REVERB ACOUSTICS

Noise and Vibration Consultants

Noise Impact Assessment
Poultry Breeder/Rearing Farms
Lot 1 DP.1022013
Lots 1-3 DP.1206485 &
Lot 22 DP.866857
1130 Gooloogong Road
Grenfell NSW

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Prepared for Baiada Properties Pty Limited
Report No. 20-2563-R2

Building Acoustics-Council/EPA Submissions-Modelling-Compliance-Certification

REVERB ACOUSTICS PTY LTD
ABN 26 142 127 768 ACN 142 127 768
PO Box 252 BELMONT NSW 2280
Telephone: (02) 4947 9980
email: sbradyreverb@gmail.com

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1.1 INTRODUCTION

Reverb Acoustics has been commissioned to conduct a noise impact assessment for four (4) poultry breeder/rearing farms consisting of 10 poultry sheds per farm (40 sheds in total) at 1130 Gooloogong Road, Grenfell, NSW. This assessment considers the likely noise impact at nearest residential receivers from all activities associated with operation and construction of the entire site.

The assessment was requested by Baiada Properties Pty Limited in support of and to form part of an Environmental Impact Statement (EIS), and to ensure any noise control measures required for the facility are incorporated during the design stages.

1.2 TECHNICAL REFERENCE / DOCUMENTS

Beranek, L.L and Istvan, L.V. (1992). *Noise and Vibration Control Engineering.* John Wiley and Sons, Inc.

Bies, D.A. and Hansen, C.H. (1996). *Engineering Noise Control: Theory and Practice*. London, E & F.N. Spon.

Harris, C.M. (ed) (1957). *Handbook of Noise Control.* New York, McGraw-Hill.
Gréhant B. (1996). *Acoustics in Buildings.* Thomas Telford Publishing.

NSW Environment Protection Authority (2017). *Noise Policy for Industry*

NSW Environment Protection Authority (2011). *NSW Road Noise Policy.*

NSW Environment Protection Authority (2009). *Interim Construction Noise Guideline.*

Department of Environment, Climate Change and Water's (2006). *Assessing Vibration: A Technical Guideline*

Department for Environment Food and Rural Affairs (DEFRA). (2005). *Update of Noise database for Prediction of Noise on Construction and Open Sites.*

Plans supplied by our client. Note that variations from the design supplied to us may affect the acoustic recommendations.

A Glossary of commonly used acoustical terms is presented in Appendix A to aid the reader in understanding the Report.

SECTION 2

Project Description
Existing Acoustic Environment
Assessment Criteria

2.1 PROJECT DESCRIPTION

The proponent intends to construct and operate four (4) poultry breeder/rearing farms consisting of 10 poultry sheds per farm (40 sheds in total) at 1130 Gooloogong Road, Grenfell, NSW. The facility will operate over a 24 hour period and is ideally located near major arterial roads and markets.

Potential noise sources, which may impact nearby neighbours, will include equipment associated with the operation of the sheds (fans, bird collection, clean-up, etc), feed lines, mobile plant (bobcats used primarily inside sheds during cleanouts, fork lifts, etc), feed offloading and trucks on the site. Other noise sources include mechanical plant, truck movements, employee vehicle movements, delivery vehicles, and maintenance machinery.

Ventilation to the sheds will be supplied by fans on the end of the sheds. The sheds are completely enclosed to maintain consistent internal temperatures and air is drawn across radiators located at one end of the shed by the fans located at the other end. During the day in warmer months the majority of fans may be operating, with a 50% reduction in fans operating at night.

The proposed program is as follows:

- Farm 1 cleanout ≥ every 20 weeks.
- Farms 2 and 3 cleanout ≥ every 45 weeks.
- Farm 4 cleanout and restock ≥ every 64 weeks.

Delivery and removal of birds is expected to generate the majority of heavy vehicle movements, while other heavy vehicle movements will result from deliveries of fuel, LPG, bedding litter, feed, etc. Removal of fertile eggs and delivery of hatchery trollies and egg fillers will also occur during business hours daily as part of the egg laying cycle at Farms 2, 3 and 4 only.

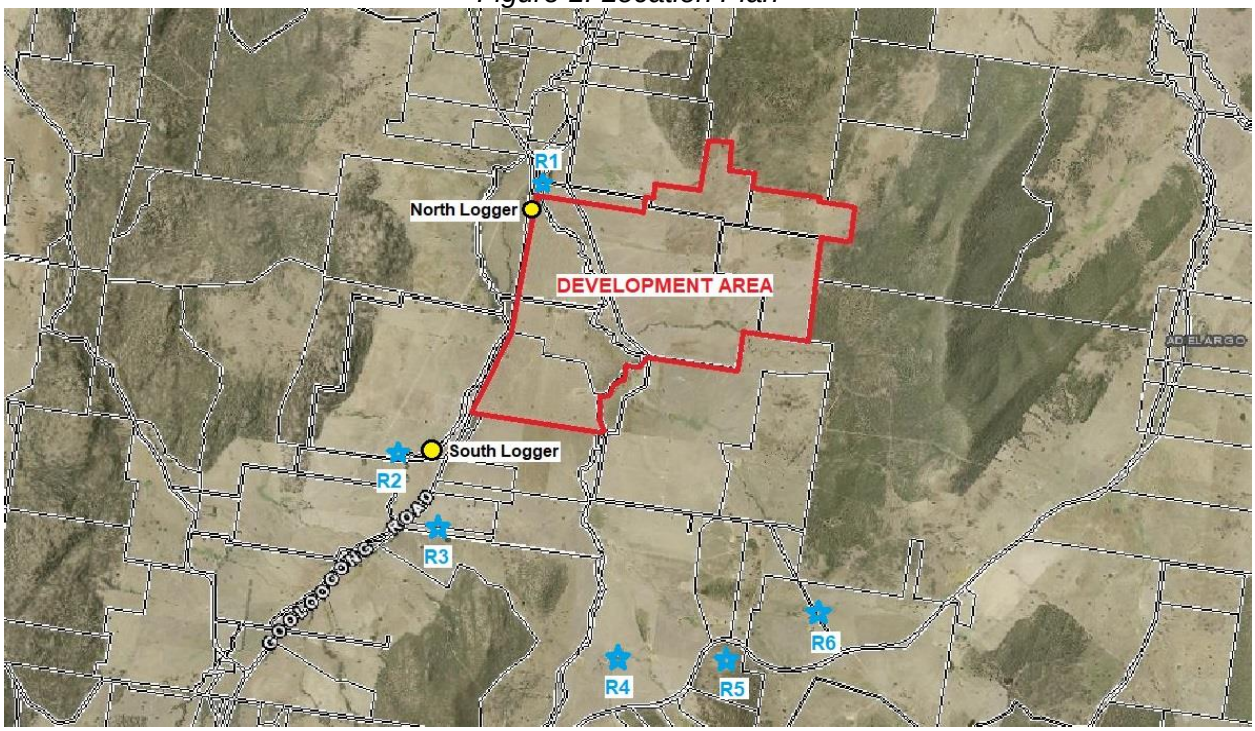
During bird removal up to 2 prime movers and 3 trailers would arrive at one end of the shed and the engines turned off once in position. Collection of birds and operation of fork lifts will occur at night due to bird welfare, and would be continuous until each shed is empty at the designated farm. All fans, heaters, feed lines, etc, would not operate during bird collection.

2.2 EXISTING ACOUSTIC ENVIRONMENT

Nearest receivers identified by our client are as follows:

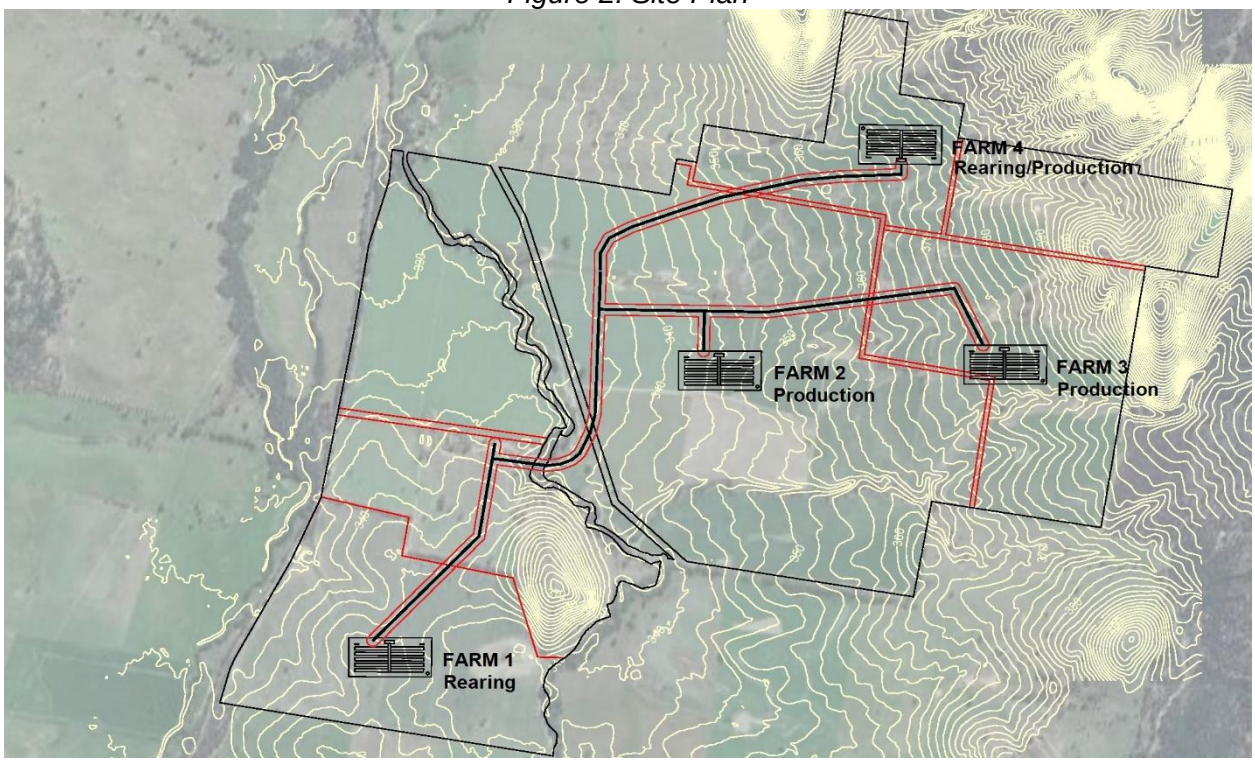
R1. Residence 1,500m from nearest Farm.
R2. Residence 1,600m from nearest Farm.
R3. Residence 2,000m from nearest Farm.
R4. Residence 3,100m from nearest Farm.
R5. Residence 3,600m from nearest Farm.
R6. Residence 3,900m from nearest Farm.

