

Residential Aged Care Facility

Acoustic report for Development Application



CONTENTS

Contents	2
1. Referenced Documents	4
2. Executive Summary	5
3. Project Description	5
4. Applicable Noise Criteria	6
4.1 State Environmental Planning Policy (SEPP) – Housing for Seniors or People with a Disability (2004)	6
4.2 State Environmental Planning Policy (Infrastructure) 2007 – Development near Rail Corridors and Busy Roads: Interim Guideline (2008)	7
4.3 The NSW Industrial Noise Policy (INP) 2000	8
4.4 NCC Building Code of Australia	9
4.5 Australian Standards	10
5. Existing Noise Environment	11
5.1 Long Term Noise Logging	11
5.2 Operator Attended Noise Measurements	12
6. INP - Noise Criteria at the Nearest Residential Boundary	13
7. Compliance with SEPP: Rail & Roads	13
7.1 Glazing	13
8. Compliance with NCC BCA	15
9. Compliance with Australian Standards	15
9.1 AS 2107:2000-Acoustics - Recommended design sound levels and reverberation times for building interiors	15
9.2 AS 2021:2015-Acoustics - Aircraft noise intrusion - Building siting and construction	15
10. Conclusion	15
11. Appendix – Noise Logger Measurements	17

Document Control Sheet

Title	Acoustic report for Development Application
Project	Residential Aged Care Facility
Description	
Key Contact	Claudiu Pop

Prepared By

Company	JHA
Address	Level 23, 101 Miller Street, North Sydney NSW 2060
Phone	61-2-9437 1000
Email	@jhaengineers.com.au
Website	www.jhaservices.com
Author	IA
Checked	RO
Authorised	CP

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1. REFERENCED DOCUMENTS

- a. *“Project Consultant Brief”* Issued September 2016, by CHL
- b. *“Casula RACF Options”* REV. A, Issued by Group GSA
- c. *“Casula Aged Care Updated Plans”* Issued 8 December 2016, by Group GSA

2. EXECUTIVE SUMMARY

JHA has been engaged by Catholic Healthcare Limited to prepare an Acoustic Report for the Development Application for a Residential Aged Care Facility (RACF) at Casula, NSW.

This report forms part of the development application submission to the Liverpool City Council for the development application for the proposed Aged Care Facility that is to be located at the corner of Lang Rd and Hume Hwy Casula, NSW, 2170. This report assesses the acoustic requirements for the design of the building and quantifies the existing noise environment, which could be impacted by the construction of the Facility in accordance with the Liverpool City Council requirements.

The report includes the following:

- Measurements of existing background noise on site to establish noise criteria as per the NSW INP, Council and SEPP conditions.
- NCC BCA compliance for architectural and building acoustics sound insulation.
- Mechanical services noise control.
- Council conditions of consent assessment and recommendations for driveway noise.
- Compliance with AS 2107 and AS 2021.

This report has been carried out in accordance with the JHA Engineers Quality Assurance System based on the Australian Standards AS/NZS ISO 9001.

3. PROJECT DESCRIPTION

The proposed development is a 144 bed Residential Aged Care Facility (RACF) located at the corner of Lang Rd and Hume Hwy Casula, NSW, 2170. The Facility will contain sole occupancy units, en-suites, common dining and lounge rooms, office, staff rooms, Chapel, consulting rooms, reception area, kitchen and bathrooms. Under the Liverpool City Council Local Environmental Plan (LEP), the site is zoned as R3 – Medium Density Residential.

The proposed development (outlined in orange in Figure 1) is to be located on existing blocks:

- 11, 13 and 15 Lang Road, Casula NSW 2170
- 76, 78 and 80 Marsh Parade, Casula NSW 2170
- 536, 538, 540 and 542 Hume Highway Casula NSW 2170

The existing properties on this site will be demolished for the project to take place.

The nearest affected receivers (outlined in red in Figure 1) are:

- 74 Marsh Parade, Casula NSW 2170
- 9 Lang Road, Casula NSW 2170



Figure 1: Aerial view of proposed development site (outlined in orange) and nearest affected receivers (outlined in red). Long term logger measurements were taken at location marked “L” in blue. Operator attended measurements were taken at locations marked “M1” “M2” and “M3” in yellow.

