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BayWa r.e.

Wimmera Plains Energy Facility

Noise Impact Assessment

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Noise Impact Assessment

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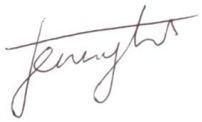

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

Acronyms	Description
BESS	Battery Energy Storage System
dB	Decibel, a derived unit used to express values on a logarithmic scale. In acoustics, the dB scale is used to measure sound pressure and sound power levels, each of which are related to a standard reference point to allow comparison between measurements.
dB(A)	dB(A) denotes a single number sound pressure level that includes a frequency weighting ("A-weighting") to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).
DEECA	Department of Energy, Environment and Climate Action (formerly DELWP)
DELWP	Department of Environment, Land, Water and Planning (now DEECA and DTP)
DTP	Department of Transport and Planning (formerly DELWP)
EP Act	*Environmental Protection Act 2017*.
EP Regulations	*Environment Protection Regulations 2021*.
Host Dwelling	Dwellings whose owners are hosting Project infrastructure or have entered into a wind turbine noise agreement (as defined in Part 5.3 Division 5 Clause 131A of the EP Regulations) in relation to the Project. The word 'Host' may also be defined as 'Associated', 'Stakeholder' or 'Involved'
Hz	Hertz - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz
L_{Aeq}	Time averaged A-weighted equivalent continuous sound pressure level.
L_{A90}	A-weighted sound pressure level which is exceeded for 90% of the measurement period. Often referred to as the Background noise level.
Non-host Dwelling	All other dwellings which are not Host Dwellings
NML	Noise Monitoring Location
SWL	Sound Power Level - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment
SPL	Sound Pressure Level - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from LW in that this is the received sound as opposed to the sound 'intensity' at the source
The Guidelines	Planning Guidelines for Development of Wind Energy Facilities (DTP, 2023)
The Standard	NZS 6808:2010 Acoustics – Wind Farm Noise (Standards New Zealand, 2010)

EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by BayWa r.e. Projects Australia Pty Ltd (BayWa) to facilitate a planning permit amendment required to support the development and delivery of the Wimmera Plains Energy Facility, herein referred to as "the Project".

The Project comprises the planning and development, construction, operation and decommissioning of a wind energy facility and BESS with generating capacity of up to 312 MW connected to the existing electricity network. The facility will connect to the national electricity grid at the 220 kV power line which currently transverses the site.

The Project will be affected by the following key noise sources:

- 52 wind turbines;
- 1 Battery Energy Storage System (BESS) and
- 1 Substation.

This Noise Impact Assessment (NIA) has been conducted in accordance with the following Victorian legislation and guidelines:

- Environment Protection Act 2017 (Victorian Government, 2017)
- Environment Protection Regulations 2021 (Victorian Government, 2021)
- Planning Guidelines for Development of Wind Energy Facilities (DTP, 2023)
- NZS 6808:2010 Acoustics – Wind Farm Noise (Standards New Zealand, 2010)
- Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues - Publication 1826 (EPA Victoria, 2021)

Two different noise models were created to assess the following, due to the different criteria being applicable to different Project components:

- Wind turbine noise
- BESS and Substation noise

Noise modelling was undertaken with ISO 9613-2:1996 algorithms implemented into the environmental noise propagation software, SoundPLAN 9.

Wind turbine noise from the proposed layout of 52 WTGs was modelled with Serrated Trailing Edge (STE) technology and higher modes (lower rated power output) applied to specific wind turbines. Out of the 52 wind turbines, 19 wind turbines were modelled under Mode 0 (5700 kW), 26 wind turbines were modelled under Mode 0 with STE technology and 7 wind turbines were modelled under Mode 10 (4960) with STE technology. The applicable modes and STE technology were determined through preliminary noise modelling, based on compliance with the Project wind turbine noise limits being achieved.

The highest predicted noise levels (at any hub-height wind speed) at the nearest dwellings (Stakeholder and Non-stakeholder) were assessed against the applicable base (minimum) limits. The modelled wind turbine noise results indicate that compliance with the applicable Project wind turbine criteria is predicted at all dwellings.

Noise from the BESS and Substation were modelled based on conservative assumptions on sound power levels for the battery containers (with integrated inverters), medium voltage transformers and high voltage transformers. The modelled BESS and Substation noise results indicate that compliance with the applicable Project noise criteria is predicted at all dwellings.

Should the wind turbine, BESS and Substation layout and the final equipment selections deviate from this assessment significantly (major shifts in separation distances from equipment to dwellings, increase in equipment quantities or increase in equipment sound power levels used in this assessment), an updated noise assessment of the final layout and equipment selections would be required to assess compliance with the applicable Project noise criteria.

1. INTRODUCTION

1.1 OVERVIEW

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by BayWa r.e. Projects Australia Pty Ltd (BayWa) to facilitate a planning permit amendment required to support the development and delivery of the Wimmera Plains Energy Facility, herein referred to as "the Project".

In support of this amendment to the existing planning permit, this Noise Impact Assessment (NIA) has been prepared.

Operational wind turbine noise associated with the Project is assessed in accordance with:

- New Zealand Standard NZS6808:2010, Acoustics - Wind Farm Noise (Standards New Zealand, 2010) (the Standard), as required by Part 5.3 Division 5 of the Environment Protection Regulations 2021 (the Regulations) and
- Publication 2061: Wind Energy Facility Turbine Noise Regulation Guidelines (EPA Victoria, 2021).

Operational Battery Energy Storage System and Substation noise associated with the Project is assessed in accordance with:

- Environment Protection Regulations 2021 under the Environment Protection Act 2017 (Victorian Legislation, 2021) and
- Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues, Publication 1826 (EPA Victoria, 2021)

The wind turbines, BESS and the Substation would be the only Project noise sources with the potential to generate operational noise impacts to the nearest sensitive receivers in the surrounds of the Project.

1.2 EXISTING PLANNING PERMIT

Ministerial Planning Permit no. PA2000877 was issued on 20 July 2021 for the '*Use and development of the land for a wind energy facility and utility installation, the removal of native vegetation, the creation and alteration of access to a Road Zone Category 1 and the construction of business identification signage*'.

This existing planning permit generally allows for the following:

- A maximum of 52 wind turbines
- Associated permanent infrastructure, including two substations, overhead power lines, underground cabling, internal access tracks and four permanent met masts;
- Associated temporary infrastructure, including a construction compound and two concrete batching plants;
- Road upgrades, including roads that intersect with Henty Highway;
- Up to 0.296 hectares of native vegetation removal; and
- Display for business identification signage.

Also of relevance to the proposed amendment is Ministerial Planning Permit No. PA1800346 that was issued on 8 October 2018 for the '*Use and development of a wind energy facility with associated works and removal of native vegetation'*, which allowed for a maximum of two wind turbines on a single parcel of land that adjoins the boundary of land associated with Planning Permit no. PA2000877. This permit has now expired. The land associated with this permit is hereafter referred to as the 'Jung' land.

1.3 PROPOSED CHANGES AS PART OF THE AMENDMENT

The application to amend Planning Permit no. PA2000877 is made on the basis of the following key changes:

- Inclusion of the 'Jung' land – this land is to accommodate ancillary components of the Project (no wind turbines);
- Inclusion a Battery Energy Storage System (BESS) facility (defined as a Utility Installation within the Horsham Planning Scheme);
- Changes to the specifications of the proposed wind turbines, including:
  - Reduction of the minimum blade tip clearance to 44 metres (from the originally approved 75 metres); and
  - Increases to the maximum rotor diameter to 180 metres (from the originally approved 162 metres).
- Increases to the amount of native vegetation removal within the Project boundary to 0.951 ha (from the originally approved 0.296 hectares); and
- Changes to locations of ancillary infrastructure within the site, including:
  - Re-location of permanent infrastructure such as the switchyard, substation, operations and maintenance building; and
  - Re-location of temporary infrastructure such as the concrete batching plant, construction compound and laydown areas.

The number of wind turbines and the locations in which they were originally approved are not proposed to change as part of this application.

2. SITE CONTEXT

2.1 SUBJECT SITE

The Project is to be located in the Wimmera region of Western Victoria, approximately 3 km north-west of the township of Jung and 6 km north of Dooen. The Project is situated entirely within the Horsham Rural City Council Local Government Area (LGA) with a total Project site of approximately 3,800 hectares (ha).

The Project site is bounded by Kalkee East Road and Mokepilly Road to the north, Dogwood Road, Dooen-North Road and Kelly Road to the west, Ladlows Road and Johns Road to the south and Jung Wheat Road and Jung North Road to the east.

Situated within the Wimmera Plains, the site is predominantly flat and lies at an approximate average elevation of 140 metres Australian Height Datum (AHD). The landscape is characterised by large agricultural fields (wheat and canola) and treeless or planted road reserves. Native vegetation is limited to low-quality linear road reserves of degraded natural and derived plains savannah and grassland, with infrequent scattered trees (River Red-gum, Buloke, and introduced Sugar Gum) or small Buloke woodlands with a mostly non-native understorey occurring in pockets on private land.

2.2 LOCATIONAL CONTEXT

The area within and immediately surrounding the Project site is sparsely populated with a number of small townships located within approximately 10 km from the site, including Jung and Dooen, with each town having a population of less than 250 people. Horsham is the largest regional centre within proximity of the site, located approximately 12 km south of the Project. Refer to **Figure 2-1** for the locational context of the site.

The area immediately surrounding the site is primarily utilised for broad acre cropping and some quarrying activity. Further afield there are small pockets dedicated to other land uses, such nature reserves and townships, however these areas make up a very small component of the broader region surrounding the Project, which is dominated by agriculture.

The Avonbanks Mineral Sands project is proposed to the south of the Project site. The report and decision on the proposal (following public enquiry) is awaiting release. The Project is planned on land located entirely outside the Avonbanks project area, mineral resource area and mine footprint.

3. SENSITIVE RECEPTORS

Dwellings whose owners are hosting Project infrastructure or have entered into a wind turbine noise agreement (as defined in Part 5.3 Division 5 Clause 131A of the EP Regulations) in relation to the Project are referred to as Stakeholder Dwellings, with all other dwellings referred to as Non-stakeholder Dwelling.

As per the requirements of Clause 52.32-3, there are no Non-stakeholder dwellings within 1 km of a proposed turbine location, with the only dwelling (Dwelling ID no.4) within 1 km having consented to this within the previous planning permit application.

Table 3-1 lists the Stakeholder and Non-stakeholder Dwellings assessed and provides their respective distances to the nearest wind turbine. Dwellings located within 10 km of any Project wind turbine are considered to be within the area of influence by the Project for noise and are listed. It should be noted that the distances of the wind turbines from these dwellings remain unchanged as part of this amendment from the original planning permit application.

