

This copied document to be made available  
for the sole purpose of enabling  
its consideration and review as  
part of a planning process under the  
Planning and Environment Act 1987.  
The document must not be used for any  
purpose which may breach any  
copyright

**ADVERTISED  
PLAN**

**Resonate**

**Darnum BESS**

**Environmental Noise Assessment**

M250114RP1 Revision H

Tuesday, 23 June 2026



## Document Information

|                       |                                |
|-----------------------|--------------------------------|
| <b>Project</b>        | Darnum BESS                    |
| <b>Client</b>         | Umwelt (Australia) Pty Ltd     |
| <b>Report title</b>   | Environmental noise assessment |
| <b>Project Number</b> | M250114                        |

## Revision Table

| <b>Report revision</b> | <b>Date</b>           | <b>Description</b>       | <b>Author</b> | <b>Reviewer</b> |
|------------------------|-----------------------|--------------------------|---------------|-----------------|
| 0                      | 26 August 2025        | For issue                | Harry Miles   | Xun Li          |
| H                      | Tuesday, 23 June 2026 | Final for DTP submission | Mathieu Boué  | Alec Kuoch      |

## ADVERTISED PLAN

**This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright**

## Disclaimer

*This report has been prepared by Resonate Consultants Pty Ltd (Resonate) for the exclusive use of our Client. Our advice is not intended for use by any third parties, and any reliance on our advice by third parties shall be entirely at their own risk. Resonate accepts no responsibility or liability for any consequences arising from the use of our advice by persons other than our Client. Our advice has been prepared for the specific purpose and scope agreed with our Client. It is not intended to be a substitute for professional advice in other contexts or to address other issues outside the scope of work for this project.*

*The information, findings, and recommendations are based on the conditions and data available at the time of preparation. Any opinions or recommendations expressed are subject to the assumptions, limitations, and conditions as stated. Any reliance on external information has been accepted in good faith as being accurate and valid.*

## Glossary

|                                    |                                                                                                                                                                                                                                                                                                        |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A-weighting                        | A spectrum adaption that is applied to measured noise levels to represent human hearing at typical levels of environmental noise. A-weighted levels are used as human hearing does not respond equally at all frequencies.                                                                             |
| Adjustments                        | Adjustments may be applied to effective noise levels noise sources to account for annoying noise character, duration and/or measurement position.                                                                                                                                                      |
| Aggravated noise                   | Noise defined by the Environment Protection Regulations to exceed the noise limits established under the Noise Protocol by more than 15 dB, or to exceed a noise level of 75 dB $L_{Aeq}$ during the day period, 70 dB $L_{Aeq}$ during the evening period or 65 dB $L_{Aeq}$ during the night period. |
| Ambient noise                      | The overall environmental noise level at a given location caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, insects, animals and the like. It is typically described by the $L_{Aeq}$ metric.                                          |
| Alternative assessment location    | An alternative location used to quantify the noise from a commercial, industrial or trade premises at a noise sensitive area. An alternative location may be used where it is difficult to measure the noise at the noise sensitive area itself.                                                       |
| Background Level                   | The Background Level determined in accordance with the Noise Protocol, for different times of day.                                                                                                                                                                                                     |
| Background noise                   | The underlying noise level at a given location, measured in the absence of a noise source under investigation and any other short-term noise sources such as intermittent traffic, industry, lawnmowers, insect, animals and the like. It is typically described using the $L_{A90}$ metric.           |
| C-weighting                        | A spectrum adaption that is applied to measured noise levels to represent human hearing at high levels of noise. Unlike the A-weighting, the C-weighting does not apply large negative weightings to low frequency noise levels, so it is commonly used for the assessment of low frequency noise.     |
| Day period                         | Monday to Saturday (except public holidays), from 7 am to 6 pm as defined in the Environment Protection Regulations.                                                                                                                                                                                   |
| dB                                 | Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of loudness.                                                             |
| Duration adjustment<br>$A_{dur}$   | If noise emissions from the commercial, industrial or trade premises do not occur continuously over the whole 30-minute period, a duration adjustment is applied to represent the level of noise over the 30-minute period.                                                                            |
| Effective noise level              | The level of noise, expressed as an $L_{Aeq,30min}$ , emitted from the commercial, industrial or trade premises after relevant adjustments have been applied.                                                                                                                                          |
| Environment Protection Regulations | The Victorian <i>Environment Protection Regulations</i> are subordinate legislation to the <i>Environment Protection Act 2017</i> . They give force to noise limits for commercial, industrial and trade premises.                                                                                     |
| EPA Victoria                       | Environment Protection Authority Victoria.                                                                                                                                                                                                                                                             |
| Evening period                     | Monday to Saturday, from 6 pm to 10 pm; and Sunday and public holidays, from 7 am to 10 pm, as defined in the Environment Protection Regulations.                                                                                                                                                      |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Extraneous noise                      | Extraneous noise refers to any noise that is not part of the noise emissions from a noise source and is not relevant to the typical background noise. Extraneous noise includes noise from aircraft, local traffic, construction works, insects, bird chirping, people talking, rustling leaves, and the effect of wind on the microphone diaphragm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Frequency (Hz)                        | The number of times a sound pressure wave oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| GED                                   | General Environmental Duty – As defined by Section 25(1) of the <i>Environment Protection Act 2017</i> , it requires that any person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Impulse adjustment<br>$A_{imp}$       | When noise is impulsive in character than an adjustment of +2 dB for just detectable impulse character of the noise, adjustment of +5 dB for prominent impulse character of the noise.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Intermittency<br>adjustment $A_{int}$ | An intermittency adjustment is applied to situations where noise from a commercial, industrial or trade premises increases noticeably in level on multiple occasions during a 30-minute period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| $L_{A90}$                             | A-weighted sound pressure level, measured using the Fast time-weighting, that is exceeded for 90% of the time interval considered. This metric is often used to quantify the background noise level in an environment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| $L_{Aeq}$                             | The equivalent continuous A-weighted sound pressure level. It is the value of the A-weighted sound pressure level of a continuous steady sound that has the same acoustic energy as a given time-varying A-weighted sound pressure level when determined over the same measurement time interval. The $L_{Aeq}$ metric is used to quantify the effective noise level from a premises.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Low frequency noise                   | Noise that occurs at frequencies of below 200 Hz. Examples of low frequency noise include truck engine noise and bass music noise.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Noise Limit                           | The maximum effective noise level allowed in a noise sensitive area, as determined in accordance with the Noise Protocol.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Night period                          | Between 10 pm and 7 am of the following day as defined in the Environment Protection Regulations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Noise Protocol                        | Environmental Protection Authority 1826.4 <i>Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues</i> . The current version is published by EPA Victoria on its website.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Noise sensitive area                  | Defined by the Environment Protection Regulations as the part of the land within the boundary of a parcel of land that is: <ul style="list-style-type: none"> <li>• within 10 m of the outside of external walls of dwellings (including a residential care facility but not including a caretaker's house), residential building or noise sensitive residential use, or</li> <li>• within 10 m of the outside of external walls of any dormitory, ward, bedroom or living room of a caretaker's house, hospital, hotel, residential hotel, motel, specialist disability accommodation, corrective institution, tourist establishment, retirement village or residential village, or</li> <li>• within 10 m of the outside of external walls of a classroom or any room in which learning occurs during the operating hours of a child care centre, kindergarten, primary school or secondary school.</li> </ul> |

|                                    |                                                                                                                                                                                                                                                      |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tonal adjustment $A_{\text{tone}}$ | When noise is tonal in nature then an adjustment is applied depending on the prominence of the tonality. Examples of tonal noise may include reversing beepers or transformer hum.                                                                   |
| Unreasonable noise                 | Noise that is unreasonable due to its character as defined under the Environment Protection Act or because it is prescribed to be unreasonable, for example because it exceeds a noise limit set forth under the Environment Protection Regulations. |
| Zone Level                         | The Zone Level determined on the basis of land zoning around a noise sensitive area in a rural area in accordance with the Noise Protocol.                                                                                                           |
| Zoning Level                       | The Zoning Level determined on the basis of land zoning around a noise sensitive area in an urban area in accordance with the Noise Protocol.                                                                                                        |

## ADVERTISED PLAN

**This copied document to be made available  
for the sole purpose of enabling  
its consideration and review as  
part of a planning process under the  
Planning and Environment Act 1987.  
The document must not be used for any  
purpose which may breach any  
copyright**