4. APPLICABLE NOISE CRITERIA

4.1 State Environmental Planning Policy (SEPP) – Housing for Seniors or People with a Disability (2004)

SEPP – Housing for Seniors or People with a Disability Current Chapter 3 Part 3 Division 2 Clause 34 states:

34 Visual and acoustic privacy

The proposed development should consider the visual and acoustic privacy of neighbours in the vicinity and residents by:

- (a) appropriate site planning, the location and design of windows and balconies, the use of screening devices and landscaping, and*
- (b) ensuring acceptable noise levels in bedrooms of new dwellings by locating them away from driveways, parking areas and paths.*

4.2 State Environmental Planning Policy (Infrastructure) 2007 – Development near Rail Corridors and Busy Roads: Interim Guideline (2008)

The “Development near Rail Corridors and Busy Roads – Interim Guideline (2008)” requires that for developments affected by ‘busy roads’ with road traffic movements in excess of 40,000 vehicles daily, the development must comply with Section 3.6.1 Airborne Noise Criteria of the guideline.

The data shown in Figure 2 below shows the 2016 Annual Average Daily Traffic (AADT) Southbound and Northbound volume of 73,177 vehicles on the Hume Highway at Casula. The data is sourced from the Roads and Maritime services Traffic Volume Viewer.

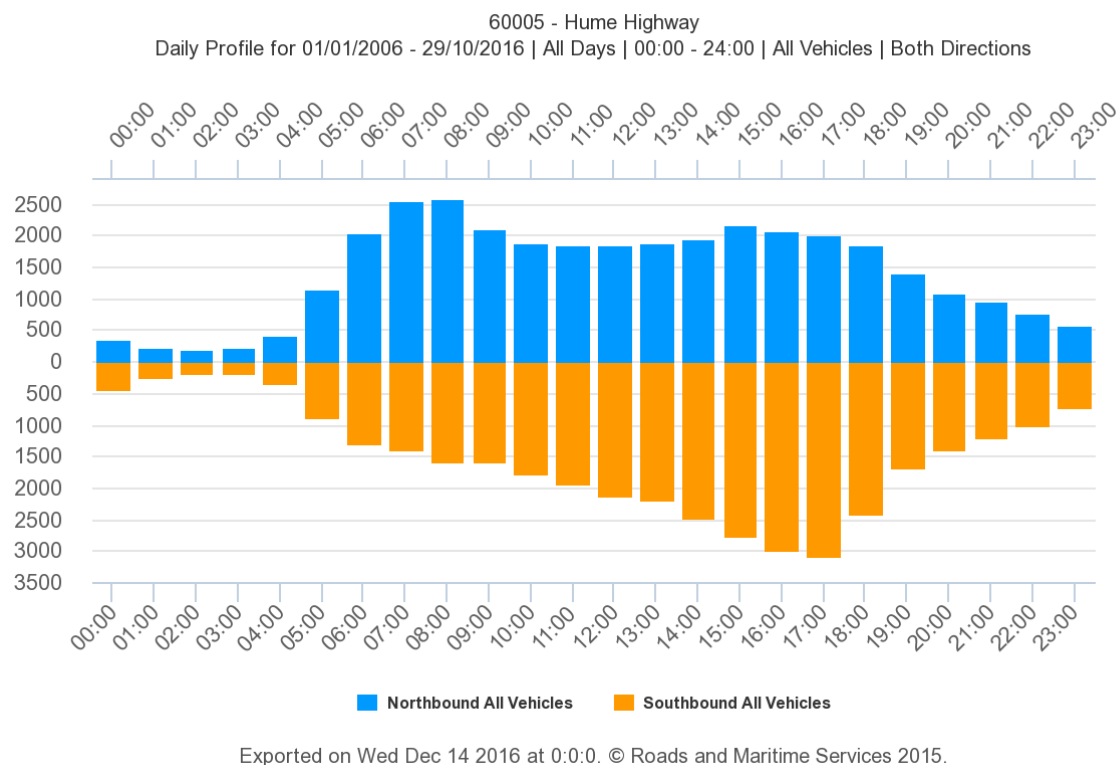


Figure 2: Annual Average Daily Traffic (AADT) Southbound and Northbound volume on Hume Highway Casula.

