MEMO

MARSHALL DAY Acoustics

Project:	Berrybank Terminal Station Extension	**Document No.:**	Mm 001 R01		
To:	Umwelt	**Date:**	24 September 2026		
Attention:	Caroline Funnell	**Project No.:**	20260462		
From:	Liam Kemp	**No. Pages:**	18	**Attachments:**	No
Subject:	Environmental noise assessment				

INTRODUCTION

The Berrybank Terminal Station (BTS) is an existing 220 kV switchyard constructed in 2020 to connect Berrybank Wind Farm to the national electricity network via the existing BATS-TRG 220 kV single-circuit transmission line.

The land on which BTS is located is known as volume 12442/Folio 187.

It is proposed to extend BTS to provide additional primary and auxiliary infrastructure (project).

This memo summarises an assessment of the project from an environmental noise perspective, including the regulatory requirements and maximum allowable noise levels for proposed equipment.

A glossary of terminology is provided in Appendix A.

PROJECT DESCRIPTION

Surrounding area and receivers

The project is located in a rural area. Five assessment receivers represent the nearest residential dwellings surrounding the site. These are summarised in Table 1.

Table 1: Assessment receivers

Receiver number	Address	Distance to site, m
1	169 Willowvale Road	899
2	630 Crambs Road	1,487
3	796 Calverts Road	1,750
4	1022 Lismore Road	1,806
5	680 Lismore-Pitfield Road	2,934

The project and all assessment receivers are located within farming zones (FZ and FZ1). An intervening road zone (TRZ2) occurs between receivers 4 and 5 and the project.

An image showing the location of the project and receivers is provided as Figure 1 and a planning map is provided in Appendix B. The image includes all receivers identified by the client within 2km.

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Figure 1: Project location and receivers



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Site infrastructure

The existing primary site infrastructure includes line bays consisting of current and voltage measurement equipment, switches, gantries, bus bars, circuit breakers and surge arrestors. Auxiliary infrastructure includes security, amenities and lighting, as well as a diesel generator.

The proposed extension includes a single line bay with the same primary electrical infrastructure as the existing line bays and an additional diesel generator.

The key proposed noise generating equipment for the project are summarised in Table 2.

Table 2: Proposed equipment

Item	Quantity proposed	Quantity existing
Circuit breakers	3	4
Disconnectors and earth switches	7	12
Control building air-conditioning split system	4	2
Standby diesel generator	1	1

An image showing the proposed site is provided as Figure 2.