## Table of Contents

|            |                                                                       |    |
|------------|-----------------------------------------------------------------------|----|
| 1          | Introduction .....                                                    | 2  |
| 2          | Project description .....                                             | 3  |
| 2.1        | Equipment.....                                                        | 3  |
| 2.2        | Operation hours .....                                                 | 3  |
| 2.3        | Noise sensitive areas around site .....                               | 4  |
| 3          | Legislation, policy and guidelines.....                               | 7  |
| 3.1        | Environment Protection Act 2017.....                                  | 7  |
| 3.1.1      | General Environmental Duty .....                                      | 7  |
| 3.1.2      | Unreasonable noise .....                                              | 7  |
| 3.2        | Environment Protection Regulations.....                               | 8  |
| 3.3        | Baw Baw Planning Scheme .....                                         | 9  |
| 3.4        | Noise Protocol.....                                                   | 9  |
| 3.4.1      | Distance adjustment.....                                              | 9  |
| 3.4.2      | Background adjustment.....                                            | 9  |
| 3.4.3      | Zoning levels .....                                                   | 10 |
| 3.4.4      | Noise Protocol limits .....                                           | 10 |
| 3.5        | EPA Victoria Publication 1996 .....                                   | 10 |
| 3.6        | enHealth Guidance .....                                               | 11 |
| 4          | Environmental noise assessment .....                                  | 12 |
| 4.1        | Environmental noise prediction methodology.....                       | 12 |
| 4.2        | Noise sources .....                                                   | 12 |
| 4.3        | Prediction model .....                                                | 13 |
| 4.4        | Noise character adjustments.....                                      | 14 |
| 4.5        | Assessment without additional noise mitigation .....                  | 15 |
| 4.6        | Assessment with mitigation.....                                       | 18 |
| 4.6.1      | Site noise barrier .....                                              | 18 |
| 4.6.2      | Discussion on noise barrier .....                                     | 21 |
| 4.6.3      | Options for further noise attenuation at host dwelling (NSA R1) ..... | 21 |
| 4.7        | Low frequency noise .....                                             | 23 |
| 5          | Conclusion .....                                                      | 24 |
| Appendix A | Planning map.....                                                     | 25 |
| Appendix B | Predicted noise contour maps.....                                     | 26 |
| Appendix C | Proposed noise barrier.....                                           | 31 |
| Appendix D | Sound Power Spectra .....                                             | 33 |

## 1 Introduction

Darnum BESS Pty Ltd (ACN 694 489 828) as trustee of the Darnum BESS Trust (ABN 84 694 489 828) (the Applicant), owned by Samsung C&T Renewable Energy Australia (SREA) (ABN 74 661 046 331), is proposing the development of the Darnum Battery Energy Storage System (the Project) at 875 Darnum Shady-Creek Road, Shady Creek, Victoria (the Project Site). The Project would involve the construction, operation and decommissioning of a Battery Energy Storage System (BESS) with a delivery capacity of up to approximately 200 Megawatts (MW) / 800 MWh (4 hr).

This Environmental Noise Assessment has been prepared as part of the Planning Permit Application for the Project which will be assessed by the Minister for Planning as the responsible authority. Resonate Consultants have been engaged to prepare this Environmental Noise Assessment.

This environmental noise assessment has been conducted in accordance with the *Environment Protection Regulations* (the Regulations) and supporting Environment Protection Authority (EPA) Victoria Noise Protocol<sup>1</sup>. It:

- summarises relevant legislation, policy and guidelines
- establishes applicable noise limits
- presents predicted noise levels from the proposed Project
- discusses noise mitigation measures.

## ADVERTISED PLAN

**This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright**

---

<sup>1</sup> EPA Victoria Publication 1826.5, *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*

## 2 Project description

### 2.1 Project Overview

The Project would comprise the following key components:

- A 200 MW / 800 MWh BESS compound, including 196 battery modules, 49 x 6.36 MVA step-up transformers and associated cabling.
- An onsite 33/220 kV Project substation, including a 240 MVA HV transformer, switchgear / control rooms, harmonic filters and associated infrastructure.
- A switchyard to facilitate Project connection into the National Electricity Market (NEM) via the existing 220 kV overhead transmission line (Yallourn Power Station to Rowville Terminal Station) that runs across the southern portion of the Project Site.
- Ancillary infrastructure and works including site access, internal access roads and parking, operations and maintenance facilities, stormwater infrastructure, noise walls and radiant heat walls, fire water tanks and systems, asset protection zones, lightning protection, lighting, signage, security devices and fencing, landscaping/screening.

The Project would have a total development footprint of approximately 7 ha, inclusive of approximately 2.5 ha for the BESS compound and approximately 3.0 ha for the Project substation, switchyard and grid connection including asset protection zones, along with approximately 1.5 ha for ancillary infrastructure external to the main infrastructure compounds.

Access to the Project is planned directly from Darnum Shady Creek Road via a modified version of the existing crossover which currently provides access to the host dwelling and associated farm infrastructure and operations. A secondary access is also proposed off Darnum Shady Creek Road near the southern site boundary and would function primarily as an emergency access.

Construction is expected to commence in 2027 and take up to 18 months to complete. For planning purposes, an indicative construction envelope of up to approximately 20.5 ha has been identified to encompass areas required for access, material and equipment laydown, staff parking and amenities, offices and construction water supply, along with temporary working buffers around the development footprint. Not all of the indicative construction envelope is expected to be disturbed for construction of the Project. Additional temporary construction areas beyond the permanent infrastructure footprint would be minimised, wherever practicable, to reduce disturbance impacts, and would be investigated once the construction contractor is appointed and detailed construction scheduling / sequencing has been confirmed.

The Project would operate 24 hours a day, 7 days a week and has an expected 25-year operating lifespan. At the conclusion of this 25-year period, the BESS components may be replaced or refurbished to extend the life (subject to market conditions) or otherwise decommissioned.

#### 2.1.1 Equipment

The key noise sources for the Project as shown in the DNB-E-DRG-001 Concept Design include:

- 196 x battery containers
- 49 x 6.36 MVA step-up transformers
- 1 x 240 MVA HV transformer.

#### 2.1.2 Operation hours

The proposed site will operate continuously 24 hours a day, 7 days a week.

## 2.2 Noise sensitive areas around site

The Project Site is located at 875 Darnum-Shady Creek Road, Shady Creek within the Gippsland region of Victoria approximately 7 km north of Darnum and 8 km north-east of Warragul. The Project Site comprises a single parcel of privately owned freehold land having a total area of approximately 51.2 ha and is located in the Baw Baw Shire Local Government Area (LGA).

The Project Site primarily comprises an open, agricultural landscape which has been largely cleared of native vegetation and is used for grazing. Patches of native vegetation and some scattered trees are present in the north-west, north-east, and south-east parts of the site. There are three shelterbelts of planted trees (Monterrey Cypress) within the central parts of the Project Site and two water bodies (farm dams) near the northern and western site boundaries.

The Project Site currently contains a dwelling, large shed and cattle yard which are located on the eastern part of the site and are accessed off Darnum-Shady Creek Road. The existing dwelling, large shed and cattle yard will remain on site during the operation of the BESS. The closest dwelling to the proposed Project is the host dwelling located approximately 160 m east of the BESS compound, with the closest neighbour dwellings located approximately 450 m west and approximately 480 m north of the BESS compound.

The existing 220 kV overhead transmission line (Yallourn Power Station to Rowville Terminal Station) into which the Project would connect, runs across the southern part of the Project Site within an easement held by Ausnet.

Figure 1 shows the site location and surrounding Noise Sensitive Areas (NSAs) R1 – R21. The Noise Sensitive Areas (NSAs) around the proposed Project were determined from aerial photography and they are presented Table 1

**This copied document to be made available  
for the sole purpose of enabling  
its consideration and review as  
part of a planning process under the  
Planning and Environment Act 1987.  
The document must not be used for any  
purpose which may breach any  
copyright**

**ADVERTISED  
PLAN**



Figure 1 Site location and surrounding areas

**ADVERTISED  
PLAN**

This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

**Table 1 Noise sensitive areas**

| <b>NSA</b>                          | <b>Approx distance from proposed BESS boundary, m</b> |
|-------------------------------------|-------------------------------------------------------|
| R1 (875 Darnum-Shady Creek Road)    | 160                                                   |
| R2 (935 Darnum-Shady Creek Road)    | 480                                                   |
| R3 (72 Baldwins Road)               | 450                                                   |
| R4 (64 Baldwins Road)               | 610                                                   |
| R5 (943 Nilma-Shady Creek Road)     | 850                                                   |
| R6 (1151 Yarragon-Shady Creek Road) | 800                                                   |
| R7 (1137 Yarragon-Shady Creek Road) | 900                                                   |
| R8 (1121 Yarragon-Shady Creek Road) | 1000                                                  |
| R9 (805 Darnum-Shady Creek Road)    | 600                                                   |
| R10 (772 Darnum-Shady Creek Road)   | 890                                                   |
| R11(782 Darnum Shady Creek Road)    | 940                                                   |
| R12 (760 Darnum-Shady Creek Road)   | 1100                                                  |
| R13 (235 Tripp McDonalds Road)      | 1800                                                  |
| R14 (203 Tripp McDonalds Road)      | 1850                                                  |
| R15 (760 Nilma-Shady Creek Road)    | 1350                                                  |
| R16 (762 Nilma-Shady Creek Road)    | 1500                                                  |
| R17 (790 Nilma-Shady Creek Road)    | 1350                                                  |
| R18 (750 Nilma-Shady Creek Road)    | 1600                                                  |
| R19 (748 Nilma-Shady Creek Road)    | 1750                                                  |
| R20 (716 Nilma-Shady Creek Road)    | 1900                                                  |
| R21 (744 Nilma-Shady Creek Road)    | 1850                                                  |