Based on this number, the proposed development is assessed as located within a short distance from a “busy road” (>40,000 vehicles/day average) and must comply with the SEPP “Development near Rail Corridors and Busy Roads – Interim Guideline 2008” condition as follows:

3.6.1 Airborne Noise Criteria

The airborne noise criteria for residential buildings are shown in table below for both road and rail, which are specified in the Infrastructure SEPP. Other values in table below are based on the Environmental Criteria for Road Traffic Noise (EPA 1999).

These criteria apply to all forms of residential buildings as well as aged care and nursing home facilities. For some residential buildings, the applicants may wish to apply more stringent design goals in response to market demand for a higher quality living environment.

Table 1: excerpt from Table 3.1 of SEPP (Rail & Roads) – Noise Criteria

Type of occupancy (residential)	Noise Level – dB(A)	Applicable time period
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time

4.3 The NSW Industrial Noise Policy (INP) 2000

NSW Industrial Noise Policy (INP) 2000 assessment procedure for industrial noise sources consists of two components, which are:

- Controlling intrusive noise impacts in the short term for residences.
- Maintaining noise level amenity for particular land uses for residences and land users.

The intrusiveness of an industrial noise source is considered acceptable if the continuous (energy-average) A-weighted level of noise from the source measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5dB at the nearest residence.

The intrusiveness criterion as defined by the NSW INP is summarised as follows:

“ $L_{Aeq, 15 \text{ minute}} \leq \text{rating background level plus 5}$, where:

$L_{Aeq, 15 \text{ minute}}$ represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes. Other descriptors may be used as appropriate provided they can be justified on the basis of being characteristic of the source (Section 2.3 of INP). This is to be assessed at the most-affected point on or within the residential property boundary - or, if that is more than 30 m from the residence, at the most-affected point within 30 m of the residence.”

The Rating Background Level (RBL) is the background level used for the assessment purposes and the $L_{A90, 15\text{minute}}$ measure as recommended in Table 3.1 of the INP is used in the determination.

To limit the continuing increases in noise levels and maintain noise level amenity, the INP has set recommended and maximum noise for the various land usages. The amenity criteria applicable to this Development Application are shown in Table 2 below.

Table 2: excerpt from table 3.1 of the INP – Noise Amenity Criteria.

Type of Receiver	Indicative Noise Amenity Area	Time of Day	L_{Aeq} - dB(A)	
			Recommended	Maximum
Residence	Suburban	Day	55	60
		Evening	45	50
		Night	40	45

“Note 10. In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable L_{Aeq} noise level may be increased to 40 dB L_{Aeq} (1hr).”

The NSW INP requires that any noise generated by the proposed development must be acoustically treated so that:

(a) *“The emission of noise associated with the use of the premises including the operation of any mechanical plant and equipment shall comply with the following criteria:*

(i) The L_{Aeq} , 15minute noise level emitted from use must not exceed background noise level L_{A90} , 15minute by more than 5dB when assessed at boundary of any affected residence.

(ii) The L_{Aeq} , 15minute noise level shall be adjusted for modifying factors in accordance with Part 4 of the Environmental Protection Authority (EPA) NSW Industrial Noise Policy.”

4.4 NCC Building Code of Australia

4.4.1 BCA Design Criteria – Airborne sound Insulation of walls

The National Construction Code (2016) Building Code of Australia part F5 (Acoustic Amenity) criteria for airborne sound insulation of internal partitions of class 9c buildings is summarised in Table 3:

Table 3: BCA airborne sound insulation of walls recommendations

Area served	Required floor construction
Separating sole-occupancy units	$R_w \geq 45$
Separating sole-occupancy unit from a bathroom, sanitary compartment (not being an associated en-suite), plant room or utilities room.	$R_w \geq 45$
Separating sole-occupancy unit from a kitchen or laundry.	$R_w \geq 45$ Discontinuous Construction

A wall indicated as being “discontinuous construction” shall mean a wall having a minimum 20mm air gaps between two separate leaves and:

- *For masonry walls, where wall ties are required to connect leaves, the ties are of the resilient type.*
- *For all other walls, there is no mechanical linkage between the leaves, except at the periphery.*

