Terang BESS

Environmental Noise Assessment

S8026C3

July 2024

PLANNING and ENVIRONMENT ACT
CORANGAMITE PLANNING SCHEME

INCORPORATED DOCUMENT
TERANG BATTERY ENERGY STORAGE SYSTEM BESS

ENDORSED PLAN
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Signed for
MINISTER FOR PLANNING
Date: 30 October 2024

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1 INTRODUCTION

An environmental noise assessment has been completed for the proposed Terang battery energy storage system (**BESS**), to be located at 70 Littles Lane, Terang. The proposed development will be located on land leased for the purpose by the owner of 70 Littles Lane, Terang (the **Landowner**), who also resides at the address. The BESS is proposed to have a capacity of 100MW/200MWh.

The assessment considers the noise at the nearby noise sensitive receivers based on the proposed layout and equipment selections. The proposed layout can be seen in Appendix A. The location of the subject site relative to the nearby noise sensitive receivers is shown in Figure 1.

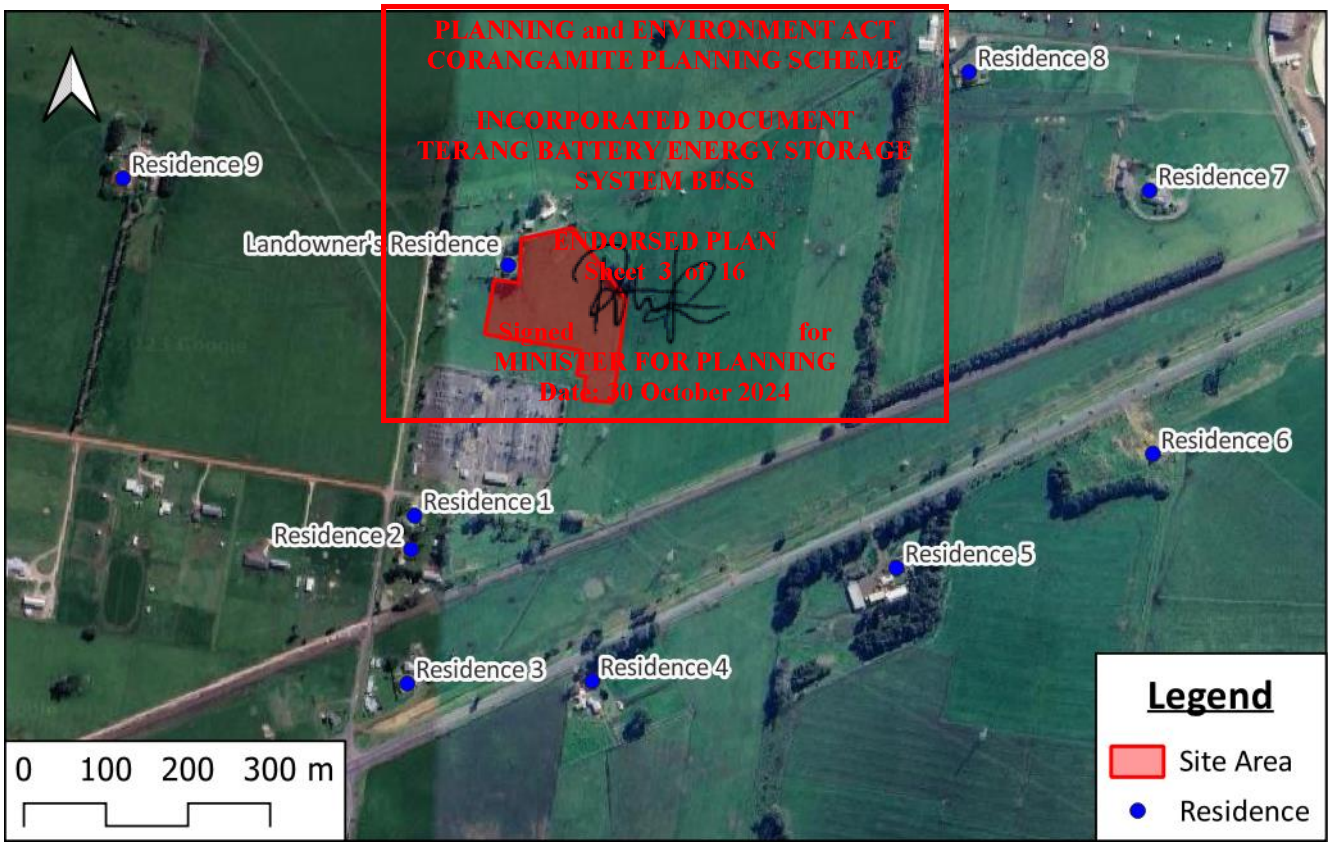

Figure 1: Site Locality

The predicted noise levels have been compared against the relevant criteria determined in accordance with the *Corangamite Planning Scheme*, the *Environment Protection Regulations*, and the *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises*.

2 CRITERIA

The subject site and the nearby sensitive receivers are all located within a Farming Zone of the *Corangamite Planning Scheme* (the **Planning Scheme**). The Planning Scheme has been reviewed and particular regard has been given to the following relevant provisions:

2.1 Planning Scheme

Environmental Risks and Amenity

13.05-1S Noise management

Objective

To assist the management of noise effects on sensitive land uses.

Strategy

Ensure that development is not prejudiced and community amenity and human health is not adversely impacted by noise emissions.

Minimise the impact on human health from noise exposure to occupants of sensitive land uses (residential use, child care centre, school, education centre, residential aged care centre or hospital) near the transport system and other noise emission sources through suitable building siting and design (including orientation and internal layout), urban design and land use separation techniques as appropriate to the land use functions and character of the area.

Policy guidelines

Consider as relevant:

- *The noise requirements in accordance with the Environment Protection Regulations under the Environment Protection Act 2017.*

Policy documents