Figure 1: Location Plan



Source: Six Maps

Figure 2: Site Plan



Long-term monitoring was conducted along Gooloogong Road in April 2021. The first logger was placed approximately 150 metres south of Residence R1 (North Logger) and the second opposite Residence R2 (South Logger). Table 1 shows a summary of results, with high wind/rain periods excluded prior to analysis, including the Rating Background Level's (RBL's) which were calculated from Assessment Background Levels (ABL's), for the day, evening and night periods, according to the procedures described in the NSW Environment Protection Authority's (EPA's) Noise Policy for Industry (NPfI) and as detailed in Australian Standard AS1055-1997, "Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures".

Table 1: Summary of Noise Logger Results – North Logger, dB(A)

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
19-20 Apr	-	12.3	6.7	-	57.0	48.8
20-21 Apr	28.4	24.2	16.9	60.6	59.4	49.8
21-22 Apr	25.1	-	-	60.5	-	-
RBL	**26.7**	**18.3**	**11.8**	**--**	**--**	**--**
LAeq	**--**	**--**	**--**	**60.6**	**58.4**	**49.3**

Table 1: Summary of Noise Logger Results – South Logger, dB(A)

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
19-20 Apr		20.4	18.6		55.2	47.9
20-21 Apr	29.4	26.7	21.0	60.0	58.4	50.0
21-22 Apr	26.9			59.9		
RBL	**28.2**	**23.5**	**19.8**	**--**	**--**	**--**
LAeq	**--**	**--**	**--**	**59.9**	**57.1**	**49.1**

The above background (L90) noise levels are below the minimum assumed RBL's specified in Table 2.1 of the NPfI. Therefore, for assessment purposes the minimum RBL's have been adopted in all receiver areas for assessment purposes, i.e. 35dB(A),L90 for day (7am-6pm) and 30dB(A) for the evening and night (6pm -10pm and 10pm-7am).

2.3 CRITERIA

2.3.1 Road Traffic

The Roads and Maritime Services (RMS) base their assessment criteria on those outlined by EPA. Reference to Page 160 of their Environmental Noise Management Manual released in December 2001, indicates that noise reduction measures for new and existing developments should endeavour to meet the noise level targets set out in the EPA's Environmental Criteria for Road Traffic Noise (ECRTN). The ECRTN has been superseded by the NSW Road Noise Policy (RNP) which contains a number of criteria applied to a variety of road categories (freeway, arterial, sub-arterial and local roads) and situations (new, upgraded roads and new developments affected by road traffic). Table 2 shows the relevant categories, taken from Table 3 of the RNP:

Table 2: - Extract from Table 3 of RNP Showing Relevant Criteria.

Road Category	Day	Night
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	60 LAeq,15hr (external)	55 LAeq,9hr (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments.	55 LAeq,1hr (external)	50 LAeq,1hr (external)

Based on the categories defined in the RNP, Gooloogong Road is classified as a sub-arterial road.

2.3.2 Site Activities/Mechanical Plant & Equipment

Noise from industrial noise sources scheduled under the Protection of Environment Operations Act is assessed using the EPA's NPfI. However, local Councils and Government Departments may also apply the criteria for land use planning, compliance and complaints management. The NPfI specifies two separate criteria designed to ensure existing and future developments meet environmental noise objectives. The first limits intrusive noise to 5dB(A) above the background noise level and the other is based on the total industrial noise in an area in relation to the noise levels from the development to be assessed. Project Noise Trigger Levels are established for new developments by applying both criteria to the situation and adopting the more stringent of the two.

The existing L(A)eq for the receiver areas is dominated by traffic on nearby roads, and rural activities during the day, evening and night. Reference to Table 2.2 of the NPfI shows that all receiver areas are classified as rural.

The Project Amenity Level is derived by subtracting 5dB(A) from the recommended amenity level shown in Table 2.2. A further +3dB(A) adjustment is required to standardise the time periods to LAeq,15 minute. The adjustments are carried out as follows:

Recommended Amenity Noise Level (Table 2.2) – 5dB(A) +3dB(A)

Table 3 below specifies the applicable project intrusiveness and amenity noise trigger levels for the proposed redevelopment.

Table 3: - Intrusiveness and Amenity Noise levels

Period	Intrusiveness Criteria	Amenity Criteria
Day	40 (35+5)	48 (50-5+3)
Evening	35 (30+5)	43 (45-5+3)
Night	35 (30+5)	38 (40-5+3)
Receiver Type: Rural (See EPA's NPfI - Table 2.1)		

Project Noise Trigger Levels, determined as the more stringent of the intrusiveness criteria and the amenity / high traffic criteria, are as follows:

Day	**40dB LAeq,15 Minute**	7am to 6pm Mon to Sat or 8am to 6pm Sun and Pub Hol.
Evening	**35dB LAeq,15 Minute**	6pm to 10pm
Night	**35dB LAeq,15 Minute**	10pm to 7am Mon to Sat or 10pm to 8am Sun and Pub Hol.

NOTE: Section 2.6 of the NPfI states that assessment should be to the most affected point on or within the residential property boundary, or if that is more than 30m from the residence, at the most affected point within 30m of the residence.

2.3.3 Maximum Noise Level Event Assessment - Sleep Arousal

Section 2.5 of EPA's NPfI requires a detailed maximum noise level event assessment to be undertaken where the subject development/premises night-time noise levels exceed the following:

- LAeq (15 minute) 40dB(A) or the prevailing RBL plus 5dB whichever is greater, and/or
- LAFmax 52dB(A) or the prevailing RBL plus 15dB, whichever is greater.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night period.

2.3.4 Modifying Factors - Tonality

Fact Sheet C of the NPfI defines tonal noise as follows:

Level of 1/3 octave band exceeds the level of the adjacent bands on both sides by:

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

2.3.5 Construction Noise

Various authorities have set maximum limits on allowable levels of construction noise in different situations. Arguably the most universally acceptable criteria, and those which will be used in this Report, are taken from the EPA's Interim NSW Construction Noise Guideline (ICNG). Since the project involves a significant period of construction activity, a "quantitative assessment" is required, i.e. comparison of predicted construction noise levels with relevant criteria. Table 4.2 of the ICNG is reproduced below in Table 4:

Table 4: - Table 4.2 of ICNG Showing Relevant Criteria at Residences

Time of Day	Management Level Leq (15min)	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public holidays	Noise affected RBL +10dB(A) i.e**. 45dB(A) day**	- The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{AEQ\ (15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details
	Highly noise affected 75dB(A)	- The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. - If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended Standard hours	Noise affected RBL +5dB(A) i.e**. 35dB(A) evening** **35dB(A) night**	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. - For guidance on negotiating agreements see Section 7.2.2

Standard construction hours are from 7am to 6pm Monday to Friday and 8am to 1pm on Saturday, with no construction permitted on Sundays or public holidays.

SECTION 3
Noise Impact Assessment

3.1 METHODOLOGY

3.1.1 Road Traffic

Due to the non-continuous nature of traffic flow to and from the site, noise generated by traffic associated with the facility, on public roads, is assessed using the EPA approved US Environment Protection Agency's Intermittent Traffic Noise guidelines.

Equation 1 outlines the mathematical formula used in calculating the Leq,T noise level for intermittent traffic noise.

$$L_{eq},T = L_b + 10\log\left[1+\frac{ND}{T}\left(\frac{10^{(L\max - Lb)/10}-1}{2.3}-\frac{\left(L_{\max}-L_b\right)}{10}\right)\right] \quad \text{..... Equation 1}$$

Where L_b background noise level (dB(A))
T is the time for each group of vehicles (min)
D is duration of noise of each vehicle (min)
L_{MAX} is vehicle noise (dB(A))
N is number of vehicle trips

Typical vehicle noise levels were sourced from our library of technical data, while background noise levels are those described in Section 2.2. The Lmax vehicle noise levels used in Equation 1 are the maximum predicted noise levels produced at the facade of a typical residence by vehicles entering and departing the site.

