EIS Volume 2 Appendix J

Environmental Noise Impact Assessment

JBS&G

project energy connect

Resonate

Project EnergyConnect EIS

Environmental Noise Impact Assessment

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Document Information

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Revision Table

Report revision	**Date**	**Comments**
0	1 May 2019	Draft
A	5 June 2019	Changed receiver to receptor, removed mention of baseline vibrations, updated figure 3
B	24 September 2019	Updated alignment
C	26 November 2019	Response to JBS&G comments
D	28 January 2021	Response to JBS&G comments, and updated alignment

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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Characteristic	Associated with a noise source, means a tonal, impulsive, low frequency or modulating characteristic of the noise that is determined in accordance with the Guidelines for the use of the Environment Protection (Noise) Policy (Noise EPP) to be fundamental to the nature and impact of the noise.
Continuous noise level	A-weighted noise level of a continuous steady sound that, for the period over which the measurement is taken using fast time weighting, has the same mean square sound pressure as the noise level which varies over time when measured in relation to a noise source and noise-affected premises in accordance with the Noise EPP
Day	Between 7 am and 10 pm as defined in the Noise EPP
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
dB(A)	Units of the A-weighted sound level.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
Indicative noise level	Indicative noise level determined under clause 5 of the Noise EPP.
L_{90}	Noise level exceeded for 90 % of the measurement time. The L_{90} level is commonly referred to as the background noise level.
L_{eq}	Equivalent Noise Level—Energy averaged noise level over the measurement time.
L_{max}	The maximum instantaneous noise level.
Night	Between 10.00 p.m. on one day and 7.00 a.m. on the following day as defined in the Noise EPP
Noise source	Premises or a place at which an activity is undertaken, or a machine or device is operated, resulting in the emission of noise
Okta	Unit of measurement used to describe the amount of cloud cover at a location, with 0 meaning sky completely clear of clouds, and 9 meaning no sky is visible.
Quiet locality	A locality is a quiet locality if the Development Plan provisions that make land use rules for the locality principally promote land uses that all fall within either or both of the following land use categories: (a) Residential; (b) Rural Living;

Table of Contents

1 Introduction

Resonate has been commissioned by JBS&G to undertake an environmental noise impact assessment to form part of the Environmental Impact Statement (EIS) for the proposed high voltage interconnector between Robertstown, SA and Wagga Wagga, NSW. This assessment relates to the SA portion of the proposed high voltage interconnector only.

The proposed works assessed encompassed the area around the proposed transmission line alignment, collectively referred to as the study area. This includes the Project area which is a 500m buffer around the alignment, and a 1km x 1km square clearance at the proposed substation site, as well as an additional 2.7km buffer to assess the extended noise impact.

The scope of this assessment includes construction, operation and heavy vehicle haulage (road traffic) noise impacts. The predicted airborne noise emissions from both construction and operation of the project have been assessed against the requirements of the following:

- *ElectraNet: Project EnergyConnect Impact Assessment Methodology (November 2020)*
- *South Australian Environment Protection (Noise) Policy 2007*
- *The Goyder Council Development Plan*
- *The Riverland Paringa Council Development Plan.*

Furthermore, an environmental impact risk assessment, in context with identified reasonable and practicable noise mitigation and/or management options, has been presented.

2 Project description

2.1 Background

ElectraNet and Transgrid are collectively exploring options to develop a high capacity interconnector between Robertstown in SA and Wagga Wagga in NSW (Project EnergyConnect) which will form a key infrastructure component of the National Electricity Market. The SA portion of Project EnergyConnect (the Project) involves the construction of a 330 kV transmission line between Robertstown and the SA-NSW border as well as construction of a new substation approximately 14 km north-east of Robertstown.

JBS&G Australia Pty Ltd (JBS&G) has been appointed by ElectraNet to manage and co-ordinate the successful delivery of all environmental approvals, stakeholder engagement and communications and land access for the SA portion of the works. This includes preparation of an Environmental Impact Statement (EIS).

The Project is in the preliminary design stage with the study corridor currently extending approximately 200km from Robertstown to the SA/NSW border. The corridor has been refined to 500 m for most of the route. While the final alignment is subject to further environmental and social investigations, land access negotiations, stakeholder and community consultation and engineering design, it is anticipated that the final route will remain within the 500m corridor. For the purposes of the noise component of the EIS, a 6.4km corridor around the current interconnector alignment has been defined as the study area.

2.2 Study area

The study area for the Project is defined as the zone at which noise might have an impact on the amenity of the environment. Collectively, the study area includes the following:

- the entirety of the proposed transmission line alignment, comprising a length of approximately 200km between the existing Robertstown substation, and the SA/NSW border approximately 38km northeast of Cooltong
- the Project area as defined by JBS&G as a 500m buffer around the transmission line, comprising a 1km corridor
- an extra 2.7km buffer around the Project area to assess the extended noise impact
- a 1km x 1km clearance around the proposed substation site.

The entirety of the study area is shown in Figure 1.

2.3 Noise generating activities

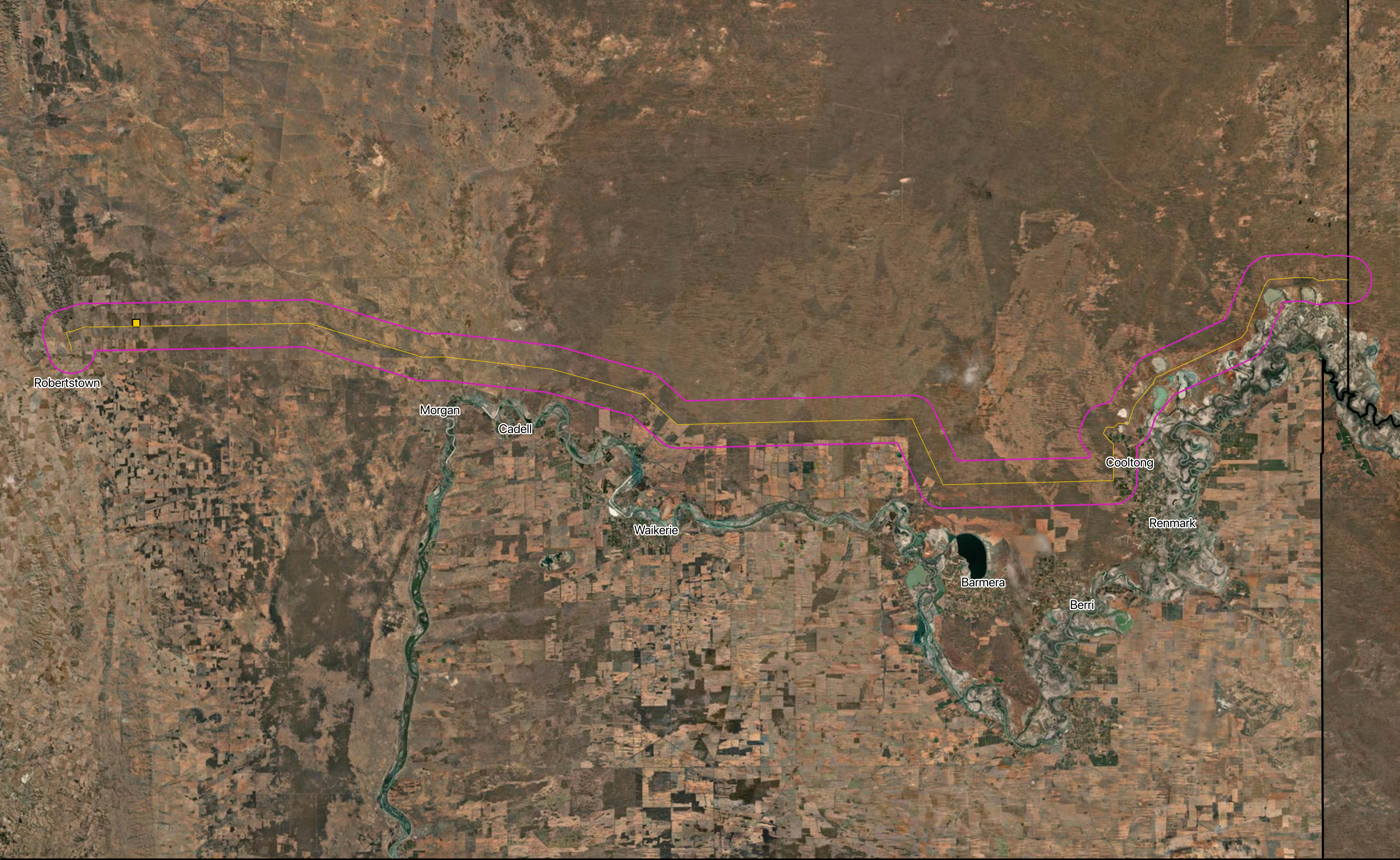
A number of Project noise generating plant and equipment activities being undertaken within the Project area have been identified. The general construction of the substation and towers, and operational noise associated with the transmission line (including maintenance) have the potential the generate noise impact on the surrounding environment. These noise levels are expected to vary on a day-to-day basis and during the various phases of the Project which include:

- clearing land around the new substation site and along the transmission line alignment
- installation of the substation and transmission line towers
- stringing of transmission lines.

Each of these Project phases is considered in this acoustics assessment.

The type of noise generating equipment that is proposed for use within the site areas and the likely activities undertaken are as follows:

- bulldozer
- grader
- front end loader



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Legend

- Transmission line alignment
- Study area corridor
- Substation site
- State boundary

Project EnergyConnect EIS

Study area and transmission line alignment

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Dated: December 2020
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Client: JBS&G
Data sources: Google

Figure 1

- small excavator
- concrete truck
- mobile concrete batching plant
- semi-trailer
- mobile crane
- helicopter.

Each of these plant, equipment and activities has the potential to generate high noise level events. Therefore, the noise assessment has considered these items to quantify and assess the magnitude of representative worst-case noise impacts for each Project phase.

2.4 Proposed work hours

The hours of construction, including the delivery of materials to and exported from the Staging Site, will be set out in the development consent and will occur from 6 am – 6 pm, every day of the week.

These extended hours are consider acceptable as Division 1 of the Noise EPP does not apply to construction activity related to public infrastructure as stated in Clause 22(b).

3 Assessment criteria

This section outlines the relevant assessment criteria relating to the identified environmental values.

3.1 Environmental values

Environmental values are defined as the physical characteristics and qualities of the environment that contribute to biodiversity conservation, and the social, spiritual and economic health of individuals and society. Implicit in this definition is that an environmental value has some degree of significance. A list of relevant environmental values for the entire Project has been included in the *ElectraNet: Project EnergyConnect Impact Assessment Methodology (November 2020)*.

Table 1 shows the environmental values considered for the noise component of the EIS, and their potential effect.

Table 1 Environmental values - noise

Environmental value	Potential effects (worst case)
Public health and safety	Excessive noise from the construction and operation of the Project has a small possibility to cause minor hearing damage to residents at the nearest receptors. This will only happen if the resident is exposed to high noise levels for extended periods of time.
Socio-economic	Noise from the Project has the potential to cause distress to local residents and could influence their day to day life. This is likely to cause unhappiness towards the Project, and would negatively impact community feelings towards the Project.
Listed flora and fauna	Noise impact from the Project could lead to involuntary relocation of the local fauna population. There is also the possibility that noise from the Project could negatively impact the health of local fauna. It is noted that noise from the Project will not have a negative impact on the flora.
Other flora and fauna	See above.

