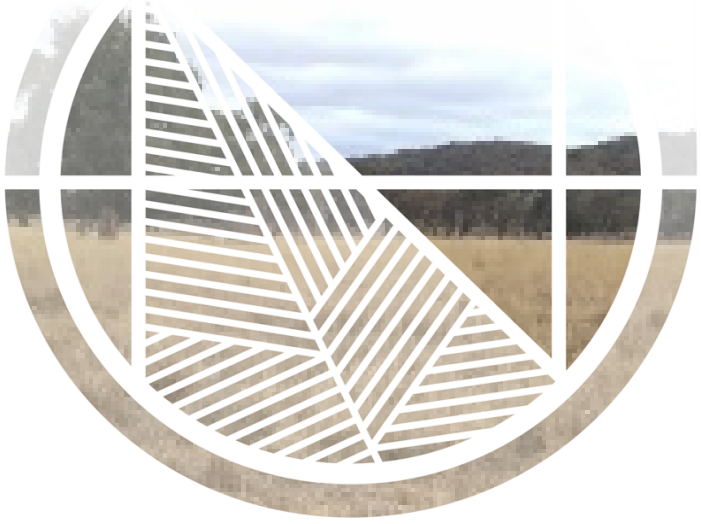
APPENDIX I DRAFT NOISE MANAGEMENT PLAN

NOISE MANAGEMENT PLAN

Oxley Solar Farm

February 2021

Project Number: 19-489



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ACRONYMS AND ABBREVIATIONS

AS	Australian Standard
dB(A)	Decibels
DECC	Department of Climate Change
DECCW	Department of Climate Change and Water
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
ICNG	Interim Construction Noise Guidelines
INP	*NSW Industrial Noise Policy*
km	kilometres
L_{Aeq}	Equivalent continuous noise level
LGA	Local Government Area
m	Metres
MW	Megawatt
NML	Noise Management Level
NMP	Noise Management Plan
NSW	New South Wales
POEO	*Protection of the Environment Operations Act 1997*
PV	Photovoltaic
RBL	Rating Background Level (background noise level)
RNP	NSW *Road Noise Policy*

1. INTRODUCTION

The construction of a solar farm comprises activities such as road construction, civil works, excavation and foundation construction and electrical infrastructure works requiring processes such as heavy vehicle movements, loaders, excavators, piling, generators and cranes.

A Construction and Operational Noise and Vibration Assessment for the proposed Oxley Solar Farm was undertaken by Renzo Tonin and Associates (2021). Noise emissions from the construction phase of the project were predicted to exceed the construction noise management levels at the nearest affected receivers.

In general, the most significant impact of construction occurs from any activity proposed at night (i.e. after 6pm and before 7am). The proposed hours of the construction of the solar farm are as follows:

- Monday to Friday: 7am to 6pm
- Saturday: 8 am to 1pm
- Sunday and Public Holidays: no work

With day time only activity occurring at significant separation distances, the construction of Oxley Solar Farm is not expected to generate significant impacts, subject to implementation of the feasible and reasonable noise mitigation measures, as set out in the noise assessment (Renzo Tonin 2021) and carried over to this construction Noise Management Plan (NMP).

This draft NMP has been prepared in advance of the detailed design, to demonstrate the framework for noise management during construction. It would be updated prior to implementation.

It is not anticipated that the construction of the solar farm would adversely affect current noise levels. Although it will contribute to the existing traffic noise levels, at the most affecting residences along the surrounding roads, no additional mitigation measures will be required.

2. EXISTING ENVIRONMENT

2.1. SENSITIVE RECEIVERS

The proposal is located in a rural setting, approximately 14 kilometres (km) south-east of Armidale. The surrounding land uses to the proposed solar farm are primarily agriculture and associated rural dwellings. A currently non-operational waste facility is located adjacent to the site. Oxley Wild Rivers National Park is located south of the proposal site. Noise sources in the locality include traffic along the Waterfall Way (scenic drive linking Coffs Harbour and Armidale, via Grafton Road) and agricultural activities such as operation of tractors, quad bikes and 4WD vehicles. Noise from agricultural activities would include operation of tractors, quad bikes and 4WD vehicles as well as from livestock grazing and management, spraying, cultivating and harvesting crops. Noise levels from farm activities are concentrated at peak times during the year such as seeding and harvesting whereas noise from local roads (and the waste facility when operational) is more continuous throughout the year.

