West Mokoan Solar Farm

Operational Noise Assessment

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Client: 892 Yarrawonga Development Pty Ltd C/- South Energy (South Energy)

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Prepared by

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Executive Summary

AECOM has assessed the potential environmental noise emissions from the operation of the proposed West Mokoan Solar Farm in relation to applicable environmental noise criteria.

The main sources of noise from the operation of the proposed solar farm will be the inverters associated with the Power Conversion Units (PCUs), and a substation.

The Concept Design for the proposed solar farm includes noise control measures comprising acoustic enclosures to 14 PCUs located across the site and all PCUs in the BESS facility, and acoustic enclosures plus acoustic screening to a further five PCUs.

There are residences located in the vicinity of the site of the proposed solar farm. The Victorian Environment Protection Authority (EPA) publication *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (Noise Protocol) will apply to noise emissions from the proposed solar farm at these nearby residences.

The noise limits have been determined in accordance with the procedures of the Noise Protocol for each period at the nearest and potentially worst noise-affected residential locations.

The inverters are proposed to operate at nominal power and 100% fan speed during the hours 7am to 10pm, which covers the Noise Protocol Day and Evening periods, and operate at a reduced current with the fan speed not exceeding 50%, thus emitting less noise, from 10pm to 7am, which is the Night period.

Computer noise modelling was performed to predict the solar farm operational noise levels at the nearest residential locations for the two inverter operating conditions. The noise levels were predicted for neutral weather conditions, and with a moderate breeze assisting noise propagation towards the sensitive receptor locations.

The modelling results indicate that the proposed solar farm, under the currently-proposed Concept Design, with noise control measures as presented in this report, will be compliant with the noise limits.

The inverter suppliers may be able to integrate noise control measures into the PCU skid, or supply details of new technologies and products available at the time of detailed design of the project to reduce the required extents of noise control included in the current Concept Design.

This report has considered noise from inverters. Other equipment may emit noise, and all significant noise-emitting items should be assessed for compliance during the detailed design phase. Further, it is possible that the range of plant items available at the time of final selection will be different to the range that is currently on the market. Acoustic modelling of the final plant selections and layout should be undertaken to confirm that the Project will comply with the environmental noise criteria.

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1.0 Introduction

AECOM Australia Pty Ltd was engaged by 892 Yarrawonga Development Pty Ltd C/- South Energy (South Energy) to undertake an assessment of the potential noise emissions from the operation of the proposed West Mokoan Solar Farm. There are residential premises in the vicinity of the site that may be affected by noise from the inverters and substation at the solar farm, which will be the main sources of noise emission from the site.

The scope of this assessment includes prediction of the inverter and substation noise levels and consideration of the predicted noise levels in relation to applicable noise criteria. The scope does not include measurement of the existing acoustic conditions surrounding the proposed solar farm site.

This report presents noise criteria applicable at the nearby residences with respect to the operational noise emissions, the methodology used to predict the noise emissions, and discussion on the predicted noise levels in relation to the nominated criteria.

2.0 Site Description

The subject site is approximately ten kilometres north-east of Benalla, as shown in Figure 1, below. The site comprises land located at 892 Benalla-Yarrawonga Road, Goorambat; Benalla-Yarrawonga Road, Benalla, Crown Land, 616 Benalla-Yarrawonga Road, Benalla and the road reserves of Lake Mokoan Road and Benalla-Yarrawonga Road (the subject site) formally described as:

- Lot 1 PS625748F
- Lot 1 TP173518C
- Lot 1 TP104377
- Lot 1 LP206524H
- 98B PP2704
- Lots 2-5 LP206524H

The subject site is located on the eastern side of Benalla-Yarrawonga Road and has frontages to Benalla-Yarrawonga Road, Lake Mokoan Road and Dam Wall/Boundary Road and is intersected by Stockyard Creek. The site is irregular in shape with a total area of approximately 426 hectares.

The nearest residential locations are as follows:

- 81 Lake Mokoan Road, towards the northern end of the site, approximately 100 metres from the site boundary
- 18 Farnley Road, to the north of the site, approximately 700 metres from the site boundary
- 286 Farnley Road, to the north of the site, approximately 350 metres from the site boundary
- 623 Benalla-Yarrawonga Road, to the west of the site, approximately 70 metres from the site boundary
- 524 Benalla-Yarrawonga Road, to the south of the site, approximately 150 metres from the site boundary

Approximately 58 Power Conversion Units (PCUs) are proposed to be located across the site, with another 10 PCUs at the Battery Energy Storage System (BESS). A substation is also proposed to be located on the site.