3.2 Construction noise criteria

Division 1 of the Noise EPP contain provisions in relation to noise from construction, demolition and related activities. The following provisions apply to construction activity resulting in noise with an adverse impact on amenity:

a) *subject to paragraph (b), the activity—*
   i) *must not occur on a Sunday or other public holiday; and*
   ii) *must not occur on any other day except between 7.00 a.m. and 7.00 p.m.;*

b) *a particular operation may occur on a Sunday or other public holiday between 9.00 a.m. and 7.00 p.m., or may commence before 7.00 a.m. on any other day—*
   i) *to avoid an unreasonable interruption of vehicle or pedestrian traffic movement; or*
   ii) *if other grounds exist that the Authority or another administering agency determines to be sufficient;*

c) *all reasonable and practicable measures must be taken to minimise noise resulting from the activity and to minimise its impact, including (without limitation)—*
   i) *commencing any particularly noisy part of the activity (such as masonry sawing or jack hammering) after 9.00 a.m.; and*
   ii) *locating noisy equipment (such as masonry saws or cement mixers) or processes so that their impact on neighbouring premises is minimised (whether by maximising the distance to the premises, using structures or elevations to create barriers or otherwise); and*
   iii) *shutting or throttling equipment down whenever it is not in actual use; and*

iv) *ensuring that noise reduction devices such as mufflers are fitted and operating effectively; and*
v) *ensuring that equipment is not operated if maintenance or repairs would eliminate or significantly reduce a characteristic of noise resulting from its operation that is audible at noise-affected premises; and*
vi) *operating equipment and handling materials so as to minimise impact noise; and*
vii) *using off-site or other alternative processes that eliminate or lessen resulting noise.*

Construction noise with an adverse impact on amenity is defined as that which results in a noise level greater than 45 dB(A) L_{eq} (continuous noise level) or 60 dB(A) L_{max} (maximum noise level) at a noise-affected premises such as a residence. However, Clause 23(4) of the Noise EPP also states that:

(a) if measurements of ambient noise at the noise-affected premises show that the ambient noise level (continuous) exceeds 45 dB(A), the construction activity does not result in noise with an adverse impact on amenity unless the source noise level (continuous) exceeds the ambient noise level (continuous);

(b) if measurements of ambient noise at the noise-affected premises show that the ambient noise level (maximum) consistently exceeds 60 dB(A), the construction activity does not result in noise with an adverse impact on amenity unless the source noise level (maximum) exceeds the ambient noise level (maximum) or the frequency of the occurrence of the ambient noise level (maximum).

The above provisions recognise that construction noise is inherently noisy, with limited opportunity for mitigation. However, given the temporary nature and limited duration of construction noise, it is considered acceptable provided it is undertaken within reasonable hours and all reasonable and practicable measures to mitigate noise are implemented.

Clause 22(b) of the Noise EPP states that the criteria outlined in Division 1 does not apply to construction activity related to public infrastructure. For the purposes of this assessment these levels are considered suitable as a guideline to avoid an adverse impact on amenity.

It is noted that Schedule 1(3) states that aircraft noise is excluded from the Noise EPP, however the stringing of transmission lines (involving a helicopter) is considered a construction activity under Part 6, Division 1 for the purposes of this assessment. This is due to the absence of helicopter noise guidelines in South Australia.

3.3 Operational noise criteria

Environmental noise emissions from the proposed development are required to comply with the *Environment Protection (Noise) Policy* 2007 (Noise EPP), which is also the most relevant guideline to address the requirements of the overarching *Environment Protection Act 1993.*

The noise goals in the Noise EPP are based on the zoning of the proposed development and the closest noise affected premises in the relevant development plan. The land uses primarily promoted by the zones are used to determine the indicative noise factors shown in Table 2.

Table 2 Indicative noise factors for various land use categories

Land use category	Indicative noise factor dB(A)	
	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Rural living	47	40
Residential	52	45
Rural industry	**57**	**50**
Light industry	**57**	**50**
Commercial	62	55

Land use category	Indicative noise factor dB(A)	
	Day (7 am to 10 pm)	Night (10 pm to 7 am)
General industry	65	55
Special industry	70	60

In this case, the Project is located in several different development plans and zones along the alignment, as are the nearest receptors. It is noted that the Project is located in the same zone as each of the nearest noise sensitive receptors.

The *Guidelines for use of the Environment Protection (Noise) Policy 2007* state that:

> The title 'Rural Industry' is not intended to create a link to the term 'industry' as defined in the Development Act 1993. The term 'industry' has been used in the Policy to indicate that the locality principally promotes a primary industry or associated activity. For example, in general farming zones, where the land use principally promoted is agriculture and residences are contemplated, the Rural Industry land use category would be assigned.

The *Rural Industry* land use category therefore applies to the zones within the Goyder and Mid Murray Development plan. The Renmark Paringa Development Plan also promotes light industry, hence the *Light Industry* and *Rural Industry* land use categories both apply to this zone. It is noted that the indicative noise factor for these land use categories are the same. For the assessment of operational noise, the nearest noise sensitive receptors are considered to be within 1km of the alignment. Table 3 shows the Development Plan Zone and corresponding Noise EPP land use category for all receptors within 1km of the alignment. Table 4 shows the developments promoted within each zone. The locations of the nearest noise sensitive receptors are shown on Figure 2.

Table 3 Land use categories for each Zone within 1km of the alignment

Receptor(s)	Development Plan	Zone	Land use category
1	Goyder	Primary Production	Rural Industry
2	Goyder	Primary Production (Policy 2)	Rural Industry
3 – 15	Renmark Paringa	Primary Production (Policy 4)	Rural/Light Industry

Table 4 Promoted developments for Zones within 1km of the alignment

Development Plan	Zone	Promoted Development
Goyder	Primary Production	• tourist accommodation, including through the diversification of existing farming activities and conversion of farm buildings • farming • intensive animal keeping • wind farm and ancillary development • wind monitoring mast

Development Plan	Zone	Promoted Development
Goyder	Primary Production (Policy 2)	• farming and farm buildings • intensive animal keeping • organic waste compositing facilities • resource recovery • supporting infrastructure • wind farm and ancillary development • wind monitoring mast
Renmark Paringa	Primary Production (Policy 4)	• dwelling associated with envisaged forms of development • farming • horticulture • light industry and service industry associated with the processing, packaging and distribution of produce • small-scale tourist development in association with wineries, farms and heritage places • wind farms and ancillary development • wind monitoring mast

Clause 5(5) of the Noise EPP requires that if the noise source and the noise sensitive premises are located in the same land use category, the indicative noise level for the noise source is the indicative noise level for that land use category. In this case, the indicative noise level for all receptors is the Rural and Light Industry factors, i.e. 57 dB(A) during the daytime and 50 dB(A) during the night.

In accordance with Part 5 of the Noise EPP, the relevant planning assessment criteria for this development is the determined indicative noise level minus 5 dB(A), as shown in Table 5. The *Guidelines for use of the Environment Protection (Noise) Policy 2007* note that the more stringent criteria which are applied to assessment of development applications is in recognition of a range of factors, including increased sensitivity to noise from a new noise source, the increased scope for inclusion of reasonable and practicable noise reduction measures to new development, and the cumulative effect of noise.

The planning criteria apply to external noise levels predicted at the facade of any noise sensitive receptor.

Table 5 Planning noise criteria

Land use category	Planning noise criteria dB(A) L_{eq}	
	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Rural Industry	52	45
Light Industry	52	45

Penalties can also be applied to a noise source for a variety of characteristics, such as impulsive, low frequency, modulating or tonal characters. For a characteristic penalty to be applied to a noise source it must be fundamental to the impact of the noise and dominate the overall noise impact. Application of the characteristic penalty is discussed in the noise emission assessment.

We note that under Part 5, Clause 20(6) of the Noise EPP, exceedance of the recommended criterion does not necessarily mean that the development will be non-compliant. The following matters must be considered when considering compliance:

- the amount by which the criterion is exceeded (in dB(A))
- the frequency and duration for which the criterion is exceeded
- the ambient noise that has a noise level similar to the predicted noise level
- the times of occurrence of the noise source
- the number of persons likely to be adversely affected by the noise source and whether there is any special need for quiet
- land uses existing in the vicinity of the noise source.

3.4 Fauna noise criteria

The potential impact of noise on fauna has been described as including physiological and behavioural responses, permanent and temporary damage to hearing organs, interference with breeding, and the masking of vital communication (Patricelli, 2006; Dooling, 2007; Parris, 2009; Ortega, 2012). The noise impact on fauna can be classified as one of four categories:

- **Permanent threshold shift (PTS)** is defined as a noise-induced threshold shift that persists after a recovery period subsequent to exposure (Ryan, 2016). It results in a permanent loss of hearing in fauna and may occur during to impulsive noise, or continuous exposure to high intensity noise. This impairs their ability to detect predators, and communicate with other fauna. As birds rely on vocal stimuli and the transmission of vocal signals for predator detection, the loss of hearing will lead to higher risks of predation (Ramírez-Santos, 2018).
- **Temporary threshold shift (TTS)** is similar to PTS, however the hearing loss is only temporary. The length of time at which hearing is lost will depend on the properties of the noise, and the species of fauna.
- **Masking** is the interference with the detection of one (biologically relevant) sound by another (Dooling, 2007). It impairs the ability to communicate effectively, and detect predators. This will only occur during the time at which the noise is present, and will not cause any damage to the hearing ability of fauna. Some birds have been known to alter the frequency of their communication in order to avoid masking by other noise (Francis, 2011).
- **Physiological and/or behavioural response** is defined as noise that causes any kind of response in fauna. The most common behavioural response for birds is flight as they perceive the noise as a threat, it is noted that the visual stimuli of humans also influences their response (Wright, 2010).

The level of impact on fauna depends on the type of noise produced, including frequency, loudness, consistency, and duration (Ortega, 2012), the species of animal and other physical and environmental factors, such as age, season, weather, ambient noise level and degree of previous exposure (Cayford, 1993; Yasue et. al, 2003; Yasue, 2006).

Currently there is limited knowledge on the specific hearing sensitivity of fauna native to the area of interest. As such there is no current government or other widely accepted guidelines. Interim guidelines for potential effects from different noise sources have been recommended previously for the average bird (Dooling, 2007) and are outlined in Table 6.

Table 6 Recommended Interim Guidelines for Potential Effects from Different Noise Sources (Dooling, 2007)

Noise Source Type	PTS	TTS	Masking	Behavioural or Physiological Effects
Single Impulse (e.g. blast)	140 dB(A)[1]	NA[3]	NA[7]	Any audible component of highway noise has the potential of causing behavioural and/or physiological effects
Multiple Impulse (e.g. jackhammer, pile driver)	125 dB(A)[1]	NA[3]	ambient dB(A)[5]	
Non-Strike Continuous (e.g. construction noise)	**None[2]**	**93 dB(A)[4]**	**ambient dB(A)[5]**	

<table>
<tr><th>Noise Source Type</th><th>PTS</th><th>TTS</th><th>Masking</th><th>Behavioural or Physiological Effects</th></tr>
<tr><td>Highway Noise</td><td>None[2]</td><td>93 dB(A)[4]</td><td>ambient dB(A)[5]</td><td rowspan="2">independent of any direct effects on auditory system of PTS, TTS, or masking.</td></tr>
<tr><td>Alarms (97 dB/100 ft)</td><td>None[2]</td><td>NA[2]</td><td>NA[6]</td></tr>
</table>

(1) Estimates based on bird data Hashino et al. 1988 and other impulse noise exposure studies in small mammals.

(2) Noise levels from these sources do not reach levels capable of causing auditory damage and/or permanent threshold shift based on empirical data on hearing loss in birds from the laboratory.

(3) No data available on TTS in birds caused by impulse noises.

(4) Estimates based on study of TTS by continuous noise in the budgerigar and similar studies in small mammals.

(5) Conservative estimate based on addition of two uncorrelated noises. Above ambient noise levels, critical ratio data from 14 bird species, well documented short term behavioural adaptation strategies, and a background ambient noise typical of a quiet suburban area would suggest noise guidelines in the range of 50-60 dB(A).

(6) Alarms are non-continuous and therefore unlikely to cause masking effects.

(7) Cannot have masking to a single impulse.

There is limited information on the hearing sensitivity of reptiles and mammals, however some reptile species tested under laboratory conditions have shown to experience a TTS when exposed to 95 dB(A) for several minutes (Defour, 1980). A study into the effect of dune buggy noise on the mammalian kangaroo rat reported that a TTS was present when subjecting the rat to 95 dB(A) for 500s (Brattstrom, 1983). From this information, it is inferred that birds are the most noise sensitive fauna in the study area, and will form the basis of the criteria.