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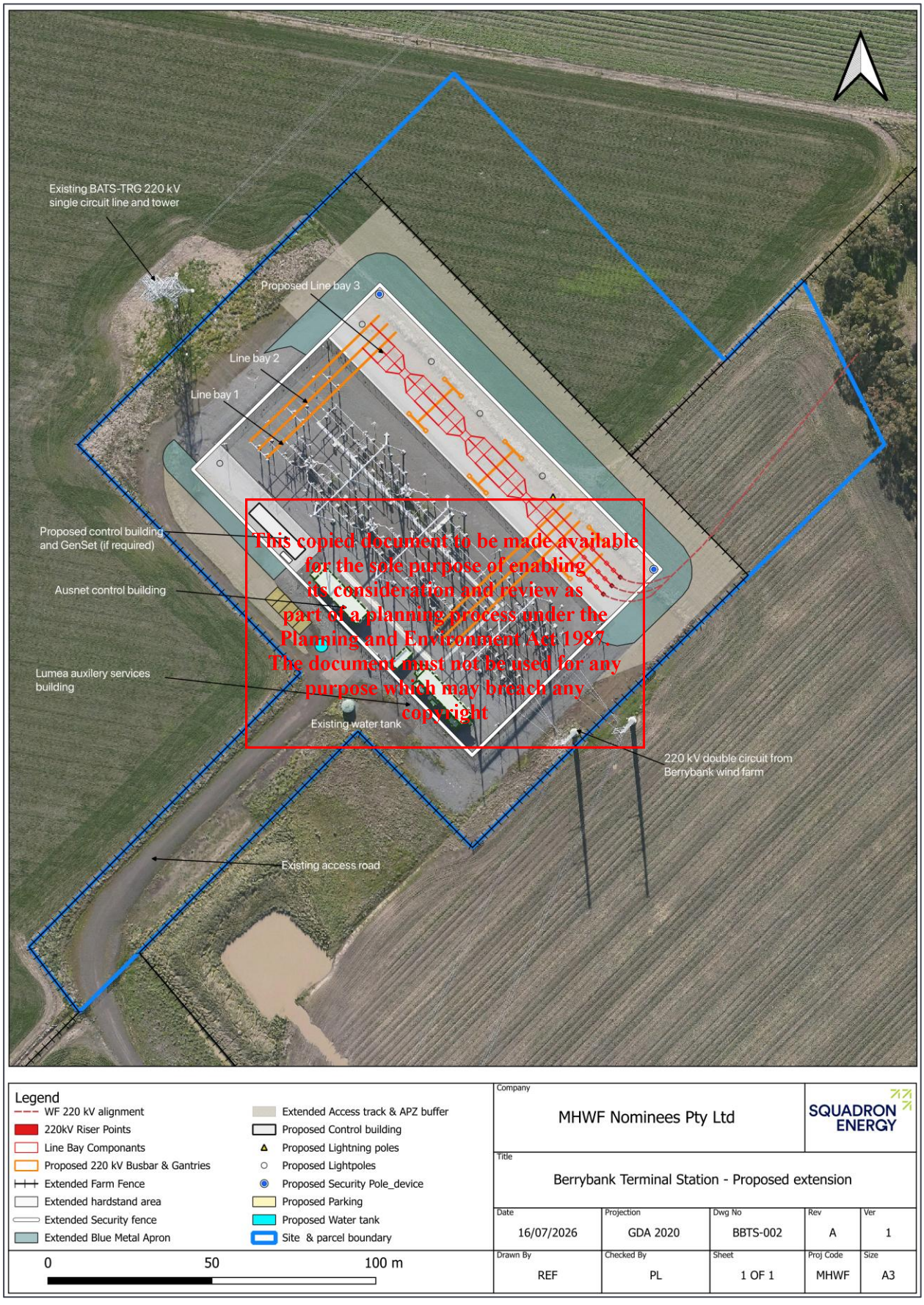
Figure 2: Existing and proposed infrastructure



GENERAL ENVIRONMENTAL DUTY

The EP Act includes the general environmental duty (GED) which requires that all measures to reduce the risk of harm, including from noise, are implemented so far as practicable.[1]

The GED applies to the lifetime of the project.

Examples of reasonably practicable measures that may be considered by the project team include:

- selection of low noise equipment
- regular inspections and maintenance to prevent unanticipated noise due to faulty equipment operation.

NOISE LIMITS

Mandatory noise limits apply to the operational noise from the project in accordance with the rural area method outlined in the Noise Protocol.[2]

The limits apply to an effective noise level (ENL), which is the 30-minute equivalent project noise level (L_{Aeq}) adjusted for specific characteristics if applicable. They apply to the operation of the whole site.

The Noise Protocol allows an increased noise limit for testing and maintenance of emergency equipment, such as stand-by generators.

The project noise limits are provided in Table 3.

Table 3: Project noise limits, dB ENL

Period	Day of week	Start time	End time	Noise limit	Emergency noise limit [a]
Day	Monday–Saturday	07:00	18:00	45	55
Evening	Monday–Saturday	18:00	22:00	39	44
	Sunday, Public holidays	07:00	22:00		
Night	Monday–Sunday	22:00	07:00	34	39

a Applies to testing and maintenance of emergency equipment only, such as standby generators.

The project is located within the broader Central Highlands Renewable Energy Zone (REZ). However, this does not materially change the regulatory requirements for noise that apply to the project.

Further detail on the noise limit derivation is provided in Table 10 of Appendix C2.

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1 Victoria State Government, *Environment Protection Act 2017*, Act Number 51/2017 (EP Act)

2 Environment Protection Authority Victoria, *Publication 1826.*5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol)

EQUIPMENT NOISE LEVELS

Normal operations

Overall A-weighted sound power levels for the proposed equipment have been provided to MDA by the client based on manufacturer information.