Consider 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, Environment Protection Authority, May 2021)*

2.2 Noise Limit and Assessment Protocol 1826.4

The Planning Scheme references the *Environment Protection Regulations* (the **Regulations**) and the *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (the **Protocol**). It is noted that the Planning Scheme "incorporated document" relevant to the site references the Environment Protection Authority's Noise from Industry in Regional Victoria Standard (the **NIRV**), documented in the EPA publication 1411. The NIRV has since been replaced by the Regulations and the Protocol. It is therefore considered that the Protocol is the appropriate assessment framework. The Protocol provides guidance in determining noise limits for new and existing commercial, industrial, and trade premises in Victoria.

The Protocol provides two methods for determining appropriate noise limits, an urban method, and a rural method. As per the definition in the Regulations, the area around Terang is considered a rural area, and as such, the rural area method has been used to determine appropriate noise limits. The objective noise limits for a rural area are based on the planning zones in the vicinity of the site, the type of noise source, and the existing background noise levels in the environment.

For a utility and sensitive receivers all located in a Farming Zone, as is the case here, the distance-adjusted level for each period is as follows:

- 45 dB(A) during the day period (7:00am to 6:00pm Monday to Saturday).
- 39 dB(A) during the evening period (6:00pm to 10:00pm Monday to Saturday and 7:00am to 10:00pm Sunday and public holidays).
- 34 dB(A) during the night period (10:00pm to 6:00am Monday to Sunday).

The applicable noise limit is the distance-adjusted level as defined above, unless a background level assessment has been conducted. Where a background noise level assessment has been conducted, the noise limits are as follows:

- The greater of the distance-adjusted level or the background noise level plus 8 dB for the day period.
- The greater of the distance-adjusted level or the background noise level plus 5 dB for the evening period.
- The greater of the distance-adjusted level or the background noise level plus 5 dB for the night period but not greater than 55 dB(A).

Publicly available data for background noise measurements conducted in the vicinity of the proposed BESS have been reproduced in Table 1. The locations where the background noise measurements were taken can be seen in Figure 2.

