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Operational Noise Impact Assessment
Proposed 4.95 Megawatts Solar Farm

At:-

181 Cobden - Terang Road,

Cobden, Vic 3631

Prepared for: -

BE Pro G Pty Ltd
C/- Habitat Planning Pty Ltd
409 Kiewa Street
Albury NSW 2640

Attention: Mr David Hunter

Reference: 2011009E-R

Prepared by: -

Matthew Harwood MAAS
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Habitat Planning Pty Ltd on behalf of BE Pro G Pty Ltd commissioned Harwood Acoustics to carry out an Environmental Noise Impact Assessment for a 4.95 Megawatts Solar Farm proposed to be constructed on a portion of 181 Cobden – Terang Road, Cobden, Victoria.

Accordingly, Harwood Acoustics has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics and may not be suitable for use beyond that scope.

Harwood Acoustics undertakes no duty nor accepts any responsibility to any third party who may rely upon this report.

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1. INTRODUCTION AND SUMMARY

Habitat Planning Pty Ltd on behalf of BE Pro G Pty Ltd commissioned Harwood Acoustics to carry out an Operational Noise Impact Assessment for a 4.95 Megawatts Solar Farm proposed to be constructed on a portion of land located at 181 Cobden-Terang Road, Cobden, Victoria, (the Site).

The Site is a large rural property located on the southern side of Cobden-Terang Road, approximately 3 kilometres to the south west of the town of Cobden in the Corangamite Shire.

The overall Site is approximately 22.6 hectares in size and is situated on land zoned FZ1 Farming Zone Schedule 1. The overall site is separated into two parcels of land by Cobden – South Ecklin Road. The proposed renewable energy facility is to occupy the north western portion of the subject site towards Cobden-Terang Road. It will retain frontage to each road, through a 515 metre frontage along Cobden-South Road. The solar farm will be established on approximately 14 hectares, as shown in Figure 2 in this Report.

The area surrounding the Site is predominantly rural farming land and there are rural residential receptors toward the north west, north east, east and south east. as shown in Figure 1. The nearest of these is located toward the north east at approximately 400 metres from the proposed substation area.

It is proposed to establish a 4.95 Megawatts Solar Farm (referred to henceforth as the Facility) on the Site with access via Cobden – South Ecklin Road at the eastern end of the lease area. The Facility will comprise the installation of 16,500 solar photovoltaic panels (PV Panels) to be mounted in arrays on single axis trackers with cabling from the solar arrays to panel inverters and a substation, with connection into the local electricity network. The substation will be on the eastern side of the of the development area as shown in Figure 2 in this Report and the two inverters will be located within the substation area adjacent to the transformer. There will also be battery storage capacity to be housed in containers located within the substation area.

The Facility will also include construction of internal access tracks as well as perimeter fencing. The Facility will generate power during daylight hours with all infrastructure being operational at all times.

The facility is expected to take approximately 6 months to complete construction. It will operate for a period of up to 30 years, after which it will be subject to further operation or decommissioning and removal of all components.

It is a requirement of Corangamite Shire Council that an Operational Noise Impact Assessment be prepared to address the potential for noise impact arising from the operational phase of the project.

The Victorian Government (via the EPA) has developed the *Solar Energy Facilities – Design and Development Guideline* (August 2019) to support the siting, design and assessment for large scale solar energy facilities in Victoria. The Guideline recommends that a facility should keep its noise impacts at or below the levels in EPA Victoria's *Noise from Industry in Regional Victoria Guideline* (NIRV).

The NIRV Guidelines recommend maximum noise levels from commerce, industry and trade premises in regional Victoria and establish noise limits for various generating and receiving planning zones.

In this instance the generating and receiving zones, for all receptors, are each FZ1 Farming Zone Schedule 1 and the resultant noise limits are therefore 46 dBA ($L_{eq,\ 30\ minute}$) in the day time period, 41 dBA ($L_{eq,\ 30\ minute}$) in the evening period and 36 dBA ($L_{eq,\ 30\ minute}$) in the night time period.

However, the EPA Victoria has recently published the document *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* in July 2021 (the Protocol). The Protocol applies from July 2021 and it is understood that the Protocol is to be referred to from July 2021, rather than the NIRV Guidelines.

The establishment of noise limits in the Protocol for rural areas in Victoria is similar to the methodology prescribed in the NIRV. Based on the FZ1 Farming Zone being applicable to both the generating and receiving zones, the distance adjusted levels remain the same for this proposal.

However, Section 2.6 of the Protocol includes methodology for the establishment of *Noise Limits in Rural Areas for Utilities*. The distance adjusted levels for utilities in contiguous farming zones are 45 dBA ($L_{eq,\ 30\ minute}$) in the day time period, 39 dBA ($L_{eq,\ 30\ minute}$) in the evening period and 34 dBA ($L_{eq,\ 30\ minute}$) during the night time period.