**ADVERTISED  
PLAN**

**This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright**

## 3 Legislation, policy and guidelines

### 3.1 Environment Protection Act 2017

#### 3.1.1 General Environmental Duty

The *Environment Protection Act 2017* (the Act) sets out environmental obligations and protections for Victorians. The cornerstone of the Act is the General Environmental Duty (GED), which states:

A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

In the context of the Act, 'reasonably practicable' measures mean putting in controls to eliminate the risk of harm to human health and the environment so far as reasonably practicable. If eliminating the risk of harm is not reasonably practicable, then the risk of harm must be reduced so far as reasonably practicable. A number of matters must be considered in deciding what is reasonably practicable in the circumstances:

- the likelihood of those risks eventuating
- the degree of harm that would result if those risks eventuated
- what the person concerned knows, or ought reasonably to know, about the harm or risks of harm and any ways of eliminating or reducing those risks
- the availability and suitability of ways to eliminate or reduce those risks
- the cost of eliminating or reducing those risks

EPA Victoria Publication 1856: Reasonably practicable explains that, when dealing with a common risk or harm, it is possible to demonstrate that the risk has been eliminated or reduced so far as reasonably practicable if well-established effective practices or controls have been adopted to eliminate or manage risk. Where well-established practices or controls do not exist, then it is necessary to show that effective controls have been assessed and adopted.

For the purposes of this assessment, compliance with the noise limits established under the Noise Protocol is expected to demonstrate that the GED has been met with respect to noise at the relevant noise sensitive areas. Where predicted noise levels comply with the Noise Protocol limits, no further demonstration of reasonably practicable measures is required. However, where a residual exceedance of the Noise Protocol limits is predicted, it is necessary to demonstrate that all reasonably practicable measures have been implemented to minimise the risk of harm, having regard to the matters set out in Section 25(2) of the Act. This may include, but is not limited to, the implementation of noise mitigation measures at the source, along the propagation path, or at the receiver, as well as operational controls and agreements with affected landowners

#### 3.1.2 Unreasonable noise

The Act also prohibits the emission of unreasonable noise and aggravated noise. The Act provides a definition for 'Unreasonable noise' in two parts. Section 3(1)(a) states that noise that is unreasonable having regard to the following:

- its volume, intensity or duration
- its character
- the time, place and other circumstances in which it is emitted
- how often it is emitted
- any prescribed factor.

Section 3(1)(b) states that noise is unreasonable noise if it is prescribed to be so. Under the *Environment Protection Regulations*, noise that exceeds the noise limits established in accordance with EPA 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) is prescribed to be unreasonable noise.

Unreasonable noise occurs if noise meets the requirements of Section 3(1)(a) and/or Section 3(1)(b) of the Act.

## 3.2 Environment Protection Regulations

The *Environment Protection Regulations* (the Regulations) are subordinate legislation that support the Act. Under the Regulations, the assessment of noise from commercial, industrial and trade premises at noise sensitive areas must be carried out in accordance with the Noise Protocol, both in terms of establishing noise limits at noise sensitive areas and in terms of the measurement of noise from the subject premises.

The noise limits set under the Regulations apply generally to noise emitted from the proposed Project. The noise limits are not applicable to noise that may arise from the following sources that may be relevant to the site:

- construction works
- intruder, emergency or safety alarms or sirens
- equipment used in relation to an emergency
- non-commercial vehicles (except for maintenance activities).

The GED still applies to noise arising from the above sources but compliance with the noise limits set under the Regulations is not mandatory.

Noise sensitive areas are defined in the Regulations as:

- The area within 10 m of the external walls of dwellings (including residential care facilities but excluding caretaker's houses), residential buildings and noise sensitive residential uses
- The area within 10 m outside the external walls of any dormitories, wards, bedrooms and living rooms of caretaker's houses, hospitals, hotels, motels, residential hotels, specialist disability accommodation, corrective institutions, tourist establishments, retirement villages and residential villages.
- The area within 10 m outside the external walls of classrooms or other rooms in which learning occurs at childcare centres, kindergartens, primary schools and secondary schools.
- Within the boundary of tourist establishments, campgrounds and caravan parks that are located in rural areas.

The Regulations also define Day, Evening and Night periods for the assessment of noise, reproduced in Table 2.

**Table 2 Applicable time periods**

| Time period | Details                                                                         |
|-------------|---------------------------------------------------------------------------------|
| Day         | Monday to Saturday, 7 am to 6 pm                                                |
| Evening     | Monday to Saturday, 6 pm to 10 pm<br>Sundays and public holidays, 7 am to 10 pm |
| Night       | 10 pm to 7 am any day                                                           |

The Regulations define:

- Unreasonable noise as noise from commercial, industrial and time periods that exceeds the applicable noise limits from the Noise Protocol.
- Aggravated noise as noise commercial, industrial and time periods that exceeds:
  - 75 dB  $L_{Aeq,30m}$  or the Noise Protocol noise limit by more than 15 dB during the day
  - 70 dB  $L_{Aeq,30m}$  or the Noise Protocol noise limit by more than 15 dB during the evening
  - 65 dB  $L_{Aeq,30m}$  or the Noise Protocol noise limit by more than 15 dB during the night.

### 3.3 Baw Baw Planning Scheme

Baw Baw Planning Scheme Clause 13.05-1S Noise Management has an objective to assist the management of noise effects on sensitive land uses and sets out the following 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.

Clause 13.05-1S identifies the Act, the Regulations, the Environment Reference Standard and Noise Protocol as relevant considerations in meeting the objective.

### 3.4 Noise Protocol

EPA Victoria has prepared the Noise Protocol to specify methodologies for establishing noise limits for operational noise sources and for assessing noise levels against the noise limits. Compliance with the noise limits defined by the Noise Protocol is required by Regulations and is expected to assist with meeting the GED.

The Noise Protocol defines different processes for establishing noise limits depending on whether the noise sensitive area is located within a major urban area or not.

For rural areas, the Noise Protocol primarily defines noise limits dependent on the following:

- Time of day. Different noise limits apply for the different time periods of Day, Evening and Night.
- Land zoning of both the noise source and noise sensitive areas used to determine the Zone Level.
- A distance adjustment is applied to the Zone Level where a noise sensitive area is in a different zone to a noise source.
- Type of noise source. Specific limits are set for certain noise sources, such as utilities and earth resources.

#### 3.4.1 Distance adjustment

In rural areas, the Noise Protocol applies a distance adjustment to noise levels where the zone type differs between source and receiver, and where there is a distance of 100 m or greater between the source zone boundary and the NSA (based on the shortest distance between the two). The distance adjustment is 1 dB for every 100 m of receiver distance and applies as a reduction to the base noise limit. The maximum subtraction is 9 dB.

For the proposed Project, the BESS and associated substation as well as surrounding NSAs are within a Farming Zone so no distance adjustment is implemented.

#### 3.4.2 Background adjustment

According to the Noise Protocol background noise levels may be taken into account in establishing noise limits in rural areas where the noise sensitive area is located within a 'background relevant area.' Background relevant areas are those rural areas where background levels may be higher than usual and include areas where road traffic is a significant audible source. If a noise sensitive area is located in a background relevant rural area, then in accordance with clause 24 of the EPA Noise Protocol (Publication 1826.5) the applicable noise limit is the greater of the noise limit determined using the land-use zoning and distance-adjusted methodology, or:

- The background noise level plus 8 dB for the Day period
- The background noise level plus 5 dB for the Evening period
- The background noise level plus 5 dB for the Night period.

The purpose of a background assessment is therefore to prevent excessive restrictions where the environment is already noisy — not to justify stricter limits.

No background noise monitoring or adjustment has been applied to the assessment. The NSAs around the Project are not classified as background relevant areas, as they are away from high traffic road which generally increase background noise.

### 3.4.3 Zoning levels

Noise Protocol determines the applicable noise criteria given the 'generating zone', the land-use zone in which the noise emitter is located, and the 'receiving zone' which is the land-use zone where the NSA is located.

The proposed Project is within an area designated Farming Zone (FZ) and NSAs are in the same zone type FZ according to the zoning as defined under the Baw Baw Planning Scheme. The Noise Protocol specifies a Zone Level for a utility, e.g. a BESS facility if it is located in a Farming Zone, Rural Activity Zone or Green Wedge Zone and the distance adjustment is 0 dB.

Table 3 presents the Zone Levels for the Project corresponding to time periods presented in Table 2.

**Table 3 Noise Protocol Zone Levels for the Project at surrounding NSAs within FZ during time periods**

| Zone type                      | Zone Level during time period, dB(A) $L_{eq}$ |         |       |
|--------------------------------|-----------------------------------------------|---------|-------|
|                                | Day                                           | Evening | Night |
| Utilities <sup>(1)</sup> in FZ | 45                                            | 39      | 34    |

(1) It should be noted that a BESS and associated installation are not considered as a 'utility installation' under the Baw Baw Planning Scheme (being and that is used to transmit, distribute or store power).