TABLE 3-1 STAKEHOLDER AND NON-STAKEHOLDER DWELLINGS (BY DISTANCE TO NEAREST WIND TURBINE)

Dwelling ID	Dwelling Type	Coordinates (GDA 2020 Zone 54)		Distance to Nearest wind turbine (m)	Nearest wind turbine (no.)
		X, m	Y, m		
4	Stakeholder	614867	5951583	657	41
3	Stakeholder	613143	5953314	1012	43
18	Stakeholder	617633	5956569	1048	33
1	Stakeholder	614683	5950101	1120	7
6	Non-stakeholder	613536	5948867	1170	54
5	Non-stakeholder	614762	5950924	1172	7
63	Stakeholder	609525	5950816	1337	48
61	Stakeholder	611026	5951627	1377	48
8	Non-stakeholder	620871	5949576	1388	1
19	Non-stakeholder	615046	5955633	1424	35
7	Non-stakeholder	620832	5949409	1452	1
39	Non-stakeholder	617297	5957730	1472	33
11	Non-stakeholder	621535	5953066	1515	15
58	Stakeholder	621646	5951665	1550	15
14	Non-stakeholder	619632	5954743	1593	30
2	Non-stakeholder	619626	5954517	1741	30
12	Non-stakeholder	620948	5953943	1759	26

Dwelling ID	Dwelling Type	Coordinates (GDA 2020 Zone 54)		Distance to Nearest wind turbine (m)	Nearest wind turbine (no.)
		X, m	Y, m		
9	Non-stakeholder	621445	5950021	1779	1
10	Stakeholder	621813	5951460	1791	15
38	Non-stakeholder	615424	5957939	1903	33
22	Stakeholder	611823	5947355	2026	51
17	Non-stakeholder	620310	5956485	2040	30
84	Non-stakeholder	607509	5948109	2055	53
73	Non-stakeholder	608005	5949963	2055	53
60	Stakeholder	608041	5947051	2111	53
71	Non-stakeholder	607522	5949538	2215	53
40	Non-stakeholder	616448	5958725	2293	33
16	Non-stakeholder	620955	5955524	2561	30
66	Non-stakeholder	608385	5951289	2571	48
62	Stakeholder	610840	5952878	2588	43
42	Non-stakeholder	620421	5957478	2651	30
80	Non-stakeholder	607624	5946412	2864	53
36	Stakeholder	611600	5954903	2910	35
83	Non-stakeholder	606712	5947601	2961	53
15	Non-stakeholder	621335	5955324	2963	30
64	Non-stakeholder	608509	5945624	3108	53
21	Non-stakeholder	613465	5946491	3224	54
81	Non-stakeholder	607614	5945948	3234	53
69	Non-stakeholder	610077	5945248	3366	53
68	Non-stakeholder	607148	5951008	3399	53
44	Non-stakeholder	620146	5958881	3577	30
43	Non-stakeholder	621223	5958053	3636	30
37	Non-stakeholder	613026	5957808	3753	35
72	Non-stakeholder	608822	5953637	3873	48
54	Non-stakeholder	623523	5949754	3874	1

Dwelling ID	Dwelling Type	Coordinates (GDA 2020 Zone 54)		Distance to Nearest wind turbine (m)	Nearest wind turbine (no.)
		X, m	Y, m		
55	Non-stakeholder	623281	5948555	3995	1
86	Non-stakeholder	610909	5956470	4137	35
70	Non-stakeholder	608956	5944442	4161	53
53	Non-stakeholder	623820	5949670	4180	1
41	Non-stakeholder	622554	5956546	4224	30
56	Non-stakeholder	623634	5948677	4268	1
20	Non-stakeholder	616358	5945962	4415	7
32	Non-stakeholder	611880	5944663	4455	52
57	Non-stakeholder	624178	5950010	4475	13
26	Non-stakeholder	621474	5946129	4539	1
117	Non-stakeholder	624974	5952069	4749	15
85	Non-stakeholder	604755	5948697	4759	53
82	Non-stakeholder	608012	5944023	4784	53
65	Non-stakeholder	606303	5944962	4826	53
102	Non-stakeholder	604635	5949002	4896	53
34	Non-stakeholder	612506	5944399	4951	52
67	Non-stakeholder	605800	5945244	4981	53
33	Non-stakeholder	612540	5944300	5055	52
103	Non-stakeholder	604478	5949454	5111	53
52	Non-stakeholder	618027	5961380	5147	33
24	Non-stakeholder	619411	5945146	5163	1
46	Non-stakeholder	615691	5961534	5176	33
35	Non-stakeholder	612507	5944097	5223	52
27	Non-stakeholder	622553	5945830	5311	1
112	Non-stakeholder	620269	5960799	5376	30
51	Non-stakeholder	618939	5961378	5470	33
106	Non-stakeholder	609158	5955853	5491	43
104	Non-stakeholder	607861	5954959	5500	48

Dwelling ID	Dwelling Type	Coordinates (GDA 2020 Zone 54)		Distance to Nearest wind turbine (m)	Nearest wind turbine (no.)
		X, m	Y, m		
48	Non-stakeholder	612011	5959521	5523	33
25	Non-stakeholder	619495	5944397	5908	1
105	Non-stakeholder	608499	5955761	5927	48
45	Non-stakeholder	623025	5959573	5993	30
49	Non-stakeholder	617396	5962521	6137	33
116	Non-stakeholder	606039	5943454	6180	53
31	Non-stakeholder	614909	5943603	6419	54
78	Non-stakeholder	622667	5960612	6461	30
50	Non-stakeholder	621723	5961365	6517	30
47	Non-stakeholder	613307	5962131	6574	33
114	Non-stakeholder	624535	5958175	6591	30
100	Non-stakeholder	603250	5946468	6604	53
30	Non-stakeholder	617965	5943714	6675	2
101	Non-stakeholder	603296	5945946	6746	53
115	Non-stakeholder	608162	5941947	6755	53
107	Non-stakeholder	608523	5957586	6763	35
113	Non-stakeholder	624815	5959312	7331	30
28	Non-stakeholder	618061	5943032	7336	2
29	Non-stakeholder	618071	5942850	7515	2
74	Non-stakeholder	613323	5963499	7782	33
108	Non-stakeholder	609071	5960102	7888	35
111	Non-stakeholder	609216	5961325	8733	35
110	Non-stakeholder	609681	5961898	8809	33
109	Non-stakeholder	610032	5962638	9027	33
75	Non-stakeholder	621382	5965014	9724	30
77	Non-stakeholder	618769	5966114	9918	33

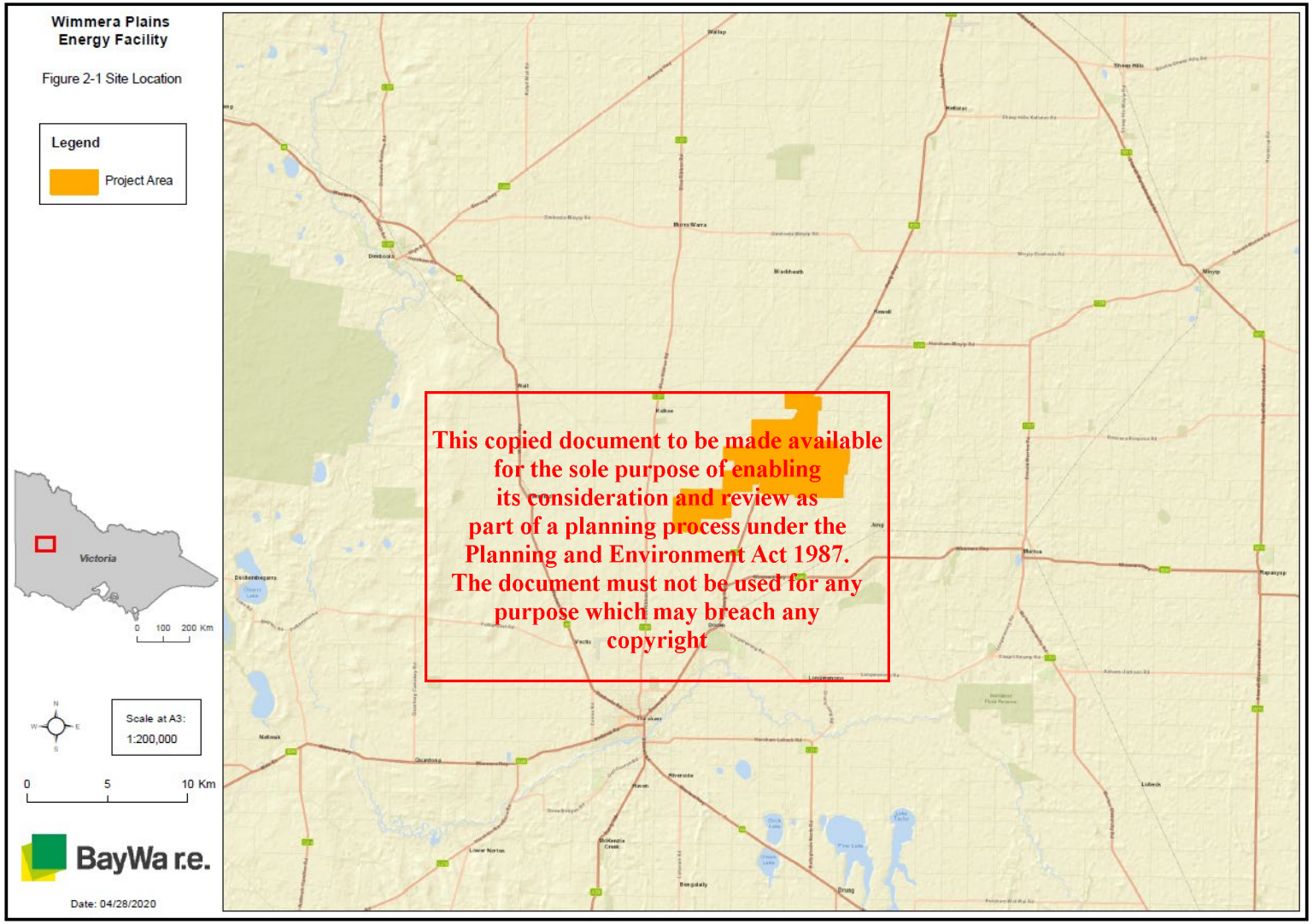


FIGURE 2-1 SITE LOCATION

4. PROJECT DESCRIPTION

The Project comprises the planning and development, construction, operation and decommissioning of a wind energy facility and BESS with generating capacity of up to 312 MW connected to the existing electricity network. The facility will connect to the national electricity grid at the 220 kV power line which currently transverses the site.