For the purposes of noise modelling, spectral data from 63 Hz – 4 kHz has been estimated by MDA based on the provided overall levels and measurements of similar equipment at other sites.

The noise data is summarised in Table 4. The data for circuit breakers and switches is given in terms of maximum sound power ($L_{W\ max}$) and the corresponding equivalent sound power ($L_{W\ eq}$) across a given period of time would be lower.

Table 4: Proposed equipment, sound power levels, dB L_W

	Octave band centre frequency, Hz							
Item	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**A**
Outdoor split system air-conditioning unit, $L_{W\ eq}$	68	71	69	64	60	55	49	66
Circuit breaker, 245 kV, 3150 A, 40 kA/1s, $L_{W\ max}$	97	106	111	111	115	112	107	118
Disconnector and earth switch, $L_{W\ max}$	79	88	93	93	97	94	89	100

Emergency scenario - standby generators

The sound power level of the proposed standby generators is provided in Table 5. It was calculated based on the manufacturer reported A-weighted sound pressure level at 7 m and the dimensions of the unit, including reference to spectra from similar equipment measured by MDA at other sites.

Table 5: Proposed standby generator, sound power levels, dB L_W

	Octave band centre frequency, Hz							
Item	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**A**
Diesel generator Deutz DPS-75, $L_{W\ eq}$	99	103	95	95	94	94	89	99

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PREDICTED NOISE LEVELS

Normal operations

Normal operations are categorised into 2 scenarios which are described in Table 6.

Table 6: Normal operational scenarios

Scenario	Description
Typical daily operation	No switching equipment activity, including from circuit breakers. Continuous operation of air-conditioning.
Occasional maintenance or testing	This is anticipated to occur up to 3 times per year and is not likely to occur at the same time as the maintenance or testing of the remaining equipment at the site. Characterised by up to 7 individual circuit breaker events and 19 disconnector/earth switch events. This equates to one event per item of existing and proposed equipment. Continuous operation of air-conditioning.

The occasional maintenance or testing scenario is the worst-case scenario for noise generation and typical daily operations will generate significantly lower noise levels.

Noise levels at receivers during both scenarios have been predicted according to the method outlined in Appendix D.

The predicted noise levels during typical daily operations are below 10 dB at all receptors which is significantly below the noise limits during all time periods.

The dominant noise source during occasional maintenance or testing is circuit breaker and disconnector or earth switching events. Each of these is characterised by a single impulsive noise.

Each impulse event is assumed to last for 10 seconds when calculating the effective noise level across the 30-minute period in line with Noise Protocol requirements.

Predicted noise levels for the maintenance and testing scenario are presented and compared to the night period noise limit in Table 7. The night period noise limit is the most stringent and compliance with the night period noise limit indicates compliance with the day and evening noise limits.

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Table 7: Predicted noise levels, worst-case scenario, dB ENL

Receiver	Predicted noise level	Noise limit, night	Predicted compliance?
1 - 169 Willowvale Road	30	34	Yes
2 - 630 Crambs Road	23	34	Yes
3 - 796 Calverts Road	21	34	Yes
4 - 1022 Lismore Road	20	34	Yes
5 - 680 Lismore-Pitfield Road	12	34	Yes

The predicted noise levels are below the noise limits at all assessment receivers. They include noise from existing and proposed equipment. The smallest margin is 4 dB.

The noise protocol requires either a + 2 or + 5 dB adjustment to be made to the effective noise level if the noise at the receiver is characterised as impulsive. The magnitude of the adjustment depends on the prominence of the impulsive characteristic at the receiver.

The predicted noise levels allow for an impulsiveness adjustment of + 2 dB to be applied without changing the compliance outcome. A + 2 dB adjustment is considered reasonable on the basis of the infrequent nature of the worst-case scenario, and since each circuit breaker would not be repeatedly activated throughout a 30-minute assessment period.

No adjustments for intermittency or tonality have been applied to the effective noise level based on review of the operational information and the predicted noise levels and the magnitude of the predicted levels.

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Emergency scenario - standby generators

No limits apply during emergencies.

Provided they are used only in emergency situations, such as disruption to the normal power supply, the elevated noise limits provided in Table 3 apply only to the testing and maintenance of diesel generators on site.