Further to this, a wall required to have sound insulation has a floor above it, then the wall must either continue to:

- *The underside of the floor above.*
- *A ceiling that provides the sound insulation required for the wall.*

A wall required to have sound insulation has a roof above it, then the wall must either continue to:

- *The underside of the roof above.*
- *A ceiling that provides the sound insulation required for the wall.*

4.4.2 BCA Design Criteria – Airborne sound Insulation of floors

The National Construction Code (2016) Building Code of Australia part F5 (Acoustic Amenity) criteria for airborne sound insulation of floors of class 9c buildings is summarised in Table 4:

Table 4: BCA airborne sound insulation of floors recommendations

Area served	Required floor construction
Separating sole-occupancy units	$R_w \geq 45$

4.5 Australian Standards

4.5.1 Australian Standard AS 2107:2000

The Australian Standard “AS 2107:2000-Acoustics - Recommended design sound levels and reverberation times for building interiors” recommended values for the internal background noise levels and reverberation times are presented in Table 5:

Table 5: Excerpt from table 1 of AS/NZS 2107 – Recommended design sound levels and reverberation times.

Type of Occupancy for Aged Care Buildings	Recommended Design Sound Level, L_{Aeq} , dB(A)		Recommended Reverberation Time (s)
	Satisfactory	Maximum	
Living areas	30	40	-
Sleeping areas	30	35	-
Work areas	35	40	-
Common areas	45	55	Minimized
Consulting rooms	40	45	0.4 – 0.6
Cafeterias	45	50	<1
Common rooms	40	45	<1
Games rooms	45	50	<1
Kitchens and service areas	45	55	-

4.5.2 Australian Standard AS 2021:2015

The Australian Standard “AS 2021:2015-Acoustics - Aircraft noise intrusion - Building siting and construction” recommends that an aged care facility, to be acceptable, should be located in Australian Noise Exposure Forecast zone of below 20 ANEF based on the forecasted noise levels from the future Badgerys Creek Airport.

5. EXISTING NOISE ENVIRONMENT

5.1 Long Term Noise Logging

Automatic logging noise measurements were performed at the site to document the existing acoustic environment, including traffic noise.

Long term noise monitoring with a Rion NL-52 Type 1 noise logging sound level meter were conducted between Monday 5th December 2016 and Sunday 18th December 2016 at Logger location (L) shown in blue in Figure 1. The sound level meter calibration was checked before and after the measurements using a Brüel & Kjær Acoustic Calibrator. No calibration deviations were recorded. Detailed results of the logger measurements are shown in Appendix 1.



Figure 3: Automatic long-term sound logger location L.

The results of the automatic logging measurements are presented in Table 6:

Table 6: Automatic sound logger measurement results.

Start Date and Time	End Date and Time	Logging Period	Assessment Period	L _{A90} [dB]	L _{Aeq} [dB]
5/12/16 3:15 pm	18/12/2016 9:00 am	15 min. intervals	Daytime	60	70
5/12/16 3:15 pm	18/12/2016 9:00 am	15 min. intervals	Evening	58	69
5/12/16 3:15 pm	18/12/2016 9:00 am	15 min. intervals	Night	50	66

The L_{A90} rating background noise levels were determined using the methodology as described in Section 3.1 of the NSW INP.

5.2 Operator Attended Noise Measurements

Operator attended noise measurements were performed on site to document the existing acoustic environment, including traffic noise. The operator attended noise measurement survey was conducted on with an integrating Type 1 sound level meter and windshield. Measurements were taken continuously and the microphone was set to receive direct frontal sound and facing the direction of sound emission. The survey was conducted with the following instruments:

- NTI Precision Integrating Octave Band Sound Level Meter, Type XL2 with 1/3 Oct band filter unit, which conforms to applicable standards of IEC 61672-1:2002-05 CLASS1 & IEC 60651 TYPE1.
- The sound level meter calibration was checked before and after the measurements using a Brüel & Kjær Acoustic Calibrator. No calibration deviations were recorded.

The measurement results are presented in Table 7.



Figure 4: Operator attended measurement position M1 (Hume Hwy).

Table 7: Operator attended measurement results.