It is not clear whether the proposed, privately operated solar farm would be considered a utility under the Protocol. However, the Victorian State Government in its Planning Provisions, 73.03 *Land Use Terms* defines a Utility Installation, as land used to transmit, distribute or store power, including battery storage.

For this reason, this assessment considers that the Facility is a Utility under the Protocol and as such the noise limits applicable to Utilities in Rural Areas are applied in this assessment.

The main sources of noise associated with the operational phase of the project are the inverters, battery storage units and the transformer within the substation.

Noise modelling has been undertaken based on noise data established for each item of plant and equipment. Noise data for each of the inverters has been provided by the manufacturer of SMA central inverter model SC2475. Noise data for the battery storage units and the transformer has been established from noise measurements of similar items of equipment carried out by Harwood Acoustics over the past 19 years.

An adjustment of + 5 dB is also applied to all predicted noise levels from the transformer and the inverters to account for a potential prominent tonal character of noise emission from these noise sources at each receptor.

Recommendations are made in Section 6 of this Report to construct acoustical screening to the north and east of the inverters and the transformer. Providing the recommendations are implemented, the noise limits for utilities in rural areas for contiguous FZ1 Farming zones will be met at all receptor locations for this proposal.

2. SITE AND DEVELOPMENT DESCRIPTION

2.1 Site Description

The Site is a large rural property located on the southern side of Cobden-Terang Road, approximately 3 kilometres to the south west of the town of Cobden in the Corangamite Shire.

The overall Site is approximately 22.6 hectares in size and is situated on land zoned FZ1 Farming Zone Schedule 1. The overall site is separated into two parcels of land by Cobden – South Ecklin Road. The proposed renewable energy facility is to occupy the north western portion of the subject site towards Cobden-Terang Road. It will retain frontage to each road, through a 515 metre frontage along Cobden-South The solar farm will be established on approximately 14 hectares at the southern extent of the land, as shown in Figure 2 in this Report.

The area surrounding the Site is predominantly rural farming land and there are rural residential receptors toward the north west, north east, east and south east.

The closest residential receptors to the Site are shown in Figure 1 below and as follows:-

R1 – 290 Cobden-Terang Rd
(circa 520 metres)

R2 – 230 Cobden-Terang Rd
(circa 240 metres)

R3 – 180 Cobden-Terang Rd
(circa 600 metres)

R1 – 181 Cobden-Terang Rd
(circa 600 metres)