3.1.2 Site Activities & Equipment

Noise levels produced by activities/equipment associated with the proposal were sourced from information supplied by our client, manufacturer's data and/or our library of technical data, which has been accumulated from measurements taken at existing poultry farms in Tabbita, Tamworth and Manilla, NSW. These noise level measurements were taken with a Svan 912AE Sound and Vibration Analyser. The instrument is Class 1 accuracy, in accordance with the requirements of IEC 61672, and has the capability to measure steady, fluctuating, intermittent and/or impulsive sound, and to compute and display percentile noise levels for the measuring period. A calibration signal was used to align the instrument train prior to measuring and checked at the conclusion. Difference in the two measurements was less than 0.5dB. Each measurement was taken over a representative time period to include all aspects of machine operation, including additional start-up noise where applicable. Items of equipment, which produced a brief burst of noise, such as a truck, were measured for a similarly brief time period to ensure the results were not influenced by long periods of inactivity between operations.

Reverb Acoustics completed compliance monitoring at four (4) existing poultry farms at Allwood near Tabbita, NSW. Near-field measurements were conducted for operation of tunnel ventilation fans, litter collection (bobcat), feedlines, feed pumps and augers, bird catching, etc. All measurements were taken during appropriate day and night periods during worst-case periods, i.e. during shed cleanout and restock. Additional measurements of egg collection, roosters crowing, truck movements and loading, etc, were measured at an existing poultry layer/rearing farm at Warrah Ridge, NSW.

Sound measurements were generally made around all sides of each item of equipment/activity, to enable the acoustic sound power (dB re 1pW) to be calculated. The sound power level of each item is then theoretically propagated to each receiver with allowances made for geometric spreading, directivity, molecular absorption, intervening topography or barriers and ground effects giving the received noise level at the receiver from that particular plant item.

Addition of the received Sound Pressure Level (SPL) for each of the individual operating sources gives the total SPL at each receiver, which is then compared to the relevant criteria. Where noise impacts above the criteria are identified, suitable noise control measures are implemented and reassessed to demonstrate satisfactory received noise levels.

Due to the non-continuous nature of some site activities, adjustments for duration have been made using the following mathematical formula. Note that fixed plant items such as a fan will be continuous over the entire assessment period and no duration adjustment is necessary.

Equation 2:

$$L_{eq},T = Lw - \quad 10\ log\ (2\ \pi\ r^2)\ + 10\ log\ \frac{(D\ x\ N)}{T}$$

Where Lw is sound power level of source (dB(A))
r distance to receiver (m)
D is duration of noise for each event (sec)
N is number of events
T is total assessment period (sec)

Calculations were performed with RTA Technology Environmental Noise Model computer software and INoise Environmental Modelling Package, which accept information on ground type and topography, source and receiver locations, weather details and source sound power spectra. Ground contours were obtained from topographical maps of the site and surrounds. Results from the noise model are presented for various scenarios in later Sections of this report.

3.1.3 Atmospheric Conditions

In the Grenfell region atmospheric conditions can exacerbate received noise levels for a percentage of the time. Temperature inversions may be expected in the area during the night and early morning at a greater frequency during winter and to a lesser degree in the warmer months. Inversion effects are strongest in the early hours of the morning but tend to weaken rapidly and may be considered to have completely dissipated by 9am or earlier. The ENM model was prepared for the following operating scenarios, as shown below:

1. Day/Evening/Night neutral atmospheric conditions, stability categories A-D, i.e. with wind speed up to 0.5m/s at 10m AGL.
2. Day/Evening, noise enhancing meteorological conditions, stability categories A-D, i.e. light winds up to 3m/s at 10m AGL.
3. Night, noise enhancing meteorological conditions, stability categories F inversion of 3°C/100m and with winds up to 2m/s at 10m AGL source to downhill receiver. (See Table D1, NPfI)

3.1.4 Construction

Future noise and vibration sources on the site cannot be measured at this time, consequently noise and vibration levels produced by plant and machinery to be used on the site have been sourced from manufacturers' data, DEFRA database, and/or our library of technical data, which has been accumulated from measurements taken in many similar situations on other sites for others.

All noise level measurements were taken with a Svan 977 Sound Level Meter. This instrument is Class 1 accuracy, in accordance with the requirements of IEC 61672, and has the capability to measure steady, fluctuating, intermittent and/or impulsive sound, and to compute and display percentile noise levels for the measuring period. A calibration signal was used to align the instrument train prior to measuring and checked at the conclusion. Difference in the two measurements was less than 0.5dB. Each measurement was taken over a representative time period to include all aspects of machine/process operation, including additional start-up noise where applicable. Sound measurements were generally made around all sides of each machine, to enable the acoustic sound power (dB re 1pW) to be calculated. The sound power level is then theoretically propagated to the receiver, with allowances made for spherical spreading. Atmospheric absorption, directivity and ground absorption have been ignored in the calculations. As a result, predicted received noise levels are expected to slightly overstate actual received levels, thus providing a measure of conservatism. Addition of the received Sound Pressure Level (SPL) for each of the individual operating sources gives the total SPL at each receiver, which is then compared to the criteria. Where noise impacts above the criterion are identified, suitable noise control measures are implemented and reassessed to demonstrate satisfactory received noise levels.

3.2 ANALYSIS & DISCUSSION

3.2.1 Received Noise Levels – Road Traffic

Traffic due to the proposal travelling on nearby public roads is assessed separate to site noise and is subject to the criteria described in Section 2.3.1 of this report. Trucks and vehicles will approach and depart the site from both directions along Gooloogong Road. Our client has supplied projected traffic numbers for the site:

Table 5: Traffic Numbers

DAY (7am-10pm)			NIGHT (10pm-7am)		
Light	Heavy	TOTAL	Light	Heavy	TOTAL
36	10	46	4	2	6

Truck noise varies from one machine to another, with more modern larger trucks consistently producing a sound power in the range 104 to 108 dB(A) at full power. This assessment assumes a typical truck sound power of 106dB(A), as full engine power is not typically required to approach and depart the site. Cars typically produce an average sound power of 92dB(A), however wide variations are noted particularly with smaller modern cars and larger V8 or diesel powered vehicles. Our calculations present the worst case for the situation, as the noise produced by a typical car accelerating at full power is used to determine the received noise level. In reality, many people will not leave the site at full acceleration but will depart more sedately.

The following Table shows results of traffic noise calculations from cars and trucks associated with the site, propagated to a theoretical facade of typical receivers at varying distances from Gooloogong Road. Received noise is the combined noise impact from cars and trucks at the facade of the residence.

Table 6: Traffic Noise Calculations for Proposed Operations, dB(A),Leq

Traffic and Receiver	Day (7am-10pm)		Night (10pm-7am)	
Vehicle Type	Trucks	Cars	Trucks	Cars
Movements per period	10	36	2	4
Vehicle Sound Power	106	92	106	92
Distance to Receiver, m	20			
Received Noise Level	39.7	30.3	35.0	24.5
Total Received	**40.1**		**35.4**	
Criteria	**60dB(A),Leq 15hr**		**55dB(A),Leq 9hr**	
Impact	**-**		**-**	
Distance to Receiver, m	50			
Received Noise Level	35.7	26.9	31.2	22.4
Total Received	**36.3**		**31.7**	
Criteria	**60dB(A),Leq 15hr**		**55dB(A),Leq 9hr**	
Impact	**-**		**-**	
Distance to Receiver, m	100			
Received Noise Level	32.8	24.6	28.5	21.3
Total Received	**33.5**		**29.3**	
Criteria	**60dB(A),Leq 15hr**		**55dB(A),Leq 9hr**	
Impact	**-**		**-**	

Results in the above Table show that noise levels from cars and trucks travelling to and from the proposed poultry farms along Gooloogong Road are predicted to be compliant with the RNP day and night criteria for all residences.

3.2.2 Received Noise Levels – Site Operation Proposed Situation

The Lw's of plant and equipment operating at the poultry complex during the day, evening and night, which were input into our computer model, are shown in the following Tables. The Tables gives the A-weighted sound power levels for each listed plant item, principally based on our measurements at operating Farms or sourced from our library of technical data. Also shown is the number of items operating at each location on the site for a worst-case situation (also see Appendix B for noise source locations).

Additional plant and noise sources encountered on the site may include split system air conditioners, small compressors, pumps, etc, all of which produce a sound power less than 75dB. Collectively, with up to 3 or 4 sources operating simultaneously on occasions, the sum could be as high as 80dB. This overall sum is more than 10dB below significant sources at the site, therefore they will not contribute or raise the sound level at nearby receivers. Furthermore, sheds are enclosed when using tunnel ventilation and sources of noise such as auger feed lines, poultry catching, mist sprays, etc, are much quieter compared to previously designed sheds using natural ventilation methods.