Date	Time	L _{Aeq} – dB(A)	L _{AF10} - dB(A)	L _{AF90} - dB(A)	Location
5/12/16	3:00pm	71.1	74.0	55.5	M1
5/12/16	3:05pm	67.3	70.0	57.8	M2
5/12/16	3:10pm	63.3	66.8	51.8	M3

6. INP - NOISE CRITERIA AT THE NEAREST RESIDENTIAL BOUNDARY

In accordance with the NSW INP, the criteria for the project's intrusiveness and amenity noise criteria at the boundaries of the nearest affected residences at 74 Marsh Parade and 9 Lang Road will be determined at the detailed design stage. The mechanical, electrical and hydraulic services, equipment and plant rooms for the proposed development will be acoustically treated to achieve the noise criteria imposed determined by long-term sound logger measurements as per the INP. The noise from the new mechanical, electrical and hydraulic services shall not increase more than 5 dB above existing background noise, as not to cause noise disturbance to the nearest affected residences. The acoustic treatment of the building services and plant rooms will be finalised in the design development phase of the project.

7. COMPLIANCE WITH SEPP: RAIL & ROADS

7.1 Glazing

The proposed development site may be affected by road traffic noise, due to its proximity to a major highway and the sensitive nature of the use of the site. The recommended minimum $R_w + C_{tr}$ rating for the external glazing assembly (including frames and acoustic seals) for the façade to ensure sufficient insulation of traffic noise for the amenity of the occupants are shown in Table 8 below. Referring to Figure 5 for locations of each glazing type, the following is recommended depending on the vicinity to the Hume Highway:

Table 8: Glazing specification.

Location	Glazing type	Design $R_w + C_{tr}$	Notes
Facing Hume Highway + 20m continued down Lang Road and Marsh Parade (red in Figure 5)	VLam Hush 10.5mm + 16mm airgap + 6mm float glass	39	Framing must not degrade the performance of the glazing.
Facing Marsh Parade and Lang Road (orange in Figure 5)	VLam 6.38mm laminated glass	30	
Eastern Façade/s (green in Figure 5)	6mm (minimum) annealed glass	29	



Figure 5: Glazing specification locations.

It is important to consider appropriate attenuation by external walls and glazing for the spectral properties of incident traffic noise, which is characteristically comprised of more low frequency content than mid-high frequencies. C_{tr} is a spectrum adaptation term specifically for low frequencies, often quoted with R_w . In this instance, glazing must have high C_{tr} value to sufficiently attenuate low frequency traffic noise. The rest of the external building envelope of habitable spaces shall have a minimum $R_w + C_{tr}$ rating of 45.

8. COMPLIANCE WITH NCC BCA

Partition and floor specifications will be included in the detailed design stage, and it should be noted that for compliance with NCC BCA the following is required:

- Internal walls separating sole-occupancy units from other sole-occupancy units, bathrooms, sanitary compartments (not being an associated en-suite), plant room or utilities room are to have airborne sound insulation rating not less than R_w 45.
- Internal walls separating sole-occupancy units from a kitchen or laundry shall have airborne sound insulation rating not less than R_w 45, and discontinuous construction, as described in section 3.4.1.
- Internal floors separating sole occupancy units shall have airborne sound insulation rating not less than R_w 45.
- Plumbing and duct work between residences will be insulated so that the background noise levels in residences are compliant with noise criteria specified in AS 2107 and NCC BCA.

9. COMPLIANCE WITH AUSTRALIAN STANDARDS

9.1 AS 2107:2000-Acoustics - Recommended design sound levels and reverberation times for building interiors

The design criteria for background noise levels and reverberation time recommended by AS 2107:2000 are outlined in section 3.5 of this report.

Background noise levels should be minimised in the design of the building and mechanical services, walls and glazing.

9.2 AS 2021:2015-Acoustics - Aircraft noise intrusion - Building siting and construction

The proposed development is not expected to be affected by aircraft noise. The proposed ANEF contours for Badgery's Creek Airport are placed such that the Aged Care Facility will be in a zone of below 20 ANEF.

10. CONCLUSION

This report forms part of the development application submission for the proposed development of the Residential Aged Care Facility located at the corner of Lang Rd and Hume Hwy, Casula NSW 2170.