Noise levels at receivers during the occasional maintenance or testing of standby generators have been predicted according to the method outlined in Appendix D. They are presented and compared to the evening period noise limit in Table 8 on the basis that the testing and maintenance can be scheduled so that it does not occur during the night period.

Table 8: Predicted noise levels, emergency equipment testing and maintenance, dB ENL

Receiver	Predicted noise level	Noise limit, evening	Predicted compliance?
1 - 169 Willowvale Road	27	44	Yes
2 - 630 Crambs Road	21	44	Yes
3 - 796 Calverts Road	19	44	Yes
4 - 1022 Lismore Road	18	44	Yes
5 - 680 Lismore-Pitfield Road	11	44	Yes

The predicted noise levels comply with the noise limit for testing and maintenance of emergency standby generators.

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CONCLUSION

We have reviewed the proposed equipment to be installed at the existing Berrybank Terminal Station.

Predicted noise levels during the worst-case operating scenario correlate to testing and maintenance of circuit breakers and switches. These predicted noise levels are below the mandatory noise limits for the project. Typical daily operation will be significantly less noisy than these predicted levels.

Standby generators are also predicted to comply with the mandatory noise limits for maintenance and testing of emergency equipment.

The over-arching requirements of the EP Act including the GED must continue to be considered by the project team throughout the project design and delivery and following construction.

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APPENDIX A GLOSSARY OF ACOUSTIC TERMINOLOGY

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. Sound levels using an "A" frequency weighting are expressed as dB L_A. Alternative ways of expressing A-weighted decibels are dBA or dB(A).
dB	Decibel. The unit of sound level.
ENL	The effective noise level from commercial, industrial or trade premises determined in accordance EPA Publication 1826.5 *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.
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.
Hertz (Hz)	The unit of frequency, named after Heinrich Hertz. One hertz is one pressure cycle of sound per second. One thousand hertz – 1,000 cycles per second – is a kilohertz (kHz).
L_w	Sound power level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L_{WA}.

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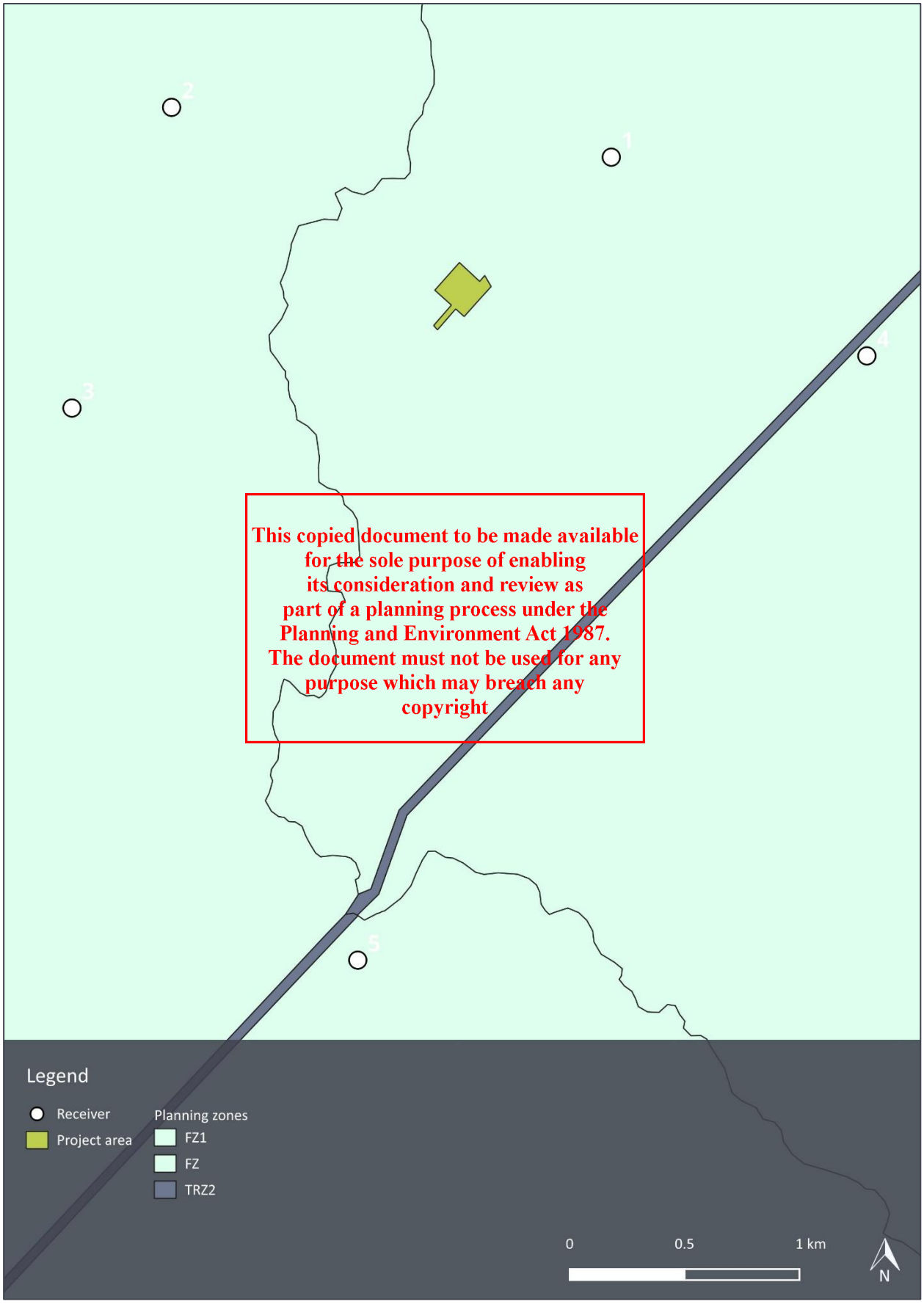
APPENDIX B PLANNING MAP



