holidays	0700 hrs	2200 hrs
Night	Monday-Sunday	2200 hrs	0700 hrs

The noise limits based on background noise levels applicable to this development are derived in Table 14 to Table 16.

Table 14: 12 Millers Road

Period	Day of week	Start time	End time	Measured background, dB L_{A90}	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	Monday-Saturday	0700 hrs	1800 hrs	53	57	High	59
Evening	Monday-Saturday	1800 hrs	2200 hrs	47	51	Neutral	51
	Sunday, Public holidays	0700 hrs	2200 hrs				
Night	Monday-Sunday	2200 hrs	0700 hrs	39	46	Neutral	46

Table 15: 1A Eames Avenue

Period	Day of week	Start time	End time	Measured background, dB L_{A90}	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	Monday-Saturday	0700 hrs	1800 hrs	53	57	High	59
Evening	Monday-Saturday	1800 hrs	2200 hrs	47	50	Neutral	50
	Sunday, Public holidays	0700 hrs	2200 hrs				
Night	Monday-Sunday	2200 hrs	0700 hrs	39	45	Neutral	45

Table 16: 394 Francis Street

Period	Day of week	Start time	End time	Measured background, dB L_{A90}	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	Monday-Saturday	0700 hrs	1800 hrs	-	52	Assumed Neutral	52
Evening	Monday-Saturday	1800 hrs	2200 hrs	-	46	Assumed Neutral	46
	Sunday, Public holidays	0700 hrs	2200 hrs				
Night	Monday-Sunday	2200 hrs	0700 hrs	-	41	Assumed Neutral	41

The derivation of noise limits at 394 Francis Street assumes neutral background noise levels. This assumption is considered acceptable given the neutral background noise measured at Millers Road and that the design of the facility to achieve the design targets at Millers Road is also expected to satisfy the design targets at Francis Street.

APPENDIX C NOISE SURVEY DETAILS

Background noise measurements were conducted using a Rion NL-31 noise logger of Type 1/Class 1 standards in accordance with AS IEC 61672.1. For all measurements, the microphone was mounted on a tripod at approximately 1.5m above local ground and fitted with a wind shield. The unit was calibration checked before and after the survey and no significant drift was observed.

Figure 6 shows the installation of the noise monitor.

Figure 6: Noise monitor installation

APPENDIX D NOISE MANAGEMENT PLAN

A noise management plan is recommended for the site. A noise management plan is prepared to review potential noise impacts associated with the proposed works and outline noise management procedures for site personnel.

It is recommended that the noise management plan includes the following information with regard to noise:

- Description of proposed works
- Details of the site layout
- Identification of all noise risks the project may pose to the public or environment, including equipment schedules
- A schedule for routine inspections of subject site operations and equipment to consider noise emissions and maintenance of mitigation measures
- Details of the relevant noise limits that apply to the operations of the subject site
- Specification of the measures used to eliminate or minimise identified risks and monitor performance, including:
  - All required noise management controls that have been recommended for the project
  - Applicable adjustments to account for noise character (e.g. tonality, intermittency, etc) according to processes outlined in the Noise Protocol
  - Specification of any communications requirements for internal and external stakeholders
  - Reporting and record-keeping requirements, and triggers to periodically review the noise management system to maintain its effectiveness
- Community engagement plan, including noise complaints register and handling procedure