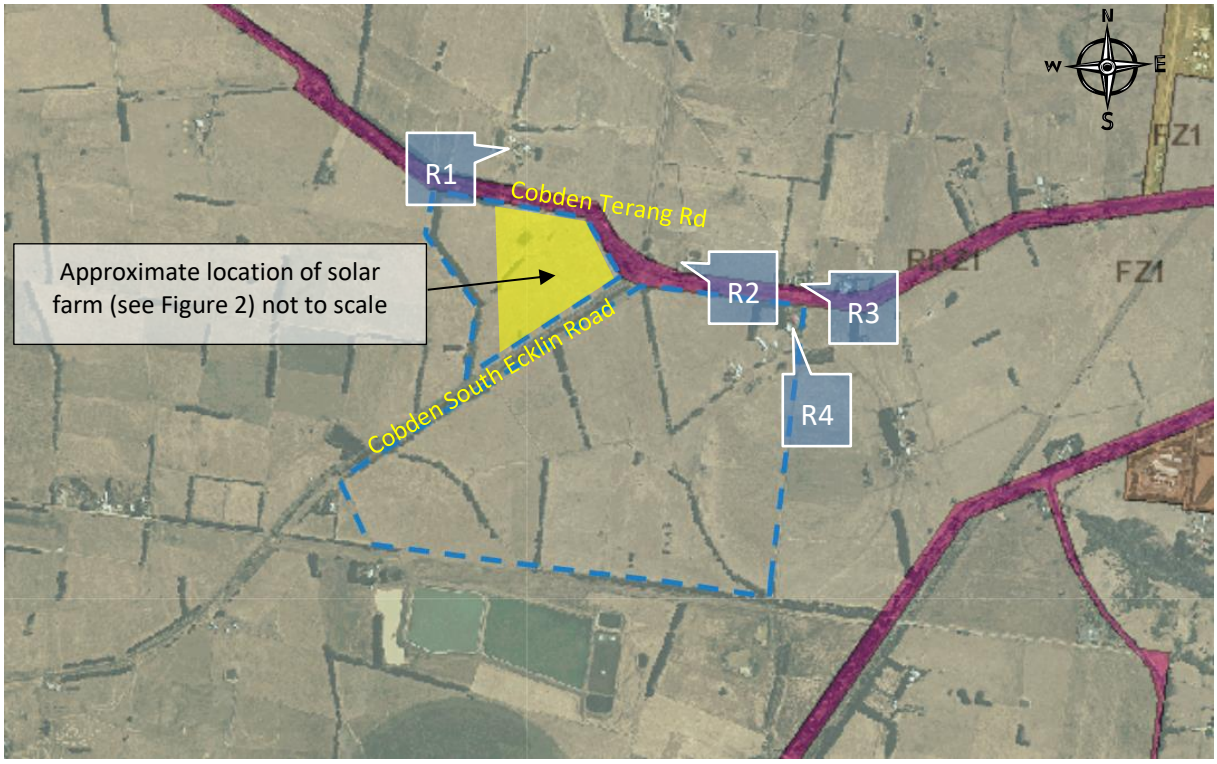

Figure 1. Location Plan – 181 Cobden-Terang Road, Cobden, Vic

(source: VicPlan – Victoria State Government)

2.2 Development Description

It is proposed to establish a 4.95 Megawatts Solar Farm (referred to henceforth as the Facility) on the Site with access via Cobden – South Ecklin Road at the eastern end of the lease area. The Facility will comprise the installation of 16,500 solar photovoltaic panels (PV Panels) to be mounted in arrays on single axis trackers with cabling from the solar arrays to panel inverters and a substation, with connection into the local electricity network. The substation will be on the eastern side of the of the development area as shown in Figure 2 in this Report and the two inverters will be located within the substation area adjacent to the transformer. There will also be battery storage capacity to be housed in containers located within the substation area.

The Facility will also include construction of internal access tracks as well as perimeter fencing. The Facility will generate power during daylight hours with all infrastructure being operational at all times.

The facility is expected to take approximately 6 months to complete construction. It will operate for a period of up to 30 years, after which it will be subject to further operation or decommissioning and removal of all components.

Figure 2. Solar Farm Lease Area and Solar Farm Layout

(source: Habitat Planning Pty Ltd)

3. NOISE CRITERIA

This section outlines the noise guidelines applicable to this proposal and establishes the project specific noise trigger levels and noise design goals / acceptable noise limits.

3.1 Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (Protocol)

The Victorian State Government via the Environment Protection Authority (EPA) recently published the *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* in July 2021 (the Protocol).

It is understood that the Noise Protocol replaces, or supersedes the previous documents used to assess noise emission in Victoria, being:-

- *State Environmental Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1,*
- *Noise from Industry in Regional Victoria* 2011 (NIRV), and
- *State Environment Protection Policy (Control of Music Noise from Public Premises) No. N-2.*

Part I of the Protocol outlines the methodology for setting the noise limits for a commercial, industrial and trade premises in both urban and rural areas of Victoria. It further outlines the steps that must be followed to undertake an assessment (measurement or prediction) of the effective noise level within a noise sensitive area or at an alternative assessment location. A comparison between the effective noise level and the relevant noise limit or the relevant alternative assessment criterion will determine whether the noise that is emitted from the commercial, industrial or trade premises is determined to be unreasonable under Regulation 118 of the Environment Protection Regulations.

Part II outlines the noise limits for indoor and outdoor entertainment venues and outdoor entertainment events. Part II is not relevant to this proposal.

The following sections relate to the parts of the Protocol relevant to this proposal and this assessment.

3.1.1 Noise Limits Rural Area Method

Section 2 of the Protocol describes the method to determine noise limits for commercial, industrial and trade premises in rural Victoria (other than utilities and earth resources) and includes the following steps:-

- (17) Determine the zone level and distance-adjusted level for each period using the method in clauses 19 and 20,
- (18) For each period, the noise limit is the greater of the distance-adjusted level and base noise level in Regulation 118(2)(b), unless a background level assessment has been conducted in accordance with clauses 21 to 23.

Zone Levels and Distance Adjusted Levels

- (19) Determine the zone levels for each of the day, evening and night periods using Annex B to this Noise Protocol.

- (20) Adjust the zone levels determined under clause 19 by accounting for the distance between the zone where the noise generator is located and the location of the noise receiver in the noise sensitive area –
    a. if the noise generator and receiver are covered by the same contiguous zone, the distance adjustment is 0 dB;
    b. if the noise generator and receiver are not located in land use zones with the same zone code subtract 1 dB for every 100 metres of receiver distance;
    c. if the noise generator and receiver are located in land use zones that have the same zone code and there is an intervening zone that is not for a road or railway line, subtract 1 dB for every 100 metres of receiver distance;
    d. if there is a zone for a road or a railway line that divides a noise-emitting zone, ignore the road or railway zone (that is, the zone should be treated as one contiguous zone for the receiver-distance adjustment);
    e. if a distance adjustment is required, the maximum subtraction is 9 dB;
    f. the distance adjustment must be applied to the zone level for the day, evening and night periods

Background Level Assessment

- (21) If the noise sensitive area is located within a background relevant area, an assessment of the background level must be made in accordance with clauses 39 to 55, unless clause 23 applies.
- (22) An assessment of the background level may be made where the assessment location in the noise sensitive area is further than 600 metres from the boundary of the land-use zone in which the commercial, industrial or trade premises is located, to ensure the noise limit is not set below the background level.
- (23) Where the noise being assessed will meet the noise limit based on either the base noise limits or distance-adjusted levels and there is no other contributing noise source from a commercial, industrial or trade premises, an assessment of background level is not mandatory.