Table 1: Publicly Available Background Noise Measurements

Noise Monitoring Location	Average Background Noise Level, L_{A90}		
	Day Period	Evening Period	Night Period
1	41 dB(A)	43 dB(A)	42 dB(A)
2	40 dB(A)	40 dB(A)	39 dB(A)

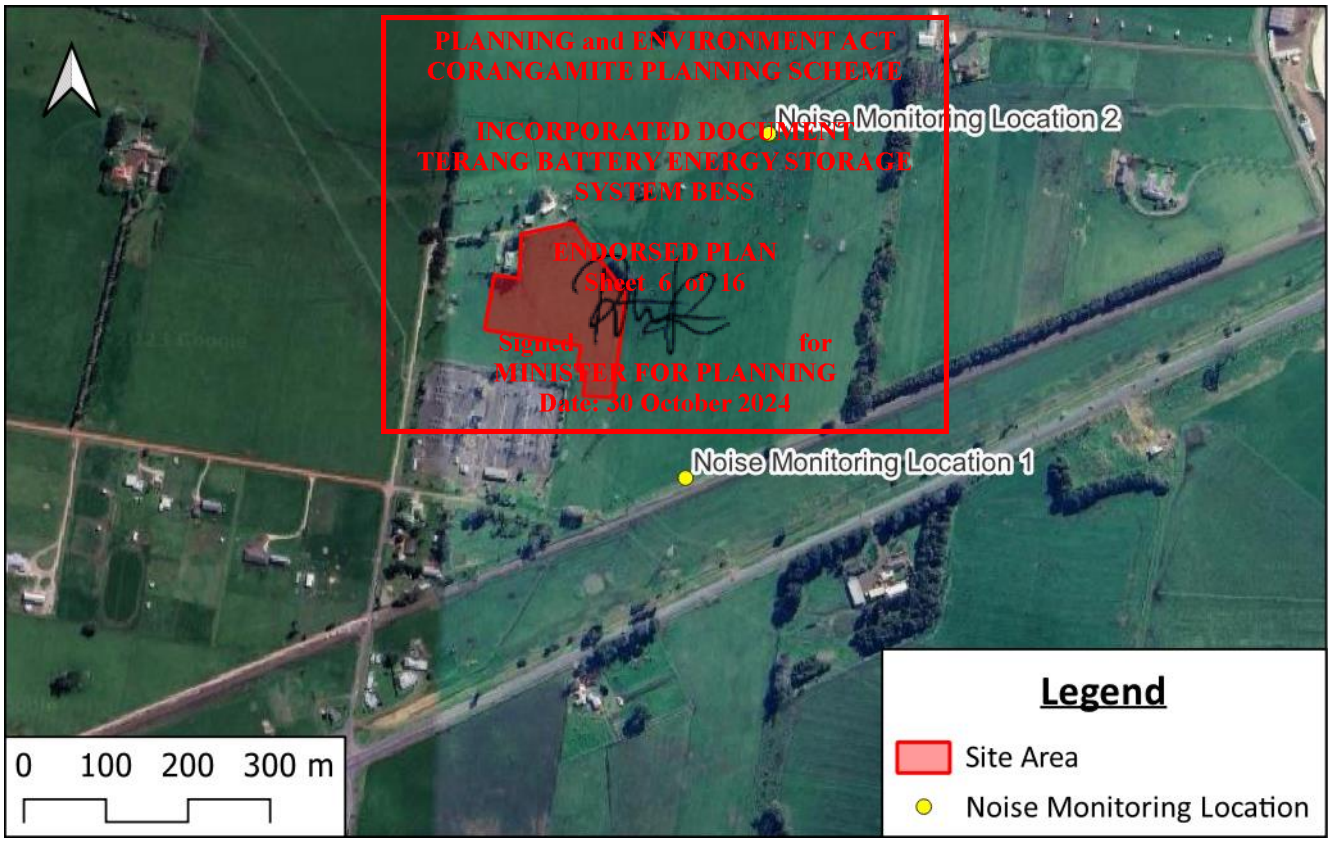

Figure 2: Background Noise Measurement Locations

Given the distance-adjusted levels and the previous background noise measurements, the applicable noise limits are as shown in Table 2 for the residences as indicated on Figure 1. It is noted that while the Landowner is associated with the development, they have still been assessed as a sensitive receiver.