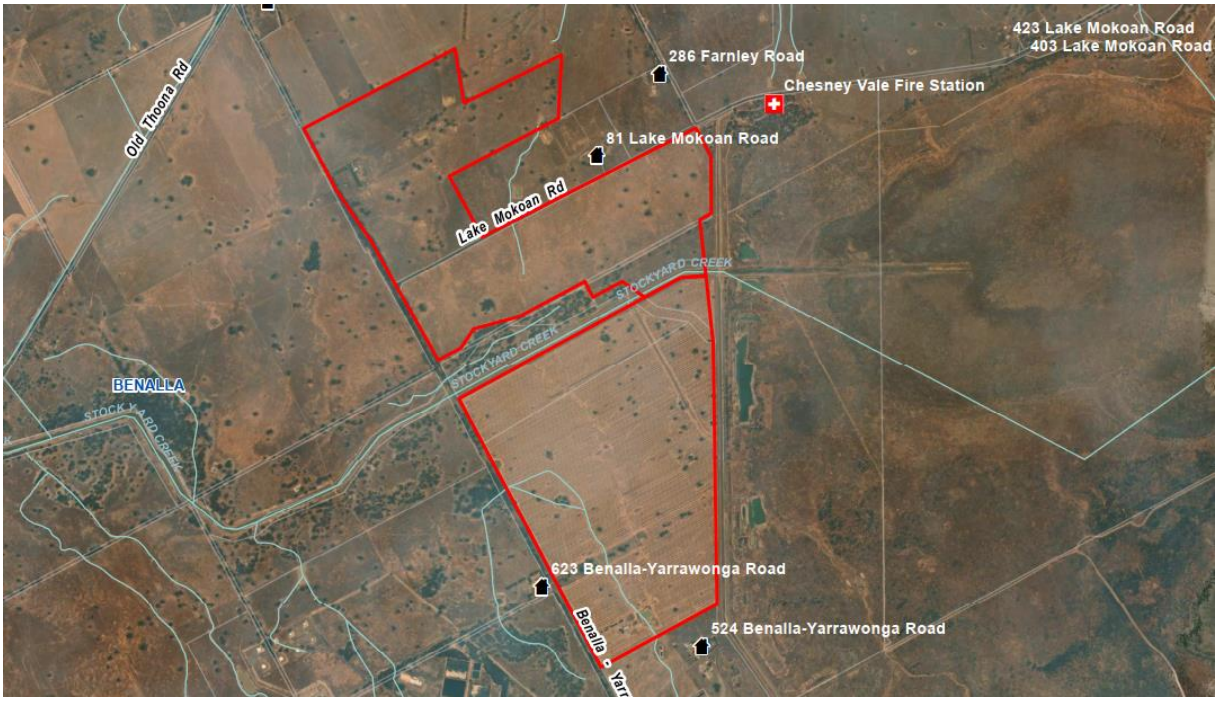

Figure 1 Proposed West Mokoan Solar Farm site and surrounds

3.0 Noise Criteria

3.1 Victorian EPA Noise Protocol

The EPA publication *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (Noise Protocol) will apply to noise emissions from the proposed solar farm. The Noise Protocol specifies the procedure for establishing noise criteria, and for measuring and assessing industrial noise at noise sensitive locations.

Under the Noise Protocol assessment procedure, noise from the source under consideration is measured or predicted to determine its impact over a continuous 30-minute period. Adjustments to the noise level are then applied to account for the effects of duration, tonality, intermittency and impulsiveness. The resultant noise level is called the Effective Noise Level.

3.2 Time Periods

Using the Noise Protocol, noise criteria are established for the three periods; Day, Evening and Night. The following time period classifications are defined by the Noise Protocol:

Table 1 Noise Protocol Time periods

Time Period	Time
Day	7am to 6pm Monday to Saturday
Evening	6pm to 10pm Monday to Saturday 7am to 10pm Sundays and Public Holidays
Night	10pm to 7am

3.3 Noise Limits

3.3.1 Step 1 – Zone Levels

Noise criteria for the proposed solar farm have been established using the procedures from the Noise Protocol, Part 1, Section 2, Noise Limits - Rural Area Method.

Step 1 in determining the noise limits involves determining 'Zone Levels', based on the zoning of the land at the noise sensitive area and at the noise-emitting premises. The Zone Levels are read from Table B.1 of the Noise Protocol.

Referring to the relevant Planning Scheme, presented in Appendix A, the proposed solar farm site is situated on land zoned *Farming Zone* (FZ).