### 3.4.4 Noise Protocol limits

Considering the above, the noise limits for the assessment in this report have been established based on the Zone Levels presented in Table 3.

## 3.5 EPA Victoria Publication 1996

EPA Victoria Publication 1996 provides guidance on the assessment of low frequency noise from commercial, industrial and trade premises. As frequency spectrum is a separate prescribed factor under the Act, operational sources with the potential to produce a higher relative level of low frequency noise should be separately assessed against this guidance in addition to the noise limits applicable under the Regulations.

EPA Victoria Publication 1996 defines low frequency noise as that occurring between the frequency range of 10 Hz and 160 Hz. It provides noise thresholds, in one-third octave bands, with levels above the threshold indicating a potential risk of problematic low frequency noise that would require further consideration, investigation and potentially mitigation.

Table 4 presents the low frequency noise thresholds for predictions and measurements conducted outdoors. The outdoor threshold levels are based on indoor thresholds with an assumed façade noise reduction, as specified by EPA Victoria Publication 1996. For the purposes of this assessment, the outdoor thresholds have been adopted but, should a risk of exceedance be identified, further investigation of the specific building façade could be undertaken to assess whether it offers a greater attenuation of low frequency noise than assumed by EPA Victoria Publication 1996.

Table 4 Outdoor low frequency noise thresholds

| Outdoor noise level in dB $L_{eq}$ at one-third octave band centre frequency in Hz |      |    |    |    |      |    |    |    |    |     |     |     |
|------------------------------------------------------------------------------------|------|----|----|----|------|----|----|----|----|-----|-----|-----|
| 10                                                                                 | 12.5 | 16 | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 |
| 92                                                                                 | 89   | 86 | 77 | 69 | 61   | 54 | 50 | 50 | 48 | 48  | 46  | 44  |

## 3.6 enHealth Guidance

In addition to the EPA Victoria noise framework, consideration has been given to the enHealth publication “*The health effects of environmental noise*” (2018), prepared by the Environmental Health Branch of NSW Health (enHealth Guidance). The enHealth Guidance provides a review of evidence relating to the effects of environmental noise on human health, including sleep disturbance, cardiovascular disease and cognition. As such, it is relevant in the consideration of the risk of harm to human health from noise

Based on the review of higher quality studies, the enHealth Guidance specify that:

There is sufficient evidence of a causal relationship between environmental noise and both sleep disturbance and cardiovascular disease to warrant health based limits for residential land uses:

- During the night-time, an evidence based limit of 55 dB(A) at the facade using the  $L_{eq,night}$ , or similar metric and eight-hour night-time period is suggested.
- During the day-time, an evidence based limit of 60 dB(A) outside measured using the  $L_{eq,day}$ , or similar metric and a 16 hour day-time period is suggested

The enHealth Guidance also notes that the WHO *Night Noise Guidelines for Europe* (2009) proposed a lowest observable adverse effect level (LOAEL) of 40 dB  $L_{night,outside}$ . However, the enHealth review concluded that this threshold is “*not consistent with the threshold levels identified in the higher quality studies*” reviewed, and that the evidence supports sleep disturbance effects commencing above 55 dB(A)  $L_{night,outside}$  at the façade.

The enHealth Guidance also observes that:

Due to their lightweight construction, windows are generally the weakest point in the sound propagation path. Single and double window glazing can reduce noise by up to 30 and 35 dB(A) when closed. However, when windows are slightly open, outside sound levels are reduced only by 10 to 15 dB(A). This is particularly important as many Australians prefer their windows slightly open at night for ventilation. In Western Australia state planning policies recommend fans or air conditioning in conjunction with upgraded glazing to ensure adequate ventilation when windows are closed to exclude noise.

**ADVERTISED  
PLAN**

**This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright**

## 4 Environmental noise assessment

An environmental noise model for proposed noise emissions from the Project was developed using a proprietary noise modelling software package, SoundPLAN (version 8.2). The relative noise source contributions from the site can be quantified based on the prediction model and assist to determine noise mitigation requirements, if applicable.

### 4.1 Environmental noise prediction methodology

The environmental noise prediction methodology provided in the international standard ISO 9613-2 *Acoustics — Attenuation of sound during propagation outdoors* was adopted for the prediction model. The methodology considers the following:

- geometrical divergence
- atmospheric absorption
- ground effect
- reflection from surfaces
- screening by obstacles.

The ISO 9613-2 methodology provides a prediction representative of conditions where the receiver is downwind of the source in a light breeze or under a moderate ground-based temperature inversion.

### 4.2 Noise sources

Table 5 summarises the noise sources and modelling assumptions for this assessment.

The Project is proposing to use the Tesla Megapack 3 battery. Currently verifiable noise emission data is not available for the Megapack 3 however it is expected to be quieter than the currently available Megapack 2XL model. Noise data for the Megapack 2XL was provided by the manufacturer in a document titled 'Darnum BESS - Battery Energy Storage System Noise Application Note 1.0 (Darnum Noise Application Note)' and has been adopted in this assessment. As Tesla Megapack 2XL is expected to have higher published noise emissions, the assessment is considered to represent a worst-case scenario. This ensures that predicted operational noise levels are conservative and that compliance is maintained even if actual equipment noise is lower than modelled.

The locations of all modelled noise sources are displayed in Appendix C. Full spectral data for each modelled noise source is provided in Appendix D. All equipment items are assumed to be in operation for the entirety of a 30-minute assessment period. The noise emission of the BESS equipment is typically dominated by cooling noise sources, which can be variable depending on the percentage of maximum power (charge/discharge) and the subsequent temperatures, both ambient and that being generated by the equipment. During detailed design, noise source levels and the number of plant items will be validated with the chosen equipment suppliers to ensure they are equal to or lower than those presented and remain compliant with the assessment. In our experience, these specified sound power levels are consistent with typical sound power levels for BESS projects

**ADVERTISED  
PLAN**

**This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright**

**Table 5 Modelled noise sources and assumptions**

| Plant Item                 | Sound Power Level per Plant Item, LAeq(15 min) dB(A)         | Sound Power Level Reference                                      | Quantity | Assumptions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|--------------------------------------------------------------|------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High Voltage Transformer   | 93                                                           | As advised by client and verified by Resonate database           | 1        | <ul style="list-style-type: none"> <li>Reference data - Sound Power Level of 93 dB(A).</li> <li>Source modelled at a height of 2m.</li> <li>Spectral data calculated based on transformer sound spectra measured for previous BESS projects (Resonate database)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| BESS                       | 89 (100% fan duty)<br>84 (60% fan duty)<br>79 (40% fan duty) | Manufacturer's data reference (Darnum Noise Application Note)    | 196      | <ul style="list-style-type: none"> <li>The Darnum Noise Application Note identifies the majority of time the BESS will operate at 20% PE (power electronic) fan and 40% FD (fan duty)</li> <li>During summer time it is expected that the battery fan duty may spike higher for short periods when ambient temperatures are higher (in the order of minutes)</li> <li>Reference data - Sound Power Level of 85.7 dB(A) for daytime &amp; evening periods (based on fan duty operating at 60% for 10 minutes and 100% for 20 minutes)</li> <li>Reference data - Sound Power Level of 79 dB(A) for night (based on fan duty operating at 40%)</li> <li>Source modelled at a height of 3.3m.</li> <li>Spectral data calculated based on transformer sound spectra measured for previous BESS projects, adjusted to match sound power levels (Resonate database)</li> </ul> |
| Medium Voltage Transformer | 80                                                           | Based on Resonate experience with similar equipment and projects | 49       | <ul style="list-style-type: none"> <li>Reference data - Sound Power Level of 80 dB(A).</li> <li>Source modelled at a height of 1.5m.</li> <li>Spectral data calculated based on transformer sound spectra measured for previous BESS projects (Resonate database)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright.

**Table 6 Fan duty and corresponding sound power level assessed in this report**

The sound power spectrum distributions for MV transformer and substation transformer are presented in Appendix D

## 4.3 Prediction model

The following inputs were used in the environmental noise model:

- Nearest NSAs surrounding the proposed site were determined from aerial photography. The NSAs were positioned 1.5 m above floor level within 10 metres of the outside of the external walls of dwelling in accordance with the Regulations.
- Proposed site location: as indicated in Figure 1.
- General ground absorption factor:
  - 0% for site and road (hard surface).
  - 50% for other land uses
- Topography: accessed from the Department of Energy, Environment and Climate Action DataShare website on 6 October 2025.

## 4.4 Noise character adjustments

According to the Noise Protocol, a measured or predicted noise level needs to be adjusted for noise characteristics to derive the Effective Noise Level for the assessment. The Effective Noise Level, with noise character adjustment, is then assessed against the noise limit.