Table 2: Applicable Noise Limits

Period	Applicable Times	Noise Criteria at Sensitive Receivers	
		1, 2, 3, 4, 5, 6	7, 8, 9, Landowner
Day	Monday to Saturday – 7:00am to 6:00pm	49 dB(A)	48 dB(A)
Evening	Monday to Saturday – 6:00pm to 10:00pm Sunday and public holidays – 7:00am to 10:00pm	48 dB(A)	45 dB(A)
Night	Monday to Sunday – 10:00pm to 6:00am	47 dB(A)	44 dB(A)

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3 ASSESSMENT

The noise from the operation of the BESS has been predicted for the nearby noise sensitive receivers. The predictions have been conducted using the *ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (**ISO 9613**) noise propagation model, as implemented in the *SoundPLANnoise* modelling software. The ISO 9613 noise propagation model is widely accepted as an appropriate model for ground-based sources and has the ability to take into account relevant influences, including:

- Sound power levels of each individual noise source.
- The location and orientation of noise sources.
- Separation distances between the noise sources and the sensitive receivers.
- The influence of barriers.
- The influence of the ground.
- Directivity of the noise source.
- Atmospheric absorption.

The ISO 9613 model is known as a downwind noise model and is based on the meteorological conditions that are favourable to noise propagation and the assumption that the receiver is downwind from the noise source. For the purpose of this assessment, it has been assumed that there is hard ground at the site of the BESS and terminal station, and soft ground in other areas.

Sound power levels used for the battery and inverter units are as per the provided manufacturer's data, while the transformers have been based on the 'standard' level derived from the Australian/New Zealand Standard *AS/NZS60076.10:2009 Power Transformers Part 10: Determination of sound levels (IEC 60076-10, Ed.1 (2001) MOD)* (**AS/NZS60076**). The sound power levels and quantities of equipment used for the assessment can be seen in Table 3.

Table 3: Equipment Quantities and Sound Power Levels

Equipment	Quantity	Sound Power Level per Unit
SolBank Battery Container (80% Fan Speed)	48	80.6 dB(A)
SolBank Battery Container (100% Fan Speed)*		86.4 dB(A)
SMA Inverter	38	85.3 dB(A)
120MVA Transformer	1	95 dB(A)
4MVA SMA Transformer	38	74 dB(A)
1MVA Transformer	4	66 dB(A)
15MVAR Filter Bank	1	82 dB(A)

* The battery units will only operate in this mode during the day period.

It is understood that the battery units may operate at up to 100% fan speed during the day period, that is between the hours of 7:00am and 6:00pm Monday to Saturday, but will be limited to 80% fan speed at all other times.

The sound power level noted above for the inverter units is based on there being attenuation applied, as advised. Spectral data is however not available for this option, so the spectrum in Table 4 has been assumed. This spectrum has been based on the proposed inverter model with a flat level reduction applied. Where the spectrum of the final equipment differs from that assumed here, this assessment should be updated. One-third octave band sound power levels for other equipment can be seen in Appendix A.

Table 4: Attenuated Inverter Assumed One-third Octave Band Spectrum, dB(A)

25Hz	31Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz
32	40	41	47	53	56	57	66	62	67
250Hz	**315Hz**	**400Hz**	**500Hz**	**630Hz**	**800Hz**	**1kHz**	**1.25kHz**	**1.6kHz**	**2kHz**
70	74	72	70	70	73	71	71	71	69
2.5kHz	**3.15kHz**	**4kHz**	**5kHz**	**6.3kHz**	**8kHz**	**10kHz**	**Overall SWL**		
73	81	64	64	73	62	59	85		