Table 7: Plant and Equipment – Proposed Operations (Day/Evening)

Machine/Process	Lw dB(A)	Main Access Road	Silos	Load/ Cool Room	Sheds East	Sheds West	W'shop
Heavy truck	**104**	3(S1)	1(S1)	1(S1)	-	-	-
Bobcat/Fork Lift	**106**	-		2(S2)-	-	-	-
Refrigeration plant	**98**	-	-	1(S3)	-	-	-
Ventilation fans [1]	**92**	-	-	-	10(S4)	10(S4)	-
Generator [2]	**95**	-	-	-	-	-	1(S5)
Feed pump & auger[3]	**96**	-	1(S6)	-	-	-	-
Bird catching	**82**	-	-	-	-	-	-
Maintenance activities	**78**	-	-	-	-	-	1(S8)
Loading/Unloading	**86**	-	-	1(S9)	-	-	-
Egg collection	**95**	-	-	-	1(S10)	1(S10)	-
Roosters	**92**	-	-	-	-	-	-

1. Recent measurements by Reverb Acoustics at operating farms confirmed Lw of 92dB(A).
2. K19 Series Diesel Generator housed in acoustic enclosure with hospital grade silencer, i.e. 30-35dB reduction.
3. Primary silo filled with feed then distributed to other silos.

Table 8: Plant and Equipment – Proposed Operations (Night)

Machine/Process	Lw dB(A)	Main Access Road	Silos	Load/ Cool Room	Sheds East	Sheds West	W'shop
Heavy truck	**104**	1(S1)	-		2(S1)	-	-
Bobcat/Fork Lift	**106**	-	-	2(S2)-	-	-	-
Refrigeration plant	**98**	-	-	1(S3)	-	-	-
Ventilation fans [1]	**92**	-	-	-	10(S4)	10(S4)	-
Generator [2]	**95**	-	-	-	-	-	1(S5)
Feed pump & auger[3]	**96**	-	1(S6)	-	-	-	-
Bird catching	**82**	-	-	-	1(S7)	1(S7)	-
Maintenance activities	**78**	-	-	-	-	-	-
Loading/Unloading	**86**	-	-	2(S9)	-	-	-
Egg collection	**95**	-	-	-	-	-	-
Roosters	**92**	-	-	-	30(S11)	30(S11)	-

1. Recent measurements by Reverb Acoustics at operating farms confirmed Lw of 92dB(A).
2. K19 Series Diesel Generator housed in acoustic enclosure with hospital grade silencer, i.e. 30-35dB reduction.
3. Primary silo filled with feed then distributed to other silos.

Legend:

S1. Trucks on main access rd & farm access rd
S2. Fork loading truck/Bobcat spread litter
S3. Cool room plant operating continuously
S4. Ventilation fans at all sheds
S5. Generator for E and W sheds
S6. Feed pump & auger lines at all sheds
S7. Catching birds inside sheds
S8. Maintenance activities/servicing
S9. Load birds on trailer
S10. Load eggs on truck
S.11 Roosters crowing in sheds.

The following Tables show predicted received noise levels at nearby residential receivers under neutral and noise enhancing atmospheric conditions for the proposed situation. To present a worst-case situation, our calculations assume the following simultaneous operations:

- Farm 2 night bird collection, includes fork lift, trucks, loading, etc.
- Farms 1, 3, 4 ventilation fans, heaters & feed lines running at night.
- Farm 2 day litter spread, empty shed, generator operating.
- Farms 2, 3 normal day operation, including silo fill (always 1 silo only), all plant operating.
- Farm 3 egg collection including loading, truck movements, etc, during day.

Allowances have been made in our acoustic model for intervening structures, atmospheric absorption, weather variations, and topographical features.

Table 9: Received Noise Levels for Proposed Operation dB(A)Leq (15 minute)

Receiver	Received Noise Levels, dB(A),Leq			
	Neutral Conditions (DAY)	3m/sec Wind Source to Rec (DAY)	Neutral Conditions (NIGHT)	3°C/100m Inversion (NIGHT)
R1 – Res. (W)	34	36	35	**37**
R2 – Res. (SW)	28	29	28	30
R3 – Res. (SW)	25	26	25	28
R4 – Res. (S)	19	20	20	24
R5 – Res. (S)	17	19	19	24
R6 – Res. (S)	15	17	16	21

Criteria: Day=40dB(A),Leq, Evening=35dB(A),Leq, Night=35dB(A),Leq.

Table 10: Received Noise Levels for Proposed Operation dB(A)Lmax

Receiver	Received Noise Levels, dB(A),L1			
	Neutral Conditions (DAY)	3m/sec Wind Source to Rec (DAY)	Neutral Conditions (NIGHT)	3°C/100m Inversion (NIGHT)
R1 – Res. (W)	N/A	N/A	32	34
R2 – Res. (SW)	N/A	N/A	<30	<30
R3 – Res. (SW)	N/A	N/A	<30	<30
R4 – Res. (S)	N/A	N/A	<30	<30
R5 – Res. (S)	N/A	N/A	<30	<30
R6 – Res. (S)	N/A	N/A	<30	<30

Criteria: Night=52dB(A),Lmax.

Reference to theoretical results in the above Tables show that site operations are predicted to be compliant with the criteria at all nearby residential receivers during the day and night for neutral and adverse weather conditions. A minor 2dB(A) exceedance is predicted at residence R1 during adverse weather conditions.

The above calculations assume all ventilation fans, truck movements and the emergency generator are operating simultaneously at the nearest Farm 2. In reality, all items and activities will not occur at the same time, implying compliance. See Section 4 for noise control strategies.

Given that there is some uncertainty in theoretical calculations there is the possibility that exceedances may occur at nearest residence R1 under adverse weather conditions. Our acoustic model reveals that the following noise sources are of main concern:

1. Ventilation fans at Farm 2.
2. Feed silo refilling, pump & auger at Farm 2.
3. Generator at Farm 2 during the night.
4. Trucks on access roads

We consider that no special acoustic modifications are necessary to achieve compliance, however, in the unlikely event of the site producing unacceptable noise emissions, we suggest as a first course of action constructing a landscaped earthen mound along part of the west side of the sheds at Farm 2. The mound should be 1500-1800mm above ground level. See Section 4 for mound location and other suggested noise control strategies.

3.2.3 Corrections for Annoying Noise Characteristics

Reverb Acoustics recently completed compliance noise monitoring at nearby poultry farms at Allwood near Tabbita, NSW. As previously stated, Reverb Acoustics completed compliance monitoring at four (4) existing poultry farms at Allwood near Tabbita, NSW. Our compliance monitoring included measurements of worst-case operations co-ordinated with staff when a bird collection was scheduled for night. During measurement tunnel ventilation fans, feed pumps and augers, etc, were all operating continuously at adjacent sheds on the farm. Noise monitoring results taken at residences exposed to the sites loudest items, i.e. truck movements, collections, fans, etc, were all generally inaudible during the day, evening and night. Shown below is our theoretical assessment, based on near field measurements at the Riverina site, for noise tonality at receivers ≥1500mm from the facility.

TONALITY ASSESSMENT

Data Input																											
Frequency, Hz	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.3k	1.6k	2k	2.5k	3.2k	4k	5k	6.3k	8k	10k	dB
Measured Spectrum	-15.6	-14.7	-13.5	-11	-7.7	-7.7	-0.7	7.5	9.3	12.3	13.7	13.3	14.3	17.5	18.5	18	18.2	16.3	15.3	15.3	10.3	7.3	7.2	5.3	4.3	2.2	-2	27.0
NSW EPA, Noise Policy for Industry (2017)																											
Frequency, Hz	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.3k	1.6k	2k	2.5k	3.2k	4k	5k	6.3k	8k	10k	
Spectrum	-15.6	-14.7	-13.5	-11	-7.7	-7.7	-0.7	7.5	9.3	12.3	13.7	13.3	14.3	17.5	18.5	18	18.2	16.3	15.3	15.3	10.3	7.3	7.2	5.3	4.3	2.2	-2	27.0
Tonality	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Adjusted Level																												**27.0**
AS 1055.1-1997																											
Frequency, Hz	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.3k	1.6k	2k	2.5k	3.2k	4k	5k	6.3k	8k	10k	
Spectrum	-15.6	-14.7	-13.5	-11	-7.7	-7.7	-0.7	7.5	9.3	12.3	13.7	13.3	14.3	17.5	18.5	18	18.2	16.3	15.3	15.3	10.3	7.3	7.2	5.3	4.3	2.2	-2	27.0
Tonality	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Adjusted Level																												**27.0**
NSW EPA, Industrial Noise Policy (2000)																											
Frequency, Hz	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.3k	1.6k	2k	2.5k	3.2k	4k	5k	6.3k	8k	10k	
Spectrum	-15.6	-14.7	-13.5	-11	-7.7	-7.7	-0.7	7.5	9.3	12.3	13.7	13.3	14.3	17.5	18.5	18	18.2	16.3	15.3	15.3	10.3	7.3	7.2	5.3	4.3	2.2	-2	27.0
Tonality	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Adjusted Level																												**27.0**

As can be seen by the above results, noise emissions at nearest receivers are not expected to contain any significant tonal components, in accordance with the requirements of Fact Sheet C of the NPfI. No further adjustments or penalties are therefore required for noise predictions at residential receivers.