The dwellings located at 81 Lake Mokoan Road, 18 Farnley Road, 286 Farnley Road, and 524 Benalla-Yarrawonga Road are also located on land zoned FZ.

For these land use zonings, i.e. noise-generating zone FZ to receiving zone FZ, from Table B.1 of Noise Protocol, the Zone Levels are as follows:

- Day period: 46
- Evening period: 41
- Night period: 36

The dwelling at 623 Benalla-Yarrawonga Road is located on land which is zoned *Special Use Zone* (SUZ) 'Group D' (as defined by Table B.2 for Defence Industries Benalla).

For these land use zonings, i.e. noise-generating zone FZ to receiving zone SUZ, from Table B.1 of Noise Protocol, the Zone Levels are as follows:

- Day period: 54
- Evening period: 49
- Night period: 44

3.3.2 Step 2 – Distance-Adjusted Levels

Step 2 in determining the noise criteria is to adjust the Zone Levels based on the distance from the noise sensitive receiver to the boundary of the zone in which the noise-emitting premises is located. The distance adjustment is 1 dB for every 100 metres from the boundary of the zone on which the noise emitter is located, to the noise sensitive receptor.

The Noise Protocol prescribes that where the noise-emitting premises and the receptor are in the same continuous zone, the distance adjustment is zero. The dwellings on Lake Mokoan Road, Farnley Road and 524 Benalla-Yarrawonga Road are in the same zone as the proposed solar farm site, therefore for these receptors the distance adjustment is zero.

The land use zoning at 623 Benalla-Yarrawonga Road is different to the zoning of the proposed site, however the distance from the edge of the zone of the solar farm site to the dwelling is less than 100 metres, therefore the distance adjustment for this receptor is also zero.

3.3.3 Step 3 – Base Noise Level Check

Step 3 in determining the criteria is the base noise level check. For each period, the greater of the distance adjusted noise levels and the Victorian Environment Protection Regulations 2021 'base noise limits' (Regulation 118(2)(b)) are to be adopted. The base noise limits are as follows:

- Day period: 45
- Evening period: 37
- Night period: 32

Therefore, the Zone Levels determined in Step 1 are to be adopted for each of the receivers.

3.3.4 Step 4 – Background Noise Level Check and Adjustment

The Noise Protocol also prescribes that if the noise sensitive area is determined to be a 'background-relevant area', a background noise assessment including background noise monitoring may be conducted. If the noise sensitive area is not a background-relevant area, the noise limits are the applicable Zone Levels, adjusted as appropriate from Steps 2 and 3.

Background-relevant area is defined in the Noise Protocol as follows:

> *'Background-relevant area' means a noise-sensitive area where background levels may be higher than usual for a rural area. 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 surf.*

For a background relevant area, the noise criteria will be the Day period background level plus 8 dB(A), and the Evening and Night period backgrounds plus 5 dB(A), if these values exceed the applicable limits for the respective periods.

It is considered that the background noise levels in the vicinity of the proposed site would not be higher than usual for a rural area, and that adjustments for background noise would not be applicable.

The determined noise limits are presented in Table 2, below.

Table 2 Noise Limits

Time Period	Time	Noise Limit [dB(A)]	
		81 Lake Mokoan Road, 18 Farnley Road, 286 Farnley Road, and 524 Benalla-Yarrawonga Road	623 Benalla-Yarrawonga Road
Day	7am to 6pm Monday to Saturday	46	54
Evening	6pm to 10pm Monday to Saturday 7am to 10pm Sundays and Public Holidays	41	49
Night	10pm to 7am	36	44

The noise limits presented above apply to the noise emitted from the proposed solar farm, outdoors within 10 metres of the dwellings at the identified nearest receptors.

4.0 Noise Modelling

This section outlines the methodology that was used to undertake acoustic computer modelling to predict the noise levels at the nearby residential locations due to the operation of the proposed solar farm.

4.1 Noise Modelling Software

The noise levels at the nearby residential locations due to the operation of the solar farm were calculated using 'SoundPLAN' environmental noise modelling software, version 8.0. This software is capable of accurately modelling environmental noise levels and mapping the results. SoundPLAN is used extensively worldwide and takes a standards-based approach to modelling.

The modelling was undertaken using the CONCAWE[1] prediction method that is widely used in Australia for modelling environmental noise and is accepted by the EPA. The CONCAWE method was originally developed for predicting the long-distance propagation of noise from petrochemical complexes. It is especially suited to predicting noise propagation over large distances because it accounts for a range of atmospheric conditions that can significantly influence the propagation of noise over large distances.