The Project is to consist of the following key elements:

- 52 wind turbines;
- Turbine foundations;
- Hard stand areas;
- Two onsite substations;
- One onsite BESS;
- Underground cable reticulation;
- Construction compound, including site offices, storage and carparking;
- Concrete batching plants and temporary water supply infrastructure; and
- One meteorological mast.

The proposed Project site layout plan with development footprint is provided in **Figure 3-1**. An indicative elevation of the proposed wind turbine displaying a hub-height of 157m (maximum blade tip clearance of 247m – blade length of 90m) and a 180m rotor diameter is provided in **Figure 3-2**.

Wimmera Plans Energy Facility

Figure 3-1 Site Plan

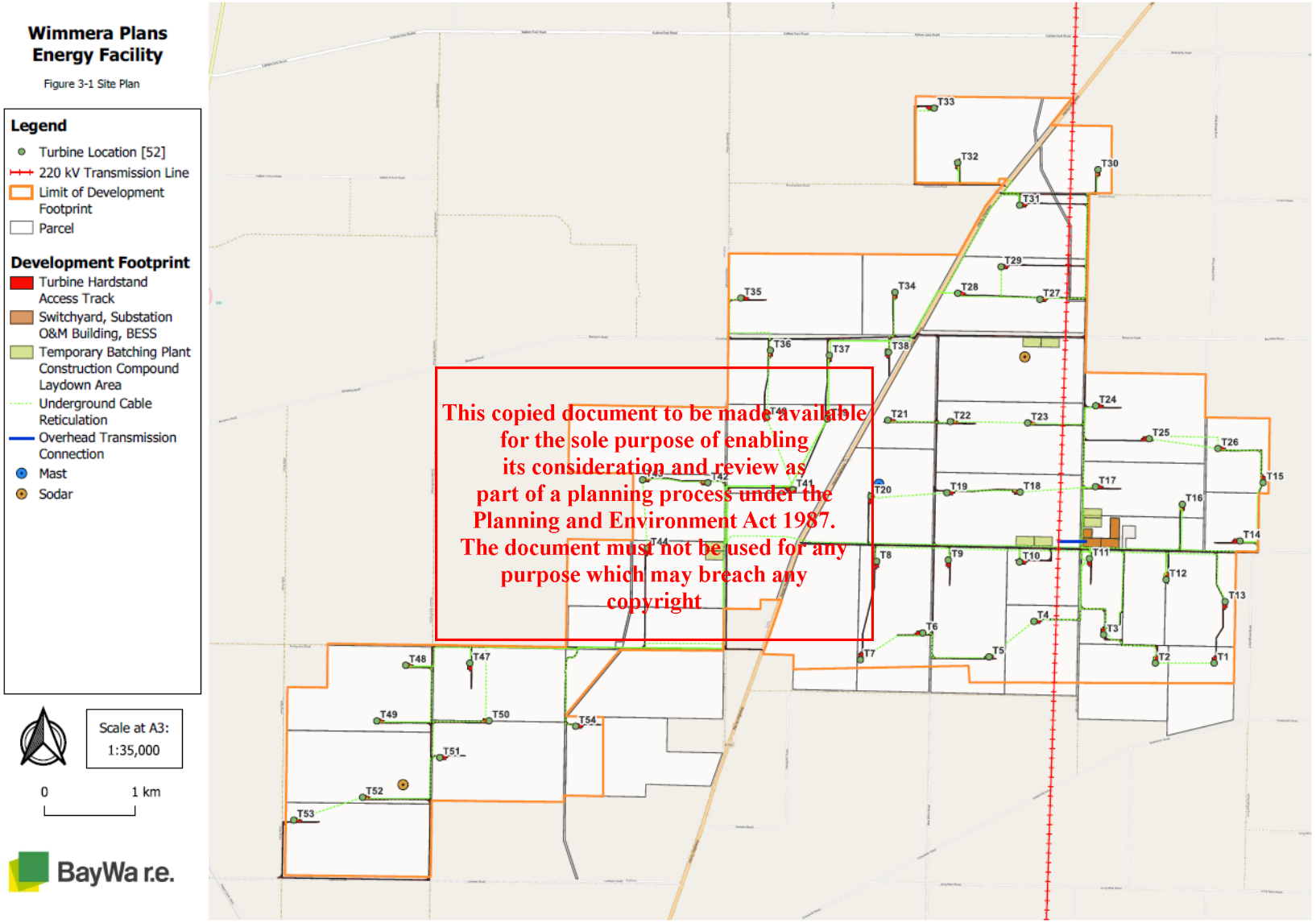


FIGURE 4-1 SITE LAYOUT PLAN

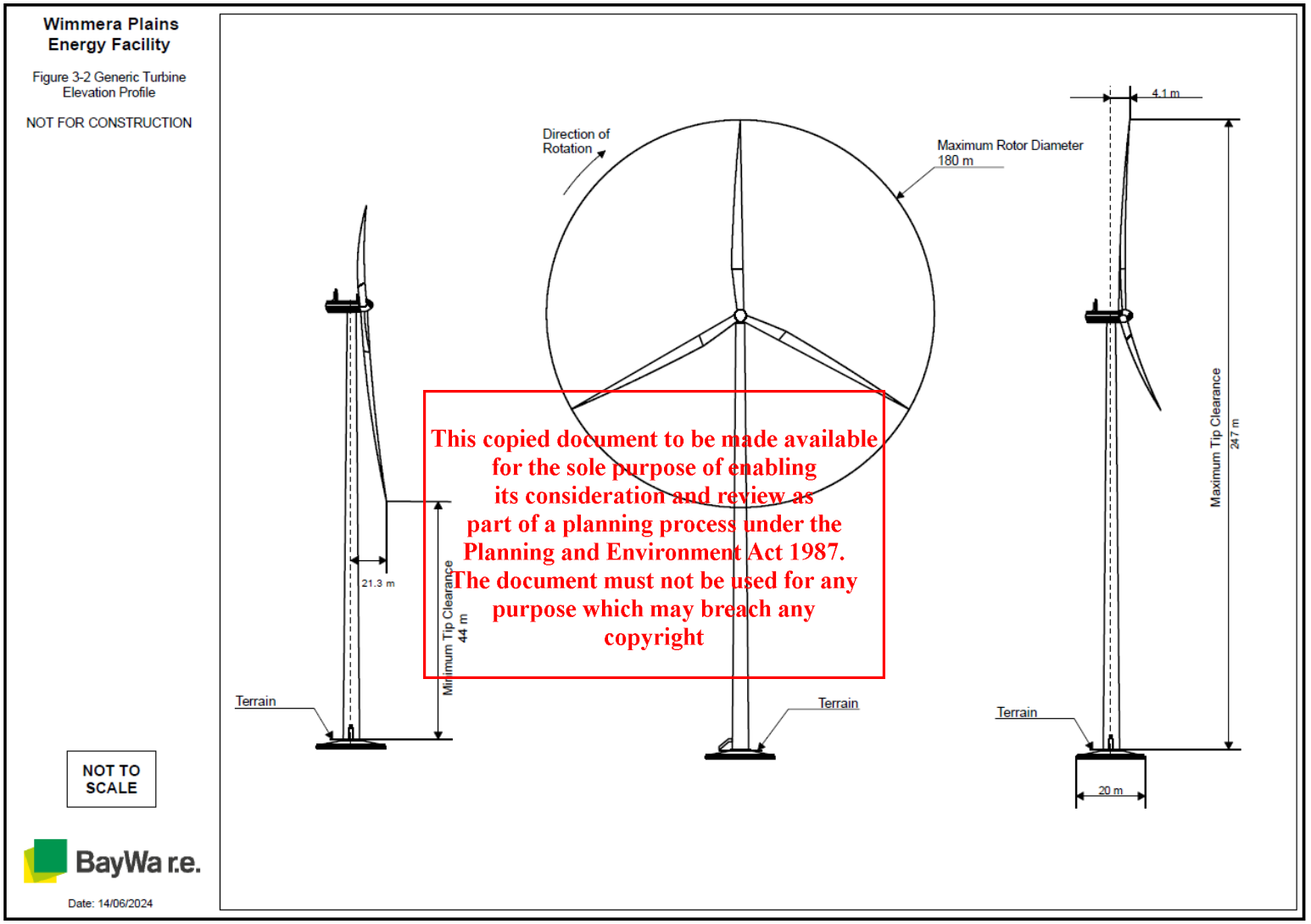


FIGURE 4-2 WIND TURBINE ELEVATION DRAWING

5. LEGISLATION AND GUIDELINES

This NIA has been conducted in accordance with the following documents:

- Environment Protection Act 2017 (Victorian Government, 2017);
- Environment Protection Regulations 2021 (Victorian Government, 2021) (incorporating amendments as at 8 November 2023);
- Planning Guidelines for the Development of Wind Energy Facilities (DTP, 2023) and
- New Zealand Standard NZS6808:2010 Acoustics – Wind Farm Noise (Standards New Zealand, 2010)
- Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues - Publication 1826 (EPA Victoria, 2021)

The legislation and guidelines above are discussed in the following sub-sections.

5.1 ENVIRONMENT PROTECTION ACT 2017

The *Environment Protection Act 2017* (the EP Act) (Victorian Government, 2017) provides the overarching legislative framework for the protection of the environment in Victoria.

The EP Act establishes a general environmental duty to minimise the risks of harm to human health or the environment from pollution or waste, including noise related amenity impacts, so far as reasonably practicable.

5.2 ENVIRONMENT PROTECTION REGULATIONS 2021

The *Environment Protection Regulations 2021* (the EP Regulations) (Victorian Government, 2021) give effect to the EP Act by establishing prescriptive requirements for a range of environmental considerations including noise. The EP Regulations were amended on 18 October 2022 to specify matters in relation to wind turbine noise from wind energy facilities (Victorian Government, 2022).

Part 5.3 Division 5 Clause 131A of the EP Regulations states that an owner or operator of a wind energy facility and a relevant landowner may enter into a written agreement regarding noise limits with which the wind turbine noise from that facility must comply (wind turbine noise agreement).

Part 5.3 Division 5 Clause 131B of the EP Regulations sets New Zealand Standard 6808:2010 Acoustics – Wind farm noise (the Standard) (Standards New Zealand, 2010) as the relevant standard for assessing wind energy facilities in Victoria on or after 1 January 2011.

Part 5.3 Division 5 Clause 131BA of the EP Regulations states that if a wind energy facility is the subject of a wind turbine noise agreement, the noise limit for that facility in relation to noise emissions to the premises of the relevant landowner is—

- if the agreement is made before 1 November 2021, the noise limit specified in the agreement or
- if the agreement is made on or after 1 November 2021, the noise limit that is the greater of—
  - 45 dB(A); or

- the background sound level plus 5 dB

Dwellings with a wind turbine noise agreement are identified as Stakeholder Dwellings in this NIA.