For the purposes of this assessment it is considered reasonable that noise due to construction and operations does not cause any form of threshold shift in fauna. Masking is acceptable, as an increase of noise level from the ambient noise is considered unavoidable, and will only occur temporarily in the case of construction. All noise from the Project is considered as non-strike continuous.

Compliance with this criterion will be achieved if noise from the Project is below 93 dB(A) at the expected location of noise sensitive fauna receptors.

4 Baseline noise measurements

Baseline noise monitoring was conducted in the area surrounding the site, between the 3rd of April and the 12th of April 2019. Attended ambient noise measurements were also undertaken in the area on the 3rd of April. Figure 2 indicates the measurement locations. The measurement locations were selected to be representative of the ambient noise environment at nearest noise sensitive receptor locations and surrounding area.

4.1 Instrumentation

All sound level measurement instrumentation used for the purposes of this assessment are classified as either a Class 1 or Class 2 measurement device, as described in Australian Standard AS IEC 61672.1—2004. The noise measurements were taken with a calibrated sound level meters, as detailed in Table 7. The sound level meters were calibrated both before and after the measurements using a Class 1 Brüel & Kjær 4231 sound level calibrator, and the calibration was found to have not drifted. Sound level meters and calibrator carry current calibration certificates from a NATA accredited laboratory. Copies of the calibration certificates are available on request.

Table 7 Noise measurement instrumentation details

Measurement location	Sound Level Meter	Serial Number	Calibration Date
1	Rion NL-42	946977	18/02/2021
2	Rion NL-52	820995	10/08/2020
3	Rion NL-52	820944	05/12/2019
Attended measurements	Casella CEL-63X	3756059	11/07/2019

We note that only location 3 was adjacent to an occupied residence, the buildings at location 1 and 2 were no longer appropriate for occupation.

4.2 Procedure

Noise measurements were undertaken in accordance with the following:

- The microphone of the sound level meter was at a height of approximately 1.2 metres above the ground and at least 3.5 metres away from any wall or facade.
- The axis of maximum sensitivity of the microphone of the sound level meter was directed towards the noise source.
- A wind shield was used during all measurements.
- Weather data was collected from the Bureau of Meteorology for the duration of the measurements. Measurement periods with rainfall or wind speeds higher than 5 m/s were excluded from the results.
- Care was taken to avoid any effect on the measurement of extraneous noise, acoustic vibration or electrical interference.
- Attended noise measurements were undertaken at each location in 15-minute periods.

Periods of high wind speed were compared with noise measurements to determine if they had an effect on background noise level, and were excluded if wind was found to influence data. The nearest Bureau of Meteorology weather stations to the logger locations were located at Clare and Renmark Airport.

4.3 Results

4.3.1 Attended noise measurements

During the day of 3rd of April 2019, it is noted that the sky conditions were clear (i.e. 0 Okta) at all locations, with the ambient temperature ranging between 25 and 30°C.

0 10 20 30 km

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Legend

- Transmission line alignment
- Study area corridor
- Substation site
- State boundary
- Noise logger locations
- Nearest sensitive receptors

Project EnergyConnect EIS

Location of background noise loggers along transmission line alignment

Drawn by: AL
Checked by: DJ
Dated: December 2020
Page size: A4
Client: JBS&G
Data sources: Google

Figure
2

The results of attended noise measurements are summarised in Table 8.

Table 8 Attended noise measurement results

Location	Date and time	Measured Noise Level, dB(A)			Noise sources at the time of measurement
		L_{max}	L_{eq}	L_{90}	
1	3 April 2019 9:40 am	56	32	26	• Car noise along Eagle Hawke Gate Road: 38 – 40 dB(A). Two cars were heard during measurement. • Relatively frequent bird noise, approximately 50 dB(A) up close, and 35 – 40 dB(A) at a distance. • Constant Corona discharge noise from transmission lines: 26 dB(A). • Low wind speed: 0 – 1 m/s.
2	3 April 2019 11:07 am	57	29	21	• Constant road noise from Goyder Highway, low noise level due to distance from road of 600m. • Insect noise, mainly from flies, is occasionally audible: 30 dB(A). • One bird flyby at the end of the measurement: 57 dB(A) • No wind present during measurement.
3	3 April 2019 2:43 pm	52	31	23	• Loud bangs from local industry occurring intermittently: 45 – 50 dB(A). Note: the industry is located approximately 800m away. • Birds crowing occasionally: 40 dB(A). • Wind speed fluctuation between 0 and 4 m/s, generating noise of up to 40 dB(A).

4.3.2 Unattended noise measurements

The results of the unattended baseline noise monitoring are summarised in Table 9. Noise levels in dB(A) L_{eq} have been averaged over the daytime and night time periods for each day. L_{max} values are the 95th percentile value, while the L_{90} values are the mean for each daytime and night time period.

Results are also presented as graphs in Appendix A.

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Table 9 Baseline noise monitoring summary

Location		Measured Noise Level, dB(A)								
Date	Period	Location 1			Location 2			Location 3		
		L_{max}	L_{eq}	L_{90}	L_{max}	L_{eq}	L_{90}	L_{max}	L_{eq}	L_{90}
Wednesday	Day	89	32	25	76	30	20	85	32	24
3/4/19	Night	55	26	24	58	24	14	53	21	18
Thursday	Day	70	32	23	82	29	16	70	32	24
4/4/19	Night	51	22	20	57	23	14	58	21	18
Friday	Day[1]	71	36	28	57	34	22	73	38	22
5/4/19	Night[1]	82	40	34	65	22	17	63	20	17
Saturday	Day	69	34	27	81	28	17	74	31	21
6/4/19	Night	50	26	24	69	20	14	57	17	15
Sunday	Day[1]	84	35	25	58	25	17	77	36	22
7/4/19	Night	74	38	34	57	20	14	54	19	16
Monday	Day[1]	65	33	34	61	34	23	75	34	23
8/4/19	Night	-[2]	-[2]	-[2]	57	23	18	71	25	19
Tuesday	Day	76	40	31	75	33	23	78	35	25
9/4/19	Night	64	30	29	67	22	15	56	19	17
Wednesday	Day	83	32	22	57	28	18	75	31	21
10/4/19	Night	45	28	27	58	23	14	56	20	16
Thursday	Day	73	32	19	63	26	16	70	30	21
11/4/19	Night	43	17	16	51	19	13	48	16	14
Friday	Day	78	36	24	82	29	15	72	36	22
12/4/19	Night[3]	-	-	-	-	-	-	-	-	-
Average	**Day**	**76**	**34**	**26**	**69**	**30**	**19**	**75**	**34**	**22**
	Night	**58**	**28**	**26**	**60**	**22**	**15**	**57**	**20**	**17**

(1) Data is incomplete for this period due to high winds influencing data.

(2) All data for this time period was excluded due to high winds influencing data.

(3) Noise loggers were collected during the day on 12/4/19, so there is no night data available.

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5 Noise impact assessment

5.1 Noise sources

5.1.1 Construction noise sources

The noise levels of the relevant construction equipment were obtained from the *Noise database for prediction of noise on construction and open sites* as prepared in 2005 by the Department for Environment, Food and Rural Affairs in the UK. Table 10 shows the obtained sound power levels and expected quantity for the Project construction equipment.

Table 10 Sound power levels of expected construction equipment for the Project

Stage	Plant, Equipment or Activity	Quantity	L_W Total, dB(A)
1: Land clearing (Substation and Towers)	Bulldozer	1	103
	Grader	1	114
	Front end loader	1	104
Total	**All**	**-**	**115**
2: Tower installation (Substation and Towers)	Excavator	1	106
	Concrete truck	1	108
	Mobile concrete batching plant	1	110
	Semi-trailer	2	111
	Mobile crane	1	104
Total	**All**	**-**	**115**
3: Line stringing/tower installation[1] (Towers only)	Helicopter[2]	1	127

(1) Helicopters will be used to deliver and erect the towers in some cases, but has been included separately to the land based construction as they are unlikely to occur concurrently.

(2) We understand that different types of helicopters will be used for line stringing (Eurocopter AS350 Squirrel or similar) and tower installation (Kamov Ka-32A11BC or similar). The noise level presented is representative of the helicopter sound power level for both cases and is considered conservative.

The construction noise impact has been determined based on the following conservative assumptions:

- All construction equipment (per stage) is in operation at the same time and location
- The emission height of ground-based equipment is 1.5m
- The emission height of the helicopter is 50m.

5.1.2 Operational noise sources

Operational noise sources for the Project consist of maintenance operations, and any environmental factors, such as noise due to weather.

The dominant maintenance noise source for the Project will be annual helicopter maintenance, which will occur along the entirety of the project alignment. There will also be two ground-based visual inspections per year, however the noise impact from this maintenance is expected to be minimal.

The only significant noise impact from the environment occurs during rainy periods, where Corona discharge is heard from the transmission lines. It is heard as a hissing or crackling sound, and is caused by the implosion of ionized water droplets in the air. As part of the acoustics paper *Uncertainty of L_{DEN} Calculation for Corona Noise from Ultra High Voltage Power Lines using Reference Methods* by T. Wszołek, measurements were taken of transmission lines in Poland. It was found that the maximum noise that a transmission line will produce due to Corona discharge is 53 dB(A) at a distance of 15m. It is noted that this noise level was obtained for a 400 kV, which is a higher voltage than the proposed transmission line. This value was adopted for use in the model for this assessment.

5.2 Noise receptors

5.2.1 Noise sensitive properties

Based on information provided by JBS&G, a total of 141 verified noise sensitive receptors have been identified within the study area. It is understood that the majority of these receptors are verified as residences, however some are still awaiting confirmation. In line with the *ElectraNet: Project EnergyConnect Impact Assessment Methodology*, all of the identified properties are considered as noise sensitive as a precautionary measure.

The majority of these receptors are located at the western end of the transmission lines alignment between Robertstown and Morgan, and the eastern end at Cooltong. The nearest potential noise sensitive receptor is located approximately 330m from the transmission line alignment at 615 Cooltong Avenue, Cooltong. It is noted that the majority of the identified potential receptors are greater than 1km from the transmission line.

5.3 Project impact

5.3.1 Noise modelling methodology

Noise emissions from site have been modelled in SoundPLAN Environmental Software v8.0 program, using the CONCAWE method. The model takes into consideration:

- attenuation of noise source due to distance
- barrier effects from buildings, topography and the like
- air absorption
- ground effects
- meteorological conditions