Appendix A illustrates the locations of the nearest receivers to the proposal site, with the closest non-involved receiver is located approximately 185m west of the proposal site at 686 Gara Road, Metz (R3).

2.2. AMBIENT AND BACKGROUND NOISE MONITORING

The Rating Background Level (RBL) is the indicative background noise level at the monitoring location, while the ambient equivalent (L_{aeq}) noise level is the average noise environment at the monitoring location, determined in accordance with the NSW Industrial Noise Policy (the INP). The RBL and the ambient equivalent (L_{aeq}) noise level for L1 have been derived from the monitoring data are provided in (Table 2-1).

Table 2-1 Measured existing background (L90) & Ambient (Leq) Noise Levels, dB(A)

Location	L90 Rating Background Noise Levels (RBL)			Leq Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
L1 914 Gara Road, Metz	24	22	20	45	32	38

Based on the relevant section of the INP Guidelines, where background noise levels are less than 30dB(A), the minimum applicable background noise level is recommended to be set at **30dB(A)**. Therefore, this minimum background noise level has been adopted for all receiver locations nominated during the nighttime assessment period.

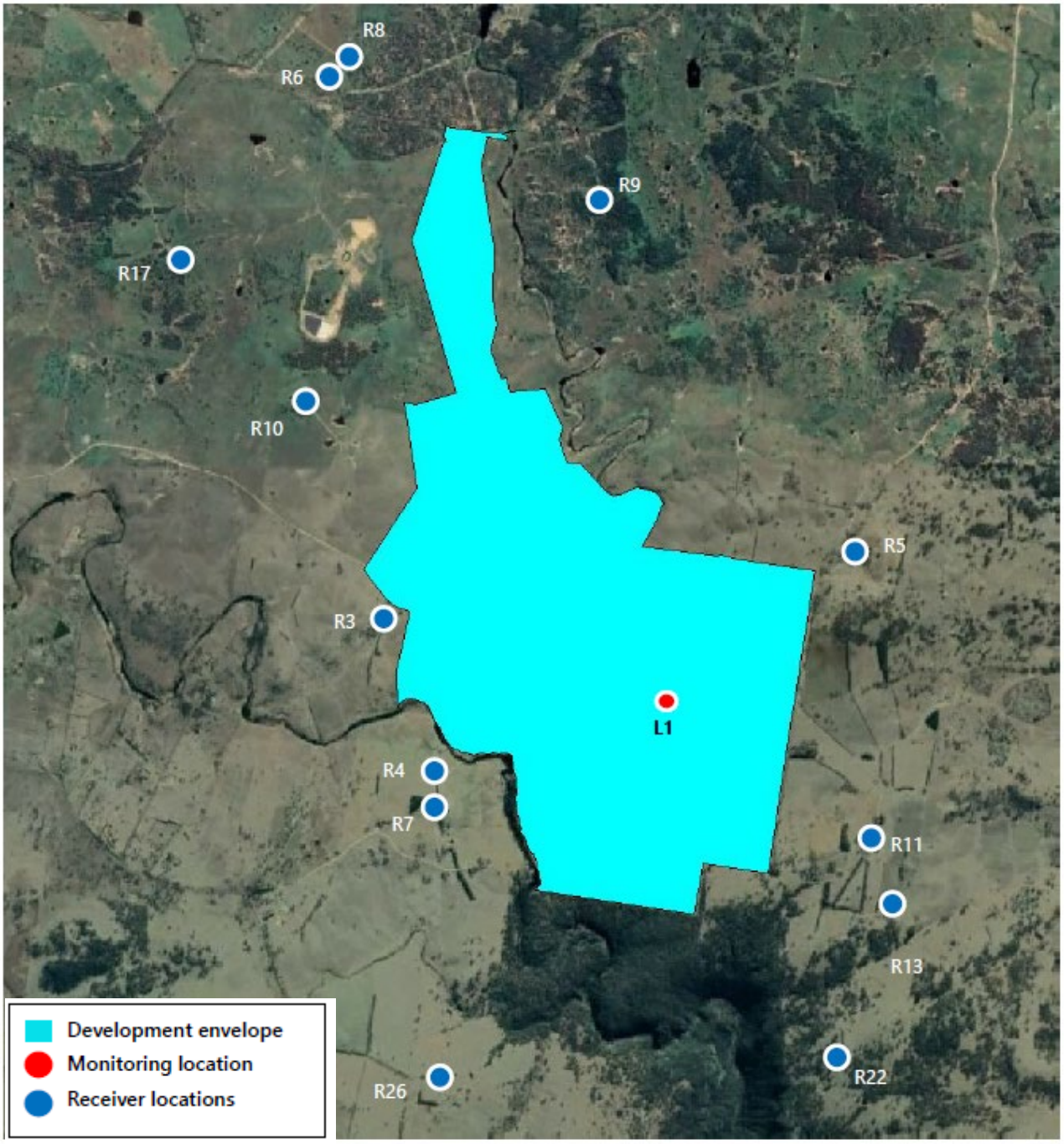

Figure 2-1 Residential receivers and noise monitoring locations adjacent to the proposal site.