4.2 Noise Modelling Parameters

The following sections outline the parameters that were input into the acoustic model to calculate the noise levels at the nearest noise-sensitive locations.

4.2.1 Topography

The project site and surrounds were modelled as being flat, which is representative of the topographical conditions in the area.

4.2.2 Ground Absorption

All ground in the study area was modelled as being 50% acoustically absorptive, as the terrain in the vicinity of the site is predominantly vegetated and soil-covered fields which will partially absorb noise.

4.2.3 Meteorological Conditions

Meteorological conditions such as the presence of a temperature inversion or light to moderate winds can have a significant effect on sound propagation. Generally, as air pressure increases, relative humidity increases and temperature decreases, noise propagation is enhanced.

Temperature inversions (i.e. when the normal temperature profile of the atmosphere is reversed such that the air temperature increases with increasing height above ground) typically occur at night and tend to assist the propagation of noise. Likewise, a light to moderate wind (i.e. 1 to 3 m/s) from the source to the receiver tends to assist the propagation of noise to the receiver, while the impact of noise for any receivers in the opposite direction would be reduced. For higher wind speeds, the wind becomes too turbulent to effectively assist the propagation of noise, and background noise levels tend to increase, masking any increases in noise level due to wind-assisted propagation.

Noise levels at the noise sensitive receptors were calculated for two meteorological conditions, as follows:

- neutral atmospheric conditions with no wind, and
- a temperature inversion with a 3m/s wind from the site to the residences.

In general, the meteorological conditions in the vicinity of the site will include higher wind speeds than were modelled, however, for the reasons noted above, wind speeds of greater than 3m/s were not incorporated into the acoustic model.

[1] CONCAWE Report No. 4/81, "The Propagation of Noise from Petroleum and Petrol Chemical Complexes to Neighbouring Communities", Published 1981.

4.2.4 Noise Sources

The main sources of noise from the operation of the proposed solar farm will be the inverters and the substation transformer.

The inverters were modelled at the locations indicated on the Concept Design drawing shown in Appendix B. Three inverter units were modelled at each location marked on the site layout as a 4.6MVA PCU. Two inverters were modelled at each location marked as a 2.3MVA PCU.

The BESS facility inverters were also modelled within the BESS area indicated on the layout. Within this area, 10 PCUs each incorporating three inverters were included in the model.

The inverters are nominally two metres high, and the majority of these units are proposed to be mounted on ground. A number of the inverter units are proposed to be mounted at a height of 1.8 metres above the ground, as indicated on the proposed site layout as 'elevated'. Each inverter was modelled as a point source; the units that are to be mounted at ground level were modelled at a height of two metres above the local ground level; the elevated units were modelled at a height of 3.8 metres above the ground level.

The substation transformer was modelled within the substation area indicated on the proposed site plan on the southern side of Lake Mokoan Road, at a height of three metres above the local ground level.

4.2.5 Receivers

Receiver points for the calculation of the noise levels at the residential locations were placed at heights of 1.5 metres above the local ground. Noise levels were calculated at these locations under 'free-field' conditions, i.e. without influence from any sound-reflecting structures.

4.3 Noise Level Data

Ingeteam model "Ingecon Sun Power B Series" inverters are proposed as one of the inverter options for installation at the site. Ingeteam supplied Sound Power Level data for the proposed inverter units for two operating conditions:

- cooling fans running at 100% and nominal power, and
- cooling fans running at 50% and a current of 1130A.

South Energy has undertaken power generation forecasting modelling for the proposed solar farm based on historical solar irradiation data. South Energy has advised that the forecasting modelling indicates that the proposed solar farm:

- will start generating power from 5am at the earliest,
- will cease power generation at 7:59pm at the latest, and
- will not exceed 50% generation capacity during the hours defined as the night period.

Therefore, the 50% fan speed and 1130A operating condition has been taken to be the maximum night period operating condition as part of the noise modelling assessment.

The provided noise level data for the two operating conditions, and times of day for which they have been modelled as part of the noise assessment is presented in Table 3, below.

Table 3 Inverter Noise Level Data

Time of Day	Maximum Operating Condition	Overall Sound Power Level (dBA)
7am to 10pm	Acoustic power with fans at 100% and a nominal power	94.5
10pm to 7am	Acoustic power with fans at 50% and a current of 1130 A	82.8

The inverters associated with the BESS facility were modelled at the louder condition (fans at 100% and nominal power) for all times, as this plant could potentially operate at full capacity during any period.