On site measurements at the existing Warrah Ridge poultry rearing/laying farm revealed that the C – A noise level difference in dB during the day and night was ≤5.2dB confirming adjustments for low frequency noise impacts is not required, in accordance with the requirements of Fact Sheet C of the NPfI. Furthermore, the dominant audible noise source from the farms at night is the ventilation fans, which can be considered quasi-steady state noise sources with no perceivable modulation of intermittent characteristics.

3.2.4 Predicted Noise levels - Construction Plant and Equipment

Received noise produced by anticipated construction activities is shown in Table 11 below, for a variety of distances to a typical receiver, with no noise barriers or acoustic shielding in place and with each item of plant operating at full power. Entries in bold type highlight exceedances of the day construction noise criterion of **45dB(A),Leq**.

Table 11: Predicted Plant Item Noise Levels, dB(A)Leq

		Distance to Residence				
Plant/Activity	**(Lw)**	**1km**	**2km**	**3km**	**4km**	**5km**
Mobile crane	(102)	34	28	24	22	20
Hammering	(98)	3	24	20	18	16
Angle grinder	(106)	38	32	28	26	24
Air wrench (silenced)	(98)	30	24	20	18	16
Compactor	(111)	43	37	33	31	29
Road truck	(104)	36	30	26	24	22
Grader	(102)	34	28	24	22	20
Backhoe	(103)	35	29	25	23	21
Air compressor	(98)	30	24	20	18	16
Concrete Agitator	(112)	44	38	34	32	30
Concrete Pump	(110)	42	36	32	30	28
Pile boring machine	(113)	45	39	35	33	31
Excavator	(104)	36	30	26	24	22
Circular saw	(108)	40	34	30	28	26

All construction equipment at the site is not expected to operate at the same time. In saying this, several machines or processes are possible simultaneously at the same time during each stage of construction. The following worst-case scenarios are expected during each phase of construction:

Stage 1: Initial Earthworks:

Item	*Lw dB(A)*
Road Truck	104
Grader	102
Backhoe	103
Pile Boring Machine	113
Excavator	104
COMBINED	115

Stage 2: Building Foundations:

Item	*Lw dB(A)*
Compactor	111
Concrete Agitator	112
Concrete Pump	110
COMBINED	116

Stage 3: Building Construction:

Item	*Lw dB(A)*
Mobile Crane	102
Hammering	98
Angle Grinder	106
Air Wrench	98
Circular Saw	108
COMBINED	111

The nearest residence is more than 1500 metres from the site and the cumulative noise impact during each stage of construction is expected to be compliant with the criteria. However, the cumulative noise impact from several machines operating simultaneously, while predicted to be compliant with the criteria, has the potential to exceed exceed limits, particularly pile boring, mobile plant and equipment associated with major concrete pours. The ICNG recommends that as a first course of action, consideration should be given as to whether any alternate feasible or reasonable method of construction is possible.

The ICNG further recommends that when alternate feasible and reasonable options have been considered the proponent then should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and any respite periods that will be provided. These strategies will be discussed in more detail in Section 4.

It should be noted that calculations are based on plant items operating in exposed locations and at full power, with no allowances made for intervening topography or shielding provided by intervening structures. Cumulative impacts, from several machines operating simultaneously, may be reduced when machines are operating in shielded areas not wholly visible to receivers. In saying this, if two or more machines were to operate simultaneously on the site, received noise levels would be raised and higher exceedances may occur. For instance, a concrete agitator, concrete pump and support truck, in exposed locations, will produce a combined noise level of 36-38dB(A),Leq at nearest residences.

Initial earthworks are expected to employ 1 or 2 excavators, a front end loader and 2-3 dump trucks. The combined acoustic power level of these machines, assuming normal contractor's machines up to 10 years old in reasonably good condition, is expected to be in the range 104 to 108B(A),Leq. However, the machines will typically be spread over the site, and noise at any receiver is typically dominated by the few closest machines, such as an excavator loading a truck, while a second truck reverses into position to be loaded by an excavator. With a combined acoustic power level of 105 dB(A) for 3 typical machines operating at full power, up to 37dB(A) is expected at the closest residence during peak activity.

Constructing temporary barriers or mounds of excess fill, etc, at least 2m high, at the perimeter of the construction site (or at least adjacent to noisy plant items) may be considered for mitigating some of the construction noise at nearest receivers. With barriers in place, worst case construction will reduce by 5dB(A) or more, although, as previously stated, these noise levels are expected to occur for a relatively short time and reduce as work progresses to a new area.

It should be acknowledged that construction activities that produce higher noise for a shorter period are often more desirable than alternate construction techniques that produce lower noise for a much longer period. This combined with noise control strategies such as co-ordination between the construction team and neighbours will ensure that minimum disruption occurs.

SECTION 4
Summary of Recommended Noise Control

4. NOISE CONTROL RECOMMENDATIONS

4.1.1 Site Operation

1. The Poultry Farms may operate over a 24 hour period.

2. No special acoustic modifications are required for site operation. However, in the unlikely event of complaint, we suggest as a first course of action constructing a landscaped earthen mound along west side of the Farm 2 sheds. The mound should be 1500-1800mm above ground level (also see Appendix B).

3. Speed restriction signs should be erected at regular intervals along all access roads. A speed limit of 20km/hr should be imposed on Farms and 40km/hr on access roads.

4. All access roads should be kept in good condition, i.e. no potholes, etc.

5. The K19 Series generator is to be located in the enclosure at the end of the amenities block, with a hospital grade silencer fitted.

7. Once plant selection has been finalised (i.e. fans, air conditioning, refrigeration, etc), noise emission details should be forwarded to the acoustic consultant for approval.

8. A regular maintenance schedule should be adopted for all mobile and fixed plant items. Items found producing high noise should be stood down until repairs are completed.

9. All complaints are to be investigated and addressed in accordance with Baiada's Complaints Management Process, which meets ISO 140001 requirements. Response to complaints or comments should be made in a timely manner and action taken reported to the concerned party.

10. All staff and employees directly involved with the facility should receive formal training as part of the induction process. Additional ongoing on the job environmental training should be incorporated with the introduction of any new process or procedure. This training should flow down contractually to all sub-contractors.

11. A noise monitoring program, during commissioning, or in the early life of the site is recommended to confirm compliance. In the event of any non-compliance(s) additional noise control strategies are to be implemented. Followed by further confirmation monitoring.

4.1.2 Site Construction

12. All combustion engine plant, such as generators, compressors and welders, should be carefully checked to ensure they produce minimal noise, with particular attention to residential grade exhaust silencers and shielding around motors.

13. Trucks and other machines should not be left idling unnecessarily. Machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made.

14. Framing guns and impact wrenches should be used sparingly, particularly in elevated locations, with assembly of modules on the ground preferred.

15. Table 12 shows some common construction equipment, together with noise control options and possible alternatives.

Table 12 - Noise Control, Common Noise Sources

Equipment / Process	Noise Source	Noise Control	Possible Alternatives
Compressor Generator	Engine	Fit residential muffler. Acoustic enclosure.	Electric in preference to petrol/diesel. Plant to be Located outside building Centralised system.
	Casing	Shielding around motor.	
Concrete breaking Drilling Core Holing	Hand piece	Fit silencer, reduces noise but not efficiency Enclosure / Screening	Use rotary drill or thermic lance (used to burn holes in and cut concrete) Laser cutting technology
	Bit	Dampened bit to eliminate ringing. Once surface broken, noise reduces. Enclosure / Screening.	
	Air line	Seal air leaks, lag joints	
	Motor	Fit residential mufflers.	
Drop/Circular saw Brick saw	Vibration of blade/product.	Use sharp saws. Dampen blade. Clamp product.	Use handsaws where possible. Retro-fitting.
Hammering	Impact on nail		Screws
Brick bolster	Impact on brick	Rubber matting under brick	Shielded area.
Rotary drills Boring	Drive motor and bit.	Acoustic screens and enclosures	Thermic lance Laser cutting technology.
Explosive tools (i.e. ramset gun)	Cartridge explosion	Use silenced gun	Drill fixing.
Material handling	Material impact	Cushioning by placing mattresses, foam, waffle matting on floor. Acoustic screening.	
Waste disposal	Dropping material in bin, trolley wheels.	Internally line bins/chutes with insertion rubber, conveyor belting, or similar.	
Dozer, Excavator, Truck, Grader, Crane	Engine, track noise	Residential mufflers, shielding around engine, rubber tyred machinery.	
Pile driving/boring	Hammer impact engine	Shipping containers between pile & receiver	Manual boring techniques

Note: Generally, noise reductions of 7-10dB will be achieved with the use of barriers, 15-30dB by enclosures, 5-10dB from silencers and up to 20-25dB by substitution with an alternate process.

16. To minimise noise impacts during construction, early work should concentrate on grading and levelling the areas. In the event of unacceptable noise emissions arising we offer the following additional strategies for consideration:

- Consider alternate construction method.
- Cease operation and discuss with neighbours suitable times for noisy construction activities.
- Place acoustic enclosures or screens directly adjacent to stationary noise sources (compressors, generators, etc).

17. We recommend that construction noise management strategies should be implemented to ensure minimum disruption to neighbours. Noise control strategies include co-ordination between the construction team and neighbours to ensure the timetable for noisy activities does not coincide with sensitive activities.

18. The site manager/environmental officer and construction contractor should take responsibility and be available to consult with community representatives, perhaps only during working hours. Response to complaints or comments should be made in a timely manner and action reported to the concerned party.