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APPENDIX C VICTORIAN POLICY

C1 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 described below.[3] Section 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.[4] 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.[5] In particular, noise from commercial, industrial and trade (CIT) 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 CIT 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 or corrective institution
  - retirement or residential village
  - a room for learning in a childcare 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.

Part 5.3 of the EP Regulations specifically address noise.

Table 9 presents a summary of the relevant Divisions and EP Regulations from this section.

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[3] Victoria State Government, *Environment Protection Act 2017*, Act Number 51/2017 (EP Act)

[4] Victoria State Government, *Environment Protection Regulations 2021* (EP Regulations)

[5] Environment Protection Authority Victoria, *Publication 1826.5 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol)

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Table 9: 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 3	Applies to noise from CIT premises
Regulation 116	Defines the day, evening and night period as follows: • Day: 07:00–18:00, Monday–Saturday • Evening: 18:00–22:00, Monday–Saturday 07:00–22:00, Sunday, and Public Holidays • Night: 22:00 –07:00 the next day, Monday–Sunday.
Regulation 117	In this Division, when the level of noise emitted from CIT 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) • wind turbines at wind energy facilities • lawnmowing • livestock.
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: Rural area: Day: 45 dB ENL Evening: 37 dB ENL Night: 32 dB ENL The noise limit for CIT premises for the night period must not exceed 55 dB ENL.
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 CIT premises, with additional guidance on low frequency noise available in EPA Publication 1996.[6]

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[6] Environment Protection Authority Victoria, *Noise guidelines: Assessing low frequency noise – Publication 1996*, June 2021 (EPA Publication 1996)

Section	Description
Regulation 121	Noise emitted from CIT 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 ENL during the day; • 70 dB ENL during the evening; or • 65 dB ENL during the night.

C2 Noise Protocol

The Noise Protocol sets noise limits that apply to CIT premises and entertainment venues within Victoria. Compliance with the noise limits is mandatory under the EP Act.

The EP Act defines a CIT premises as:

Any premises except the following –

(a) residential premises (other than common plant under the control of an owners corporation);

(b) a street or road, including every carriageway, footpath, reservation and traffic island on any street or road;

(c) a railway track used by rolling stock in connection with the provision of a freight service or passenger service—

(i) while travelling on a railway track or tramway track; or

(ii) while entering or exiting a siding, yard, depot, or workshop;

(d) a railway track used by rolling stock in connection with the provision of a passenger service, while in a siding, yard, depot, or workshop and is—

(i) powering up to commence to be used in connection with the provision of a passenger service; or

(ii) shutting down after being used in connection with the provision of a passenger service;

(e) the premises situated at Lower Esplanade, St Kilda and known as "Luna Park" and being the whole of the land more particularly described in Certificate of Title Volume 1204 Folio 109;

Based on the above the project is considered to be a CIT premises.