Potential duration and noise character adjustments are discussed below:

- **Duration adjustment (potential reduction):** When the noise emission is not audible over the whole of a continuous 30-minute period, then a duration adjustment based upon the total amount of time for which the noise is audible over that continuous 30-minute period shall be determined in accordance with Item 3.3 of Noise Protocol.
- **Impulsive adjustment (potential increase):** When the noise emission is impulsive in character, then any impulse noise emission event shall be considered to be audible for 10 seconds after the occurrence of the event for the purposes of determining the duration adjustment. Then, an adjustment shall be made as follows:
  - When the impulsive character of the noise is just detectable then the adjustment of +2 dB.
  - When the impulsive character of the noise is prominent then the adjustment of +5 dB.
- **Intermittency adjustment (potential increase):** When the noise emission is intermittent or variable and the noise emission, when measured by a sound level meter set to F time-weighting and A frequency weighting, increases in level rapidly on at least two occasions during a 30-minute period and maintains the level for at least a one-minute duration, then an adjustment determined shall be made in accordance with Item 3.4 of Noise Protocol.
- **Tonal adjustment (potential increase):** When the noise is tonal in character then an adjustment shall be made as follows:
  - When the tonal character of the noise is just detectable then a tonal adjustment of +2 dB applies.
  - When the tonal character of the noise is prominent then a tonal adjustment of +5 dB applies.

In accordance with Schedule 2 of Noise Protocol, the Effective Noise Level is then derived by applying any determined character adjustments to the measured or predicted  $L_{Aeq}$  noise level for assessment against the noise limits.

For the current assessment we note that:

- **Duration:**
  - Transformers: It has been assumed that the MV transformers and HV transformer would operate continuously over a 30-minute period. Therefore, no duration adjustment has been applied for transformers.
  - Battery containers: the duration adjustment for battery containers during 30-minute period are derived based on the following assumptions:
    - Day / Evening: The containers operate under PE fan 20% & battery fan 100% for 10 minutes and under PE fan 20% & battery fan 60% for 20 minutes.
    - Night: The containers operate continuously under PE fan 20% & battery fan 40% for 30 minutes. Therefore, no duration adjustment has been applied for container during Night operation.
- **Impulse:** The noise from the Project is expected to be steady in nature. Therefore, no adjustment has been applied for impulsive noise.
- **Intermittency:** The noise from the Project generally operates steadily. During summer periods, fan speed may spike briefly above the baseline fan duty; however, based on manufacturer's data, these spikes are expected to be short in duration (under one to two minutes). The intermittency adjustment is not considered applicable as the noise level is not expected to increase rapidly on at least two occasions within a 30-minute period, nor to maintain an elevated level for at least one minute on each occasion, as required by Item 3.4 of the Noise Protocol.

- **Tonality:** The tonal adjustment of +2 dB on predicted noise levels at NSAs where substation transformer noise could potentially be detectable above the battery system noise has been applied for substation transformer noise emission. To understand the noise contribution from the proposed substation transformer at the NSAs, the noise contributors were investigated within the *SoundPLAN* prediction model. Based on a review of the noise prediction results, a +2 dB adjustment has been applied to the NSAs R1 and R3 where tonal substation noise may be just detectable. We note that the tonal adjustment may not be applicable subject to the spectrum of the transformer selected for the Project.

## 4.5 Assessment without additional noise mitigation

Noise emissions from the Project at the NSAs presented in Table 1 have been assessed for the various operational scenarios and operating times without additional noise mitigation. Predicted noise contour maps are presented in Appendix B.

Table 7 presents the predicted Effective noise levels at NSAs for Day and Evening periods without additional noise mitigation

## ADVERTISED PLAN

**This copied document to be made available  
for the sole purpose of enabling  
its consideration and review as  
part of a planning process under the  
Planning and Environment Act 1987.  
The document must not be used for any  
purpose which may breach any  
copyright**

**Table 7 Predicted Effective noise levels at NSAs for Day and Evening periods, without additional noise mitigation**

| Noise sensitive area | Predicted noise level, dB(A) $L_{eq}$ | Tonal adjustment, dB | Effective noise level, dB(A) $L_{eq}$ | Day / Evening limits, dB(A) $L_{eq}$ | Compliance |
|----------------------|---------------------------------------|----------------------|---------------------------------------|--------------------------------------|------------|
| R1                   | 48                                    | +2                   | 50                                    | 45 / 39                              | × / ×      |
| R2                   | 39                                    | 0                    | 39                                    | 45 / 39                              | ✓ / ✓      |
| R3                   | 40                                    | +2                   | 42                                    | 45 / 39                              | ✓ / ×      |
| R4                   | 36                                    | 0                    | 36                                    | 45 / 39                              | ✓ / ✓      |
| R5                   | 33                                    | 0                    | 33                                    | 45 / 39                              | ✓ / ✓      |
| R6                   | 34                                    | 0                    | 34                                    | 45 / 39                              | ✓ / ✓      |
| R7                   | 33                                    | 0                    | 33                                    | 45 / 39                              | ✓ / ✓      |
| R8                   | 31                                    | 0                    | 31                                    | 45 / 39                              | ✓ / ✓      |
| R9                   | 34                                    | 0                    | 34                                    | 45 / 39                              | ✓ / ✓      |
| R10                  | 31                                    | 0                    | 31                                    | 45 / 39                              | ✓ / ✓      |
| R11                  | 31                                    | 0                    | 31                                    | 45 / 39                              | ✓ / ✓      |
| R12                  | 30                                    | 0                    | 30                                    | 45 / 39                              | ✓ / ✓      |
| R13                  | 25                                    | 0                    | 25                                    | 45 / 39                              | ✓ / ✓      |
| R14                  | 25                                    | 0                    | 25                                    | 45 / 39                              | ✓ / ✓      |
| R15                  | 30                                    | 0                    | 30                                    | 45 / 39                              | ✓ / ✓      |
| R16                  | 28                                    | 0                    | 28                                    | 45 / 39                              | ✓ / ✓      |
| R17                  | 29                                    | 0                    | 29                                    | 45 / 39                              | ✓ / ✓      |
| R18                  | 27                                    | 0                    | 27                                    | 45 / 39                              | ✓ / ✓      |
| R19                  | 26                                    | 0                    | 26                                    | 45 / 39                              | ✓ / ✓      |
| R20                  | 26                                    | 0                    | 26                                    | 45 / 39                              | ✓ / ✓      |
| R21                  | 27                                    | 0                    | 27                                    | 45 / 39                              | ✓ / ✓      |

This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright.

The predicted noise levels presented in the table above indicate the following:

- R1 (875 Darnum-Shady Creek Road): Predicted noise levels exceed the Day and Evening limits by 5 dB and 11 dB, respectively. This is the host landowner dwelling.
- R3 (72 Baldwins Road): Predicted noise levels meet the Day limit but exceed the Evening limit by 3 dB.
- Other NSAs: Predicted noise levels meet the Day and Evening limits, respectively.

Table 8 presents the predicted Effective noise levels at NSAs for Night period without additional noise mitigation.

**Table 8 Predicted Effective noise levels at NSAs for Night period, without additional noise mitigation**

| Noise sensitive area | Predicted noise level, dB(A) $L_{eq}$ | Tonal adjustment, dB | Effective noise level, dB(A) $L_{eq}$ | Night limit, dB(A) $L_{eq}$ | Compliance |
|----------------------|---------------------------------------|----------------------|---------------------------------------|-----------------------------|------------|
| R1                   | 43                                    | +2                   | 45                                    | 34                          | ×          |
| R2                   | 34                                    | 0                    | 34                                    | 34                          | ✓          |
| R3                   | 35                                    | +2                   | 37                                    | 34                          | ×          |
| R4                   | 31                                    | 0                    | 31                                    | 34                          | ✓          |
| R5                   | 28                                    | 0                    | 28                                    | 34                          | ✓          |
| R6                   | 30                                    | 0                    | 30                                    | 34                          | ✓          |
| R7                   | 28                                    | 0                    | 28                                    | 34                          | ✓          |
| R8                   | 27                                    | 0                    | 27                                    | 34                          | ✓          |
| R9                   | 30                                    | +2                   | 32                                    | 34                          | ✓          |
| R10                  | 27                                    | +2                   | 29                                    | 34                          | ✓          |
| R11                  | 26                                    | +2                   | 28                                    | 34                          | ✓          |
| R12                  | 25                                    | +2                   | 27                                    | 34                          | ✓          |
| R13                  | 20                                    | 0                    | 20                                    | 34                          | ✓          |
| R14                  | 20                                    | 0                    | 20                                    | 34                          | ✓          |
| R15                  | 25                                    | 0                    | 25                                    | 34                          | ✓          |
| R16                  | 23                                    | 0                    | 23                                    | 34                          | ✓          |
| R17                  | 24                                    | 0                    | 24                                    | 34                          | ✓          |
| R18                  | 23                                    | 0                    | 23                                    | 34                          | ✓          |
| R19                  | 22                                    | 0                    | 22                                    | 34                          | ✓          |
| R20                  | 21                                    | 0                    | 21                                    | 34                          | ✓          |
| R21                  | 22                                    | 0                    | 22                                    | 34                          | ✓          |

This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

The predicted noise levels for Night period presented in the table above indicate the following:

- R1 (875 Darnum-Shady Creek Road): Predicted noise levels exceed the Night limit by 11 dB. This is the host landowner dwelling.
- R3 (72 Baldwins Road): Predicted noise levels exceed the Night limit by 3 dB.
- Other NSAs: Predicted noise levels meet the noise limit.