5.3 PLANNING GUIDELINES FOR THE DEVELOPMENT OF WIND ENERGY FACILITIES

Planning Guidelines for the Development of Wind Energy Facilities, September 2023 (the Guidelines) (DTP, 2023) provide advice to responsible authorities, proponents and the community about suitable sites to locate wind energy facilities and to inform planning decisions about a wind energy facility proposal.

Section 5.1.2 of the Guidelines details information relating to the amenity of areas surrounding a wind energy facility and addresses noise. Consistent with the EP Regulations, it states that a wind energy facility should comply with the Standard (NZS6808:2010), which is discussed in the following sub-section.

Consistent with the EP Regulations, a 45-decibel limit (45 dB $L_{A90(10min)}$) is recommended in the Guidelines for stakeholder dwellings. A stakeholder dwelling is a dwelling located on the same land as the wind energy facility, or one that has an agreement with the wind energy facility to exceed the noise limit. Stakeholder dwellings are referred to as Host Dwellings in this Preliminary NIA.

5.4 NEW ZEALAND STANDARD 6808:2010 ACOUSTICS – WIND FARM NOISE

New Zealand Standard 6808:2010 Acoustics – Wind farm noise (the Standard) (Standards New Zealand, 2010) provides methods for the prediction, measurement, and assessment of sound from wind turbines.

The Standard specifies a general 40 decibel limit (40 dB $L_{A90(10min)}$) for wind energy facility sound levels outdoors at noise sensitive locations, or that the sound level should not exceed the background sound level by more than 5 decibels (referred to as 'background sound level +5 dB'), whichever is the greater.

Under Section 5.3 of the Standard, a 'high amenity noise limit' of 35 decibels may be justified in special circumstances. All wind energy facility applications must be assessed using Section 5.3 of the Standard to determine whether a high amenity noise limit is justified for specific locations, following procedures outlined in Section 5.3.1 of the Standard.

Guidance can be found on this issue in the Victorian Civil and Administrative Tribunal (VCAT) determination for the Cherry Tree Wind Farm. ERM has reviewed the VCAT determination for Cherry Tree Wind Farm (VCAT, 2013) and the zoning in the Golden Plains Shire Planning Scheme which is applicable to the Project. The scheme does not specify the Farming Zone or any other zone in the vicinity of the Project as promoting a higher degree of protection of amenity related to the sound environment. Therefore, no high amenity noise limit is triggered by the underlying zones affecting the subject site in response to the requirements of Section 5.3 of the Standard.

Noise sensitive locations are defined by the Standard as the location of a noise sensitive activity, associated with a habitable space or education space in a building not on a wind farm site. These locations are classified as 'Non-stakeholder Dwellings' in this NIA.

Section 5.4.2 of the Standard also requires that wind turbine sound levels with special audible characteristics (such as tonality, impulsiveness and amplitude modulation) shall be adjusted by arithmetically adding up to +6dB to the measured level at the noise sensitive location. Therefore, the Standard accounts for special audible characteristics at nearby residential properties.

5.5 NOISE PROTOCOL

The EP Regulations includes a reference document called *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*. This 'Noise Protocol' outlines Environment Protection Authority's (EPA) required approach to the determination of noise limits and to the measurement, prediction, and analysis of noise. The Noise Protocol is used to assess BESS and Substation noise in this NIA.

6. APPLICABLE NOISE LIMITS

6.1 WIND TURBINE NOISE

The applicable noise limits for dwellings in the NIA are based on the EP Act, EP Regulations, the Guidelines and the Standard as discussed in Section 4 and are summarised in Table 5-1.

TABLE 5-1 APPLICABLE NOISE LIMITS

Dwelling	Description	Noise Limit
Stakeholder	Dwellings whose owners are hosting Project infrastructure or have entered into a wind turbine noise agreement (as defined in Part 5.3 Division 5 Clause 131A of the EP Regulations) in relation to the Project. The word 'Host' may also be defined as 'Associated', 'Stakeholder' or 'Involved'.	45 dB or background L_{A90} + 5 dB, whichever is the greater
Non-stakeholder	All other dwellings	40 dB or background L_{A90} + 5 dB, whichever is the greater

Dwellings whose owners are hosting Project infrastructure or have entered into a wind turbine noise agreement (as defined in Part 5.3 Division 5 Clause 131A of the EP Regulations) in relation to the Project are referred to as Stakeholder Dwellings with all other dwellings referred to as Non-stakeholder Dwellings.

Non-stakeholder Dwellings 5 and 19

Operational noise limits were determined for Non-stakeholder Dwellings 5 and 19 in 2020 through background noise monitoring and regression analysis of collected noise data with hub-height wind speeds (Marshall Day, 2020). Post approval, these operational noise limits would also be able to be used to assess measured noise levels obtained from compliance noise monitoring after the wind farm commences operation. These limits are presented in **Appendix A**. It should be noted these limits provide a relaxation of operational wind turbine noise limits at high hub-height wind speeds (12m/s for Dwelling 5 and 9 m/s to 12m/s for Dwelling 19, for a 24 hour period). Notwithstanding this, the base limit of L_{A90} 40 dB for Non-stakeholder dwellings still apply to both dwellings for this assessment, for a worst-case wind turbine noise assessment.

6.2 BESS AND SUBSTATION NOISE

Noise limits for the nearest noise sensitive areas were determined in accordance with the methodology stipulated in the Noise Protocol (EPA Victoria, 2021).

The zoning level was determined for each period using the method provided in the Noise Protocol. In order to determine the zoning level, the Horsham Planning Scheme was used. The Project site and the sensitive receptors identified in Section 3 are entirely within the Farming Zone (FZ). As the noise generator (the Project) and receiver (dwellings) are covered by the same contiguous zone, no adjustments have been made for distance as per the criteria derivation procedure in the Noise Protocol.

The noise limits adopted for the assessment are presented below in Table 6-2.

TABLE 6-2 OPERATIONAL NOISE LIMITS

Receiver	Zone Level $L_{eq\ 30\ minute}$ dB(A) [1,2]			Noise limit $L_{eq\ 30minute}$ dB(A) [1]		
	Day	Evening	Night	Day	Evening	Night
All Receivers	46	41	36	46	41	36

1. *The assessment periods are defined in Environment Protection Regulations 2021 (Victorian Legislation, 2021), and are as follows:*

   a) "day period" - Monday to Saturday (except public holidays), from 7 a.m. to 6 p.m.

   b) "evening period" - (i) Monday to Saturday, from 6 p.m. to 10 p.m.; and (ii) Sunday and public holidays, from 7 a.m. to 10 p.m.

   c) "night period" - 10 p.m. to 7 a.m. the following day.

2. *Generating Zone and Receiving Zone are contiguous as Farming FZ zones.*

7. METHODOLOGY

7.1 NOISE MODEL

Two separate noise models were created to assess the following:

- Wind turbine noise
- BESS and Substation noise

This is due to the different criteria applicable to the Wind Farm, BESS and the Substation as per the legislation and guidelines discussed in Section 5.

Details of the noise model and the modelling parameters used for the assessment are provided in **Table 7-1**.

TABLE 7-1 NOISE MODELLING PARAMETERS

Modelling aspect	Parameter
Noise Modelling Software	SoundPLAN 9
Algorithm	International Standard ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO 9613-2) (Standards Australia, 1996)
Ground Absorption Factor	0.5 (50% acoustically hard ground and 50% acoustically soft ground)
Humidity	70%
Temperature	10°C
Topographical contours	10 m intervals
Receiver height	1.5 m
Wind direction	Downwind – noise level at each receiver is predicted based on being simultaneously downwind of every wind turbine at the site.

Note: Corrections for barrier attenuation being no greater 2 dB have been incorporated into the noise model.

7.2 WIND TURBINE NOISE

The wind farm layout consists of 52 wind turbines and details of the candidate wind turbine are provided in **Table 7-2**.

TABLE 7-2 CANDIDATE WIND TURBINE MODELLING ASSUMPTIONS

Feature	Parameter used
Wind Turbine Model	Nordex N163-5.X (Nordex, 2020)
Hub Height, m	157
Rotor Diameter, m	180
Cut-in wind speed, m/s	3
Cut-out wind speed, m/s	26

Feature	Parameter used
Modelled Highest Sound Power Level, dB(A) *for Mode 0 (5700 kW)*	109.2
Modelled Highest Sound Power Level, dB(A) *for Mode 0 (5700 kW) with Serrated Trailing Edge (STE) technology*	107.2
Modelled Highest Sound Power Level, dB(A) *for Mode 10 (4290 kW) with Serrated Trailing Edge (STE) technology*	101.0

The proposed wind turbine locations as well as the proposed operating conditions and the Serrated Trailing Edge (STE) technology applicable to each individual Nordex N163-5.X wind turbine are provided in **Table 7-3**.

TABLE 7-3 WIND TURBINE LOCATIONS, OPERATING CONDITIONS AND STE TECHNOLOGY

Wind Turbine ID	Coordinates (GDA 2020 Zone 54)		Proposed Operating Conditions and Treatment
	X, m	Y, m	
1	619688	5950302	Mode 0 (5700 kW)
2	619038	5950302	Mode 0 (5700 kW)
3	618466	5950618	Mode 0 (5700 kW)
4	617696	5950769	Mode 0 (5700 kW) and STE Technology
5	617200	5950371	Mode 0 (5700 kW) and STE Technology
6	616467	5950635	Mode 10 (4290 kW) and STE Technology
7	615777	5950339	Mode 10 (4290 kW) and STE Technology
8	615957	5951427	Mode 10 (4290 kW) and STE Technology
9	616748	5951442	Mode 0 (5700 kW) and STE Technology
10	617536	5951419	Mode 0 (5700 kW) and STE Technology
11	618309	5951457	Mode 0 (5700 kW)
12	619157	5951224	Mode 0 (5700 kW)
13	619810	5950981	Mode 0 (5700 kW)
14	619974	5951652	Mode 0 (5700 kW)
15	620230	5952297	Mode 0 (5700 kW)
16	619337	5952057	Mode 0 (5700 kW)
17	618376	5952252	Mode 0 (5700 kW)
18	617543	5952192	Mode 0 (5700 kW) and STE Technology