The levels at the nearby noise sensitive locations have been predicted based upon the above information for both fan speed options. The predictions indicate that when operated at a fan speed of 100%, a tonal correction of 2 dB(A) will be required at all of the nearby residences, to account for the tonal nature of the equipment, primarily the inverters. When operated at a fan speed of 80%, a tonal correction of 2 dB(A) will be required at most of the nearby residences, with a correction of 5 dB(A) required for Residence 1

The initial noise predictions, with tonal correction, indicate that the applicable noise limits will be achieved at all nearby noise sensitive receivers, with the exception of the landowner's residence. In order to reduce the noise at this location, it is recommended that a noise wall be constructed for the extent shown in Figure 3 to a height of 7m. Options for the construction of the noise wall include pre-cast concrete panels or a fence constructed on top of a 3m high earth mound. This fence should be constructed from a 'double skin' construction, consisting of a minimum 64mm thick steel structure with one layer of 0.35BMT sheet steel ('*Colorbond*' or similar) on both sides of the structure and 50mm thick insulation with a minimum density of 11 kg/m^3 installed within the cavity. It will be important to ensure that the noise wall is sealed airtight at all junctions, including the ground.

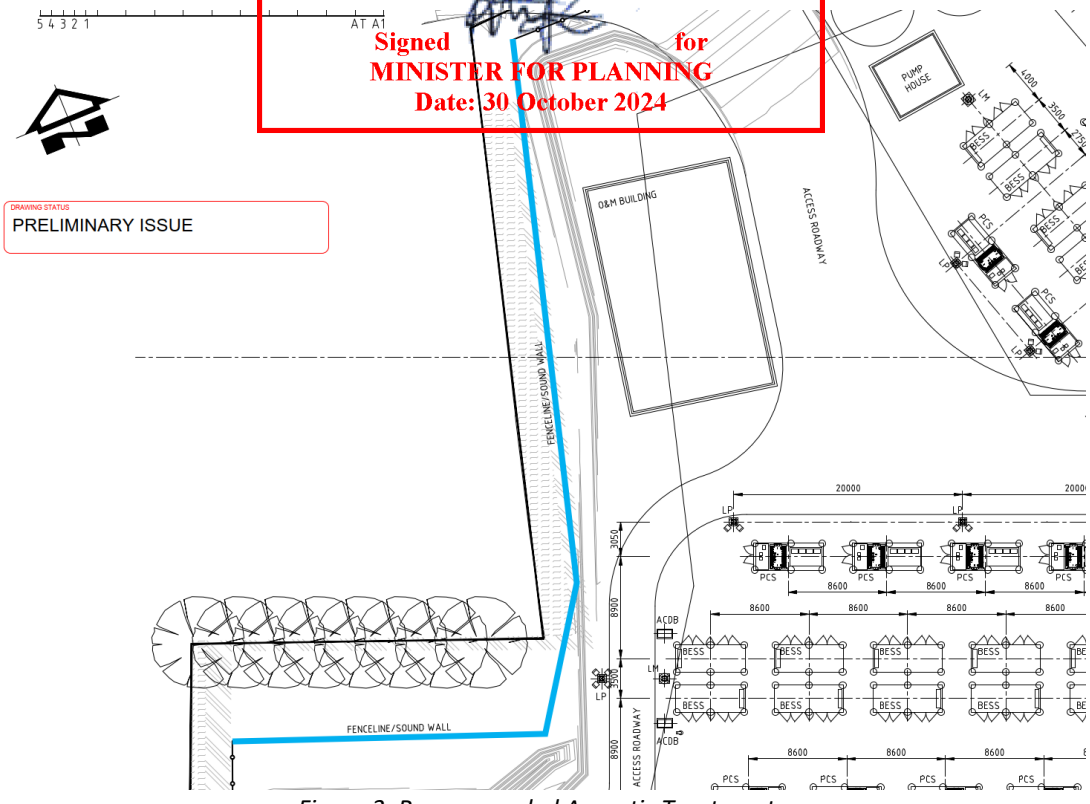

Figure 3: Recommended Acoustic Treatments

With the inclusion of the noise wall, the predicted noise levels, including the tonal correction, can be seen in Table 5.