## 4.6 Assessment with mitigation

### 4.6.1 Site noise barrier

To mitigate operational noise impacts at nearby noise sensitive areas (NSAs), a noise barrier solution has been assessed around the BESS site and the substation transformer.

The proposed mitigation comprises a 6-metre-high solid noise wall with internal acoustic treatment, enclosing the BESS site and the HV substation transformer. Predicted noise contours with the noise barrier are included in Appendix B and the indicative location and extent of the noise wall are shown in Appendix C.

The noise barrier has been modelled as a solid panel construction with a minimum weighted sound reduction index ( $R_w$ ) of 25 dB, incorporating 50 mm sound-absorptive insulation on the internal face oriented towards the BESS units and transformers.

With the addition of the noise barrier, the predicted noise levels are shown in Table 9 for the day and evening period and Table 10 for the night period

**ADVERTISED  
PLAN**

**This copied document to be made available  
for the sole purpose of enabling  
its consideration and review as  
part of a planning process under the  
Planning and Environment Act 1987.  
The document must not be used for any  
purpose which may breach any  
copyright**

**Table 9 Predicted Effective noise levels at NSAs for Day and Evening periods, with 6-metre-high noise barrier around the BESS and HV substation transformer**

| Noise sensitive area | Predicted noise level, dB(A) $L_{eq}$ | Tonal adjustment, dB | Effective noise level, dB(A) $L_{eq}$ | Day / Evening limits, dB(A) $L_{eq}$ | Compliance |
|----------------------|---------------------------------------|----------------------|---------------------------------------|--------------------------------------|------------|
| R1                   | 46                                    | 0                    | 46                                    | 45 / 39                              | x / x      |
| R2                   | 38                                    | 0                    | 38                                    | 45 / 39                              | ✓ / ✓      |
| R3                   | 39                                    | 0                    | 39                                    | 45 / 39                              | ✓ / ✓      |
| R4                   | 36                                    | 0                    | 36                                    | 45 / 39                              | ✓ / ✓      |
| R5                   | 32                                    | 0                    | 32                                    | 45 / 39                              | ✓ / ✓      |
| R6                   | 34                                    | 0                    | 34                                    | 45 / 39                              | ✓ / ✓      |
| R7                   | 33                                    | 0                    | 33                                    | 45 / 39                              | ✓ / ✓      |
| R8                   | 31                                    | 0                    | 31                                    | 45 / 39                              | ✓ / ✓      |
| R9                   | 34                                    | 0                    | 34                                    | 45 / 39                              | ✓ / ✓      |
| R10                  | 31                                    | 0                    | 31                                    | 45 / 39                              | ✓ / ✓      |
| R11                  | 30                                    | 0                    | 30                                    | 45 / 39                              | ✓ / ✓      |
| R12                  | 29                                    | 0                    | 29                                    | 45 / 39                              | ✓ / ✓      |
| R13                  | 24                                    | 0                    | 24                                    | 45 / 39                              | ✓ / ✓      |
| R14                  | 24                                    | 0                    | 24                                    | 45 / 39                              | ✓ / ✓      |
| R15                  | 29                                    | 0                    | 29                                    | 45 / 39                              | ✓ / ✓      |
| R16                  | 27                                    | 0                    | 27                                    | 45 / 39                              | ✓ / ✓      |
| R17                  | 28                                    | 0                    | 28                                    | 45 / 39                              | ✓ / ✓      |
| R18                  | 27                                    | 0                    | 27                                    | 45 / 39                              | ✓ / ✓      |
| R19                  | 26                                    | 0                    | 26                                    | 45 / 39                              | ✓ / ✓      |
| R20                  | 25                                    | 0                    | 25                                    | 45 / 39                              | ✓ / ✓      |
| R21                  | 26                                    | 0                    | 26                                    | 45 / 39                              | ✓ / ✓      |

This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

The predicted noise levels presented in the table above indicate that the predicted noise levels comply with the noise limits at all NSAs, with the exception of the host landowner dwelling R1. The predicted noise levels at the host landowner dwelling exceed the Day and Evening limits by 1 and 7 dB respectively.

## ADVERTISED PLAN

Table 10 presents the predicted Effective noise levels at NSAs for Night period with the 6 m high noise barrier around the BESS and HV substation transformer.

**Table 10 Predicted Effective noise levels at NSAs for Night periods, with 6-metre-high noise barrier around the BESS and HV substation transformer**

| Noise sensitive area | Predicted noise level, dB(A) $L_{eq}$ | Tonal adjustment, dB | Effective noise level, dB(A) $L_{eq}$ | Night limit, dB(A) $L_{eq}$ | Compliance |
|----------------------|---------------------------------------|----------------------|---------------------------------------|-----------------------------|------------|
| R1                   | 40                                    | 0                    | 40                                    | 34                          | ×          |
| R2                   | 32                                    | 0                    | 32                                    | 34                          | ✓          |
| R3                   | 33                                    | 0                    | 33                                    | 34                          | ✓          |
| R4                   | 30                                    | 0                    | 30                                    | 34                          | ✓          |
| R5                   | 27                                    | 0                    | 27                                    | 34                          | ✓          |
| R6                   | 28                                    | 0                    | 28                                    | 34                          | ✓          |
| R7                   | 27                                    | 0                    | 27                                    | 34                          | ✓          |
| R8                   | 25                                    | 0                    | 25                                    | 34                          | ✓          |
| R9                   | 28                                    | 0                    | 28                                    | 34                          | ✓          |
| R10                  | 25                                    | 0                    | 25                                    | 34                          | ✓          |
| R11                  | 25                                    | 0                    | 25                                    | 34                          | ✓          |
| R12                  | 23                                    | 0                    | 23                                    | 34                          | ✓          |
| R13                  | 19                                    | 0                    | 19                                    | 34                          | ✓          |
| R14                  | 19                                    | 0                    | 19                                    | 34                          | ✓          |
| R15                  | 23                                    | 0                    | 23                                    | 34                          | ✓          |
| R16                  | 22                                    | 0                    | 22                                    | 34                          | ✓          |
| R17                  | 23                                    | 0                    | 23                                    | 34                          | ✓          |
| R18                  | 22                                    | 0                    | 22                                    | 34                          | ✓          |
| R19                  | 20                                    | 0                    | 20                                    | 34                          | ✓          |
| R20                  | 19                                    | 0                    | 19                                    | 34                          | ✓          |
| R21                  | 20                                    | 0                    | 20                                    | 34                          | ✓          |

As for the Day and Evening periods, the predicted noise levels presented in the table above indicate that the predicted noise levels comply with the noise limits at all NSAs, with the exception of the host landowner dwelling R1. The predicted noise levels at the host landowner dwelling exceed the Night limit by 6 dB.

## 4.6.2 Discussion on noise barrier

Through comparison of the predicted noise levels in Table 7 and Table 8 with those in Table 9 and Table 10, it can be seen that noise reductions are predicted to be obtained with the noise barrier around the BESS and substation transformer. The predicted noise reductions were up to 2 dB during the Day / Evening period and up to 3 dB during the Night period.

Furthermore, the assessment was conducted based on preliminary information for the transformer noise emission. This means that the need for and extent of the noise barrier should be reviewed during detailed design once further information on transformer noise emissions, including the tonal adjustment, are determined.

The results above demonstrate that, with the proposed 6-metre-high noise wall in place, predicted operational noise levels from the proposed BESS and associated substation are capable of complying with the applicable Noise Protocol limits at all neighbouring noise sensitive areas (NSAs R2 to R21) for all assessment periods.

The only predicted exceedance is at NSA R1 (875 Darnum–Shady Creek Road), which is the host landowner dwelling on the property where the BESS is proposed to be located. Further discussion on noise mitigation options for the host landowner dwelling is provided in Section 4.6.3.

## 4.6.3 Options for further noise attenuation at host dwelling (NSA R1)

The need for noise mitigation to address the predicted exceedance at the host landowner dwelling will depend on the agreement between the landowner and the proponent. However, this section sets out potential noise mitigation options to mitigate the exceedance should it be desired.

These options are not mutually exclusive and could be implemented individually or in combination. It is emphasised that these options relate exclusively to the host landowner dwelling, for which a written agreement is in place, and not to any neighbouring dwellings where noise compliance is predicted to be able to be achieved through on-site noise controls and mitigation.

### Option 1: Indoor noise limits achieved with façade attenuation

Under the Noise Protocol there is a provision for compliance with noise limits to be achieved on an indoor, rather than outdoor, basis. Clause 74 of the Noise Protocol sets out that this should be used when “an outdoor measurement that represents noise exposure within the noise sensitive area cannot be made”.

EPA Publication 1997 *Technical guide: Measuring and analysing industry noise and music noise* provides further context on this, stating that:

In some circumstances, an outdoor measurement point might not represent the noise exposure in affected sensitive rooms and an indoor measurement point is required. For example, where:

- the most exposed part of the noise sensitive area is the side of a building that acts as a noise barrier to the outdoor spaces located behind it; or
- the building envelope has been designed and constructed to include specific noise control treatments, such as acoustic glazing; or
- the noise sensitive area does not include an outdoor area and has fixed windows, which could be the case for an apartment in a high-rise building.