3. NOISE CRITERIA

3.1. CRITERIA

The NSW Interim Construction Noise Guideline (ICNG DECC 2009) deals with managing construction noise impacts. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total.

3.1.1. Residential Receivers

The guideline specifies noise targets, or 'noise management levels', for residences and other noise sensitive receivers (Table 3-1). The RBL is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified below.

Table 3-1 Noise Management Levels at residential receivers.

Time of day	Management Level
Recommended standard hours: **Monday to Friday** **7am to 6pm** **Saturday 8am to 1pm** **No work on Sundays or public holidays**	Noise affected Rating Background Level + 10dB(A)
	Highly noise affected 75dB(A)
Outside recommended standard hours	Noise affected Rating Background Level + 5dB(A)

Table 3-2 identifies the adopted construction Noise Management Levels (NMLs) for the nearest noise sensitive residential receivers (refer to Figure 2-1). The NMLs for the receiver locations are derived from the RBLs represented by the background noise levels measured at the monitoring location (Figure 2-1) and NSW ICNG (DECC 2009) criteria (Table 3-1). Furthermore, during standard construction hours, a highly affected noise objective of 75 dB(A) applies at all receivers.

Table 3-2 Construction Noise Management Levels at residential recievers.

Location description	Day L_{A90} Background Noise Level (RBL)	Day Noise Management L_{A90} (15min)
All residential receivers	35[1]	45

Notes: 1. Construction works occur during the daytime period only, hence only the day period is assessed.

3.2. ROAD TRAFFIC NOISE CRITERIA

Noise impact from the potential increase in traffic on the surrounding road network due to construction is assessed against the NSW 'Road Noise Policy' (RNP) (DECCW 2011). The RNP sets out criteria to be applied to particular types of road and land uses. Waterfall Way is categorised as an arterial road and Gara Road is categorised as a sub-arterial road. Criteria for the roads are outlined in Table 3-3.

Table 3-3 RNP Road Traffic Noise Criteria, dB(A)

Road Category	Type of Proposal /Land Use	Assessment Criteria dB(A)	
		Day 7am-10pm	**Night 10pm-7am**
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)

4. ENVIRONMENTAL IMPACTS AND ASSESSMENT

4.1. CONSTRUCTION NOISE SOURCES

Noise impact predictions take into account the typical noise levels of construction equipment likely to be used for the construction phase. The equipment and their sound power levels are in Table 4-1.

Table 4-1 Construction equipment sound power levels

Equipment used	No. Items required	L_{Aeq} Sound power levels (dBA) per single item
Small Pile Driving Rig	6	114
Crane	2	110
Drum roller	2	109
Padfoot roller	2	109
Wheeled loader	2	109
Dump Truck	4	108
30T Excavator	8	107
Grader	4	107
Chain trencher	2	104
Water truck	4	104
Telehandler	4	98
Forklift	4	90

4.2. CONSTRUCTION NOISE ASSESSMENT

Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments surrounding the study area. The modelling calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models take into account:

- Location of noise sources and receiver locations.
- Height of sources and receivers.
- Separation distances between sources and receivers.

- Ground type between sources and receivers.

Table 4-2 presents the noise levels likely to be experienced at the nearby affected receiver locations during the construction works. The present levels are considered a worst-case scenario with up to three nosiest plants operating concurrently.

Table 4-2 Predicted $L_{Aeq\ 15\ min}$ construction noise levels at receiver locations

Receiver location (refer to Figure 2-1**)**	**Noise management level**[1]	**Predicted Construction Noise Level, $L_{Aeq\ (15\ min)}$** [2]	**Comply? (Yes/No)**
R3	**45**	<20-57	**No**
R4		<20-47	**No**
R5		<20-48	**No**
R6		<20-41	Yes
R7		<20-45	Yes
R8		<20-42	Yes
R9		<20-44	Yes
R10		<20-43	Yes
R11		<20-36	Yes
R13		<20-43	Yes
R17		<20-31	Yes
R22		<20-36	Yes
R26		<20-32	Yes

Based on the construction noise levels presented in the table above, the construction management levels at receivers R3, R4 and R5 will be exceeded when the construction works are conducted at closest proximity to the receivers. It is noted that construction noise levels at all receivers are predicted to be well below the highly noise affected level of 75dB(A).