Table 5: Predicted Noise Levels

Sensitive Receiver	100% Fan Speed		80% Fan Speed	
	Predicted Noise Level	Criteria (Day)	Predicted Noise Level	Criteria (Night)
Residence 1	46 dB(A)	49 dB(A)	46 dB(A)	47 dB(A)
Residence 2	44 dB(A)	49 dB(A)	41 dB(A)	47 dB(A)
Residence 3	39 dB(A)	49 dB(A)	36 dB(A)	47 dB(A)
Residence 4	40 dB(A)	49 dB(A)	37 dB(A)	47 dB(A)
Residence 5	38 dB(A)	49 dB(A)	36 dB(A)	47 dB(A)
Residence 6	33 dB(A)	49 dB(A)	30 dB(A)	47 dB(A)
Residence 7	33 dB(A)	48 dB(A)	30 dB(A)	44 dB(A)
Residence 8	37 dB(A)	48 dB(A)	34 dB(A)	44 dB(A)
Residence 9	35 dB(A)	48 dB(A)	32 dB(A)	44 dB(A)
Landowner's Residence	47 dB(A)	48 dB(A)	44 dB(A)	44 dB(A)

The Protocol also requires consideration of the cumulative contribution of other existing and approved noise sources affecting the noise sensitive receivers. Other noise sources in the vicinity include the Terang terminal station located directly to the south and the proposed Dalvui BESS, to be located to the southeast.

The tonal correction is dependent on the overall noise at the receiver location and will therefore change where the noise from other industrial sites serves to mask part of the noise produced on the subject site. Therefore publicly available data has been used to determine the overall noise level as well as the level of masking. The predictions indicate that, when considering the cumulative noise from all other industrial sites in the area, the tonal correction will be reduced to 2 dB(A) at all nearby residences. Based on this, the total noise level expected at residences can be estimated and is as shown in Table 6 and Table 7.

Table 6: Predicted Cumulative Noise Levels – 100% Fan Speed

Sensitive Receiver	Individual Contribution			Total Noise Level	Criteria (Day)
	Terang BESS	Terminal Station	Dalvui BESS		
Residence 1	46 dB(A)	28 dB(A)	45 dB(A)	49 dB(A)	49 dB(A)
Residence 2	44 dB(A)	<28 dB(A)	45 dB(A)	48 dB(A)	49 dB(A)
Residence 3	39 dB(A)	<24 dB(A)	43 dB(A)	44 dB(A)	49 dB(A)
Residence 4	40 dB(A)	<24 dB(A)	46 dB(A)	47 dB(A)	49 dB(A)
Residence 5	38 dB(A)	<16 dB(A)	44 dB(A)	45 dB(A)	49 dB(A)
Residence 6	33 dB(A)	<16 dB(A)	43 dB(A)	43 dB(A)	49 dB(A)
Residence 7	33 dB(A)	<16 dB(A)	42 dB(A)	43 dB(A)	48 dB(A)
Residence 8	37 dB(A)	<16 dB(A)	44 dB(A)	45 dB(A)	48 dB(A)
Residence 9	35 dB(A)	<16 dB(A)	42 dB(A)	43 dB(A)	48 dB(A)
Landowner's Residence	47 dB(A)	24 dB(A)	34 dB(A)*	47 dB(A)	48 dB(A)

* The proposed noise wall for this project will also serve to reduce the noise level from the proposed Dalvui BESS. This noise reduction has been included.