Noise Levels in Rural Areas for Utilities

- (29) Determine the zone level and distance-adjusted level for each period using the method in clauses 19 and 20.
- (30) If a utility is located in a Road Zone (RDZ), such as a pole mounted transformer –
    a. compare the distance-adjusted levels from clause 20 to the zone levels in Annex B that would apply if the utility were in the same zone as the noise sensitive area (for example, General Residential Zone emitter to General Residential Zone receiver).
    b. adopt as the distance-adjusted level the lower of –
        i. the distance-adjusted level from clause 20, and
        ii. the zone level that would apply when the emitter is in the same zone as the noise sensitive area.

c. for each period, the noise limit is the greater of the distance-adjusted level (from clause 30(b)) and base noise level, unless a background level assessment is conducted in accordance with clauses 21 to 23.

- (31) If the utility is located in a Farming Zone, Rural Activity Zone or Green Wedge Zone and the distance adjustment is 0 dB, and unless a background level assessment is conducted in accordance with clauses 21 to 23, then:

  a. the distance-adjusted level for each period is -

     i. Day 45 dBA

     ii. Evening 39 dBA

     iii. Night 34 dBA

  b. The noise limit is the distance-adjusted level defined in clause 31, unless a background level assessment is conducted in accordance with clauses 21 to 23

- (32) Where a background level assessment is conducted in accordance with clauses 21 to 23, the noise limit is determined in accordance with clause 24 and rounded to the nearest decibel.

3.1.2 Zone Noise Level Assessment & Distance Adjusted Noise Levels

Figure 3 below shows the zone levels for rural area method for commercial, industrial and trade premise from Annexure B of the Noise Protocol.

In this instance both the noise generating zone and the noise receiving zone are zoned Farming Zone FZ. The corresponding noise limits are highlighted with the red box in Figure 3, and are as follows:-

- **46 dBA** ($L_{eq, 30\ minute}$) in the day,
- **41 dBA** ($L_{eq, 30\ minute}$) in the day, and
- **36 dBA** ($L_{eq, 30\ minute}$) in the day.

Table B.1: Zone levels (dB(A)) for rural area method for commercial, industrial and trade premises