Wind Turbine ID	Coordinates (GDA 2020 Zone 54)		Proposed Operating Conditions and Treatment
	X, m	Y, m	
19	616733	5952185	Mode 0 (5700 kW) and STE Technology
20	615893	5952147	Mode 10 (4290 kW) and STE Technology
21	616080	5952987	Mode 0 (5700 kW) and STE Technology
22	616771	5952972	Mode 0 (5700 kW) and STE Technology
23	617626	5952957	Mode 0 (5700 kW)
24	618379	5953147	Mode 0 (5700 kW) and STE Technology
25	618970	5952782	Mode 0 (5700 kW) and STE Technology
26	619730	5952674	Mode 0 (5700 kW) and STE Technology
27	617761	5954323	Mode 0 (5700 kW) and STE Technology
28	616853	5954390	Mode 0 (5700 kW) and STE Technology
29	617333	5954683	Mode 0 (5700 kW)
30	618404	5955757	Mode 0 (5700 kW) and STE Technology
31	617538	5955364	Mode 0 (5700 kW) and STE Technology
32	616852	5955834	Mode 0 (5700 kW) and STE Technology
33	616593	5956437	Mode 0 (5700 kW) and STE Technology
34	616159	5954401	Mode 0 (5700 kW) and STE Technology
35	614455	5954338	Mode 0 (5700 kW) and STE Technology
36	614782	5953760	Mode 0 (5700 kW) and STE Technology
37	615434	5953704	Mode 0 (5700 kW) and STE Technology
38	616088	5953738	Mode 0 (5700 kW) and STE Technology
39	615412	5953002	Mode 0 (5700 kW) and STE Technology
40	614737	5953017	Mode 0 (5700 kW) and STE Technology
41	615031	5952219	Mode 10 (4290 kW) and STE Technology
42	614090	5952296	Mode 10 (4290 kW) and STE Technology
43	613368	5952328	Mode 0 (5700 kW) and STE Technology
44	613423	5951573	Mode 10 (4290 kW) and STE Technology
47	611458	5950302	Mode 0 (5700 kW)
48	610749	5950278	Mode 0 (5700 kW)

Wind Turbine ID	Coordinates (GDA 2020 Zone 54)		Proposed Operating Conditions and Treatment
	X, m	Y, m	
49	610429	5949663	Mode 0 (5700 kW)
50	611671	5949664	Mode 0 (5700 kW)
51	611126	5949257	Mode 0 (5700 kW)
52	610273	5948818	Mode 0 (5700 kW)
53	609512	5948566	Mode 0 (5700 kW)
54	612628	5949604	Mode 0 (5700 kW) and STE Technology

The applicable modes and STE technology listed in **Table 7-3** were determined through preliminary noise modelling, based on compliance with the wind turbine noise limits provided in Section 5.1 being achieved.

The 1/3 octave band centre frequency sound power levels at various hub-height wind speeds for the proposed wind turbine - Nordex N163-5.X (Nordex, 2020) at Mode 0 (5700 kW) and without STE technology are provided in **Appendix A**. This spectrum was utilised for all wind turbine noise source inputs in the wind turbine noise model.

7.3 BESS AND SUBSTATION NOISE

Details of the noise modelling assumptions used for the Battery Energy Storage System and the Substation are provided in **Table 7-4**.

TABLE 7-4 BESS AND SUBSTATION MODELLING ASSUMPTIONS

Plant Item	Sound Power Level per Plant Item, L_{eq} dB(A)	Quantity	Location	Notes
Battery Container	101.8 (Day) 98.3 (Evening) 89.8 (Night)	216	BESS Area	• Tesla Megapack 2XL • 2h 9 fan configuration • Fan Duty Cycle: Day – 40%, Evening – 40%, Night – 30% • 1 dB correction added for directionality skew and modelling on top of the container as per manufacturer's advice • Contains an integrated inverter Note: Day -7am to 6pm, Evening – 6pm to 10pm, Night – 10pm to 7am

Plant Item	Sound Power Level per Plant Item, L_{eq} dB(A)	Quantity	Location	Notes
Medium Voltage (MV) Transformer	75	54	BESS Area	• 4.8 MV Transformer
High Voltage (HV) Transformer	107	2	Substation Area	• 160 MVA - 250 MVA transformers • Based on AS2374.6:2003

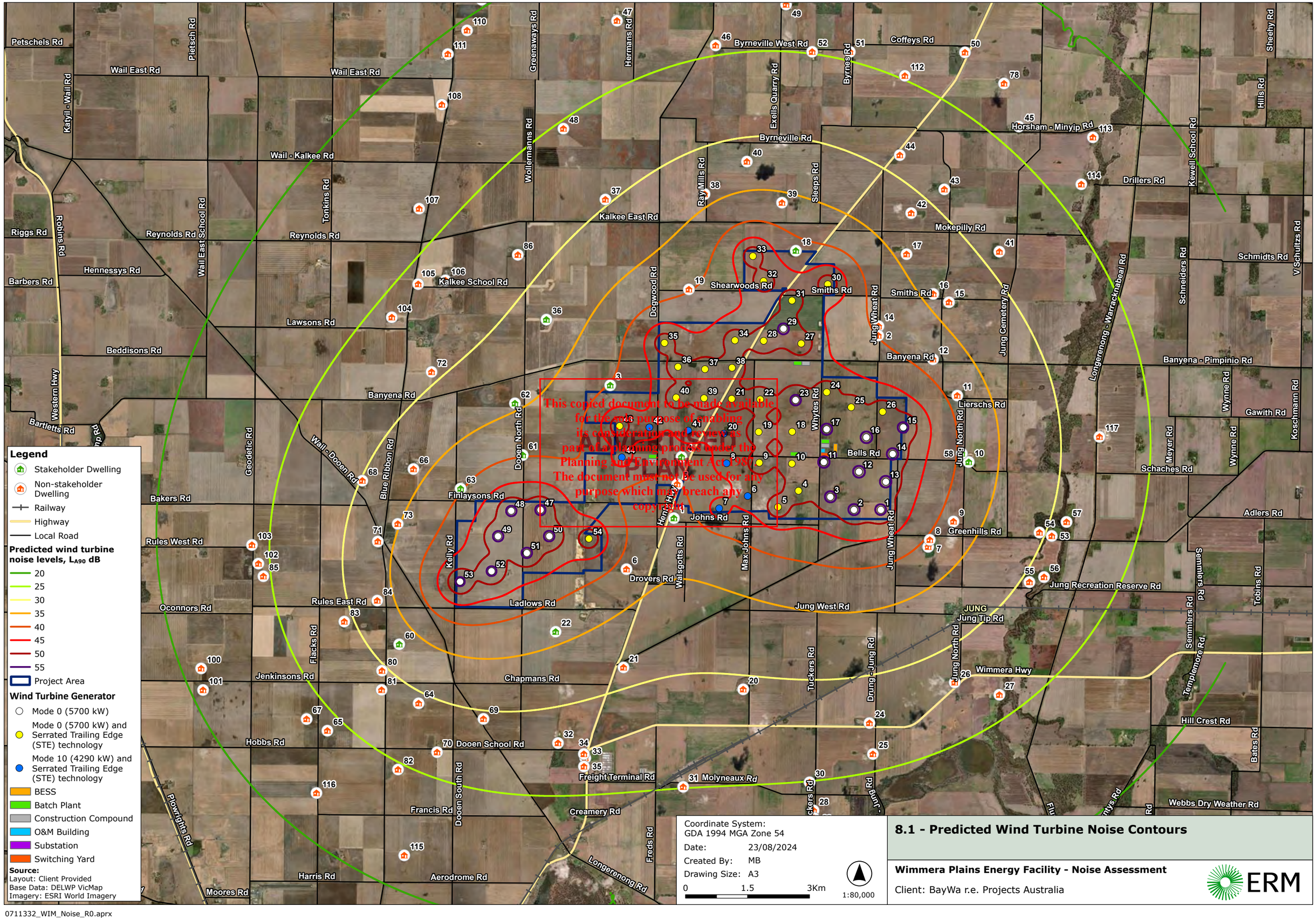
8. ASSESSMENT

8.1 WIND TURBINE NOISE

The predicted highest noise levels at Stakeholder and Non-stakeholder Dwellings are presented in **Table 8-1**. A noise contour map for predicted operational wind turbine noise is provided in **Figure 8-1**.

In accordance with Section 6.2.1 of the Standard, the resultant predicted time-average (L_{eq}) wind farm sound levels occurring at all receptors are taken as the predicted L_{90} wind farm sound levels.

Predicted noise levels comply with the applicable wind turbine noise limits are all Stakeholder and Non-stakeholder dwellings. It should be noted this outcome is predicated on the wind turbine parameters as well as the applied wind turbine modes and STE technology to specific wind turbines detailed in Section 6.2.



Legend

- Stakeholder Dwelling
- Non-stakeholder Dwelling
- Railway
- Highway
- Local Road

Predicted wind turbine noise levels, L_{A90} dB

- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- Project Area

Wind Turbine Generator

- Mode 0 (5700 kW)
- Mode 0 (5700 kW) and Serrated Trailing Edge (STE) technology
- Mode 10 (4290 kW) and Serrated Trailing Edge (STE) technology
- BESS
- Batch Plant
- Construction Compound
- O&M Building
- Substation
- Switching Yard

Source:
Layout: Client Provided
Base Data: DELWP VicMap
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 54
Date: 23/08/2024
Created By: MB
Drawing Size: A3
0 1.5 3Km
1:80,000

8.1 - Predicted Wind Turbine Noise Contours

Wimmera Plains Energy Facility - Noise Assessment

Client: BayWa r.e. Projects Australia

ERM

0711332_WIM_Noise_R0.aprx

TABLE 8-1 PREDICTED NOISE LEVELS AT SENSITIVE RECEPTORS (BY DISTANCE TO NEAREST WIND TURBINE)

Dwelling ID	Dwelling Type	X m	Y m	Highest predicted noise level L90 dB(A)	Base Limit, L90 dB(A)	Exceedance, dB	Distance to nearest wind turbine, m	Nearest wind turbine
4	Stakeholder	614867.2	5951583	42.2	45	-	657	41
3	Stakeholder	613143	5953314	40.3	45	-	1012	43
18	Stakeholder	617632.7	5956569	42	45	-	1048	33
1	Stakeholder	614682.8	5950101	38.1	45	-	1120	7
6	Non-stakeholder	613536.5	5948867	38.2	40	-	1170	54
5	Non-stakeholder	614762.1	5950924	39.9	40	-	1172	7
63	Stakeholder	609524.6	5950816	39.6	45	-	1337	48
61	Stakeholder	611026.1	5951627	39.7	45	-	1377	48
8	Non-stakeholder	620870.9	5949576	39.4	40	-	1388	1
19	Non-stakeholder	615045.9	5955633	39.8	40	-	1424	35
7	Non-stakeholder	620832.2	5949409	38.9	40	-	1452	1
39	Non-stakeholder	617297	5957730	36.3	40	-	1472	33
11	Non-stakeholder	621535.4	5953066	38.4	40	-	1515	15
58	Stakeholder	621645.8	5951665	39.3	45	-	1550	15
14	Non-stakeholder	619632.4	5954743	39.4	40	-	1593	30