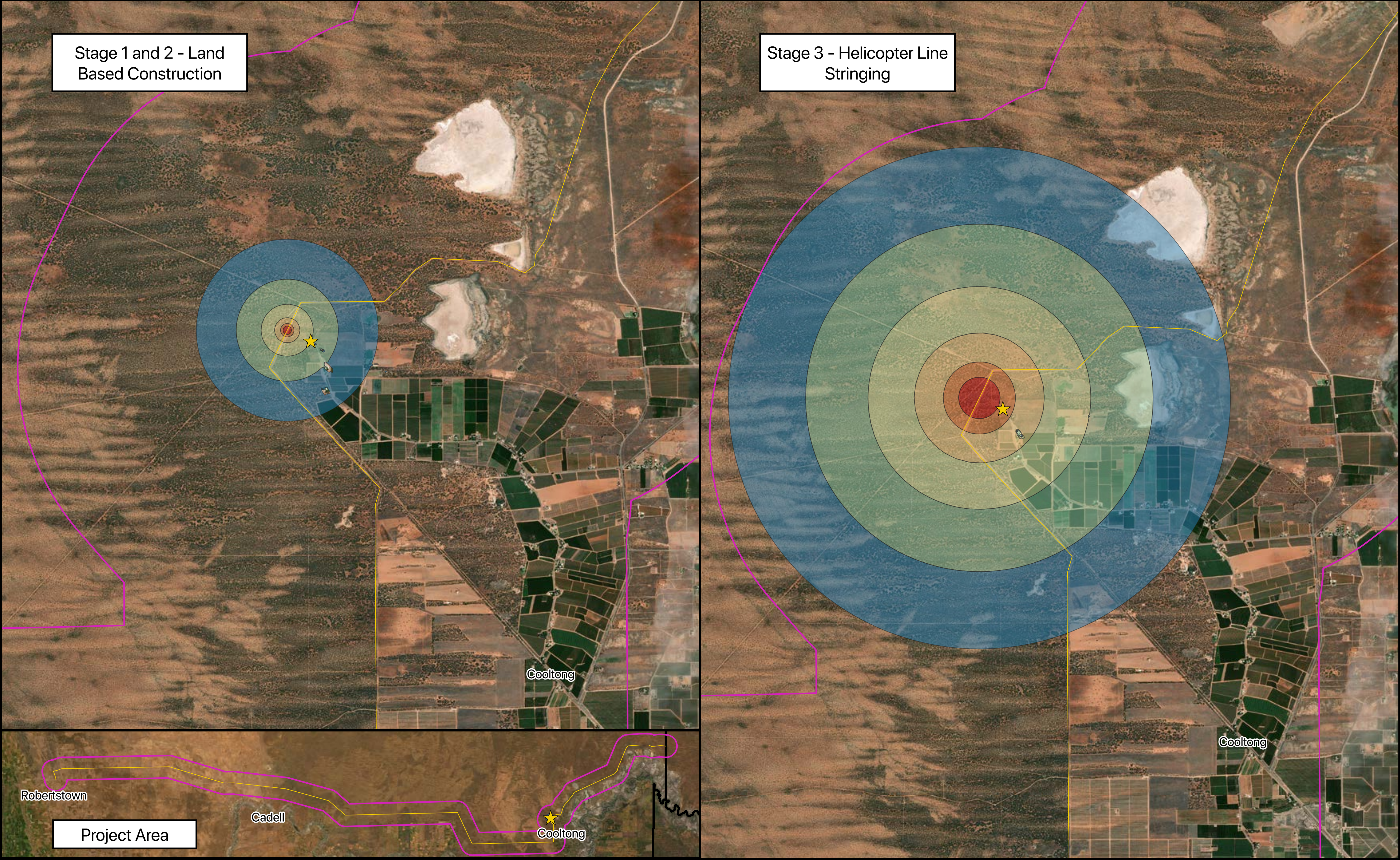
CONCAWE has six difference weather categories—CONCAWE weather category 1 represents weather conditions that are least conducive to noise propagation (best case situation with the lowest predicted noise levels), CONCAWE weather category 4 represents neutral weather conditions, and CONCAWE weather category 6 represents weather conditions that are the most conducive to noise propagation (the worst case situation with the highest predicted noise levels).

In accordance with the *Guidelines for the use of the Environmental Protection (Noise) Policy 2007*, CONCAWE weather category 5 has been used for daytime noise emissions.

The entirety of the Project has been modelled with a ground absorption factor of 0.5. The topography of the Project is modelled as 'flat'.

5.3.2 Construction noise impact

To analyse construction noise impact from the Project, a point source was placed along the transmission line alignment to determine the distance at which amenity is adversely affected for residences. This point source represents a simulation of one complete tower installation. As the sound power level is identical for stage 1 and 2, they are assessed as the same impact. The helicopter tower installation and line stringing has been included as one stage as they are unlikely to occur concurrently with ground based construction activities, and will have the same noise impact. Figure 3 shows the noise levels contour for all stages of one construction site.



0 10 20 30 km

Resonate

Legend

- Transmission line alignment
- Study area corridor
- Nearest receptor

Predicted noise levels (CONCAWE Cat 5)

- 45 - 50 dB(A)
- 50 - 55 dB(A)
- 55 - 60 dB(A)
- 60 - 65 dB(A)
- 65 - 70 dB(A)
- > 70 dB(A)

Project EnergyConnect EIS

Noise contours for all stages of one tower installation including helicopter line stringing

Drawn by: AL
Checked by: DJ
Dated: December 2020
Page size: A4
Client: JBS&G
Data sources: Google

Figure

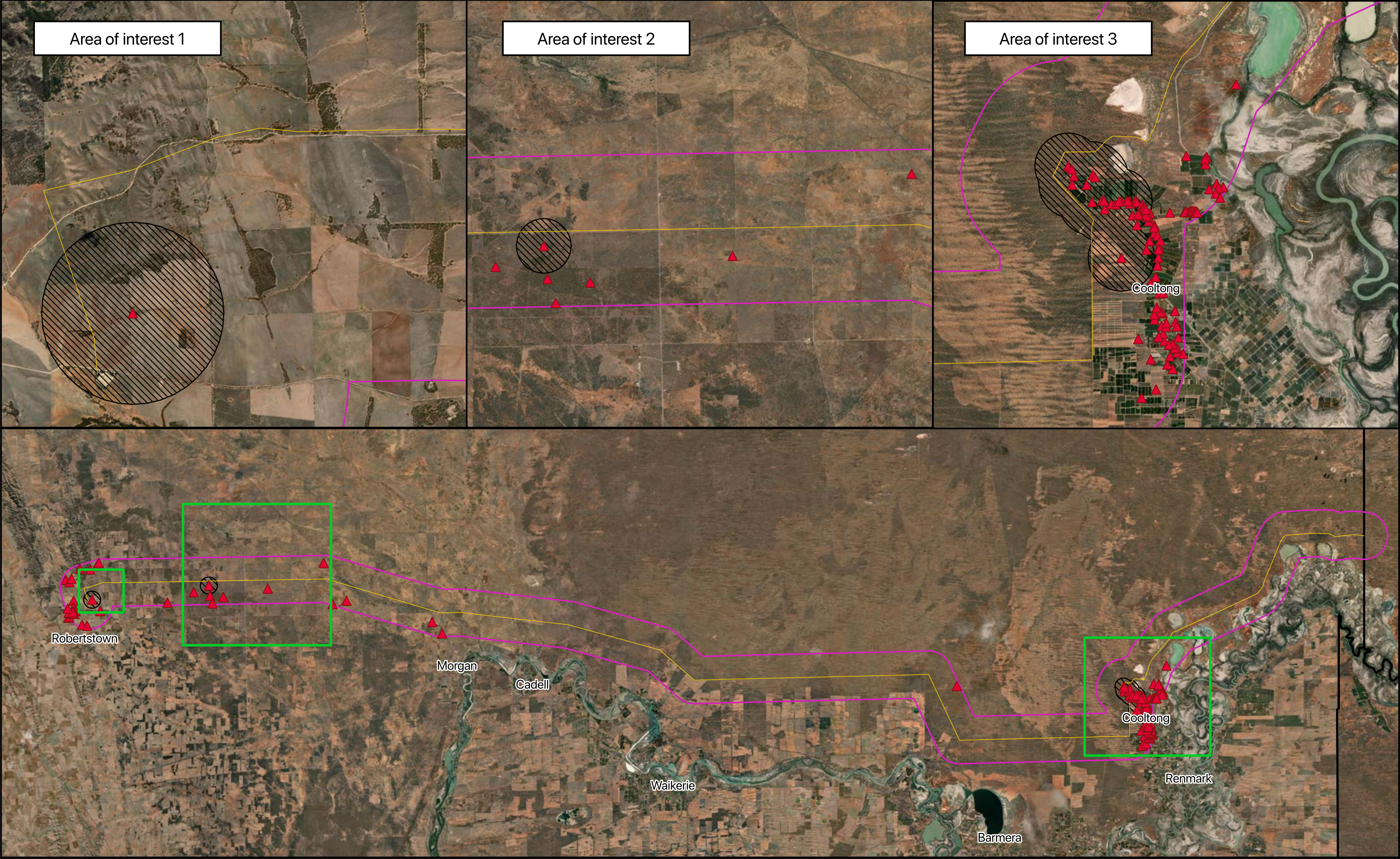
3

Table 11 shows a breakdown on the number of receivers within each noise level contour band, shown in Figure 3, and their distance from the proposed alignment. We note that noise from construction operations will cause an adverse impact on amenity up to a distance of 1160 m for Stage 1 and 2, and up to 3200 m for Stage 3.

Table 11 Construction noise impact distances and levels at nearest receptors

Construction Stage	Noise level range, dB(A)	Distance range from proposed alignment, m	Number of receivers affected
1, 2	45 – 50	650 – 1160	9
	50 – 55	330 – 650	7
	55 – 60	160 – 330	1
	60 – 65	90 – 160	0
	> 65	0 – 90	0
3	45 – 50	2200 – 3200	77
	50 – 55	1400 – 2200	41
	55 – 60	820 – 1400	11
	60 – 65	450 – 820	9
	> 65	0 – 450	3

The noise predictions indicate that receptors within the tabulated distances from the transmission line alignment may have their existing amenity adversely impacted by construction noise. Therefore, noise mitigation and/or management measures are to be identified and applied where reasonable and practicable. To assist visualisation of those areas along the study corridor where construction activities may have an adverse impact on the nearest receptors, 45 dB(A) exceedance zones have been developed. Figure 4 shows the exceedance zones for stage 1 and 2, and Figure 5 shows the exceedance zone for stage 3.



Legend

- Transmission line alignment
- Areas of interest
- Study area corridor
- Substation site
- 45 dB(A) exceedance zone - Construction activities
- State boundary
- Verified noise sensitive receptors

Resonate

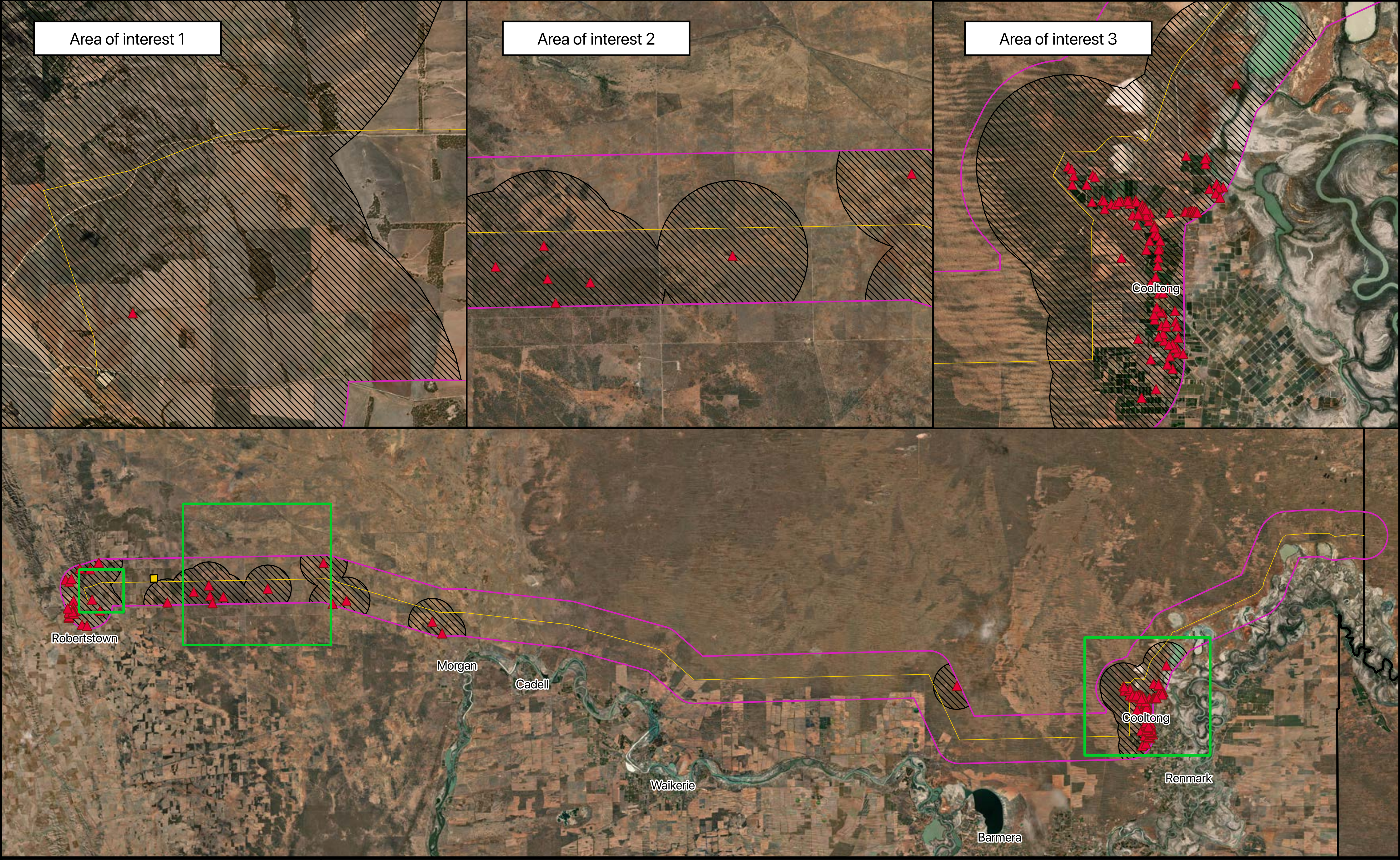
Project EnergyConnect EIS

Zones where construction activities are expected to exceed 45 dB(A) at the nearest receptors