Operator attended and long term measurements were conducted at the site. The results of the measurements are presented in this report, and initial glazing design for compliance with SEPP for rail and roads have been specified. The noise criteria derived from the measurements using NSW INP methodology at the nearest affected receiver are to be quantified.

Acoustic compliance with the Liverpool City Council Development Control Plan, the State Environmental Planning Policy, the NSW Industrial Noise Policy, NCC Building Code of Australia and Australian Standards AS 2107:2000 and AS 2021:2015 can be achieved.

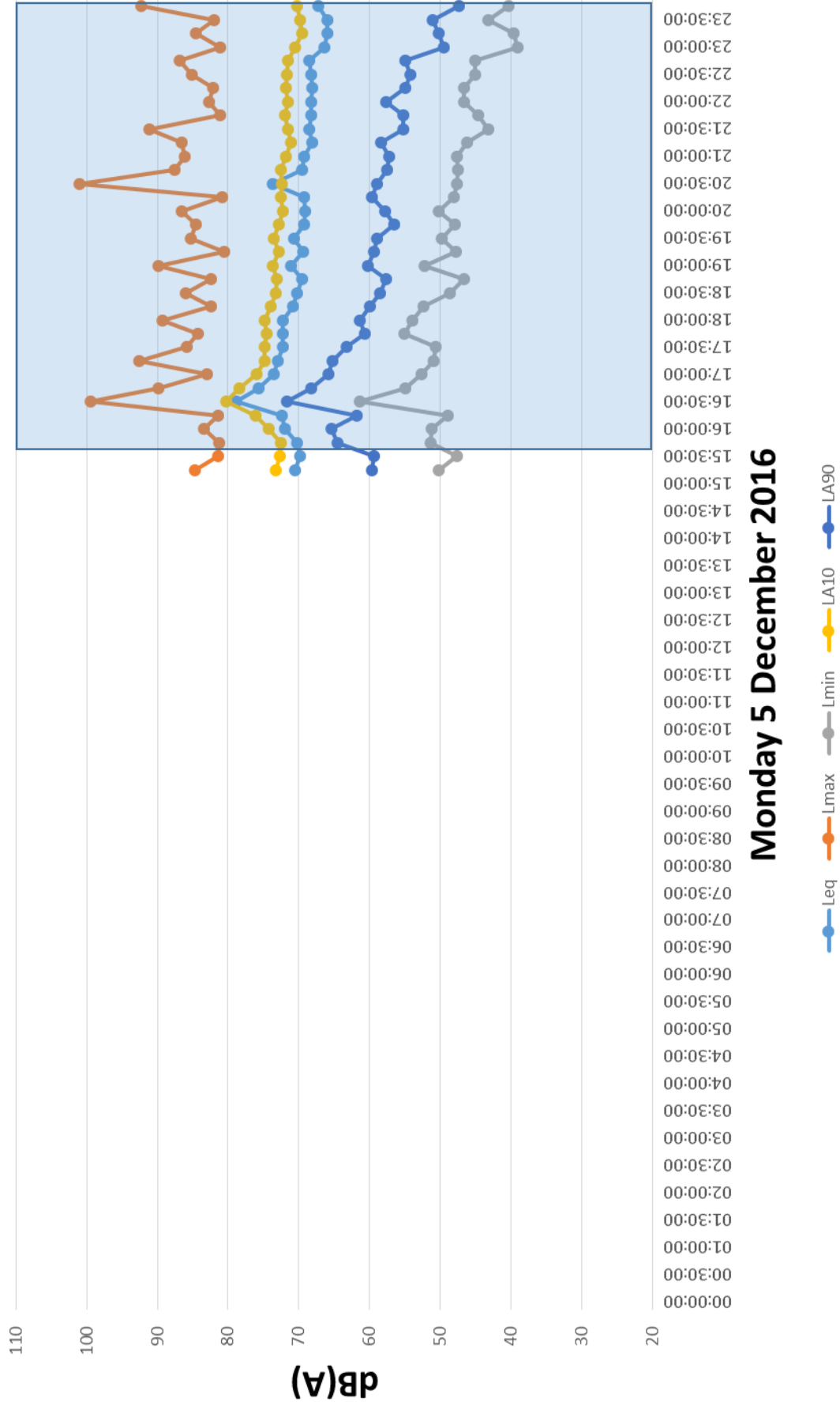
11. APPENDIX – NOISE LOGGER MEASUREMENTS