Dwelling ID	Dwelling Type	X m	Y m	Highest predicted noise level L90 dB(A)	Base Limit, L90 dB(A)	Exceedance, dB	Distance to nearest wind turbine, m	Nearest wind turbine
2	Non-stakeholder	619625.6	5954517	39.9	40	-	1741	30
12	Non-stakeholder	620948.4	5953943	38.1	40	-	1759	26
9	Non-stakeholder	621445.1	5950021	38	40	-	1779	1
10	Stakeholder	621812.7	5951460	38.3	45	-	1791	15
38	Non-stakeholder	615424	5957939	33.7	40	-	1903	33
22	Stakeholder	611823.2	5947355	36.4	45	-	2026	51
17	Non-stakeholder	620309.7	5956485	34	40	-	2040	30
84	Non-stakeholder	607508.8	5948109	32.9	40	-	2055	53
73	Non-stakeholder	608005.1	5949963	34.7	40	-	2055	53
60	Stakeholder	608041.2	5947051	32.6	45	-	2111	53
71	Non-stakeholder	607521.8	5949538	33.2	40	-	2215	53
40	Non-stakeholder	616448	5958725	32	40	-	2293	33
16	Non-stakeholder	620954.8	5955524	34.1	40	-	2561	30
66	Non-stakeholder	608385.3	5951289	33.5	40	-	2571	48
62	Stakeholder	610839.5	5952878	34.4	45	-	2588	43
42	Non-stakeholder	620421	5957478	31.4	40	-	2651	30
80	Non-stakeholder	607623.5	5946412	29.5	40	-	2864	53

Dwelling ID	Dwelling Type	X m	Y m	Highest predicted noise level L90 dB(A)	Base Limit, L90 dB(A)	Exceedance, dB	Distance to nearest wind turbine, m	Nearest wind turbine
36	Stakeholder	611600	5954903	32.1	45	-	2910	35
83	Non-stakeholder	606712.5	5947601	29.2	40	-	2961	53
15	Non-stakeholder	621335.4	5955324	33.6	40	-	2963	30
64	Non-stakeholder	608509.3	5945624	29.1	40	-	3108	53
21	Non-stakeholder	613464.8	5946491	31.2	40	-	3224	54
81	Non-stakeholder	607614	5945948	28.4	40	-	3234	53
69	Non-stakeholder	610077.3	5945248	29.4	40	-	3366	53
68	Non-stakeholder	607148	5951008	30.1	40	-	3399	53
44	Non-stakeholder	620146	5958881	28.7	40	-	3577	30
43	Non-stakeholder	621223	5958053	28.8	40	-	3636	30
37	Non-stakeholder	613026	5957808	29.6	40	-	3753	35
72	Non-stakeholder	608822.2	5953637	29.4	40	-	3873	48
54	Non-stakeholder	623523.2	5949754	30.4	40	-	3874	1
55	Non-stakeholder	623280.7	5948555	29.4	40	-	3995	1
86	Non-stakeholder	610909.3	5956470	28.4	40	-	4137	35
70	Non-stakeholder	608955.6	5944442	26.4	40	-	4161	53
53	Non-stakeholder	623820.4	5949670	29.5	40	-	4180	1

Dwelling ID	Dwelling Type	X m	Y m	Highest predicted noise level L90 dB(A)	Base Limit, L90 dB(A)	Exceedance, dB	Distance to nearest wind turbine, m	Nearest wind turbine
41	Non-stakeholder	622554	5956546	28.9	40	-	4224	30
56	Non-stakeholder	623633.9	5948677	28.8	40	-	4268	1
20	Non-stakeholder	616358.3	5945962	29.3	40	-	4415	7
32	Non-stakeholder	611879.7	5944663	27.7	40	-	4455	52
57	Non-stakeholder	624178.5	5950010	28.9	40	-	4475	13
26	Non-stakeholder	621474.3	5946129	27.9	40	-	4539	1
117	Non-stakeholder	624973.7	5952069	27.6	40	-	4749	15
85	Non-stakeholder	604755.2	5948697	24.6	40	-	4759	53
82	Non-stakeholder	608011.8	5944023	24.6	40	-	4784	53
65	Non-stakeholder	606303.1	5944962	24.1	40	-	4826	53
102	Non-stakeholder	604635.2	5949002	24.4	40	-	4896	53
34	Non-stakeholder	612505.6	5944399	27	40	-	4951	52
67	Non-stakeholder	605800.1	5945244	23.7	40	-	4981	53
33	Non-stakeholder	612540	5944300	26.7	40	-	5055	52
103	Non-stakeholder	604478.4	5949454	24.1	40	-	5111	53
52	Non-stakeholder	618027	5961380	24.9	40	-	5147	33
24	Non-stakeholder	619410.8	5945146	27.3	40	-	5163	1

Dwelling ID	Dwelling Type	X m	Y m	Highest predicted noise level L90 dB(A)	Base Limit, L90 dB(A)	Exceedance, dB	Distance to nearest wind turbine, m	Nearest wind turbine
46	Non-stakeholder	615691	5961534	24.5	40	-	5176	33
35	Non-stakeholder	612507.4	5944097	26.3	40	-	5223	52
27	Non-stakeholder	622552.9	5945830	26.1	40	-	5311	1
112	Non-stakeholder	620268.7	5960799	24.8	40	-	5376	30
51	Non-stakeholder	618939	5961378	24.6	40	-	5470	33
106	Non-stakeholder	609158	5955853	26.6	40	-	5491	43
104	Non-stakeholder	607861	5954959	25.9	40	-	5500	48
48	Non-stakeholder	612011	5959521	25.3	40	-	5523	33
25	Non-stakeholder	619495.3	5944397	25.8	40	-	5908	1
105	Non-stakeholder	608499.2	5955761	25.8	40	-	5927	48
45	Non-stakeholder	623025	5959573	24	40	-	5993	30
49	Non-stakeholder	617396	5962521	22.9	40	-	6137	33
116	Non-stakeholder	606039.2	5943454	21.6	40	-	6180	53
31	Non-stakeholder	614908.5	5943603	25.1	40	-	6419	54
78	Non-stakeholder	622667	5960612	23	40	-	6461	30
50	Non-stakeholder	621723	5961365	22.8	40	-	6517	30
47	Non-stakeholder	613307	5962131	22.4	40	-	6574	33

Dwelling ID	Dwelling Type	X m	Y m	Highest predicted noise level L90 dB(A)	Base Limit, L90 dB(A)	Exceedance, dB	Distance to nearest wind turbine, m	Nearest wind turbine
114	Non-stakeholder	624534.9	5958175	23.8	40	-	6591	30
100	Non-stakeholder	603249.8	5946468	20.7	40	-	6604	53
30	Non-stakeholder	617964.8	5943714	25	40	-	6675	2
101	Non-stakeholder	603296.1	5945946	20.5	40	-	6746	53
115	Non-stakeholder	608161.7	5941947	21.2	40	-	6755	53
107	Non-stakeholder	608522.9	5957586	23.8	40	-	6763	35
113	Non-stakeholder	624815.5	5959312	22.3	40	-	7331	30
28	Non-stakeholder	618061.1	5943032	23.8	40	-	7336	2
29	Non-stakeholder	618071.2	5942850	23.5	40	-	7515	2
74	Non-stakeholder	613323.5	5963499	20.6	40	-	7782	33
108	Non-stakeholder	609070.5	5960102	21.7	40	-	7888	35
111	Non-stakeholder	609216	5961325	20.6	40	-	8733	35
110	Non-stakeholder	609681.2	5961898	20.3	40	-	8809	33
109	Non-stakeholder	610032	5962638	19.8	40	-	9027	33
75	Non-stakeholder	621382.5	5965014	18.4	40	-	9724	30
77	Non-stakeholder	618768.8	5966114	17.9	40	-	9918	33
79	Non-stakeholder	617958	5966348	17.8	40	-	10004	33

Dwelling ID	Dwelling Type	X m	Y m	Highest predicted noise level L90 dB(A)	Base Limit, L90 dB(A)	Exceedance, dB	Distance to nearest wind turbine, m	Nearest wind turbine
76	Non-stakeholder	621613.2	5965565	17.7	40	-	10319	30

Special Noise Characteristics

Amplitude modulation is an expected characteristic of wind turbine noise and is considered to be taken into account in the sound power levels of the wind turbines and the noise limits used for this NIA. Impulsivity is not expected to occur normally and is typically a result of mechanical or aerodynamic issues with the wind turbines.

Tonality from wind turbines is generally related to rotational equipment in the turbine nacelle. It should be noted that tonal characteristics typically do not occur in well designed and well-maintained wind turbines and if present, they are usually caused by a turbine maintenance issue. Notwithstanding this, tonality was assessed using the methodology described in Appendix B2.1 of the Standard (Standards New Zealand, 2010).

Tonality is defined as when the sound pressure level of 1/3 octave band centre frequency exceeds the level of the adjacent bands on both sides by:

- 5 dB or more if the centre frequency of the band containing the tone is in the range 500 Hz to 10,000 Hz;
- 8 dB or more if the centre frequency of the band containing the tone is in the range 160 Hz to 400 Hz; and/or
- 15 dB or more if the centre frequency of the band containing the tone is in the range 25 Hz to 125 Hz.

For the assessment of tonal characteristics, the 1/3 octave band centre frequency noise level predictions at a worst-affected dwelling, Non-stakeholder Dwelling 5 was investigated.

The predicted 1/3 octave band centre frequency noise levels at Non-stakeholder Dwelling 5 are provided in **Table 8-2**.

Based on an analysis of the data using the methodology detailed above, no tonal characteristics are present at Non-stakeholder Dwelling 5. Tonality is unlikely to be a feature of the Project due to wind turbine noise.

TABLE 8-2 PREDICTED 1/3 OCTAVE BAND CENTRE FREQUENCY NOISE LEVELS AT NON-STAKEHOLDER DWELLING 5

1/3 Octave Band Centre Frequency	Predicted Noise Level, L_{90} dB
25 Hz	50.5
31.5 Hz	50.7
40 Hz	49.3
50 Hz	50
63 Hz	47.1
80 Hz	46
100 Hz	47.1
125 Hz	42.1
160 Hz	40.2
200 Hz	38.7
250 Hz	36.9
315 Hz	37.7
400 Hz	34.8
500 Hz	32.9
630 Hz	33
800 Hz	29.9
1000 Hz	28.4
1250 Hz	24.7
1600 Hz	20.1
2000 Hz	13.3
2500 Hz	4.2
3150 Hz	-9
4000 Hz	-27.8
5000 Hz	-54.1
6300 Hz	-86
Overall A-weighted value	39.9

8.2 BESS AND SUBSTATION NOISE

The predicted highest noise levels from the BESS and the Substation at Stakeholder and Non-stakeholder Dwellings are presented in **Table 8-3.** A noise contour map for predicted operational noise is provided in **Figure 8-2**.