Drawn by: AL
Checked by: DJ
Dated: December 2020
Page size: A4
Client: JBS&G
Data sources: Google

Figure

4



0 10 20 30 km

Legend

- Transmission line alignment
- Areas of interest
- Study area corridor
- Substation site
- 45 dB(A) exceedance zone - Helicopter activities
- State boundary
- Verified noise sensitive receptors

Project EnergyConnect EIS

Zones where helicopter activities are expected to exceed 45 dB(A) at the nearest receptors

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Checked by: DJ
Dated: December 2020
Page size: A4
Client: JBS&G
Data sources: Google

Figure
5

5.3.3 Operational noise impacts

The operational noise from the Project has been assessed as follows, namely:

- Annual helicopter inspection and maintenance, which involves visually checking the condition of the transmission line from a flyover
- Corona discharge noise from the transmission line under worst case weather conditions
- Operation of the substation.

Helicopter inspection and maintenance

The noise generated from helicopter inspection is assumed to be the same as that of construction stage 3 and is expected to have an adverse impact on the amenity of the nearest receptors. However, it is noted that the helicopter will move along the alignment quickly and is not expected to stop and idle for long periods of time. Therefore, this will reduce the noise exposure period for individual receptors nearest to the transmission line route and minimise the overall noise impact. As the inspections will only occur annually, the noise impact is also further reduced.

Corona discharge noise

The noise generated from Corona discharge was modelled as a line source along the Project alignment and was calculated at the western and eastern ends of the Project where the nearest receptors are located. At the nearest inhabited receptor (615 Cooltong Avenue) the predicted noise level is 41 dB(A) which complies with the most stringent night time criteria. For the Project, Corona discharge noise is expected to have a minimal impact on the amenity of nearby receptors.

330 kV substation noise

The noise generated by the substation has been modelled under the assumption of the following:

- 2 x 330 kV Transformers each with L_W = 99 dB(A) located in the centre of the site
- 6 x Reactors each with L_W = 85 dB(A)
- the addition of a 5 dB character penalty to account for tonal noise (i.e. 100 Hz 'hum')
- conventional construction (i.e. no specific mitigation).

The modelling indicates compliance with the most stringent night time criteria at receptor distances greater than 500 m from the location of the transformers within the substation. Given the size of the substation footprint (400 m x 250 m), the location of the transformers (assumed to be the centre of the site) and the significant distances to the nearest receptors, the substation is expected to have a negligible impact on the amenity of nearest receptors.

5.3.4 Noise impact on fauna

The impact on fauna from the construction and operation of the Project has been determined for the major noise sources, which are Stage 1/2 of construction, helicopter operations from construction stage 3 and maintenance, and Corona discharge from the transmission line. To assess the impact in this case, the distance at which noise the generating activity will exceed the recommended fauna noise criteria has been determined.

Table 12 Fauna criteria exceedance distances for Project noise sources

Noise source	Fauna criteria	Lw, Total	Exceedance distance[1], m
Tower construction stage 1 and 2	93 dB(A)	115 dB(A)	5
Helicopter operations		127 dB(A)	20
Corona noise from transmission lines		69 dB(A)/m	0
New substation		103 dB(A)	1

(1) Exceedance distance has been determined as an absolute distance between the source and receptor, as the receptor height is unknown and is likely to change unexpectedly.

The results indicate that noise from non-helicopter construction activities are not expected to cause TTS in local fauna.

Noise from helicopter operations is expected to cause TTS to fauna within a 20m radius of the noise source. However, due to the helicopter operating at heights of approximately 50m, this is unlikely to have an impact on surrounding fauna. There is the potential for bird flybys to come within the exceedance distance, however it is expected that the noise will cause them to avoid the helicopter as a behavioural response.

Corona noise generated from the transmission line has a sound power level considerably lower than the criteria, and will not have an impact on local fauna. The new substation will also not have an impact on local fauna given the low predicted noise emission.

5.4 Control measures

To reduce the noise impact of the Project and achieve compliance with the Noise EPP, proposed control measures are outlined in Table 13.

Table 13 Potential noise management measures

Control Measure	Accountability
Consider the distance to the nearest receptor from the location of each work area and plan noisier construction works accordingly.	Construction Manager
Site inductions should cover noise management and complaints, and reiterated through onsite training such as toolbox talks or pre-starts.	Environment Manager
Effective stakeholder communication is a key mitigation measure.	Community and Stakeholder Engagement Manager
Processes and equipment that generate lower noise levels should be selected where feasible.	Construction Manager Site Supervisors
Noisy plant, site access roads and site compounds should be located as far away as from occupied premises as is practical to allow efficient and safe completion of the task.	Construction Manager
Works planning should consider preventing vehicles and equipment queuing, idling or reversing near occupied premises where practicable.	Site Supervisors Operators
Two-way radios should be set to the minimum effective volume where practical.	Site Supervisors Operators
Truck operators should ensure tailgates are cleared and locked at the designated points.	Site Supervisors Operators
Truck movements along uneven surfaces should be restricted to minimum speeds near sensitive receptors.	Site Supervisors Operators
Plan material haulage routes to minimise impacts to the community where practical.	Construction Manager
Equipment that is used intermittently should be shut down or throttled down to a minimum during periods where it is not in use.	Site Supervisors Operators

Control Measure	Accountability
Noise associated with packing up plant and equipment at the end of works should be minimised.	Site Supervisors
Equipment should be well maintained and have mufflers and silencers installed that meet the manufacturer's specifications where relevant.	Site Supervisors Operators
Works should be planned to minimise the noise from reversing signals from any vehicles that do not have broadband alarms fitted.	Construction Manager Site Supervisors
Avoid large metal-to-metal impacts where feasible.	Site Supervisors
Avoid dropping material from height into unlined truck trays.	Site Supervisors Operators

5.5 Assessment

The noise impacts from the Project can be split into the following categories:

- the impact of land-based construction operations, which will be present in stage 1 and 2 of construction;
- the impact of helicopter tower installation and line stringing during stage 3 of construction;
- the impact of aerial visual inspections using a helicopter during operation of the transmission line;
- the impact of the operation of electrical equipment at the new substation; and
- the impact of Corona discharge noise from the transmission lines, which will occur in wet weather.

In accordance with the *ElectraNet: Project EnergyConnect Impact Assessment Methodology,* the consequence and certainty are determined from each potential impact based on a range of factors.

5.5.1 Impact consequence

The expected consequence of each identified impact needs to be considered to determine whether they are acceptable in the context of the Project. The consequence of each impact are ranked using Table 14, which requires consideration of the scale, intensity, duration and frequency of impacts and the sensitivity of the receptor.

Table 14 Acceptability of impacts

Impact category	Acceptability of impact
Negligible	Impacts are considered to be as low as reasonably practicable and no further control measures are required.
Minor	Review to determine if impacts are as low as reasonably practicable and, if not, modify control measures or consider Project design changes to lessen impacts.
Moderate	Review to determine if impacts are as low as reasonably practicable and, if not, modify control measures or consider Project design changes to lessen impacts.
Major	Impacts are unacceptable. Review Project design and control measures to ensure impacts are no higher than 'moderate'. Further review to ensure impacts are as low as reasonably practicable.
Catastrophic	Impacts are unacceptable. Review Project design and control measures to ensure impacts are no higher than 'moderate'. Further review to ensure impacts are as low as reasonably practicable.

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Table 15 shows how each impact consequence is categorised in terms of the environmental values identified as being related to the Project, as outlined in the *ElectraNet: Project EnergyConnect Impact Assessment Methodology*.

Table 15 Categorisation of impact consequence

Category	Public health and safety	Socio-economic	Listed flora and fauna species	Other flora and fauna
Negligible	No injury or illness	No impact or minor reparable socio-economic impacts on local population.	Insignificant effect.	Local short-term decrease in abundance of some species without reduction in local community viability.
Minor	An injury or illness that does not require first aid or medical treatment	Short-term impacts on local businesses and/or wellbeing of local communities.	Local short-term decrease in abundance with no lasting effects on local population.	Local long-term decrease in abundance of some species resulting in little or no change to community structure.
Moderate	Injury or illness requiring first aid or medical treatment	Ongoing impacts on the wellbeing of local communities that results in a significant proportion of the community leaving the area and/or significant mental health issues across the community. Ongoing impacts on local businesses that result in closures and (direct and indirect) loss of employment for up to 20 people. Suspension of important community services (e.g. transport, telecommunications, energy) for up to one week.	Local long-term decrease in abundance without reduction in regional population viability.	Regional long-term decrease in abundance of some species and/or local loss of some species diversity resulting in some change to the community structure.

Category	Public health and safety	Socio-economic	Listed flora and fauna species	Other flora and fauna
Major	Injury or illness that results in hospitalization or disablement.	Ongoing impacts on the wellbeing of regional communities that results in a significant proportion of the community leaving the area and/or serious mental health issues across the affected communities. Ongoing impacts on local businesses that result in closures and (direct and indirect) loss of employment for up to 100 people. Suspension of important community services (e.g. transport, telecommunications, energy) for over one week.	Regional long-term decrease in abundance and/or local loss resulting in reduction in regional viability.	Regional long-term decrease in abundance of numerous species and/or some loss of species diversity resulting in significant changes to community structure.
Catastrophic	Injury or illness that results in fatality	Complete breakdown of social order. Ongoing impacts to regional businesses that result in closures and (direct and indirect loss of employment for more than 100 employees and/or towns in the region becoming unviable. Suspension of important community services (e.g. transport, telecommunications, energy) for several weeks or more.	Regional extinction of the species.	Regional long-term loss of numerous species resulting in the dominance of only a few species.

To the allow each impact consequence to be categorised, the intensity of noise, duration of activity, frequency of impact and impact on receptors has been determined for each impact. The consequence of each impact can then be inferred. Table 16 contains the impact consequence analysis with the above information. It is noted that the scale and identified receptors for all identified impacts are equal and are excluded from the analysis.

Table 16 Impact consequence analysis

Impact	Intensity, SWL dB(A)	Duration	Frequency	Category
Land-based construction	115	Approx. 5 days per tower[1]	440 times along alignment	Minor
Helicopter tower installation	127	Less than 1 day per tower	For every tower along alignment within Taylorville, Calperum and Hawks Nest Station	Minor
Helicopter line stringing	127	Approx. 500m of transmission line per day	For every tower along alignment (i.e. constant during line stringing)	Minor
Helicopter visual inspections	127	Minimal	Once annually	Negligible
Transmission line operation	84	Constant	Constant	Negligible
New substation	103	Constant	Constant	Negligible

(1) The construction and erection of towers will be occur intermittently with breaks between activities, however the total duration of each tower installation will be 5 days.

The environmental impact consequence associated with land-based construction activities has been classified as minor due to the moderate intensity and relatively long duration. There is the potential to negatively impact all identified environmental values in the short-term at all tower construction sites without any long-term effects.

Due to the high intensity and the use at each tower, the consequence of the helicopter tower installation and line stringing impact is considered as minor. If helicopters are in operation for an excessive amount of time near to noise sensitive receptors there is the potential to impact all identified environmental values. It is noted that mitigation options for helicopter noise are limited, where the most effective mitigation/management measure in this case is providing community information on the helicopter activities.