Table 7: Predicted Cumulative Noise Levels – 80% Fan Speed

Sensitive Receiver	Individual Contribution			Total Noise Level	Criteria (Night)
	Terang BESS	Terminal Station	Dalvui BESS		
Residence 1	43 dB(A)*	28 dB(A)	45 dB(A)	47 dB(A)	47 dB(A)
Residence 2	41 dB(A)	<28 dB(A)	45 dB(A)	47 dB(A)	47 dB(A)
Residence 3	36 dB(A)	<24 dB(A)	43 dB(A)	44 dB(A)	47 dB(A)
Residence 4	37 dB(A)	<24 dB(A)	46 dB(A)	47 dB(A)	47 dB(A)
Residence 5	36 dB(A)	<16 dB(A)	44 dB(A)	45 dB(A)	47 dB(A)
Residence 6	30 dB(A)	<16 dB(A)	43 dB(A)	43 dB(A)	47 dB(A)
Residence 7	30 dB(A)	<16 dB(A)	42 dB(A)	42 dB(A)	44 dB(A)
Residence 8	34 dB(A)	<16 dB(A)	44 dB(A)	44 dB(A)	44 dB(A)
Residence 9	32 dB(A)	<16 dB(A)	42 dB(A)	42 dB(A)	44 dB(A)
Landowner's Residence	44 dB(A)	24 dB(A)	34 dB(A)**	44 dB(A)	44 dB(A)

* This is inclusive of a reduced tonal correction due to the masking provided by the other noise sources.
** The proposed noise wall for this project will also serve to reduce the noise level from the proposed Dalvui BESS. This noise reduction has been included.

As can be seen from the above tables, the predicted noise levels, when considering the cumulative contribution of other noise sources and the application of a tonal adjustment, will achieve the day period (7:00am to 6:00pm Monday to Saturday) noise limits at all locations with the inclusion of the recommended acoustic treatments when the battery units are operated at 100% fan speed. The evening (6:00pm to 10:00pm Monday to Saturday and 7:00am to 10:00pm Sundays and public holidays) and night period (10:00pm to 6:00am Monday to Sunday) noise limits will be achieved where the battery units are operated at 80% fan speed.

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4 CONCLUSION

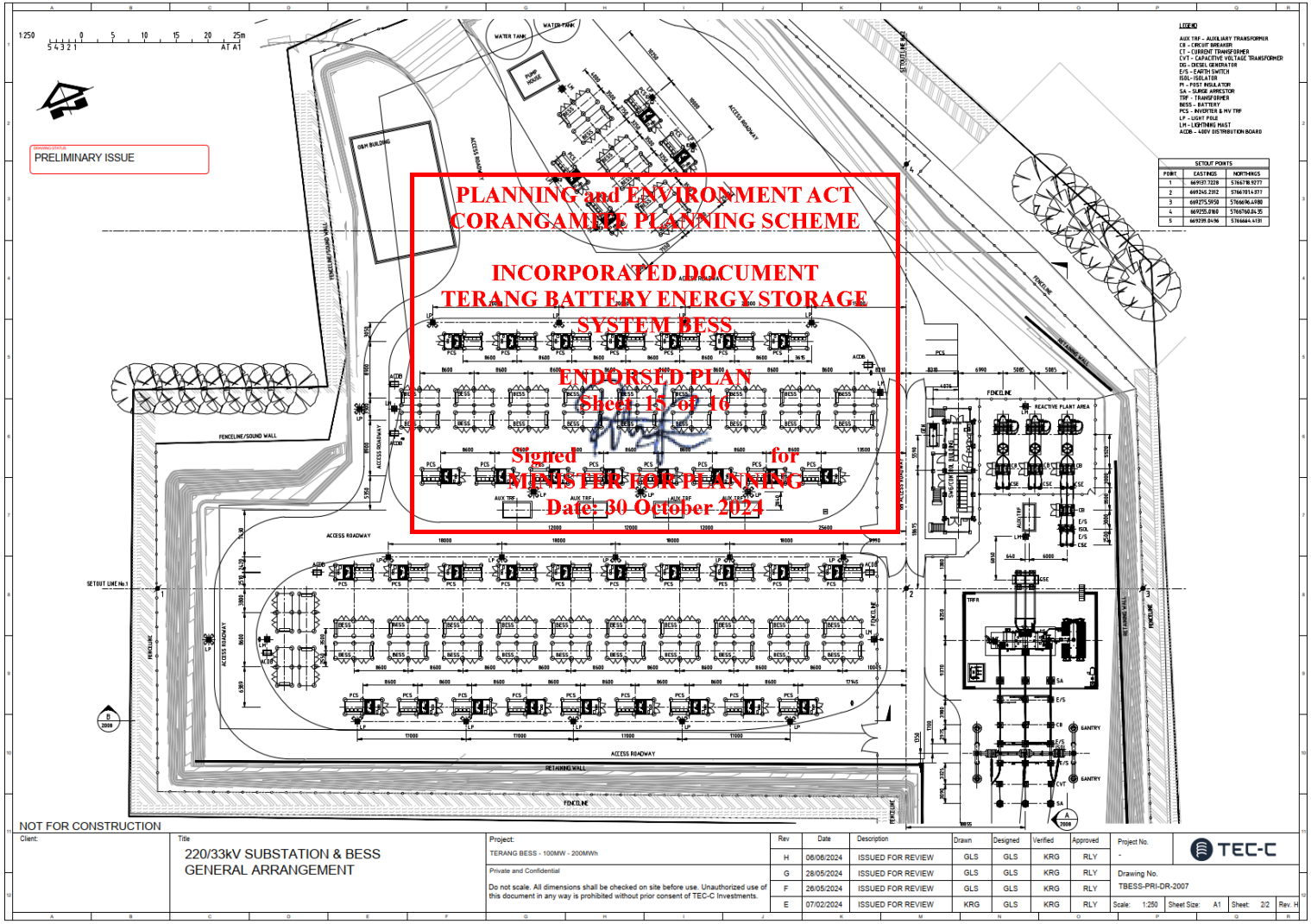
An environmental noise assessment has been completed for the proposed Terang battery energy storage system, to be located at 70 Littles Lane, Terang.