Predicted noise levels comply with the applicable Noise Protocol noise limits at all Stakeholder and Non-stakeholder dwellings.

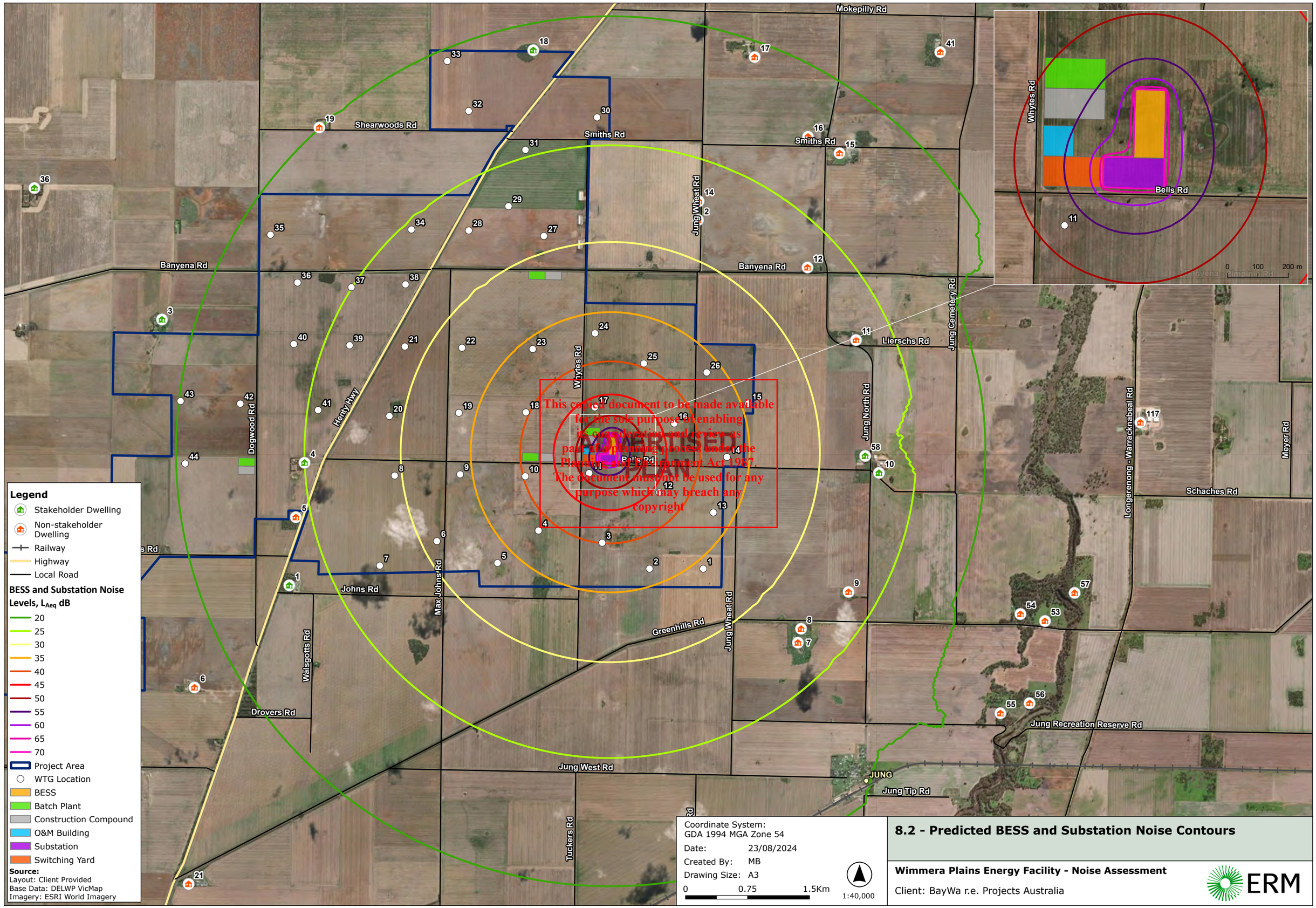
TABLE 8-3 PREDICTED OPERATIONAL BESS AND SUBSTATION NOISE LEVELS

Receiver No.	Status	Coordinates (GDA 2020 Zone 54)		Predicted BESS and Substation Noise Levels			Project Criteria			Exceedance (Day/ Evening/Night), dB
		X, m	Y, m	L_{eq} Day dB(A)	L_{eq} Evening dB(A)	L_{eq} Night dB(A)	L_{eq} Day Criterion dB(A)	L_{eq} Evening Criterion dB(A)	L_{eq} Evening Criterion dB(A)	
2	Non-stakeholder	619626	5954517	37.7	34.4	27.8	46	41	36	-/-/-
58	Stakeholder	621646	5951665	37.1	33.9	27.5	46	41	36	-/-/-
8	Non-stakeholder	620871	5949576	36.6	33.4	27.2	46	41	36	-/-/-
14	Non-stakeholder	619632	5954743	36.8	33.5	26.9	46	41	36	-/-/-
7	Non-stakeholder	620832	5949409	36.5	33.1	26.8	46	41	36	-/-/-
11	Non-stakeholder	621535	5953066	36.5	33.2	26.7	46	41	36	-/-/-
12	Non-stakeholder	620948	5953943	36.6	33.3	26.7	46	41	36	-/-/-
10	Stakeholder	621813	5951460	36.4	33.1	26.7	46	41	36	-/-/-
9	Non-stakeholder	621445	5950021	35.9	32.7	26.4	46	41	36	-/-/-
4	Stakeholder	614867	5951583	34.6	31.3	25	46	41	36	-/-/-
5	Non-stakeholder	614762	5950924	33.9	30.6	24.3	46	41	36	-/-/-
1	Stakeholder	614683	5950101	32.8	29.5	23.2	46	41	36	-/-/-

Receiver No.	Status	Coordinates (GDA 2020 Zone 54)		Predicted BESS and Substation Noise Levels			Project Criteria			Exceedance (Day/ Evening/Night), dB
		X, m	Y, m	L_{eq} Day dB(A)	L_{eq} Evening dB(A)	L_{eq} Night dB(A)	L_{eq} Day Criterion dB(A)	L_{eq} Evening Criterion dB(A)	L_{eq} Evening Criterion dB(A)	
16	Non-stakeholder	620955	5955524	32.2	28.9	22.3	46	41	36	-/-/-
15	Non-stakeholder	621335	5955324	32	28.8	22.1	46	41	36	-/-/-
18	Stakeholder	617633	5956569	30.8	27.6	20.9	46	41	36	-/-/-
17	Non-stakeholder	620310	5956485	30.5	27.2	20.5	46	41	36	-/-/-
19	Non-stakeholder	615046	5955633	29.8	26.6	20	46	41	36	-/-/-
3	Stakeholder	613143	5953314	28.7	25.4	18.9	46	41	36	-/-/-
6	Non-stakeholder	613536	5948867	28.2	25	18.6	46	41	36	-/-/-
42	Non-stakeholder	620421	5957478	27.8	24.5	17.9	46	41	36	-/-/-
54	Non-stakeholder	623523	5949754	28	24.7	17.7	46	41	36	-/-/-
39	Non-stakeholder	617297	5957730	27.6	24.3	17.7	46	41	36	-/-/-
20	Non-stakeholder	616358	5945962	27.2	23.9	17.6	46	41	36	-/-/-
41	Non-stakeholder	622554	5956546	27.3	24	17.4	46	41	36	-/-/-

Receiver No.	Status	Coordinates (GDA 2020 Zone 54)		Predicted BESS and Substation Noise Levels			Project Criteria			Exceedance (Day/ Evening/Night), dB
		X, m	Y, m	L_{eq} Day dB(A)	L_{eq} Evening dB(A)	L_{eq} Night dB(A)	L_{eq} Day Criterion dB(A)	L_{eq} Evening Criterion dB(A)	L_{eq} Evening Criterion dB(A)	
53	Non-stakeholder	623820	5949670	27.2	23.9	16.9	46	41	36	-/-/-
55	Non-stakeholder	623281	5948555	27.1	23.7	16.7	46	41	36	-/-/-
24	Non-stakeholder	619411	5945146	26.1	22.8	16.5	46	41	36	-/-/-
57	Non-stakeholder	624178	5950010	26.6	23.3	16.3	46	41	36	-/-/-
56	Non-stakeholder	623634	5948677	26.5	23.2	16.2	46	41	36	-/-/-
43	Non-stakeholder	621223	5958053	25.8	22.5	15.7	46	41	36	-/-/-
38	Non-stakeholder	615424	5957939	25.5	22.3	15.7	46	41	36	-/-/-
26	Non-stakeholder	621474	5946129	25.4	22.1	15.2	46	41	36	-/-/-
21	Non-stakeholder	613465	5946491	24.5	21.3	15	46	41	36	-/-/-
117	Non-stakeholder	624974	5952069	25.3	22	14.9	46	41	36	-/-/-
44	Non-stakeholder	620146	5958881	24.7	21.5	14.9	46	41	36	-/-/-
40	Non-stakeholder	616448	5958725	24.7	21.5	14.9	46	41	36	-/-/-

Receiver No.	Status	Coordinates (GDA 2020 Zone 54)		Predicted BESS and Substation Noise Levels			Project Criteria			Exceedance (Day/ Evening/Night), dB
		X, m	Y, m	L_{eq} Day dB(A)	L_{eq} Evening dB(A)	L_{eq} Night dB(A)	L_{eq} Day Criterion dB(A)	L_{eq} Evening Criterion dB(A)	L_{eq} Evening Criterion dB(A)	
25	Non-stakeholder	619495	5944397	24.3	21.1	14.8	46	41	36	-/-/-
61	Stakeholder	611026	5951627	24.1	20.8	14.4	46	41	36	-/-/-
36	Stakeholder	611600	5954903	23.9	20.6	14.2	46	41	36	-/-/-
62	Stakeholder	610840	5952878	23.5	20.3	13.9	46	41	36	-/-/-
30	Non-stakeholder	617965	5943714	22.9	19.7	13.4	46	41	36	-/-/-
22	Stakeholder	611823	5947355	22.9	19.7	13.4	46	41	36	-/-/-
27	Non-stakeholder	622553	5945830	23.5	20.2	13.3	46	41	36	-/-/-
28	Non-stakeholder	618061	5943032	21.5	18.3	12.1	46	41	36	-/-/-
29	Non-stakeholder	618071	5942850	21.2	18	11.8	46	41	36	-/-/-
31	Non-stakeholder	614909	5943603	21.1	17.9	11.8	46	41	36	-/-/-
45	Non-stakeholder	623025	5959573	21.1	17.9	11.5	46	41	36	-/-/-
63	Stakeholder	609525	5950816	20.8	17.6	11.4	46	41	36	-/-/-
37	Non-stakeholder	613026	5957808	21.3	18	11	46	41	36	-/-/-