The consequence for helicopter visual inspections has been considered negligible for all environmental values as the duration that the helicopter will be audible is expected to be very low for each noise sensitive receptor.

Helicopter tower installation, line stringing and visual inspections are expected to cause behavioural responses in fauna, causing them to leave the area temporarily.

It is noted in Section 5.3.3 that corona discharge and substation noise does not exceed the noise criteria at any noise sensitive receptors, hence the consequence is considered negligible.

5.5.2 Impact certainty

There are no significant sources of uncertainty present in the assessment of impacts for the Project, which create a risk that the environmental value impact may be greater than expected. Nevertheless, the level of certainty has been categorised with respect to the quality of the data relied upon for this assessment.

As outlined in *ElectraNet: Project EnergyConnect Impact Assessment Methodology,* Table 17 shows how to categorise the certainty for the quality of data.

Table 17 Rating level of certainty

Level of Certainty	Quality of data
High	Comprehensive data. Further studies are unlikely to generate additional information that would change the conclusions reached in the impact assessment.
Medium	Some site-specific information available to provide ground-truthing of regional desktop information. Further studies could change some of the conclusions reached in the impact assessment.
Low	Minimal site-specific data available. Reliance on regional desktop studies that may not accurately reflect site conditions. Low level of confidence in the impact assessment.

Table 18 shows the level of certainty for each identified noise impact with justification.

Table 18 Noise impact certainty

Impact	Certainty	Justification
Land based construction	Medium	The exact locations and operating schedule of individual noise generating construction equipment is unknown at this stage, and will likely change the noise impact. We have conservatively assumed that all land based construction equipment will be operating concurrently and in the same location to account for the worst case scenario
Helicopter tower installation	High	The locations where helicopters will be used for tower installation are known, and are only located near 1 noise sensitive receiver.
Helicopter line stringing	Medium	Helicopters will be used for line stringing for the entirety of the project, however as the hovering location will change during operations the noise impact will change slightly during operation.
Helicopter visual inspections	High	It was assumed that the helicopter inspections are just visual and the helicopter will be in constant movement along the alignment. If the helicopter is expected to stop and idle for an extended time, the impact is likely to be higher.
Transmission line operation	High	The noise levels from Corona discharge noise were obtained through research and represented a higher noise situation, hence the impact will not increase. Additionally, the low intensity of the noise levels is not expected to have an effect at any noise sensitive receptors.

Impact	Certainty	Justification
Substation operation	High	The equipment that will be implemented within the substation were provided by JBS&G. The sound power emission from this equipment has been based on research and Resonate's experience on other projects. The substation was assumed to be at a constant, maximal level of operation at all times.

Due to the rural location of the Project site, there is limited information available on whether properties within the study area are in use, abandoned or in ruin. This will also create a small level of uncertainty for all impacts. However, note that this study has assumed that any building located within the study area is noise sensitive to avoid potentially not assessing a noise sensitive receptor.

The level of certainty for land based construction and helicopter line stringing is considered as 'Medium'. As we have conservatively assumed conditions for both of these activities, it is likely that additional information will lead to a decreased noise impact from these activities, it is considered acceptable.

As the level of certainty is 'High' for all other noise impacts of the project, no further risk assessment is required.

5.6 Summary

Table 19 provides as summary of the expected impacts from the construction and operation of the transmission line.

Table 19 Impact assessment summary

<table>
<tr><th>Potential Impact</th><th>Controls</th><th>Impact Consequence</th><th>Certainty</th></tr>
<tr><td>Noise from land-based construction operations</td><td rowspan="6">Consideration of the nearest receptors during planning / timing of construction works.

Avoid night works.

Notifying nearby residences of upcoming construction works, helicopter stringing activities and maintenance.

Additional controls are outlined in Section 5.4</td><td>Minor</td><td>Medium</td></tr>
<tr><td>Noise from helicopter tower installation</td><td>Minor</td><td>High</td></tr>
<tr><td>Noise from helicopter line stringing</td><td>Minor</td><td>Medium</td></tr>
<tr><td>Noise from helicopter visual inspections</td><td>Negligible</td><td>High</td></tr>
<tr><td>Noise from transmission line operations (Corona discharge)</td><td>Negligible</td><td>High</td></tr>
<tr><td>Noise from substation operations</td><td>Negligible</td><td>High</td></tr>
</table>

6 Conclusion

Resonate on behalf of JBS&G has completed an environmental noise impact assessment as part of the EIS for the proposed high voltage interconnector between Robertstown and the SA-NSW border as well as construction of a new substation approximately 14 km north-east of Robertstown.

The proposed works assessed encompassed the area around the proposed transmission line alignment, collectively referred to as the study area. This includes the Project area which is a 500m buffer around the alignment, and a 1km x 1km square clearance at the proposed substation site, as well as an additional 2.7km buffer to assess the extended noise impact.

The scope of the assessment included construction and operational noise in relation the substation construction, tower installation and maintenance. The assessment has concluded that noise impacts associated with construction and maintenance are likely to occur if left unmitigated and without appropriate management actions taken. Notwithstanding, with appropriate mitigation measures the potential noise impacts can be effectively managed. The most effective mitigation measure in this case is notifying the nearby residences of upcoming construction works including the envisaged duration of activities as well as any planned maintenance activities prior to the events occurring.

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References

Brattstrom, B. H. 1983, “Effects of Off-Road Vehicle Noise on Desert Vertebrate”, *Environment Effects of Off-Road Vehicles*, pp. 167-206.

Cayford, J. T. 1993, “Wader disturbance a theoretical overview”, *Wader Study Group Bulletin,* vol. 68, pp. 3-5.

Chuanmin Chen, Yang Gao, and Songtao Liu, “Study on Noise Prediction Model and Control Schemes for Substation,” The Scientific World Journal, vol. 2014, Article ID 696429, 7 pages, 2014. https://doi.org/10.1155/2014/696429

Dooling, R. J. and Popper, A. N. 2007, “The Effects of Highway Noise on birds”, *California Department of Transportation.* www.dot.ca.gov/hq/env/bio/files/caltrans_birds_10-7- 2007b.pdf.

Dufour, P. A. 1980, Effects of Noise on Wildlife and Other Animals: Review of Research Since 1971, “U.S. Environmental Protection Agency”.

Forman, R. T. T. and Deblinger, R. D. 2000, “The ecological road-effect zone of a Massachusetts (U.S.A.) suburban highway”, *Conservation biology,* vol. 14, pp. 36–46.

Francis, C. D., Ortega, C. P. and Cruz, A. 2011, “Different behavioural responses to anthropogenic noise by two closely related passerine birds”, *Biology Letters,* vol. 7, pp. 850-852.

Francis, C. D., Ortega, C. P. and Cruz, A. 2009, “Noise pollution changes avian communities and species interactions”, *Current Biology,* vol. 19, pp. 1415–1419.

GHD 2016, “Legune Grow out facility noise assessment”, *Report produced by GHD Pty Ltd for CO2 Australia*.

Hashino, E., Sokabe, M. and Miyamoto, K. 1988, “Frequency specific susceptibility to acoustic trauma in the budgerigar (*Melopsittacus undulates)*”, Journal of the Acoustical Society of America, vol. 83(6), pp. 2450-2453.

Ortega, C. P. 2012, “Effects of noise pollution on birds: A brief review of our knowledge”, *Ornithological Monographs* vol. 74, pp. 6-22.

Parris, K. M. and Schneider, A. 2009, “Impacts of traffic noise and traffic volume on birds of roadside habitats”, *Ecology and Society*, vol. 14, http://www.ecologyandsociety.org/vol14/iss1/art29/.

Patricelli, G. L. and Blickley, J. L. 2006, “Avian communication in urban noise: Causes and consequences of vocal adjustment”, *Auk,* vol. 123, pp. 639–649.

Rabin, L. A., McCowan, B., Hooper, S. L. and Owings, D. H. 2003, “Anthropogenic noise and its effect on animal communication: An interface between comparative psychology and conservation biology”, *International Journal of Comparative Psychology*, vol. 16, pp. 172-192.

Ramírez-Santos, P., Enríquez, P. L., Vázquez-Pérez, J. R. and Rangel-Salazar, J. L. 2018, “Bird Behaviour during Prey-Predator Interaction in a Tropical Forest in México”, Department of Biodiversity Conservation, El Colegio de la Frontera Sur.

Ryan, A. F., Kujawa, S. G., Hammill, T., Le Prell, C. and Kil, J. 2016, “Temporary and Permanent Noise-Induced Threshold Shifts: A Review of Basic and Clinical Observations”, *Otol Neurotol,* vol. 37(8), pp. 271-275.

Slabbekoorn, H. and Ripmeester, E. A. P. 2008, “Birdsong and anthropogenic noise: implications and applications for conservation”, *Molecular Ecology,* vol. 17, pp. 72–83.

Sinclair Knight Merz 2002, “South Australia – New South Wales Interconnector: Environmental Impact Statement”, Transgrid.

Wright, M. D., Goodman, p. and Cameron, T. C. 2010, “Exploring behavioural responses of shorebirds to impulsive noise”, *Wildfowl,* vol. 60, pp. 150-167.

Yasue, M. 2006, “Environmental factors and spatial scale influence shorebirds' responses to human disturbance”, *Biological Conservation,* vol. 128(1), pp. 47-54.

Yasue, M., Quinn, J. L. and Cresswell, W. 2003, “Multiple effects of weather on the starvation and predation risk trade-off in choice of feeding location in Redshanks”, *Functional Ecology,* vol. 17(6), pp. 727-736.

Appendix A – Unattended noise logging information

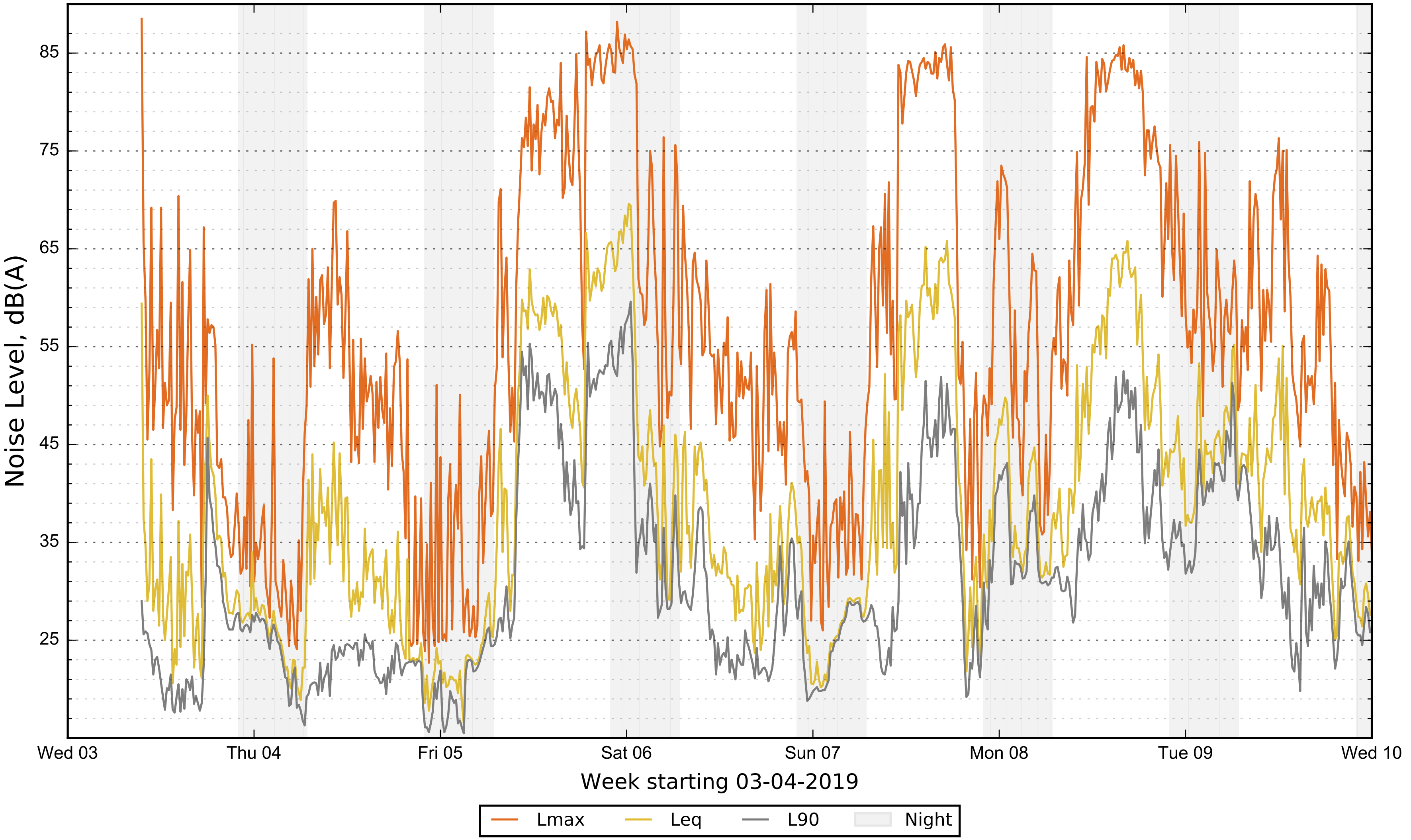
Project: Project EnergyConnect EIS	Project number: A190079
Noise logging location: Powerline Rd, Bright SA 5381, Australia – Located at back of ruined premises near the corner of Powerline Road and Eagle Hawke Gate Road. Fixed to stobie pole.	
Location ID: 1	**Installation:** free field (>5m from vertical reflective surface)
Latitude:	**Longitude:**
Equipment installed: Rion NL-42 (946977)	**Calibration valid until:** 2021-02-18
Deployment date: 2019-04-03	**Collection date:** 2019-04-12
Deployed by: Aidan Leith	**Collected by:** Aidan Leith