19. All staff and employees directly involved with the construction project should receive training with regard to noise control procedures. Additional ongoing on the job environmental training should be incorporated with the introduction of any new process or procedure. This training should flow down contractually to all sub-contractors.

20. A risk assessment should be undertaken for all noisy activities and at the change of each process. This will help identify the degree of noise and/or vibration impact at nearby receivers and ameliorative action necessary. A sample Risk Assessment Check Sheet is included in Appendix C as a guide.

SECTION 5
Conclusion

5.1 CONCLUSION

A noise impact assessment for new poultry breeder/rearing farms at 1130 Gooloogong Road, Grenfell, NSW, has been completed. The site is suitable for the intended purpose providing recommendations outlined in this report are incorporated into the design. With these or equivalent measures in place, the cumulative noise impact from Farms 1-5 will either be within the criteria or generally below the existing background noise level in the area.

A noise monitoring program, during commissioning, or in the early life of the site is recommended. This program will verify our predictions and in the unlikely event that complaints may arise, enable noise control strategies to be implemented, where required.

Noise created by traffic associated with the proposal on nearby roads is predicted to be within the criteria at all nearby receivers.

During site operation the total impact at each residence is related to the received noise level and the duration of excessive noise. To reduce the impact in the receiver area we recommend that louder activities, in particular mobile plant operated in exposed locations, are restricted to the late morning and afternoon when most people will be active or at work and background noise levels will be higher. Additionally, machines used on the site must be maintained in good condition to minimise source noise levels. Where practical, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods.

During construction the total impact at each receiver is related to the received noise level and the duration of excessive noise. Generally, construction noise will comply with the criteria, however, during major construction activities exceedances may occur. However, the community should accept some periods of high noise, considering the relatively short-term nature of louder construction activities.

To reduce the impact in the area during construction, we recommend that louder construction activities, should be completed with the minimum of undue delay. In any case, all reasonable attempts should be made to complete significant noisy activities within as short a time as possible.

Construction activities should generally be restricted to the nominated hours. If construction does occur outside the standard hours, it is vital that the local community be informed of the construction timetable with letter drops, meetings, etc.

Providing the recommendations presented in this report are implemented, operation of the proposed poultry complexes will not have any long term adverse noise impact upon the acoustical amenity of nearby residents. We therefore see no acoustic reason why the proposal should be denied.

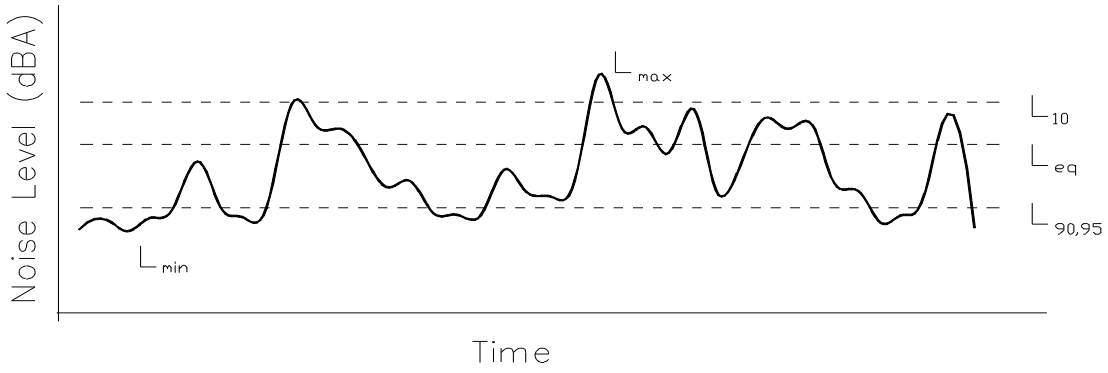
REVERB ACOUSTICS

Steve Brady M.A.S.A. A.A.A.S.
Principal Consultant

APPENDIX A
Definition of Acoustic Terms

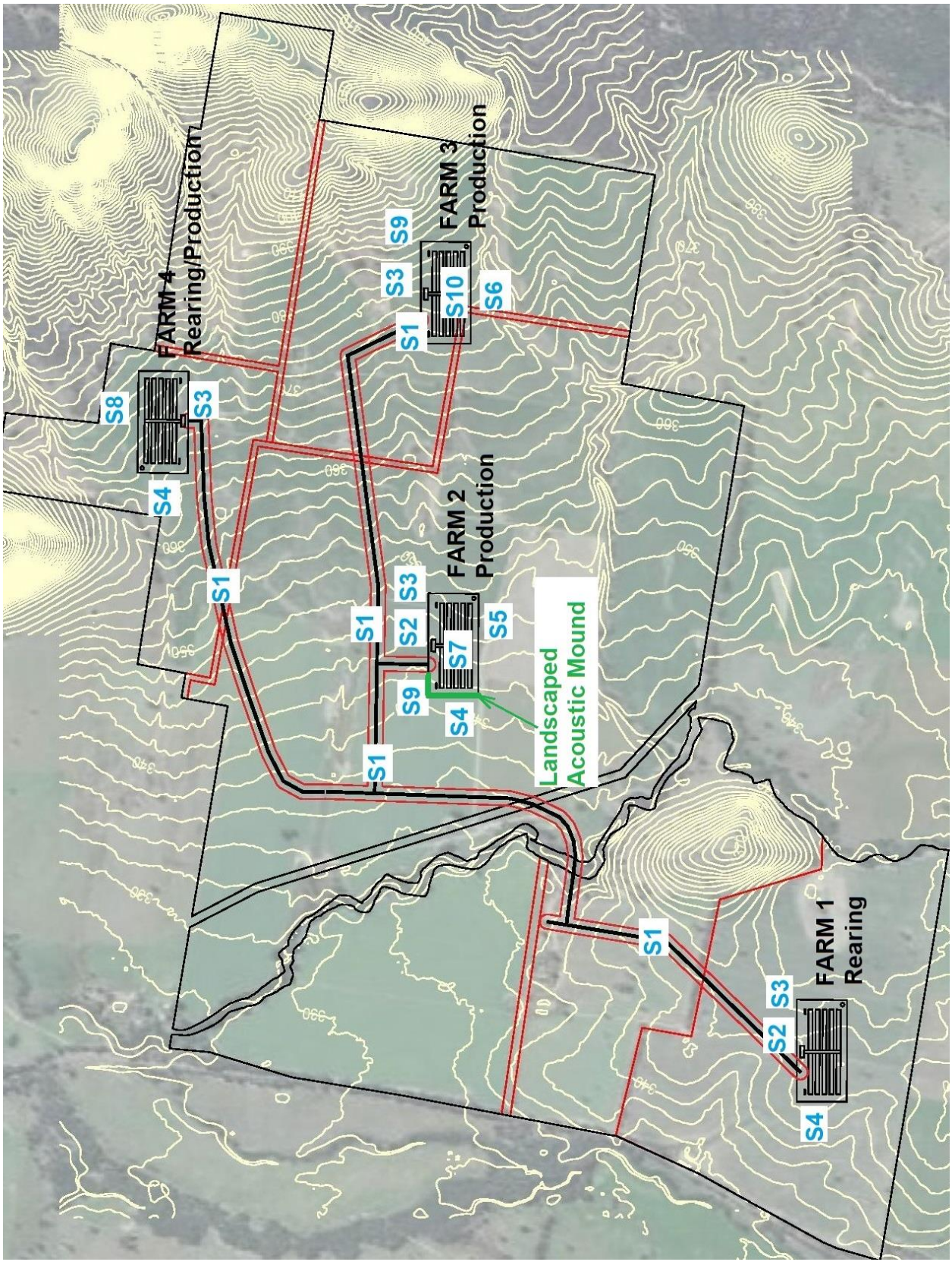
Definition of Acoustic Terms

Term	Definition
dB(A)	A unit of measurement in decibels (A), of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
ABL	*Assessment Background Level* – A single figure representing each individual assessment period (day, evening, night). Determined as the L90 of the L90's for each separate period.
RBL	*Rating Background Level* – The overall single figure background level for each assessment period (day, evening, night) over the entire monitoring period.
Leq	Equivalent Continuous Noise Level - which, lasting for as long as a given noise event has the same amount of acoustic energy as the given event.
L90	The noise level which is equalled or exceeded for 90% of the measurement period. An indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dBA).
L10	The noise level which is equalled or exceeded for 10% of the measurement period. L_{10} is an indicator of the mean maximum noise level, and was previously used in Australia as the descriptor for intrusive noise (usually in dBA).