Generating Zone ↓ / Receiving zone →	Green Wedge A GWAZ, Rural Conservation RCZ, Rural Living RLZ Group E CDZ, SUZ & UGZ (*)	Low Density Residential LDRZ Public Conservation and Resource PCRZ Public Park and Conservation PPCZ Public Use 2 & 5 PUZ2 & PUZ5 Urban Floodway UFZ	Farming Zone FZ Green Wedge GW General Residential Zone GRZ Neighbour Residential Zone NRZ Residential Growth Zone RGZ, Rural Activity Zone RAZ, Township Zone TZ Urban Growth Zone before an incorporated precinct structure plan UGZ Group B CDZ, SUZ & UGZ (*)	Commercial 1 Zone C1Z B1Z B2Z B5Z Commercial 3 Zone C3Z Mixed use Zone MUZ Activity Centre Zone ACZ Public Use Zone 1,3,4,6&7 PUZ1 PUZ3 PUZ4 PUZ6 & PUZ7 Road RDZ1 RDZ2 Group A CDZ, SUZ & UGZ (*)	Industrial 3 IN3Z Group C CDZ, SUZ & UGZ (*)	Commercial 2 Zone C2Z B3Z B4Z	Industrial 2 Zone IN2Z Industrial 1 Zone IN1Z Group D CDZ, SUZ, UGZ (*)
Low Density Residential LDRZ Public Conservation and Resource PCRZ Public Park and Conservation PPCZ Public Use 2,5 PUZ2 & PUZ5 Urban Floodway UFZ Group E CDZ, SUZ & UGZ (*)	Day 45 Evening 37 Night 32	Day 45 Evening 39 Night 34	Day 45 Evening 40 Night 35	Day 47 Evening 42 Night 37	Day 48 Evening 43 Night 38	Day 50 Evening 45 Night 40	Day 53 Evening 48 Day 43
Farming FZ (*) Green Wedge GWZ, Green Wedge A GWAZ Public Use 2 & 5 PUZ2, PUZ5 Rural Activity RAZ Rural Conservation RCZ Rural Living RLZ Urban Growth Zone before an incorporated precinct structure plan (UGZ) Group B CDZ, SUZ & UGZ (*)	Day 45 Evening 38 Night 33	Day 45 Evening 40 Night 35	Day 46 Evening 41 Night 36	Day 48 Evening 43 Night 38	Day 50 Evening 45 Night 40	Day 52 Evening 47 Night 42	Day 54 Evening 49 Night 44
Commercial 1 CZ1 B1Z B2Z BZ5 Mixed Use MUZ Activity Centre Zone ACZ Public Use 1,2,3,4,6 & 7 PUZ1 PUZ3 PUZ4 PUZ6 PUZ7 Group A CDZ, SUZ & UGZ (*)	Day 45 Evening 40 Night 35	Day 47 Evening 42 Night 37	Day 48 Evening 43 Night 38	Day 50 Evening 45 Night 40	Day 52 Evening 47 Night 42	Day 53 Evening 48 Night 43	Day 55 Evening 50 Night 45
Industrial 3 IN3Z Group C CDZ, SUZ & UGZ (*)	Day 46 Evening 41 Night 36	Day 49 Evening 44 Night 39	Day 50 Evening 45 Night 40	Day 52 Evening 47 Night 42	Day 53 Evening 48 Night 43	Day 55 Evening 50 Night 45	Day 56 Evening 51 Night 46
Commercial 2 C2Z, B3Z, B4Z Commercial 3 C3Z	Day 48 Evening 43 Day 38	Day 50 Evening 45 Night 40	Day 52 Evening 47 Night 42	Day 54 Evening 49 Night 44	Day 55 Evening 50 Night 45	Day 56 Evening 51 Night 46	Day 57 Evening 52 Night 47
Industrial 1, 2 IN1Z IN2Z Group D CDZ, SUZ & UGZ (*)	Day 50 Evening 45 Night 40	Day 52 Evening 47 Night 42	Day 53 Evening 48 Night 43	Day 55 Evening 50 Night 45	Day 56 Evening 51 Night 46	Day 57 Evening 52 Night 47	Day 58 Evening 53 Night 48

(*) For Comprehensive Development Zone (CDZ), Special Use Zone (SUZ) and Urban Growth Zone (UGZ) refer to Table B.2.

Figure 3. Noise Protocol Annexure B

The noise generator and receiver are covered by the same contiguous zone, and therefore the distance adjustment is 0 dB.

3.1.3 Base Noise Level Check

The base noise levels for rural areas are prescribed in the EPA's Regulation 118 (2) and are as follows:-

- **45 dBA** ($L_{eq,\ 30\ minute}$) in the day time period,
- **37 dBA** ($L_{eq,\ 30\ minute}$) in the evening time period, and
- **32 dBA** ($L_{eq,\ 30\ minute}$) in the night time period.

The greater of the distance-adjusted level and base noise level in Regulation 118(2)(b) is to be adopted, unless a background level assessment has been conducted in accordance with clauses 21 to 23.

3.1.4 Background Level Check and Adjustment

Consideration of the existing background noise level is to be taken into account if the Site is deemed to be in a background relevant area.

The Noise Protocol defines a background relevant area is defined as:-

> *'A noise sensitive area within a rural area where background levels may be higher than usual. This includes areas where freeway or highway traffic is a significant audible background noise source. It also includes coastal areas, where representative background levels are elevated by the sound of surf.'*

Harwood Acoustics visited the Site on Sunday 27 and Wednesday 30 December 2020 to undertake short-term background measurements and survey the area. The area is a quiet rural area with low background noise levels. Example photographs taken of the Site and surrounding area shown in Figures 5 and 6 below.

Background noise level measurements were taken at the northern end of the property at the corner of Cobden-Terang Road and Cobden South Ecklin Road opposite Receptor R2. The lowest background noise levels measured in the absence of light rain and wind were found to be below 34 dBA $L_{90,\ 30\ minute}$ and up to 40 dBA $L_{90,\ 30\ minute}$ when affected by strong winds.

The area is not considered to be a background affected area as defined by the Noise Protocol.

Instrumentation used during the background noise surveys is shown in Appendix A.

Figure 5. Site Photographs Taken During Background Noise Survey

3.1.5 Project Specific Maximum Nosie Levels

Based on the above methodology provided in the Noise Protocol the noise limits are shown below:-

Utility noise sources

- **45 dBA** ($L_{eq,\ 30\ minute}$) in the day period,
- **39 dBA** ($L_{eq,\ 30\ minute}$) in the evening period, and
- **34 dBA** ($L_{eq,\ 30\ minute}$) in the night period.

The periods are defined as follows:-

- Day – 7 am to 6 pm weekdays and 7 am to 1 pm Saturdays,
- Evening – 6 pm to 10 pm weekdays, 1 pm to 10 pm Saturdays and 7 am to 10 pm on Sundays and Public Holidays, and
- Night – 10 pm to 7 am.