8.2 - Predicted BESS and Substation Noise Contours

Wimmera Plains Energy Facility - Noise Assessment

Client: BayWa r.e. Projects Australia

ERM

0711332_WIM_Noise_R0.aprx

9. RECOMMENDATIONS

The following recommendations are provided as safeguards for compliance against the applicable Project noise limits:

- For wind turbine noise, if the candidate wind turbine, layout and number of turbines in this assessment is to be retained for final selection, the modes and STE technology detailed in Section 7.2, or an equally effective noise mitigation plan should be implemented for achieving the NZS 6808 noise limits; Should the wind turbine layout, or the number of turbines, or the final wind turbine model selection or turbine configuration change (i.e. separation distances from wind turbines to dwellings decrease or wind turbines with higher sound power levels are selected) during the detailed design stage, an updated wind turbine noise assessment of the final wind turbine layout and turbine model selection should be conducted to assess compliance with the NZS 6808 noise limits;
- Implementation of a Sector Management system involving curtailment and the use of higher modes (lower rated power output) at key wind speeds and wind sectors for wind turbines contributing to noise criteria exceedances should be considered at the detailed design stage to achieve compliance with NZS 6808 noise limits, if there are changes to the wind turbine layout or candidate wind turbine;
- Adjustment of turbine positioning (micro-siting) should be considered to achieve compliance with NZS 6808 noise limits if there are changes to the wind turbine layout or candidate wind turbine;
- For the BESS and the Substation, the sound power levels for the proposed equipment listed in Section 7.3 should be used as limits for final equipment selection;
- Should the BESS and Substation equipment quantities change (increase in quantity of battery containers and inverters or higher equipment sound power levels) during the detailed design stage, an updated noise assessment of the BESS and Substation should be conducted to assess compliance with the Noise Protocol noise criteria.
- The following general noise mitigation measures should be considered as best practice for the BESS and Substation during the detailed design stage:
  - Selection of quieter equipment to minimise noise emissions;
  - Orientation and positioning of equipment to minimise noise propagation towards nearest the nearest sensitive receptors; and
  - Installation of near-source barriers or berms to provide noise attenuation, where required.

10. CONCLUSION

The modelled wind turbine noise results indicate that compliance with the applicable Project wind turbine criteria is predicted at all dwellings. This outcome is predicated on the wind turbine parameters, wind turbine modes and application of STE technology detailed in Section 6. No other project-specific mitigation measures are necessary for wind turbine criteria compliance to occur.

Noise from the BESS and Substation were modelled based on conservative assumptions on sound power levels for the battery containers (with integrated inverters), medium voltage transformers and high voltage Transformers. The modelled BESS and Substation noise results indicate that compliance with the applicable Project noise criteria is predicted at all dwellings. No project-specific mitigation measures are necessary for criteria compliance to occur.

This NIA demonstrates that full criteria compliance with the legislation and guidelines for wind turbine noise, BESS and Substation noise is achievable.

Should the wind turbine, BESS and Substation layout and the final equipment selections deviate from this assessment significantly (major shifts in separation distances from equipment to dwellings, increase in equipment quantities and increase in sound power levels used in this assessment), an updated noise assessment of the final layout and equipment selections is required to assess compliance with the applicable Project noise criteria.

11. STATEMENT OF LIMITATIONS

1. This report is based solely on the scope of work described in the submitted proposal performed by Environmental Resources Management Australia Pacific Pty Ltd (ERM) for BayWa r.e. Projects Australia Pty Ltd (the Client). The Scope of Work was governed by a contract between ERM and the Client (Contract).
2. No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.
3. The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.
4. This report was prepared between June 2024 and September 2024 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.
5. Unless this report expressly states to the contrary, ERM's Scope of Work was limited strictly to identifying typical environmental conditions associated with the subject site(s) and does not evaluate the condition of any structure on the subject site nor any other issues.
6. All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:
    a. did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by; and
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7. Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.
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9. Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.

10. This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.
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    c. does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and
    d. does not purport to provide, nor should be construed as, legal advice.

12. REFERENCES

DTP. (2023). Planning Guidelines for Development of Wind Energy Facilities September 2023.

EPA Victoria. (2021). Publication 1826.4: Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues.

EPA Victoria. (2021). Wind Energy Facility Turbine Noise Regulation Guidelines, Publication 2061. Retrieved from https://www.epa.vic.gov.au/for-business/find-a-topic/noise-guidance-for-businesses/wind-energy-facility-turbine-noise-regulation-guidelines

Marshall Day. (2020). Wimmera Plains Energy Facility Background Noise Assessment Rp 003 20190083 17 April 2020.

Nordex. (2020). Third Octave Sound Power Levels Nordex N163/5.X F008_276_A17_EN Revision 02, 2020-02-17.

Standards Australia. (1996). ISO 9613-2:1996 Acoustics - Attenuation of Sound during Propagation Outdoors.

Standards New Zealand. (2010). New Zealand Standard 6808:2010 Acoustics – Wind farm noise.

VCAT. (2013). Cherry Tree Wind Farm Pty Ltd v Mitchell SC & Ors (Includes Summary) (Red Dot) [2013] VCAT 521 .

Victorian Government. (2017). Environment Protection Act 2017. Retrieved from https://www.legislation.vic.gov.au/in-force/acts/environment-protection-act-2017/004

Victorian Government. (2021). Environment Protection Regulations (incorporating amendments as at 8 November 2023).

Victorian Government. (2022). Environment Protection Amendment (Wind Turbine Noise) Regulations .

Victorian Legislation. (2021). Environment Protection Regulations.

APPENDIX A OPERATIONAL NOISE LIMITS AT NON-STAKEHOLDER DWELLINGS 5 AND 19

Table 6: All-hours period operational wind farm noise limits (dB L_{A90})

Location	Hub height wind speed (m/s) [1]									
	3	4	5	6	7	8	9	10	11	12
5	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5
19	40.0	40.0	40.0	40.0	40.0	40.0	41.0	42.8	44.4	45.9

Note 1: 166 m above ground level at 617,554 E / 5,953,694 N (MGA 94 Zone 54)

Table 7: Night period operational wind farm noise limits (dB L_{A90})

Location	Hub height wind speed (m/s) [1]									
	3	4	5	6	7	8	9	10	11	12
5	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
19	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.1	42.1

Note 1: 166 m above ground level at 617,554 E / 5,953,694 N (MGA 94 Zone 54)

Source: (Marshall Day, 2020)

APPENDIX B WIND TURBINE 1/3 OCTAVE BAND CENTRE FREQUENCY SOUND POWER LEVELS AT HUB-HEIGHT WIND SPEEDS

ERM

1/3 Octave Band Centre Frequency	Sound Power Level, dB(A) at Hub-height Wind Speed									
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s
10 Hz	39.5	41.8	45.5	49.8	50.2	50.7	50.7	50.7	50.7	50.7
12.5 Hz	44.4	46.7	50.3	54.6	55	55.5	55.5	55.5	55.5	55.5
16 Hz	49	51.3	55	59.3	59.7	60.1	60.1	60.1	60.1	60.1
20 Hz	53.3	55.6	59.3	63.6	64	64.5	64.5	64.5	64.5	64.5
25 Hz	57.8	60.1	63.7	68	68.4	68.5	68.5	68.5	68.5	68.5
31.5 Hz	61.9	64.2	68.2	72.5	72.9	74	74	74	74	74
40 Hz	67.8	70.1	72.6	76.9	77.3	77.5	77.5	77.5	77.5	77.5
50 Hz	69	71.3	75.8	80.1	80.5	82.6	82.6	82.6	82.6	82.6
63 Hz	73.8	76.1	78.4	82.7	83.1	83.9	83.9	83.9	83.9	83.9
80 Hz	76.8	79.1	82.1	86.4	86.8	86.7	86.7	86.7	86.7	86.7
100 Hz	77.8	80.1	84.1	88.4	88.8	91.4	91.4	91.4	91.4	91.4
125 Hz	80.5	82.8	85.6	89.9	90.3	89.9	89.9	89.9	89.9	89.9
160 Hz	84.3	86.6	89.1	93.4	93.8	91.2	91.2	91.2	91.2	91.2
200 Hz	83.8	86.1	89.5	93.8	94.2	92.8	92.8	92.8	92.8	92.8

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1/3 Octave Band Centre Frequency	Sound Power Level, dB(A) at Hub-height Wind Speed									
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s
250 Hz	85.3	87.6	91.3	95.6	96	93.9	93.9	93.9	93.9	93.9
315 Hz	87.1	89.4	93.5	97.8	98.2	97.4	97.4	97.4	97.4	97.4
400 Hz	87.7	90	93.8	98.1	98.5	97.1	97.1	97.1	97.1	97.1
500 Hz	86.5	88.8	93.7	98	98.4	97.6	97.6	97.6	97.6	97.6
630 Hz	87.4	89.7	95.1	99.4	99.8	100	100	100	100	100
800 Hz	86.7	89	94.5	98.8	99.2	99.3	99.3	99.3	99.3	99.3
1000 Hz	87.4	89.7	95.4	99.7	100.1	100.3	100.3	100.3	100.3	100.3
1250 Hz	86.7	89	94.6	98.9	99.3	99.7	99.7	99.7	99.7	99.7
1600 Hz	85.4	87.7	93.5	97.8	98.2	99	99	99	99	99
2000 Hz	83.6	85.9	91.5	95.8	96.2	97.4	97.4	97.4	97.4	97.4
2500 Hz	81.1	83.4	88.9	93.2	93.6	95.2	95.2	95.2	95.2	95.2
3150 Hz	78.9	81.2	84.7	89	89.4	91.8	91.8	91.8	91.8	91.8
4000 Hz	78.8	81.1	79.9	84.2	84.6	87.2	87.2	87.2	87.2	87.2
5000 Hz	74.2	76.5	77.4	81.7	82.1	82.1	82.1	82.1	82.1	82.1

1/3 Octave Band Centre Frequency	Sound Power Level, dB(A) at Hub-height Wind Speed									
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s
6300 Hz	70.5	72.8	75.8	80.1	80.5	81.8	81.8	81.8	81.8	81.8
8000 Hz	68.6	70.9	73.7	78	78.4	79.9	79.9	79.9	79.9	79.9
10000 Hz	64.7	67	69.9	74.2	74.6	75.7	75.7	75.7	75.7	75.7
Overall A-weighted value	97.5	99.8	104.5	108.8	109.2	109.2	109.2	109.2	109.2	109.2

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