Octave band or one-third octave band noise level data was not available for the proposed inverter units, therefore the acoustic frequency distribution, or 'spectrum shape', was assumed based on the one-third octave band data for another inverter, the SMA Solar Technology AG SC 2500 model inverter.

The one-third octave band noise levels were adjusted uniformly across the frequency range to provide overall Sound Power Levels for the two operating conditions tabulated above for use in the modelling.

Noise level data for the substation transformer was not available for use in the modelling. Therefore, the transformer was modelled as having an overall Sound Power Level of 80 dB(A), which is estimated to be within the likely range of sound output for this item. If a transformer with a higher Sound Power Level is selected for installation, details of the proposed transformer should be provided for acoustic review.

4.4 Noise Control Measures

The Concept Design includes noise control measures applied to a number of PCUs, as indicated on Concept Design shown in Appendix B. The PCU locations requiring noise control measures to enable compliance with the noise criteria were identified through preliminary noise modelling.

The Concept Design includes noise control measures as follows:

- 14 PCUs fitted with enclosures to achieve 10 dB of noise reduction, or an overall Sound Power Level of 84 dB(A) with the fans running at 100% and nominal power operation,
- 5 PCUs with enclosures fitted to achieve 10 dB of noise reduction, plus acoustic screening to further reduce the noise emissions by 5 dB, and
- all PCUs in the BESS facility fitted with enclosures to achieve 10 dB of noise reduction.

The acoustic screening to be applied to each of the five PCUs, as specified above, is to comprise solid material, such as sheet metal or fibre cement sheet, surrounding the unit on all sides, at a distance of two metres from the PCU, and a height of no less than 0.5 metres above the height of the PCU enclosure. The PCU-facing side of the screening will be faced with an acoustically absorptive material, such as 50mm thick mineral fibre, polyester, or acoustic foam, to prevent sound reflection.

Note, the required noise reductions presented on Appendix B are based on the Ingeteam model "Ingecon Sun Power B Series" inverter noise output specifications, as shown in Table 3. The presented noise reductions are only applicable if this model inverter is to be used. If quieter or louder plant items are installed, different noise reduction targets will apply.

The overall noise emission specifications for the inverters requiring noise reductions are presented on the concept plan presented in Appendix B. These specifications could be used for plant selection purposes and informing the selection of noise control measures.

Advancements in solar inverter technology may lead to the availability of quieter equipment items at the time of final plant selection for the project, such that the full extents of the noise control measures discussed above may not be required.

4.5 Noise Modelling Results

The predicted noise levels at the nearby residences due to the operation of the proposed solar farm, for full power operation and 50% power operation, for the two meteorological conditions considered, are presented in Table 4 and Table 5, below.

Table 4 Predicted Noise Levels due to Operation of Solar Farm – Nominal Power and Full Fan Speed

Receiver	Predicted A-weighted Sound Pressure Level, L_{Aeq} [dB(A)]	
	Neutral Meteorological Conditions	Temperature Inversion + 3m/s Wind
81 Lake Mokoan Road	30	36
18 Farnley Road	24	30
286 Farnley Road	25	31
524 Benalla-Yarrawonga Road	30	36
623 Benalla-Yarrawonga Road	34	39

Table 5 Predicted Noise Levels due to Operation of Solar Farm – 50% Power and 50% Fan Speed

Receiver	Predicted A-weighted Sound Pressure Level, L_{Aeq} [dB(A)]	
	Neutral Meteorological Conditions	Temperature Inversion + 3m/s Wind
81 Lake Mokoan Road	22	28
18 Farnley Road	13	19
286 Farnley Road	16	21
524 Benalla-Yarrawonga Road	19	24
623 Benalla-Yarrawonga Road	25	30

The inverter noise emissions are the dominant contributors to the predicted overall noise levels; the substation noise being a relatively minor noise contributor.

In accordance with the EPA requirements, the predicted noise levels with adjustments applied are to be assessed in relation to the noise limits. This is presented in the following section.

5.0 Assessment of Compliance

5.1 Compliance Assessment

In accordance with the Noise Protocol, adjustments are to be applied to the noise level at the receiver to account for the character of the sound. The adjusted noise level is the Effective Noise Level, which is assessed in relation to the noise limits.

One-third octave band sound level data for the Ingeteam inverters was not supplied for the assessment, however, noise emissions from inverters can exhibit strong tonal character. Therefore, a tonal adjustment needs to be considered for application to the predicted noise levels.