The assessment has considered the noise at the nearby noise sensitive receivers based on the proposed layout and equipment selections.

The noise levels have been predicted using the *ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* noise model and compared against relevant criteria determined in accordance with the *Corangamite Planning Scheme*, the *Environment Protection Regulations*, and the *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises*.

The applicable noise limits will be achieved at all nearby residences when considering the cumulative contribution of the proposed site and other nearby noise sources when the recommended acoustic treatments are incorporated. This includes constructing a noise wall along the northwestern boundary of the site with the specified construction and for the indicated extent.

APPENDIX A: SITE PLAN



APPENDIX B: SOUND POWER LEVELS

Frequency (50 Hz to 5 kHz)	Equipment Sound Power Levels [dB(A)]					
	Solbank Battery (100% fan speed)	Solbank Battery (80% fan speed)	120MVA Transformer	4MVA Transformer	1MVA Transformer	15MVAR Filter Bank
50 Hz	49	49	71	51	42	59
63 Hz	52	49	69	49	40	57
80 Hz	56	53	67	47	38	55
100 Hz	60	56	86	66	57	74
125 Hz	63	68	70	50	41	58
160 Hz	79	64	74	54	45	62
200 Hz	71	64	92	72	63	80
250 Hz	69	67	76	56	47	64
315 Hz	76	66	86	66	57	74
400 Hz	73	68	74	54	45	62
500 Hz	74	68	79	59	50	67
630 Hz	75	69	85	65	56	73
800 Hz	76	71	74	54	45	62
1 kHz	76	72	67	47	38	55
1.25 kHz	76	72	66	46	37	54
1.6 kHz	75	71	61	41	32	49
2 kHz	74	69	58	38	29	46
2.5 kHz	72	67	56	36	27	44
3.15 kHz	70	65	55	35	26	43
4 kHz	68	63	53	33	24	41
5 kHz	66	60	51	31	22	39
Overall SWL	86 dB(A)	81 dB(A)	95 dB(A)	74 dB(A)	66 dB(A)	82 dB(A)