4. OPERATIONAL NOISE EMISSION

4.1 Operational Source Noise Level Predictions

The main sources of noise associated with the proposed Solar Farm will be as follows: -

- 2 x SMA SC2475 Inverters systems,
- Transformer at solar substation, and
- Battery container storage.

Noise data has been supplied by the manufacturer of the inverters and the measured sound pressure levels have been used to establish the 'A' frequency weighted sound power levels, in decibels re: 1 pW, shown in Table 1 below. Table 1 also shows the sound power level of the transformer which is derived from our database of carrying out noise assessments of similar items of plant and equipment over the past 19 years.

Table 1 $L_{eq,\ 15\ minute}$ Sound Power Levels – Mechanical Plant & Equipment

Equipment Description	Individual Sound Power Level $L_{eq,\ 15\ minute}$ (dBA)
SMA SC 2475 Inverter	**96**
Transformer	**80**
Battery container storage (AC Unit)	**86**

A noise model has been developed using *SoundPLAN* Essential version 5.1.

Table 2 below provides details on the specific parameters used to develop the noise model.

Table 2 Computer Noise Model Parameters

Parameter	Details
Noise Sources	Inverters • Assumes that inverters operate a nominal power with 100% fan sped at any given time*, • Manufacturer's stated height of 2.3 metres is given to the noise source in the model • * This is a worst-case scenario as the units may operate at lesser capacity during the night time period. Transformer • Operating at full sound power of 80 dBA ($L_{eq,\ 15\ minute}$) at any given time, • Source height of 2.5 metres.

Table 2 Computer Noise Model Parameters *Cont…*

Parameter	Details
Algorithm & Meteorological conditions	Noise sources are modelled in accordance with the International Standard ISO 9613-2 (1996(E)) *'Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation'*. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. The method allows for downwind propagation conditions namely:- • wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and • wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground, The equations for calculating downwind sound pressure level, including the equations for attenuation… are the average for meteorological conditions within these limits. These equations also hold, equivalently, for average propagation under well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

Table 3 below shows the predicted noise levels at each receptor for the ongoing operation of the facility.

Table 3 Predicted $L_{eq,\ 15\ minute}$ Noise Levels at Receptor Locations (no noise controls)

Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) at Receptor Location			
	R1	R2	R3	R4
Noise Limit - Day	**45**	**45**	**45**	**45**
Noise Limit - Evening	**39**	**39**	**39**	**39**
Noise Limit - Night	**34**	**34**	**34**	**34**
Predicted effective noise level (with + 5 dB adjustment) *	36	34	28	28
Complies	No + 2 dB	Yes	Yes	Yes

* Includes a plus 5 dB adjustment factor applied to the predicted noise level to account for potential prominent tonal characteristics, as outlined in Section 5 below.

Predictions in Table 3 assume the following:-

- Distance loss to each receptor,
- Sound power levels for each item of plant and equipment shown in Table 1,
- A + 5 dB adjustment to the predicted noise levels for tonal characteristics.

It can be seen that there is potential for the noise limits to be exceeded at Receptor R1 by up to 2 dB during the night time.

This assumes that the noise as received at this residence displays tonal characteristic as a worst-case scenario.

Recommendations are made in Section 5 below to reduce the level of noise emission to within acceptable limits at Receptor R1.

5. NOISE CONTROL RECOMMENDATIONS

5.1 Sound Barrier Screen

- Erect a sound barrier screen on the northern and eastern side of the substation adjacent to the inverters and transformer as shown in Figure 3 below,
- The screen should be erected to a minimum height of 2.6 metres above the ground level at the transformer and inverters (or a minimum 300 mm above the top of the inverters, whichever is the higher)
- The screen should not be located further than 3 metres from the inverters.