APPENDIX B
Site Plan

SITE PLAN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Rearing/Production
FARM 3
Production
FARM 2
Production
FARM 1
Rearing
Landscaped
Acoustic Mound
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10

APPENDIX C

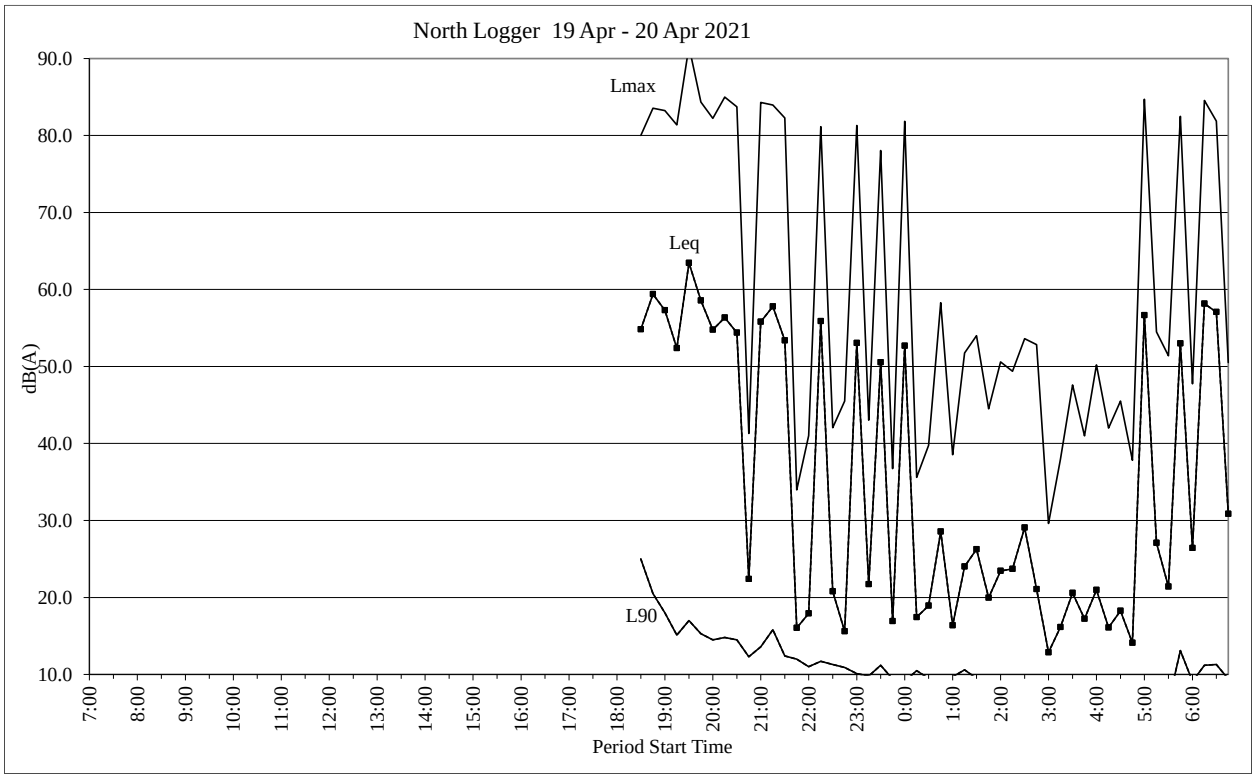
Construction Activities Risk Assessment Checklist

Construction Activities - Risk Assessment Checklist

Item/Date	Risk Identified (Yes/No)	Risk Level (H/M/L)	Noise Control Required (Yes/No)	Noise Control Strategy