As such, if the building envelope for NSA R1 were to be updated to include specific noise control treatments, then an indoor assessment could be considered to assess compliance, rather than an outdoor assessment.

If this approach were to be taken, then it would be necessary for the proponent to determine the acoustic treatments to be applied such that the BESS noise, when measured indoors and with specific indoor adjustment applied, complies with the outdoor noise limit. This would require an assessment of the dwelling's existing condition and the

design of specific attenuation treatments. However, given the predicted exceedance of up to 7 dB, it is anticipated that this could be achieved with treatments including:

- Provision of air conditioning or other alternative fresh air ventilation systems to enable windows to be closed during BESS operation.
- Installation of double-glazing or upgraded window and door assemblies to improve the sound insulation performance of the building envelope.

It is recommended that consultation be carried out with EPA Victoria should this option be pursued.

## Option 2: Localised noise barrier around host dwelling

A localised noise 4-metre noise barrier in the vicinity of the host dwelling to provide additional screening of BESS noise to the building façade and outdoor areas of the host dwelling has been assessed. The indicative location of this barrier is shown in Figure C.2.

The noise barrier has been modelled as a solid panel construction with a minimum weighted sound reduction index (Rw) of 25 dB, incorporating 50 mm sound-absorptive insulation on the internal face oriented towards the BESS units and transformers.

With the 6-metre noise barrier enclosing the BESS compound and HV substation transformer and the localised 4-metre noise barrier in place, the predicted effective noise levels at NSA R1 are presented in Table 11.

**Table 11 Predicted effective noise levels at NSA R1 for all periods, with 6-metre site barrier and 4-metre localised noise barrier around host dwelling**

| Noise sensitive area | Predicted noise level, dB(A) Leq | Tonal adjustment, dB | Effective noise level, dB(A) Leq | Limit, dB(A) Leq | Compliance |
|----------------------|----------------------------------|----------------------|----------------------------------|------------------|------------|
| R1 — Day             | 39                               | 0                    | 39                               | 45               | ✓          |
| R1 — Evening         | 39                               | 0                    | 39                               | 39               | ✓          |
| R1 — Night           | 33                               | 0                    | 33                               | 34               | ✓          |

## Noise levels at NSA R1 in context

The following additional considerations are relevant to the assessment of noise at the host dwelling NSA R1:

- NSA R1 is a host landowner, who has an agreement in place to host the BESS infrastructure and would benefit from the Project. The agreement also specifically includes terms in relation to potential Project impacts, including compensation for noise exceedances.
- Sound power level data for the assessment have utilised the Tesla Megapack 2XL, as verified data for the proposed Megapack 3 technology is not yet available. Advice from Tesla indicates that the Megapack 3 is expected to produce lower noise emissions and there is opportunity during detailed design to update the assessment with verified data.
- The predicted outdoor noise levels are also based on operation under higher temperatures and meteorological conditions conducive for the propagation of noise from source to receiver. These conditions are not typically a regular feature of the environment and noise levels under other conditions would be predicted to be lower.
- The predicted outdoor noise levels at NSA R1, are comfortably below the enHealth Guidance recommendations.

## 4.7 Low frequency noise

At this stage of the Project, insufficient information on low frequency noise emissions is available for the selected equipment. As such, no detailed low frequency noise assessment has been conducted.

Based on our previous experience with BESS projects, the controlling noise from BESS is in the mid-frequency range such that compliance with the relatively low Noise Protocol noise limits in rural areas for BESS typically results in low frequency noise below the applicable outdoor thresholds. Consideration of low frequency noise from the substation transformer would be required during detailed design, however can generally be reasonably managed given the lower contribution of the transformer relative to the battery container noise.

## 4.8 Cumulative noise assessment

A review of nearby approved and proposed energy projects was undertaken using the Department of Transport and Planning (DTP) renewables mapping tool. Two projects were identified in the vicinity of the Darnum BESS:

- North Yarragon BESS (ZEN Energy, 210 MW), located approximately 2 km from the Darnum BESS site, with a planning permit application lodged and process underway.
- Shady Creek Solar Farm (Elgin Energy, 60 MW), located approximately 6 km from the Darnum BESS site, approved but not yet operational.

Given its separation distance of approximately 6 km, the Shady Creek Solar Farm is not considered to make a meaningful contribution to cumulative noise levels at the Darnum BESS NSAs.

Should the North Yarragon BESS comply with the applicable Noise Protocol limits at its own noise sensitive areas, its contribution at the Darnum BESS NSAs — located approximately 2 km away — would be negligible. Predicted noise levels at the NSAs surrounding the Darnum BESS are substantially below the applicable Noise Protocol limits for all assessment periods. No cumulative exceedance of the applicable Noise Protocol limits is therefore predicted.

**This copied document to be made available  
for the sole purpose of enabling  
its consideration and review as  
part of a planning process under the  
Planning and Environment Act 1987.  
The document must not be used for any  
purpose which may breach any  
copyright**

**ADVERTISED  
PLAN**

## 5 Conclusion

This report presents the outcomes of an Environmental Noise Assessment for the proposed 200MW/800MWh BESS facility located at 875 Darnum-Shady Creek Road in Shady Creek. The predicted noise levels were assessed against noise limits established in accordance with the *Environment Protection Regulations* and EPA Victoria Noise Protocol.

Predicted noise levels were assessed at surrounding noise sensitive areas (NSAs). Without mitigation, noise modelling identified exceedances of the applicable noise limits at NSA R1 during the Day and Evening periods, and at NSAs R1 and R3 during the Night period. Except for the night period exceedance at neighbouring dwelling R3, noise compliance is achieved at all neighbouring dwellings for all assessment periods.

Following further discussion and analysis with the project team, a mitigation solution comprising a 6-metre-high noise wall enclosing the BESS site and HV substation transformer was assessed. With this mitigation in place, predicted operational noise levels comply with the applicable Noise Protocol limits at all neighbouring dwellings (NSAs R2 to R21). These Noise Protocol limits (Day 45 dB(A), Evening 39 dB(A), Night 34 dB(A)) are substantially below the enHealth evidence-based thresholds of 60 dB(A) daytime and 55 dB(A) night-time, providing a significant margin of protection for human health at all neighbouring receivers.

The only remaining predicted exceedance is at NSA R1 (875 Darnum-Shady Creek Road), the host landowner dwelling, for which a project agreement is in place. The predicted outdoor noise levels at R1 (up to 46 dB(A) Day, 40 dB(A) Night) remain comfortably below the enHealth evidence-based thresholds.

With a localised 4-metre noise barrier at the host dwelling (NSA R1), predicted operational noise levels comply with the applicable Noise Protocol limits at all noise sensitive areas for all assessment periods. The predicted effective noise levels at NSA R1 are 39 dB(A) Leq for the Day and Evening periods and 33 dB(A) Leq for the Night period, against limits of 45 dB(A), 39 dB(A) and 34 dB(A) respectively.

Facade attenuation at the host dwelling (e.g. air conditioning, double glazing) remains available as an alternative or supplementary measure should this be agreed with the host landowner during detailed design.

These options relate exclusively to the host landowner dwelling (NSA R1) and are not required for any neighbouring dwellings where compliance has been demonstrated.

It should be noted that this assessment has been conducted using conservative assumptions in a number of respects:

- The predicted noise levels are based on conservative meteorological conditions not regularly representative of the environment.
- Sound power level data for the Tesla Megapack 2 XL model has been used, as verified data for the proposed Megapack 3 technology is not yet available — advice from Tesla indicates that the Megapack 3 is expected to produce lower noise emissions. There is opportunity during detailed design to update the assessment with verified data
- The assessment was conducted using preliminary transformer noise data, and the tonal adjustment results should be reviewed during detailed design

As a result, it is predicted that installing a substation transformer that does not require a tonal adjustment in combination with the recommended mitigation measures, compliance is met for applicable noise limits at all noise sensitive areas..