The details of the noise logging measurements are shown below. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

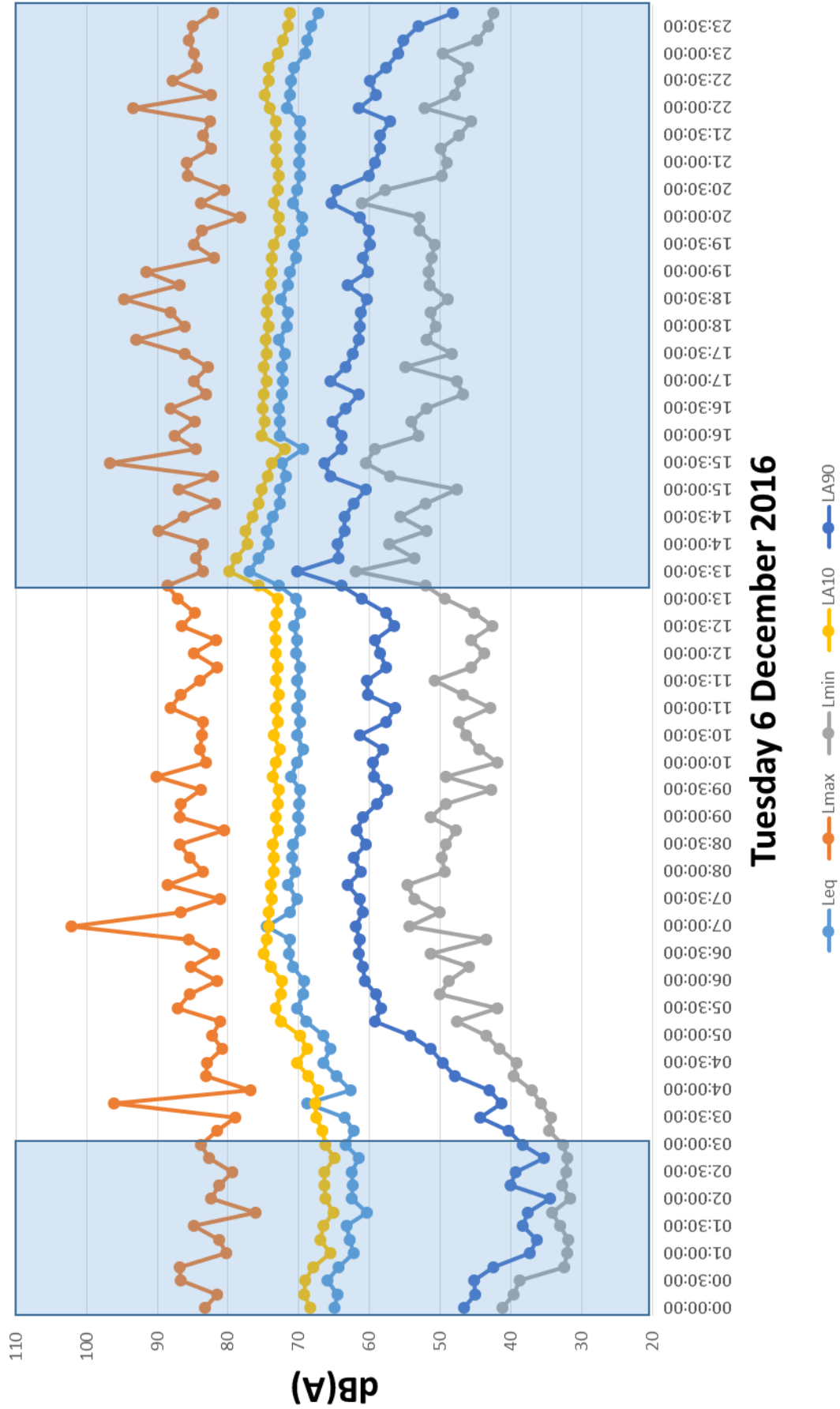
The sections marked in blue have been omitted due to rain that may have affected the measurements.