The magnitude of the tonal adjustment is determined based on the prominence of the tonal character of the noise as assessed at the location of the noise sensitive receiver. This will depend on the level and character of the noise in respect of the background noise conditions at the time of the assessment; a noise with strong tonal character in the presence of high background noise levels will exhibit a weaker tonal character than in the presence of low background noise levels.

Where the tonal character of the noise is 'just detectable', the Noise Protocol prescribes a tonal adjustment of +2 dB; where the tonal character is 'prominent', a +5 dB adjustment is applied.

In this instance, during times of low background noise levels, it has been assumed that the solar farm noise could be observed to exhibit prominent tonal character at the locations of the nearest receptors, such that the tonal adjustment would be +5 dB.

The resultant predicted Effective Noise Levels with the +5 dB tonal adjustment applied are presented in the tables below. Table 6 presents the Effective Noise Levels for the hours 7am to 10pm, for nominal power and full fan speed, and the noise limits that apply for those hours; Table 7 presents the levels for the hours 10pm to 7am, for 50% power and fan operation, and the noise limits that apply for those hours.

Table 6 Predicted Effective Noise Levels due to Operation of Solar Farm - Nominal Power and Full Fan Speed

Receiver	Noise Limit [dB(A)]		Predicted Effective Noise Level [dB(A)]	
	Day	Evening	Neutral Meteorological Conditions	Temperature Inversion + 3m/s Wind
81 Lake Mokoan Road	46	41	35	41
18 Farnley Road	46	41	29	35
286 Farnley Road	46	41	30	36
524 Benalla-Yarrawonga Road	46	41	35	41
623 Benalla-Yarrawonga Road	54	49	39	44

Table 7 Predicted Effective Noise Levels due to Operation of Solar Farm - 50% Power and 50% Fan Speed

Receiver	Noise Limit [dB(A)]	Predicted Effective Noise Level [dB(A)]	
	Night	Neutral Meteorological Conditions	Temperature Inversion + 3m/s Wind
81 Lake Mokoan Road	36	27	33
18 Farnley Road	36	18	24
286 Farnley Road	36	21	26
524 Benalla-Yarrawonga Road	36	24	29
623 Benalla-Yarrawonga Road	44	30	35

The predicted solar farm noise levels under the current Concept Deign with noise control measures implemented as specified are compliant with the noise limits at each of the receptor locations for each period for the range of meteorological conditions that were modelled.

5.2 Cumulative Impacts

There are existing industrial premises located to the west of the proposed solar farm site, namely Australian Munitions. There is the potential for the cumulative noise from the existing industry and the proposed solar farm to be non-compliant if each of the existing facilities and the solar farm in isolation were designed and operated at the noise limits. The receptor for which this would be most likely to occur is 623 Benalla-Yarrawonga Road, located to the west of the proposed solar farm site.

In these circumstances, the EPA provide a methodology that allows for the combined noise produced by all industrial premises to comply with the relevant limits. In this case, the two industrial premises would need to operate lower than the at the limits to achieve overall compliance.

Note that the noise emissions from the existing industries and their current state of compliance has not been quantified as part of this assessment. If the existing industries comply with the limits that will apply to the proposed solar farm, the potential for cumulative noise to exceed the limits is minimal.

It is recommended that details of the existing industries' operating conditions, in terms of allowable noise limits and state of compliance, be made available to enable confirmation that the cumulative impacts will be compliant. This should be undertaken as part of detailed design.

It is expected that compliance with respect to the combined noise emissions from the West Mokoan Solar Farm and the proposed Kennedys Creek Solar Farm to the south can also be achieved provided that each solar farm complies with its respective noise criteria at the surrounding receivers.

6.0 Summary

AECOM was commissioned to assess the potential environmental noise emissions from the operation of the proposed West Mokoan Solar Farm.

Noise modelling was performed to predict the noise levels at nearby residences due to the operation of the solar farm, and the modelling results were considered in relation to the noise criteria prescribed by the Victorian EPA Noise Protocol.

The modelling results indicate that the proposed solar farm, under the currently-proposed Concept Design, with noise control measures as presented in this report, will be compliant with the noise limits.

The noise control measures included in the Concept Design include acoustic enclosures to 14 PCUs located across the site and all PCUs in the BESS facility, and acoustic enclosures plus acoustic screening to a further five PCUs.

This report has considered noise from inverters and substation. Other equipment may emit noise, and all significant noise-emitting items should be assessed for compliance during the detailed design phase. Further, it is possible that the range of plant items available at the time of final selection will be different to the range that is currently on the market. Acoustic modelling of the final plant selections and layout should be undertaken to confirm that the Project will comply with the environmental noise criteria.