## Appendix A Planning map



**ADVERTISED  
PLAN**

**This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright**

## Appendix B Predicted noise contour maps

**ADVERTISED  
PLAN**

**This copied document to be made available  
for the sole purpose of enabling  
its consideration and review as  
part of a planning process under the  
Planning and Environment Act 1987.  
The document must not be used for any  
purpose which may breach any  
copyright**

Predicted noise level for Day / Evening periods, without wall

ADVERTISED PLAN

Predicted noise level, dB(A) Leq

- 35 - 39 dB(A)
- 39 - 43 dB(A)
- 43 - 47 dB(A)
- 47 - 51 dB(A)
- 51 - 55 dB(A)
- > 55 dB(A)

Legend

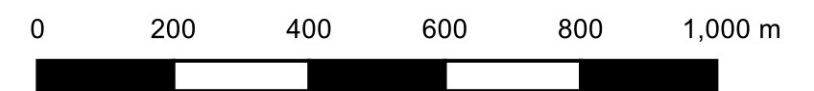
- Receiver
- Noise protection wall
- Battery container
- Substation transformer

Client: Umwelt (Australia) Pty Ltd

Drawn by: XL

Checked by:TE

Dated: October 2025



Resonate

This document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

Predicted noise level for Night period, without wall

ADVERTISED PLAN

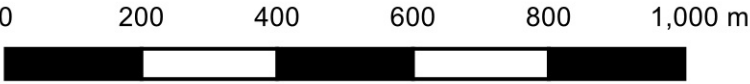
Predicted noise level, dB(A) Leq

- 35 - 39 dB(A)
- 39 - 43 dB(A)
- 43 - 47 dB(A)
- 47 - 51 dB(A)
- 51 - 55 dB(A)
- > 55 dB(A)

Legend

- Receiver
- Noise protection wall
- Battery container
- Substation transformer

Client: Umwelt (Australia) Pty Ltd  
Drawn by: XL  
Checked by:TE  
Dated: October 2025



Resonate

**Predicted noise level for Day / Evening periods, with 6m high noise wall around entire site**

**Predicted noise level, dB(A) Leq**

- 35 - 39 dB(A)
- 39 - 43 dB(A)
- 43 - 47 dB(A)
- 47 - 51 dB(A)
- 51 - 55 dB(A)
- > 55 dB(A)

**Legend**

- Receiver
- Noise protection wall
- Battery container
- Substation transformer

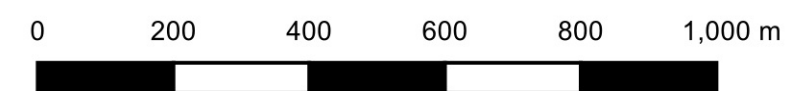
**ADVERTISED PLAN**

Client: Umwelt (Australia) Pty Ltd

Drawn by: XL

Checked by:TE

Dated: October 2025



Resonate

This document to be made available for the sole purpose of enabling consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

# Predicted noise level for Night period, with 6m high noise wall around entire site

## Predicted noise level, dB(A) Leq

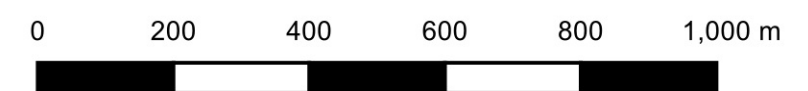
- 35 - 39 dB(A)
- 39 - 43 dB(A)
- 43 - 47 dB(A)
- 47 - 51 dB(A)
- 51 - 55 dB(A)
- > 55 dB(A)

## Legend

- Receiver
- Noise protection wall
- Battery container
- Substation transformer

## ADVERTISED PLAN

Client: Umwelt (Australia) Pty Ltd  
Drawn by: XL  
Checked by:TE  
Dated: October 2025



Resonate

This document to be made available for the sole purpose of enabling consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

## Appendix C Proposed noise barriers

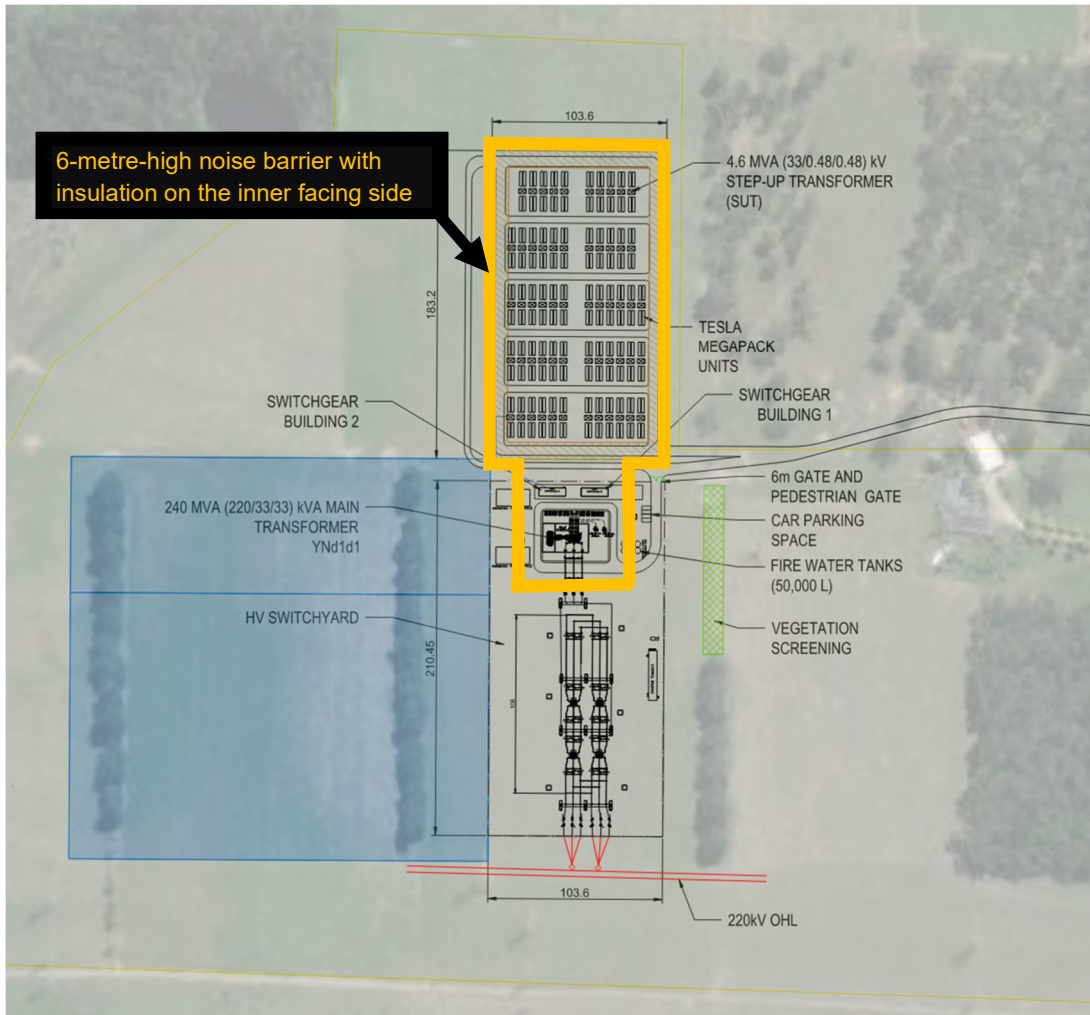


Figure C.1 Noise barrier surrounding substation transformer and BESS.

**ADVERTISED  
PLAN**

This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright



Figure C.2 Localised noise barrier at host dwelling (NSA R1).

**ADVERTISED  
PLAN**

This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright

## Appendix D Sound Power Spectra

Tables D1 to D3 present sound power spectra corresponding to overall sound power levels presented in Table 6.

Table D1 Sound power level spectrum for fan duty: PE fan 20% and battery fan 100%

| Sound power level in dB at octave band centre frequency (Hz) |     |     |      |      |      |      | Overall, dB(A) |
|--------------------------------------------------------------|-----|-----|------|------|------|------|----------------|
| 125                                                          | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                |
| 82                                                           | 94  | 85  | 83   | 81   | 76   | 65   | 89             |

Table D2 Sound power level spectrum for fan duty: PE fan 20% and battery fan 60%

| Sound power level in dB at octave band centre frequency (Hz) |     |     |      |      |      |      | Overall, dB(A) |
|--------------------------------------------------------------|-----|-----|------|------|------|------|----------------|
| 125                                                          | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                |
| 77                                                           | 89  | 80  | 78   | 76   | 71   | 60   | 84             |

Table D3 Sound power level spectrum for fan duty: PE fan 20% and battery fan 40%

| Sound power level in dB at octave band centre frequency (Hz) |     |     |      |      |      |      | Overall, dB(A) |
|--------------------------------------------------------------|-----|-----|------|------|------|------|----------------|
| 125                                                          | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                |
| 72                                                           | 84  | 75  | 73   | 71   | 66   | 55   | 79             |

The sound power spectrum distributions for MV transformer and substation transformer were calculated based on transformer sound spectra measured for previous BESS projects and are presented in D4 and D5, respectively.

Table D4 Sound power level for MV transformer

| Sound power level in dB(A) at octave band centre frequency (Hz) |     |     |     |      |      |      |      | Overall, dB(A) per transformer |
|-----------------------------------------------------------------|-----|-----|-----|------|------|------|------|--------------------------------|
| 63                                                              | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                                |
| 43                                                              | 55  | 66  | 64  | 77   | 74   | 68   | 56   | 80                             |

Table D5 Sound power level for substation transformer

| Sound power level in dB(A) at octave band centre frequency (Hz) |     |     |     |      |      |      |      | Overall, dB(A) |
|-----------------------------------------------------------------|-----|-----|-----|------|------|------|------|----------------|
| 63                                                              | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                |
| 70                                                              | 92  | 83  | 82  | 78   | 69   | 70   | 75   | 93             |

**ADVERTISED  
PLAN**