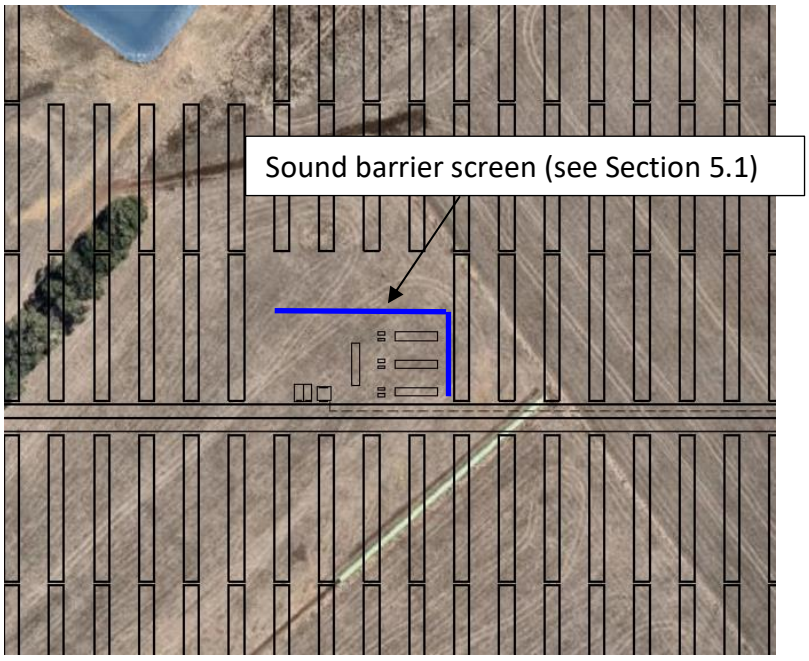

Figure 2. Example Sound Barrier Screen Location

- The screen should be constructed from an impervious material such as 9 mm thick (minimum) fibre cement sheet, or 9 mm thick (minimum) marine grade plywood, or lapped and capped timber, shipping containers, or masonry or any proprietary product with a minimum weighted sound reduction index (R_w) rating of 20,
- A final certification of the design may be provided once the location of the substation and inverters are finalised.

Table 4 below shows the predicted level of noise emission following the construction of the sound barrier screen and includes a 5 dB adjustment for tonal characteristics.

Table 4 Predicted $L_{eq,\ 15\ minute}$ Noise Levels at Receptor Locations – After noise controls

Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) at Receptor Location			
	R1	R2	R3	R4
Noise Limit - Day	**45**	**45**	**45**	**45**
Noise Limit - Evening	**39**	**39**	**39**	**39**
Noise Limit - Night	**34**	**34**	**34**	**34**
Predicted effective noise level (with + 5 dB adjustment) *	33	31	25	25
Complies	Yes	Yes	Yes	Yes

6. ADJUSTMENT FOR NOISE CHARACTER

Section 3.4 of the Protocol requires adjustments to made to the predicted noise level to account for a potential increase in annoyance due to the character of the noise, where applicable, as follows:-

Tonality Adjustment

- (82) When the noise is tonal in character then an adjustment is made based on observations of the noise
- (83) The following adjustments apply –
    a. when the tonal character of the noise is just detectable then Atone = +2 dB
    b. when the tonal character of the noise is prominent then Atone = +5 dB.
- (84) When a tone is present, but observations do not provide certainty with regards to the value to apply for the tonal adjustment, the adjustment may be determined using the objective tonal method in accordance with Annex C.

There is no one-third octave band noise data available from the manufacturers at this stage and it is not known if the units would display tonal characteristics, particularly at the greater distances to the nearest residences at this location.

However, as a conservative worst-case scenario, a 5 dB adjustment is applied to the predicted (effective) noise level for the transformer and the inverters in this assessment. These are included in the predictions shown in Tables 3 and 4 and the diagrammatical *SoundPLAN* noise map provided in Appendix B.

NB

It is the consideration of a 5 dB penalty for tonal characteristic that drives the need for the noise barrier recommended in Section 5.1 of this Report.

An assessment could be undertaken prior to the construction of the noise barrier, once the equipment has been installed and is operational to determine the noise level and character of the noise as received at the nearest residences to the Site. The noise barrier may then be installed if still deemed to be required.

7. CONCLUSION

An assessment of the potential noise emission arising from the operational of a 4.95 Megawatts Solar Farm proposed to be established at 181 Cobden-Terang Road, Cobden, Victoria, has been undertaken.

Calculations show that the level of noise emission from the ongoing operation of the facility will meet the Victorian EPA's maximum recommended noise levels derived from its *Nosie from Industry in Regional Victoria* 2011 Guidelines.

This is providing that recommendations made in Section 6 of this Report are implemented and adhered to.

Matthew Harwood, MAAS

Principal Acoustical Consultant

Attachments: -
Important note
Appendix A – Noise survey instrumentation
Appendix B – *SoundPLAN* noise model depicting operational phase of the facility – with noise controls

Important Note

All products and materials suggested by Harwood Acoustics are selected for their acoustical properties only.