Appendix A

Appendix A

Planning Scheme Zones for Subject Site and Surrounds (source: VicPlan)

Appendix B

Appendix B

ISO A0 841mm x 1189mm

Project Management Initials: Designer: J.C. Checked: A.S. Approved: R.H.

Last saved by: CACERES,J(2021-10-12) Last Plotted: 2021-10-12
Filename: P:\605X\60597809\900_CAD_GIS\910_CAD\20_SHEETS\60597809-DWG-EL-0003.DWG

LEGEND

- 10m WIDE SCREEN PLANTING ZONE
- 5m WIDE SCREEN PLANTING ZONE
- EXISTING BOUNDARY VEGETATION TO BE RETAINED
- ENVIRONMENTAL VALUE (EVC HABITAT ZONES) TO BE RETAINED
- NATIVE VEGETATION ENHANCEMENT AREA - PROJECT AREA
- NATIVE VEGETATION ENHANCEMENT AREA - CROWN LAND
- VEGETATION MANAGEMENT AREA - PROJECT AREA
- VEGETATION MANAGEMENT AREA - CROWN LAND
- TRANSMISSION LINE EASEMENT
- POWERLINE EASEMENT
- DESIGNATED WATERWAYS
- PROPOSED 22kV EASEMENT REALIGNMENT
- SITE BOUNDARY FENCE
- 10m FIREBREAK OFFSET
- PROPOSED 4m WIDE ACCESS ROADS
- SENSITIVE AREAS
- SCATTERED TREES TO BE RETAINED (INCLUDING 15m TPZ)
- SCATTERED TREES TO BE REMOVED
- 'SITE ENTRANCE' AND 'DANGER' SIGNAGE
- BUSINESS IDENTIFICATION SIGNAGE (NOTE 9)
- 4.6 MVA PCU
- 2.3 MVA PCU
- ELEVATED 4.6 MVA PCU
- ELEVATED 2.3 MVA PCU
- 10dB REDUCTION OR 84dB SOUND POWER LEVEL SPECIFICATION FOR INVERTER (NOTE 12)
- 15dB REDUCTION OR 79dB SOUND POWER LEVEL SPECIFICATION FOR INVERTER (NOTE 12)
- SOLAR PANELS INSTALLED ON SINGLE AXIS TRACKER TABLES. EACH TABLE SUPPORTS 84 PANELS IN 3 STRINGS OF 28.
- ELEVATED SOLAR PANELS INSTALLED ON SINGLE AXIS TRACKER TABLES. EACH TABLE SUPPORTS 84 PANELS IN 3 STRINGS OF 28.

SYSTEM PARAMETERS

ITEM	TOTAL
NAMEPLATE AC CAPACITY (MVA) @35°C	234.6
MAXIMUM AC CAPACITY (MW) @ 35°C (PF 0.82)	192.37
DC CAPACITY (MW) @ STC	233.74
AVERAGE DC/AC RATIO	1.22
NUMBER OF PCUs (4.6MVA)	45
NUMBER OF PCUs (2.3MVA)	12
STRINGS PER 4.6MVA PCU	372
STRINGS PER 2.3MVA PCU	186
MODULES PER 4.6MVA PCU	10,416
MODULES PER 2.3MVA PCU	5,208
TOTAL NUMBER OF TRACKERS	6,324
TOTAL STRINGS	18,972
TOTAL MODULES	531,216

SYSTEM CONFIGURATION

ITEM	SYSTEM SIZE
SOLAR MODULE	440W, 144 CELLS MONOCRYSTALLINE, 1500VDC
MODULE DIMENSIONS	2115mm x 1052mm
STRING CONFIGURATION	28 MODULES PER STRING
TRACKER SYSTEM MAKE/MODEL	SINGLE AXIS TRACKING, 2 MODULE IN PORTRAIT 3 STRINGS PER TRACKER
PCU (NAMEPLATE CAPACITY)	4.6 MVA (2 X 2.3 MVA INVERTERS @ 35°C) & 2.3 MVA (1 x 2.3 MVA INVERTER @ 35°C)
PCU (DERATED CAPACITY)	3.77 MW (PF 0.82) & 1.886 MW (PF 0.82)
TRACKER AXIS AZIMUTH ANGLE	0°
ROW SPACING (CENTRE TO CENTRE)	7.5 m
GCR - GROUND COVERAGE RATIO	0.565
DC SYSTEM VOLTAGE	1500V

NOTES:

1. E-1, E-2 AND E-5 TRANSMISSION LINE EASEMENT. WIDTH OF EASEMENT RANGING BETWEEN 61m - 74m.
2. EASEMENT E-3, E-4 AND E-5. 14m WIDE DISTRIBUTION LINE EASEMENT.
3. LOCATION OF INVERTERS TO BE CONFIRMED DURING DETAILED DESIGN.
4. ACCESS TRACK DESIGN TO BE UNDERTAKEN DURING THE DETAILED DESIGN PHASE. ACCESS TRACKS SHOWN ARE INDICATIVE ONLY.
5. SITE ENTRANCE GATES TO BE CONFIRMED DURING DETAILED DESIGN.
6. SUBSTATION DIMENSIONS APPROXIMATE ONLY.
7. DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
8. NATIVE VEGETATION THAT HAS NOT BEEN IDENTIFIED TO BE RETAINED MAY BE REMOVED WHERE NECESSARY, SUBJECT TO DELWP NATIVE VEGETATION REMOVAL PERMIT APPROVAL. NATIVE VEGETATION SHOULD BE RETAINED WHERE PRACTICABLE.
9. BUSINESS IDENTIFICATION SIGNAGE (1m (L) x 1m (W)) SHALL BE LOCATED AT THE DESIGNATED MAIN ENTRANCE OF EACH MAIN PROPERTY.
10. ENTRY/ACCESS POINTS TO BE DESIGNED IN ACCORDANCE WITH VICROADS STANDARD DRAWING GD4010 - TYPICAL ACCESS TO RURAL PROPERTIES.
11. PROPOSED OVERHEAD LINE ROUTES AND LOCATIONS ARE INDICATIVE ONLY AND SHALL BE CONFIRMED DURING DETAILED DESIGN. THE OVERHEAD LINE INFRASTRUCTURE SHALL BE DESIGNED AND CONSTRUCTED TO ENSURE NO IMPACT ON NATIVE VEGETATION. DESIGN AND CONSTRUCTION WILL NOT OCCUR IN THE CREEK LAND AND/OR CHANNEL (APPROACH TBC BY SOUTH ENERGY).
12. PCU NOISE REDUCTIONS BASED ON 94 dB(A) SOUND POWER LEVEL SPECIFICATIONS PER INVERTER.

TRUE NORTH

FARNEY ROAD
EXISTING DWELLING
CHESNEY VALE CFA FIRE STATION
LAKE MOKOAN ROAD
NOTE 1
SITE ENTRANCE GATE. NOTE 10.
BENALLA-YARRAWONGA ROAD
DESIGNATED WATERWAYS CMA FACILITY AREA & BASLIN AREA
NOTE 2
PROPOSED MV OVERHEAD LINE CONNECTIONS BETWEEN NORTH AND SOUTH SITE (INDICATIVE ONLY - REFER TO NOTE 11)
NATIVE VEGETATION ENHANCEMENT AREA. REFER TO WOODLAND MANAGEMENT PLAN FOR DETAILS
SITE ENTRANCE GATES NOTE 10.
ALL PCUs IN BESS FACILITY TO BE REDUCED BY 10dB , OR MEET 84dB SOUND POWER LEVEL SPECIFICATION REFER TO NOTE 12.
STOCKYARD CREEK
MINIMUM 15m SETBACK FROM THE CENTRELINE OF WATERWAYS
SITE ENTRANCE GATE. NOTE 10.
EXISTING DWELLING
SITE ENTRANCE GATE. NOTE 10.
EXISTING DWELLING
EXISTING DWELLING

0 125 250 m
1:5000

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR.

FOR DISCUSSION PURPOSE ONLY

PLEASE NOTE THE ENCLOSED DRAWINGS ARE ONLY PRELIMINARY AND NOT FOR CONSTRUCTION, AND THEREFORE ARE LIKELY TO BE SUBJECT TO CHANGE.

SOLAR PV PLANT

SCALE 1:5000

AECOM

PROJECT

WEST MOKOAN SOLAR FARM CONCEPT DESIGN

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Victoria

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
12	12/08/2021	REVISED ISSUE
11	03/06/2021	REVISED ISSUE
10	12/05/2021	REVISED ISSUE
9	13/04/2021	REVISED PER CLIENT REVIEW
14	12/10/2021	CHANGE OF OWNERSHIP
13	13/09/2021	REVISED ISSUE

PROJECT NUMBER

60597809

SHEET TITLE

WEST MOKOAN SOLAR FARM CONCEPT LAYOUT

SHEET NUMBER

60597809-DWG-EL-0003