APPENDIX D

Logger Charts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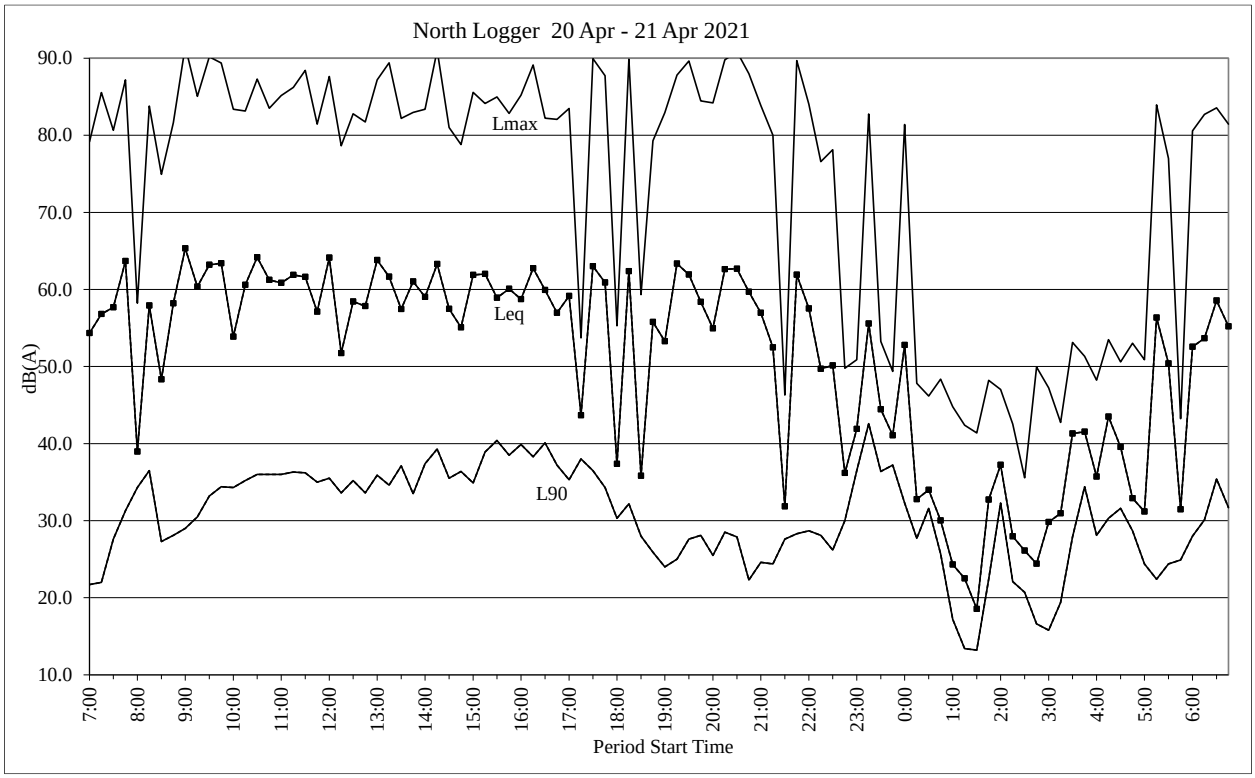
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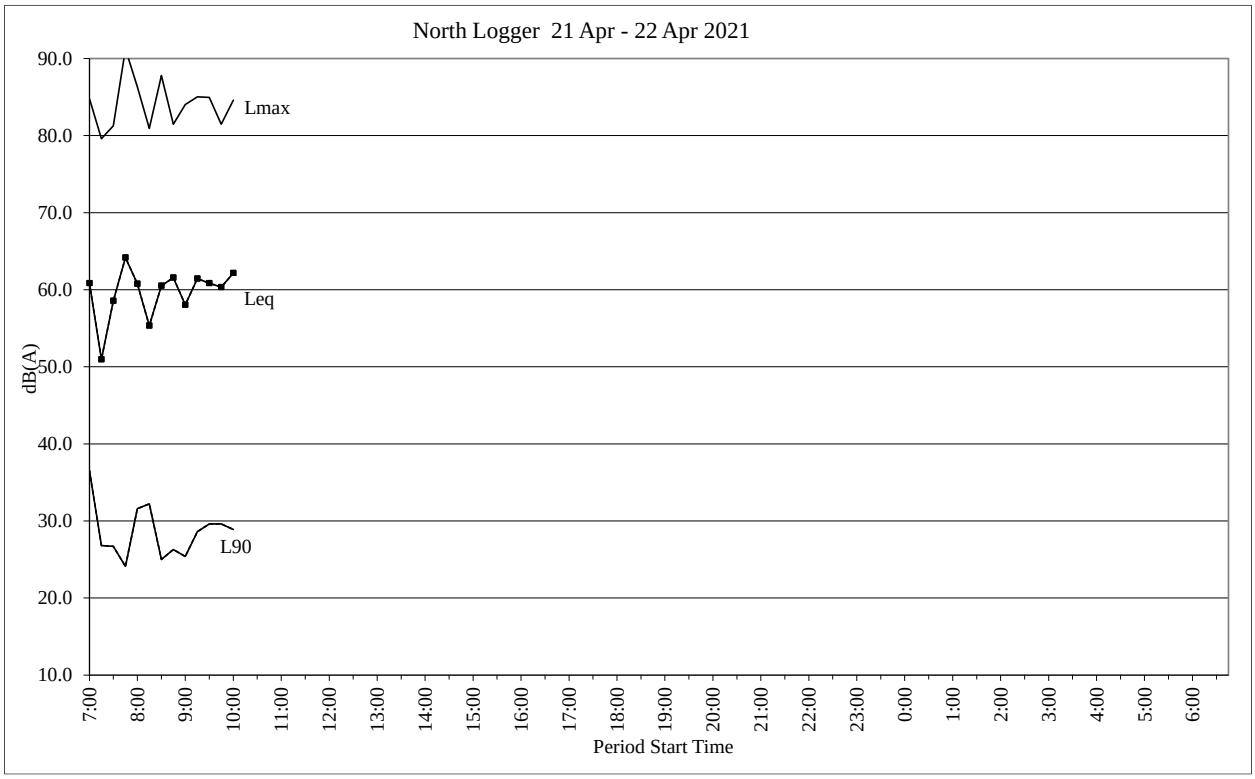
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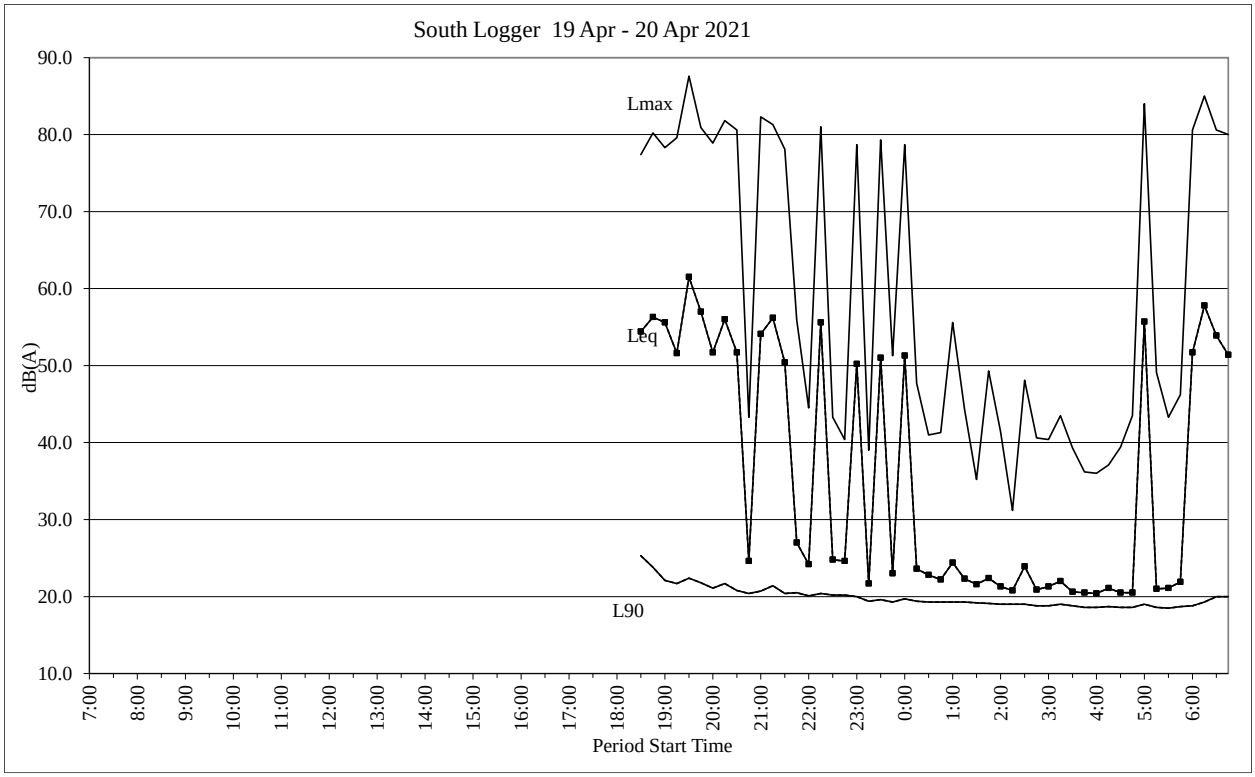
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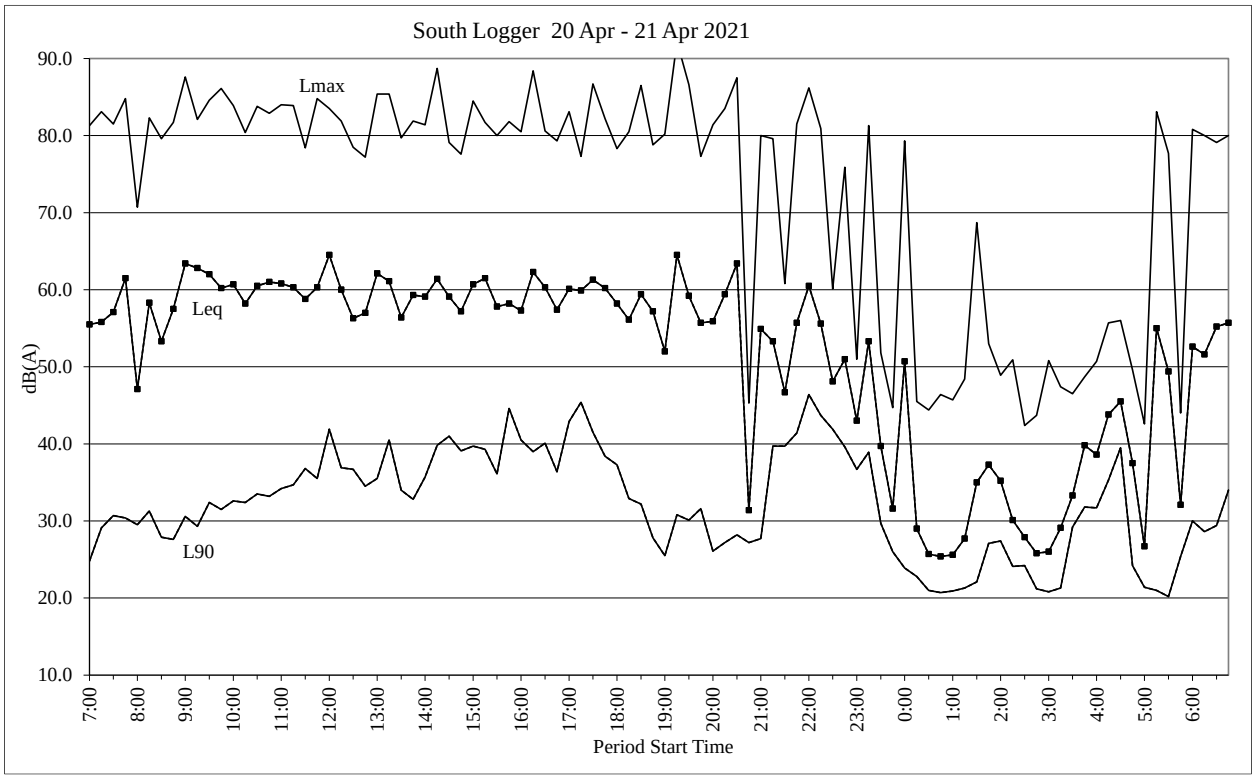
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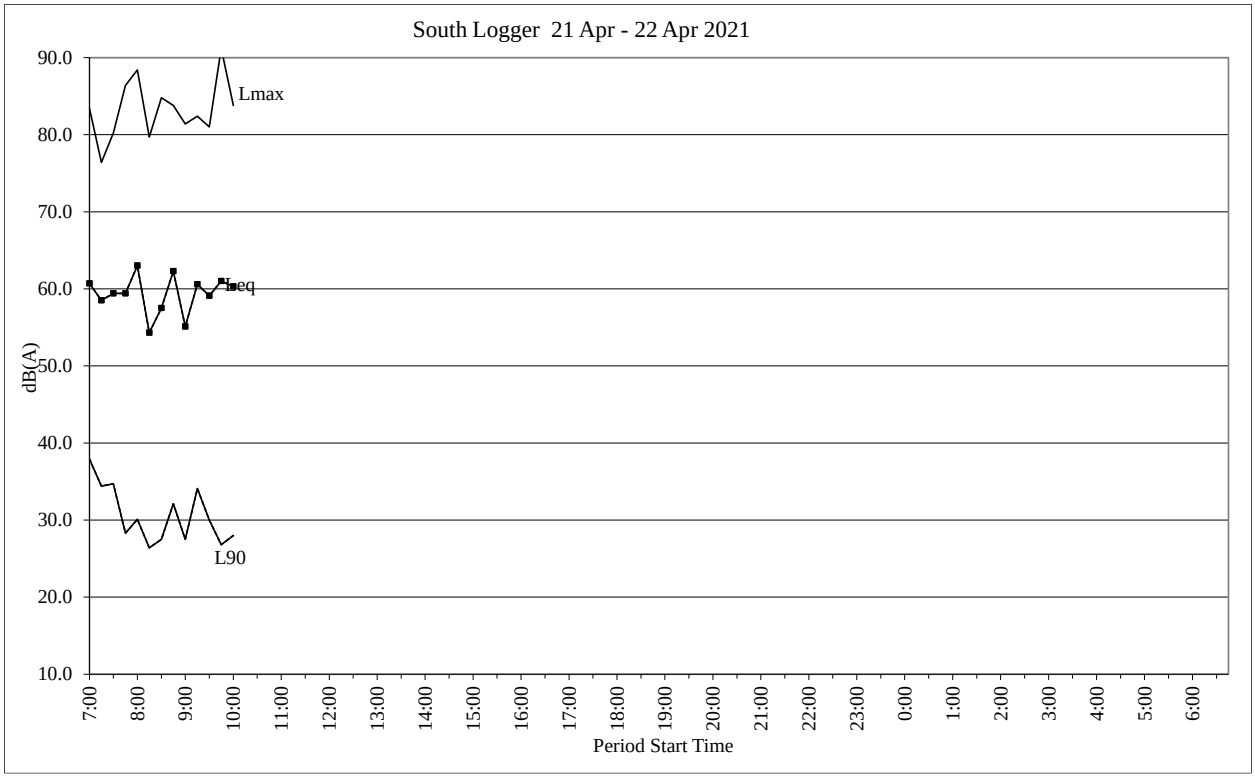
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L90
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Period Start Time