The Noise Protocol prescribes the method and measurement procedure used to determine applicable noise limits and assessment of compliance.

The EP Act requires that proposed CIT premises be designed to comply with Noise Protocol noise limits and that premises have an ongoing obligation to meet the noise limits.

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A 'noise sensitive area' is defined in the EP Regulations as:

(a) that part of the land within the boundary of a parcel of land that is—

(i) within 10 metres of the outside of the external walls of any of the following buildings—

(A) a dwelling (including a residential care facility but not including a caretaker's house);

(B) a residential building;

(C) a noise sensitive residential use; or

(ii) within 10 metres of the outside of the external walls of any dormitory, ward, bedroom or living room of one or more of the following buildings—

(A) a caretaker's house;

(B) a hospital;

(C) a hotel;

(D) a residential hotel;

(E) a motel;

(F) a specialist disability accommodation;

(G) a corrective institution;

(H) a tourist establishment;

(I) a retirement village;

(J) a residential village; or

(iii) within 10 metres of the outside of the external walls of a classroom or any room in which learning occurs in the following buildings (during their operating hours)—

(A) a childcare centre;

(B) a kindergarten;

(C) a primary school;

(D) a secondary school; or

(b) subject to paragraph (c), in the case of a rural area only, that part of the land within the boundary of—

(i) a tourist establishment; or

(ii) a campground; or

(iii) a caravan park; or

(c) despite paragraph (b), in the case of a rural area only, where an outdoor entertainment event or outdoor entertainment venue is being operated, that part of the land within the boundary of the following are not noise sensitive areas for the purposes of that event or venue—

(i) a tourist establishment;

(ii) a campground;

(iii) a caravan park;

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Noise limit derivation uses 2 separate methods:

- the rural method for receivers outside a major urban area or the Melbourne urban growth boundary
- the urban method for receivers within a major urban area or the Melbourne urban growth boundary

Once a noise limit is established, the noise level $L_{Aeq,\ 30\ min}$ due to the CIT premises is measured or predicted. If necessary, the $L_{Aeq,\ 30\ min}$ noise level is adjusted for noise character and duration to give the effective noise level ENL, which also applies over a 30-minute assessment period. If the ENL exceeds the noise limit, then remedial action is required.

The rural limit method is applicable for this project and the limits are summarised in Table 10.

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Table 10: Noise limit derivation, rural method

Step	Description				Day	Evening	Night
Zone levels, dB	Generating zone:		Receiving zone:		46	41	36
	FZ Farming		FZ Farming				
Distance adjusted levels, dB	Distance from receiver to generating zone boundary:	n/a	Distance adjustment:	0 dB	46	41	36
Utilities	Clause 31 applies - Utility is in a Farming Zone, Rural Activity Zone or Green Wedge Zone				45	39	34
Background level assessment	Not applicable				-	-	-
High traffic noise method for proposed developments	Not applicable				-	-	-
Check against EP Regulations base limits & maximum night limits, dB ENL	EP Regulations maximum night limit				-	-	55
	EP Regulations base limits				45	37	32
NP Rural method limits, dB ENL	Effective Noise Level limit				45	39	34

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APPENDIX D PREDICTION METHOD

The propagation of sound from the site to the nearest receivers has been calculated based on the method outlined in ISO 9613-2:2024.[7]

This method takes into account the distance between source and receiver, the type of ground and the effects of atmosphere on the attenuation and propagation of noise.

The calculations reflect meteorological conditions that enhance the propagation of noise from a source to a receiver.

Potential effects of shielding by terrain have not been included in the calculation and therefore the predicted levels may conservatively overestimate the noise level if land forms such as hills are located between the site and receivers.

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[7] International Organisation for Standardisation, ISO 9613-2:2024 *Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors*, January 2024 (ISO 9613-2:2024)