Recommendations made in this report are intended to resolve acoustical problems only, therefore all other properties such as aesthetics, air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, fumes, grout or tile cracking, loading, shrinkage, smoke, ventilation etc. are outside Harwood Acoustic's fields of expertise and ***must*** *be checked with the supplier or suitably qualified specialist before purchase.*

Disclaimer

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Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

Noise Survey Instrumentation	Appendix A

The instrumentation used during the noise survey consisted of the following: -

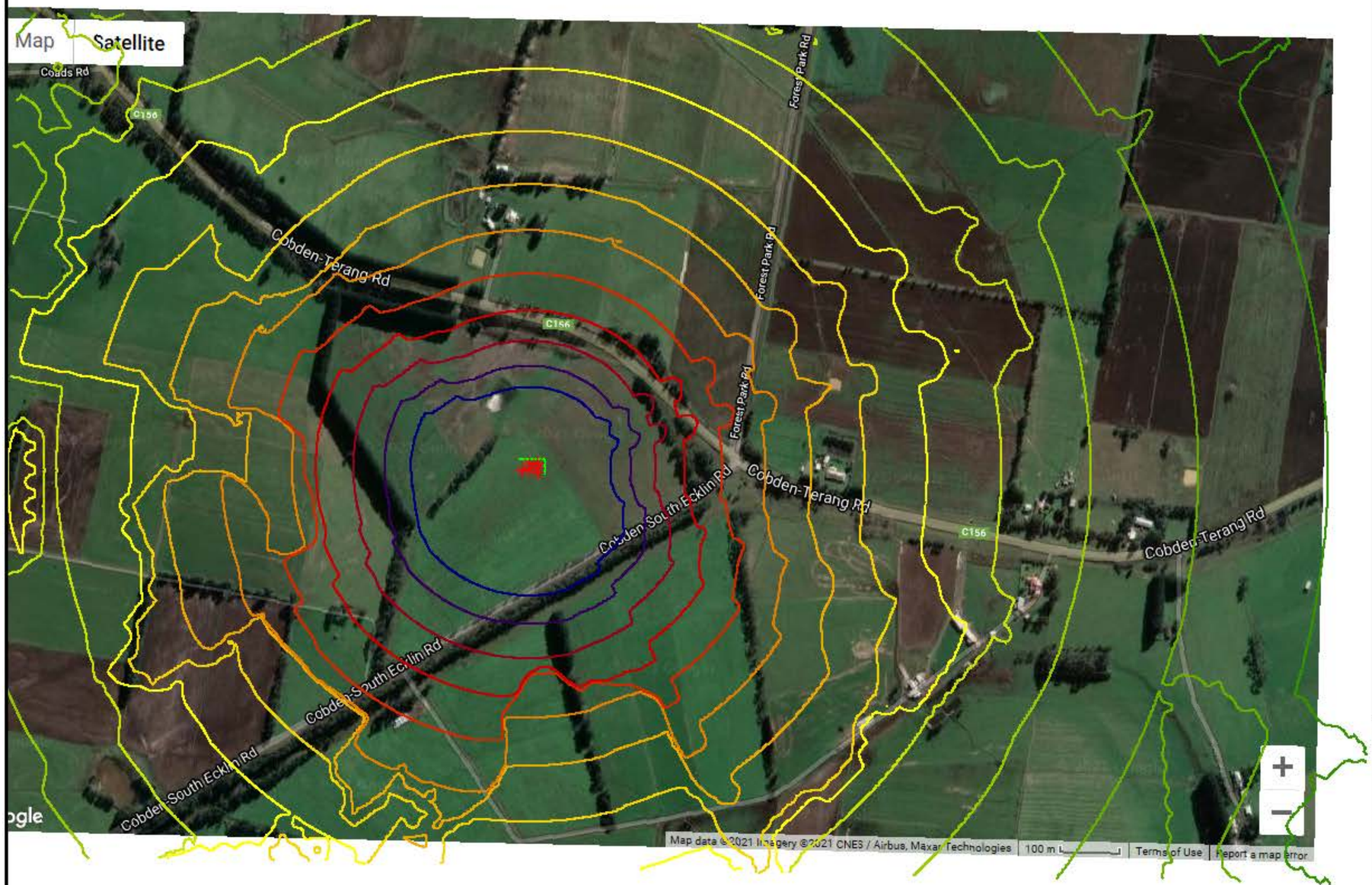
Description	Model No.	Serial No.
SVANTEK Sound Level Meter	SVAN 957	15395
Brüel & Kjaer Acoustical Calibrator	4321	3003242

The sound level meter conforms to Australian Standard AS IEC 61672.1-2004: 'Electroacoustics - Sound Level Meters – Specifications' as a Class 1 precision sound level meter and has an accuracy suitable for both field and laboratory use.

The calibration of the sound level meters was checked before and after the measurement periods. No significant system drift occurred over the measurement period.

The sound level meter and calibrator have been checked, adjusted and aligned to conform to the factory specifications and issued with conformance certificates as required by the regulations.

Cobden Solar Farm
Operational Noise
Adjustment for tonality + 5 dB
With 2.6 m high noise wall



Signs and symbols

- Wall
- Transformer, Inverters & Battery Storage Units

Levels in dB(A)

- = 20
- = 22
- = 24
- = 26
- = 28
- = 30
- = 32
- = 34
- = 36
- = 38
- = 40
- = 42
- = 44

1 : 11145

0 50 100 200 300 400 m

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