Notes:

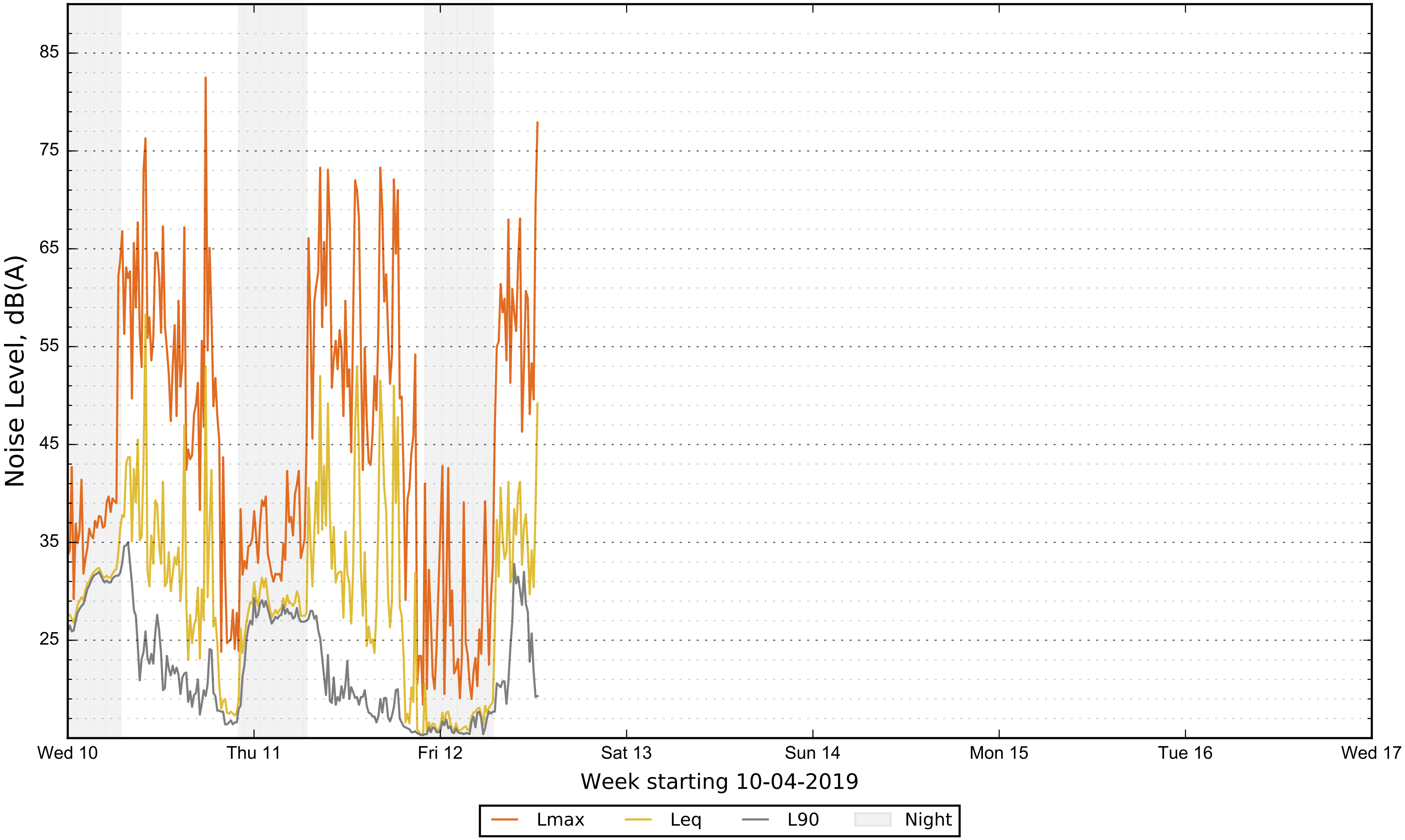
Location Map:

Installation Photos:

Calibration level at deployment, dB	Calibration level at collection, dB	Drift, dB
93.9	93.6	0.3



85
75
65
55
45
35
25
Noise Level, dB(A)
Wed 03
Thu 04
Fri 05
Sat 06
Sun 07
Mon 08
Tue 09
Wed 10
Week starting 03-04-2019
Lmax
Leq
L90
Night


85
75
65
55
45
35
25
Noise Level, dB(A)
Wed 10
Thu 11
Fri 12
Sat 13
Sun 14
Mon 15
Tue 16
Wed 17
Week starting 10-04-2019
Lmax
Leq
L90
Night

Resonate

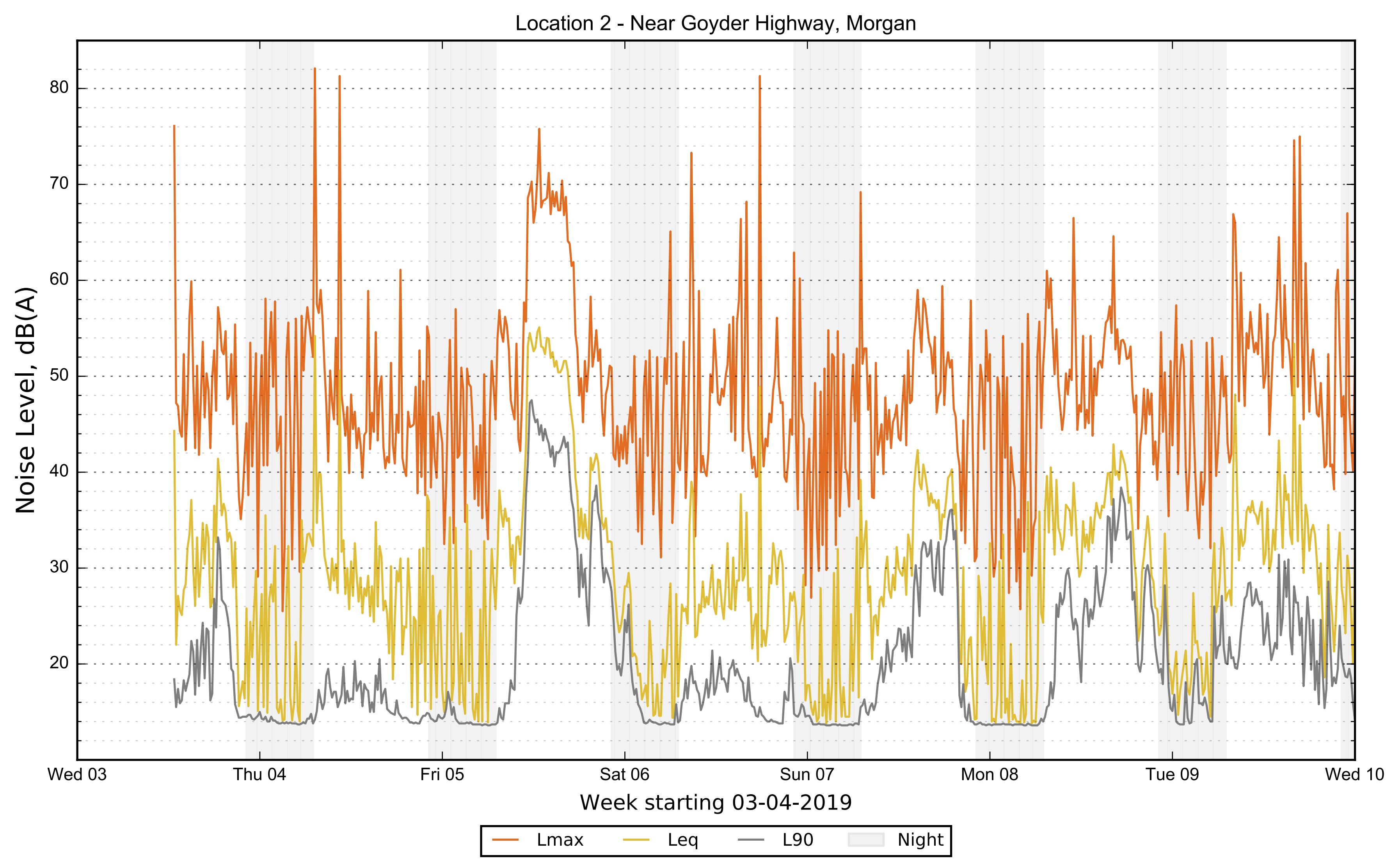
Project: Project EnergyConnect EIS	**Project number:** A190079
Noise logging location: Charcoal Rd, South Australia 5320, Australia – Actual location is on an Unnamed Road in Morgan, it is located inbetween Charcoal Road and Goyder Highway. See picture for reference. Logger is located on the corner of an old sheep shearing shed.	
Location ID: 2	**Installation:** free field (>5m from vertical reflective surface)
Latitude:	**Longitude:**
Equipment installed: Rion NL-52 (820995)	**Calibration valid until:** 2020-08-10
Deployment date: 2019-04-03	**Collection date:** 2019-04-12
Deployed by: Aidan Leith	**Collected by:** Aidan Leith

Notes:

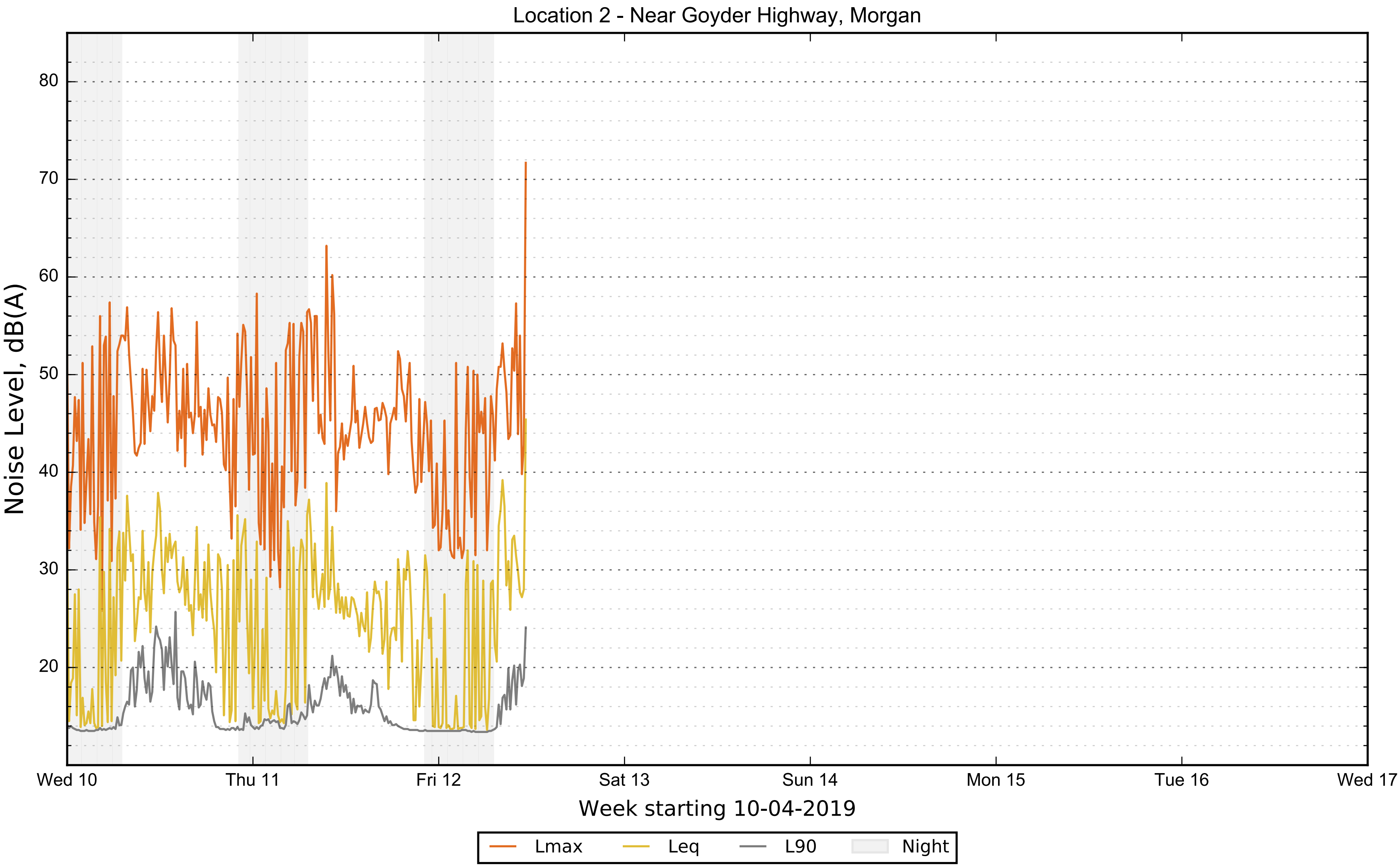
Location Map:

Installation Photos:

Calibration level at deployment, dB	**Calibration level at collection, dB**	**Drift, dB**
94.0	93.9	0.1



Location 2 - Near Goyder Highway, Morgan
Noise Level, dB(A)
20
30
40
50
60
70
80
Wed 03
Thu 04
Fri 05
Sat 06
Sun 07
Mon 08
Tue 09
Wed 10
Week starting 03-04-2019
Lmax
Leq
L90
Night


Location 2 - Near Goyder Highway, Morgan
Noise Level, dB(A)
80
70
60
50
40
30
20
Wed 10
Thu 11
Fri 12
Sat 13
Sun 14
Mon 15
Tue 16
Wed 17
Week starting 10-04-2019
Lmax
Leq
L90
Night

Resonate

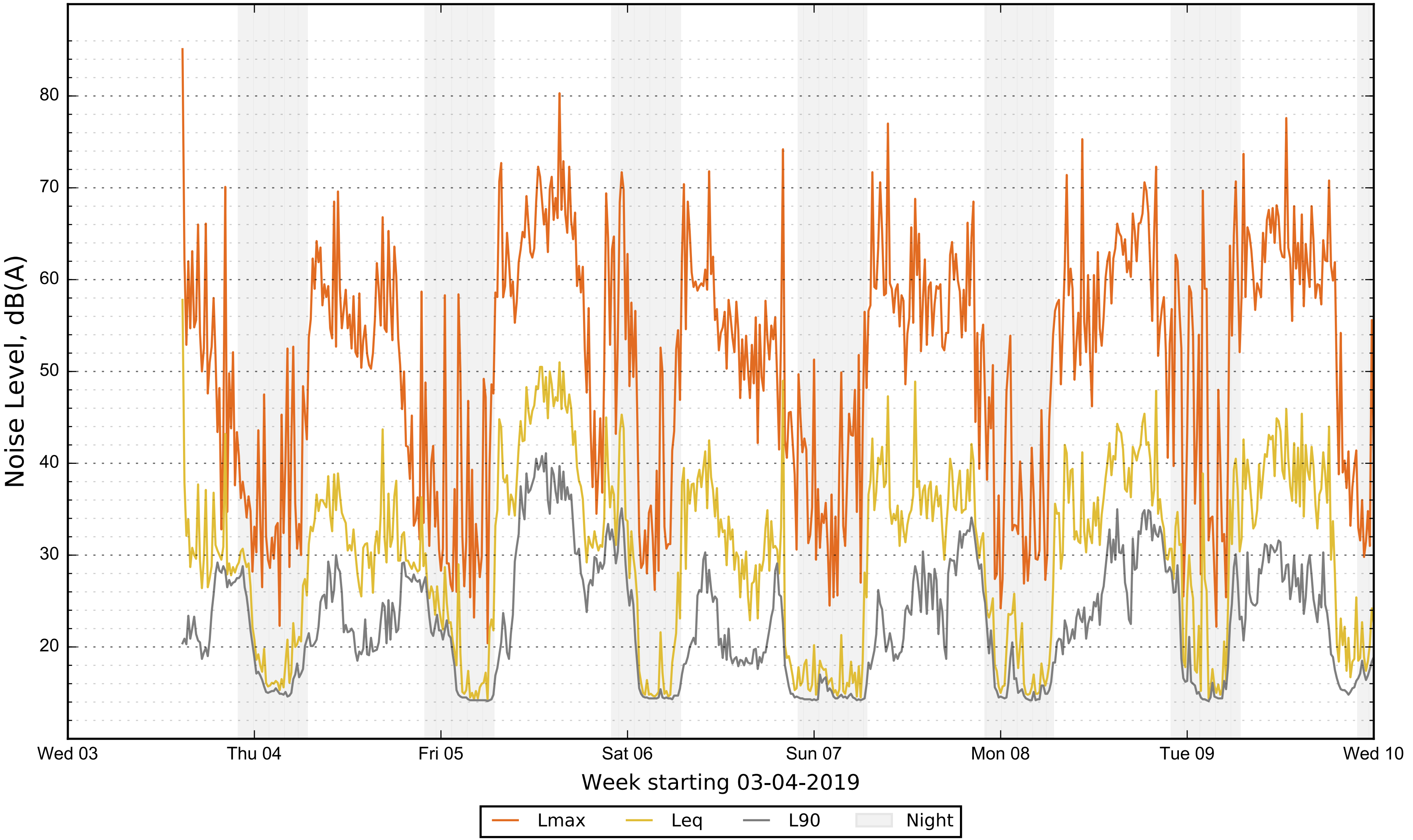
Project: Project EnergyConnect EIS	**Project number:** A190079
Noise logging location: 615 Cooltong Ave, Cooltong SA 5341, Australia – Logger is located across from the property behind the fence. It is fixed to a fence pole.	
Location ID: 3	**Installation:** free field (>5m from vertical reflective surface)
Latitude:	**Longitude:**
Equipment installed: Rion NL-52 (820944)	**Calibration valid until:** 2019-12-05
Deployment date: 2019-04-03	**Collection date:** 2019-04-12
Deployed by: Aidan Leith	**Collected by:** Aidan Leith

Notes:

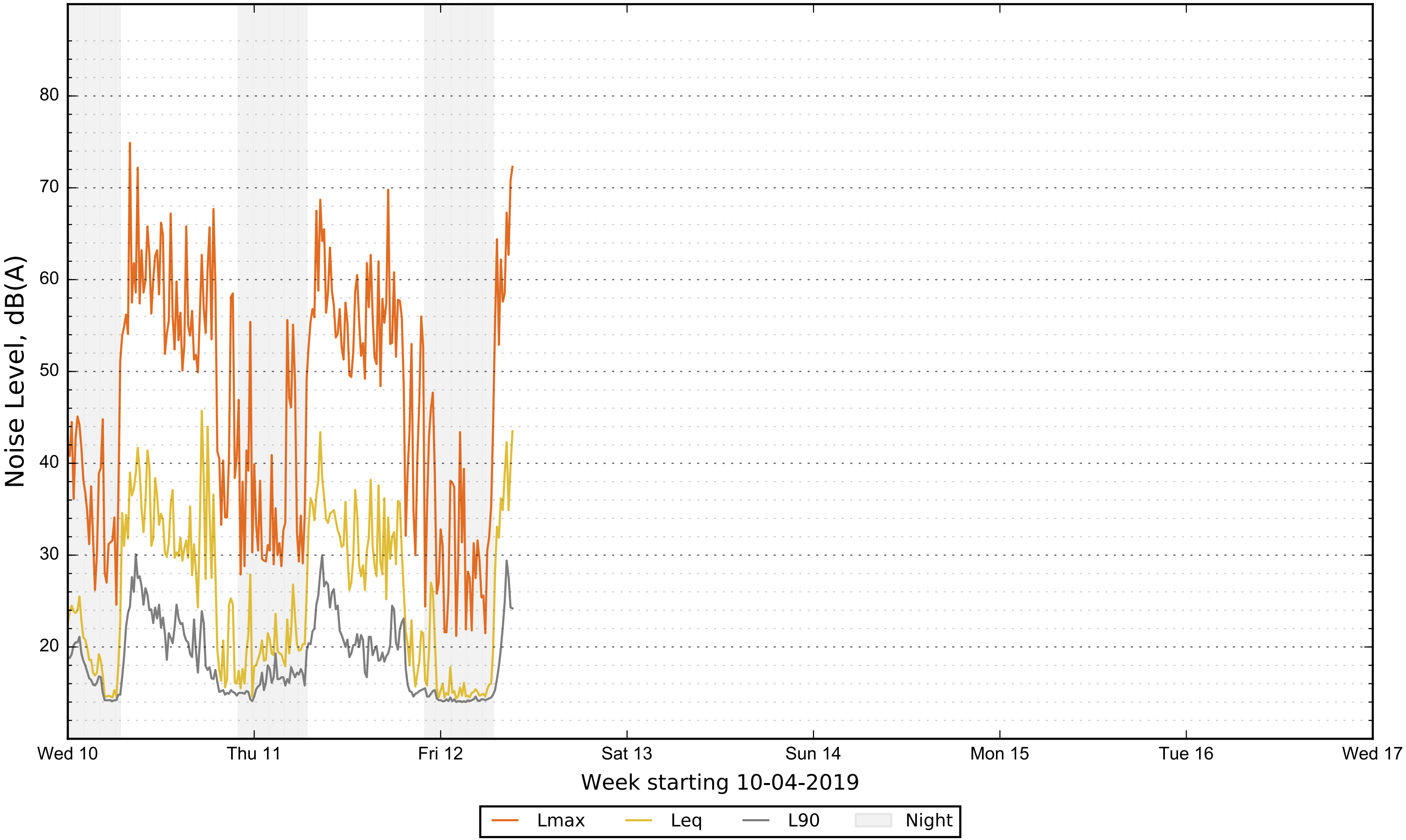
Location Map:

Installation Photos:

Calibration level at deployment, dB	Calibration level at collection, dB	Drift, dB
94.1	93.9	0.2



Noise Level, dB(A)
20
30
40
50
60
70
80
Wed 03
Thu 04
Fri 05
Sat 06
Sun 07
Mon 08
Tue 09
Wed 10
Week starting 03-04-2019
Lmax
Leq
L90
Night



Noise Level, dB(A)
80
70
60
50
40
30
20
Wed 10
Thu 11
Fri 12
Sat 13
Sun 14
Mon 15
Tue 16
Wed 17
Week starting 10-04-2019
Lmax
Leq
L90
Night