Section 5 outlines noise reduction options that will be employed to manage noise.

[1] Noise management for standard day time construction works (i.e. Monday to Friday 7am to 6pm and Saturday 7am to 1pm)

[2] Based on up to three nosiest construction plant and equipment operating concurrently.

4.3. ROAD TRAFFIC NOISE ASSESSMENT

Site access would be off Waterfall Way. The anticipated peak vehicle movements during the construction stage of the project are presented in Table 4-3 Vehicle movements will only occur during the daytime period when construction works occur.

Table 4-3 Summary of estimated construction traffic volumes during peak.

Vehicle type	Trips per day
Semi-trailers	46
B-doubles	4
Oversized vehicles	2
Standard trucks	10
Water tanks	30
Cars/light vehicles	60
Buses	40
Total	**192**

Table 4-4 Predicted road traffic noise contribution levels along public roads, dB(A).

Receiver	Road	Criteria	Truck traffic movements	Speed (km/h)	Distance to Road	Predicted Noise Level	Comply? (Yes/No)
Residences on Waterfall Way	Arterial	$L_{Aeq,\ (15\ hour)}$ 60	refer to Table 4-3	100	20m	56 dB(A)	Yes
Residences on Gara Road	Sub-arterial	$L_{Aeq,\ (15\ hour)}$ 60	refer to Table 4-3	100	20m	43 dB(A)	Yes

From Table 4-4 it can be seen that road traffic noise level contributions from the truck movements associated with the construction works are at least 4dB(A) below the applicable noise criteria based on dwellings being 20m from the road. Therefore, traffic noise levels as a result of the construction works for the solar farm would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads and require no specific mitigation.

5. PROPOSAL MITIGATION MEASURES

Exceedances of noise criteria are expected to be limited to R3, R4 and R5 (based on a worst case scenario of the 3 noisiest equipment operating concurrently near these receivers).

The following recommendations provide feasible and reasonable noise control solutions to reduce noise impacts to sensitive receivers, and specifical including works near R3, R4 and R5.

Where actual construction activities differ from those provided in this report, more detailed design of noise control measures may be required. Appendix A outlines possible noise reductions from using some recommended control methods.

5.1. PHYSICAL NOISE CONTROLS

Physical noise controls set out in Appendix A would be investigated where exceedances are predicted for specific activities:

- Doubling of distance between a source and receiver.
- Temporary acoustics barriers.
- Engine casing lagged with insulation and plywood.

5.2. GENERAL MINIMISATION MEASURES

In addition to physical noise controls, the following general noise management measures should be followed:

- Use less noisy plant and equipment, where feasible and reasonable.
- Plant and equipment should be properly maintained.
- Provide special attention to the use and maintenance of ‘noise control’ or ‘silencing’ kits fitted to machines to ensure they perform as intended.
- Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.
- Avoid any unnecessary noise when carrying out manual operations and when operating plant.
- Any equipment not in use for extended periods during construction work should be switched off.

5.3. TIMING RESTRICTIONS

For construction works conducted within approximately 700m of the dwelling building of R3, R4 and R5, potential noise impacts to these locations will be managed by implementing time restrictions and/or providing periods of repose for residents, where feasible and reasonable. That is, daily periods of respite from noisy activities may also be scheduled for building occupants during business hours.

Between 10am and 3pm Monday to Friday (with one-hour break for lunch between 12pm and 1pm), noisy activities will occur with no noise level restrictions. Outside these hours but within the construction hours of the of the project, 7am to 10am and 3pm to 6pm and Saturdays, noise level restrictions will apply. This means that all noise levels are required be below the noise management levels set out for the project, this can be achieved by using less machinery at once in the same location or completing work further than 700m away from the dwellings.

Residents would be consulted to determine appropriate respite periods and will be notified of the potential noise impact during this time period so that they can organise their day around the noisy period.

Some items of plant may exceed noise limits even after noise treatment is applied. To reduce the overall noise impact, the use of noisy plant may be restricted to within certain time periods, where feasible and reasonable and to be negotiated with Council and the residents. Allowing the construction activities to proceed, despite the noise exceedance may be the preferred method in order to complete the works expeditiously.

6. COMPLIANCE MANAGEMENT

6.1. MONITORING

The aim of a monitoring procedure is to ensure works are being carried out in accordance with the NMP. On site monitoring should include the following elements.

Regular onsite inspections will be undertaken to identify:

- Equipment has quality mufflers installed.
- Equipment is well maintained and fitted with adequately maintained silencers which meet the design specifications.
- Silencers and enclosures are intact and closed, rotating parts are balanced, loose bolts are tightened, frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp.
- Site personnel are using only necessary power to complete the task.
- Plant and equipment that is noisier than other similar machines.
- Care is being taken to place material in trucks rather than being dropped.
- Plant emitting noise strongly in one direction is orientated so that the noise is directed away from noise sensitive areas if practicable.
- Machines that are used intermittently are being shut down in the intervening periods between works or throttled down to a minimum.

6.2. COMPLAINTS RESOLUTION

The aim of the complaints resolution process is to respond promptly to complaints, identify any feasible and reasonable measures that may further reduce impacts following a complaint, and to provide feedback to the community on the above process within a reasonable timeframe.

The proponent would:

- Take prompt and direct actions to develop good relations with people living and working in the vicinity of a construction site at the beginning of a project and this would be maintained throughout the project, as this is of paramount importance.
- Keep people living and working in the vicinity of a construction site informed of progress.
- Appoint a person to liaise with the community who is adequately trained and experienced in such matters.

The complaints resolution process should implement the following noise elements;

- Establishment of a complaints mechanisms for the community via either telephone or email.
- Notification of the relevant project contact details through the community consultation process.
- Take all complaints seriously and deal with them expeditiously.
- Assess whether the issue can be resolved easily and take immediate action if possible.
- If not, ensures that the appropriate consultation has been undertaken for the activity.
- Ensures the on-site inspections of the NMP have been carried out regularly for the activity.
- Assesses the construction site and activities to determine whether there is any reason to believe the noise exposure of receivers is higher than anticipated.
- Undertake monitoring of noise levels where this cannot be confirmed, with the aim of establishing if the exposure of receivers is higher than anticipated by the NMP.
- Take remedial action if any of the above cannot be confirmed.
- Advise of complainant of action taken.

- Maintain a record of the above to enable review by an independent authority such as EPA.

7. CONCLUSION

Renzo Tonin and Associates has completed an environmental noise and vibration assessment of the proposed Oxley Solar Farm. Noise emissions from the construction phase of the proposal were predicted to exceed the construction noise management levels at the nearest affected receivers in limited situations, modelled on a worst case scenario basis.

Feasible and reasonable noise control solutions to reduce noise impacts to sensitive receivers are included in this NMP, and will be implemented specifically to address modelled exceedances at R3, R4, and R5, as well as the overall noise management of the construction site.

The NMP provides a framework document that the construction contractor can use to develop and implement action plans for each individual construction activities. It has been prepared in advance of the detailed design, to demonstrate the framework for noise management during construction and would be updated prior to implementation.

8. REFERENCES

AS 2436, 2010, *Guide to noise and vibration control on construction, demolition and maintenance sites*, Standards Australia.

DECC, 2009, *Interim Construction Noise Guideline*, Department of Environment, Climate Change and Water, Sydney, New South Wales.

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NGH (2021). *Environmental Impact Statement Oxley Solar Farm*. Prepared for Oxley Solar Development Pty Ltd by NGH Pty Ltd, Bega NSW.

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APPENDIX A EFFECTIVENESS OF NOISE CONTROLS

Table 8-1 Relative Effectiveness of Various Forms of Noise Control, dB(A)

Noise control method	Practical examples	Typical noise reduction possible in practice		Maximum noise reduction possible in practice	
		AS 2436-2010	Renzo Tonin and Associates	AS 2436-2010	Renzo Tonin and Associates
Distance	Doubling of distance between source and receiver	6	6	6	6
Screening	Acoustics barriers such as earth mounds, temporary or permanent noise barriers	5 to 10	5 to 10	15	15
Acoustic enclosures	Engine casing lagged with insulation and plywood	15 to 25	10 to 20	50	30
Engine Silencing	Residential class mufflers	5 to 10	5 to 10	20	20
Substitution by alternative process	Use electric motors in preference to diesel or petrol	-	15 to 25	-	40