- **Maximum Noise Level (L_{Amax})** – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.
- **L_{A10}** – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.
- **L_{A90}** – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.
- **L_{Aeq}** – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.
- **Minimum Noise Level (L_{Amin})** – The minimum noise level over a sample period is the minimum level, measured on fast response, during the sample period.

Logger - Cnr Hume Hwy. and Lang Rd. Casula

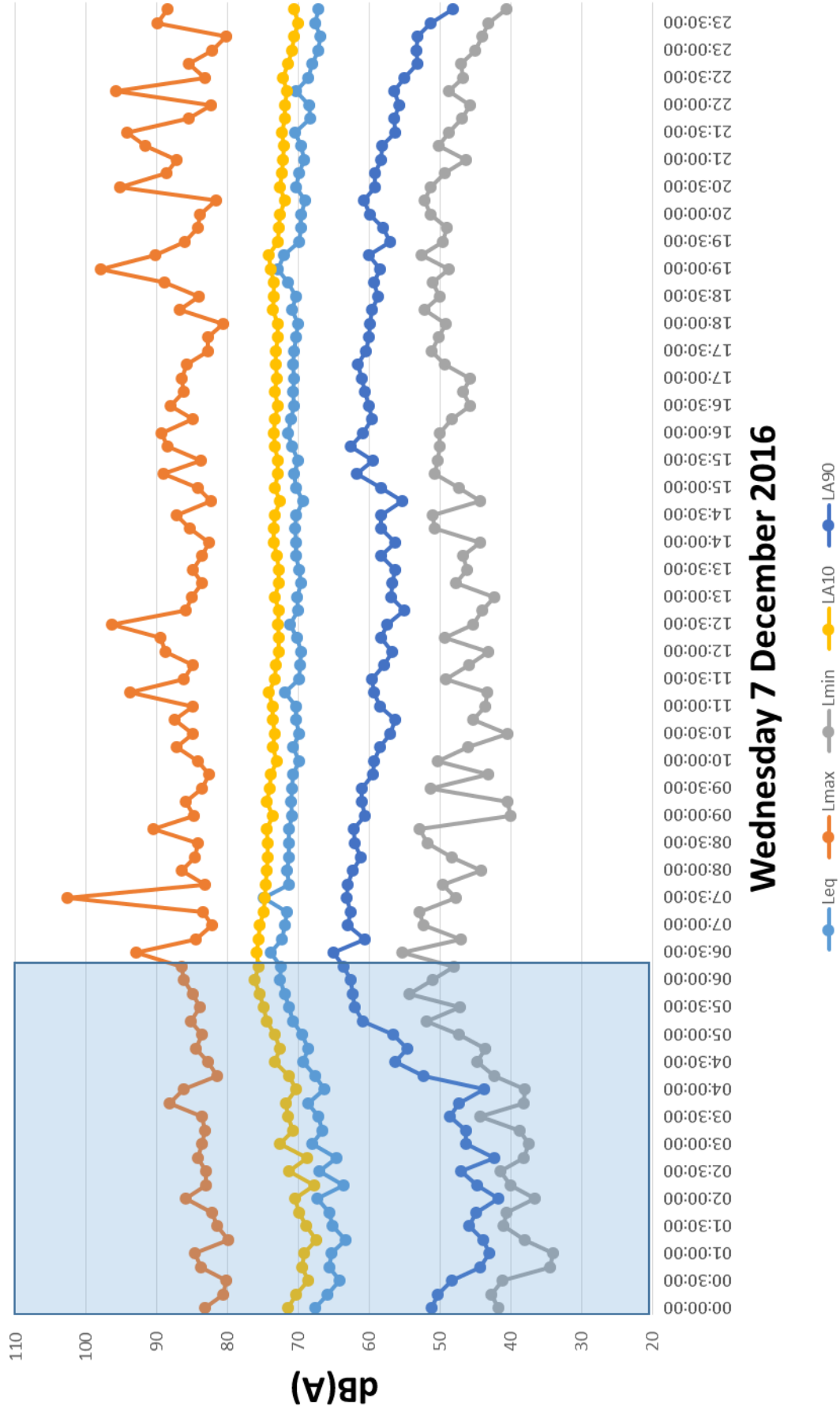


Logger - Cnr Hume Hwy. and Lang Rd. Casula



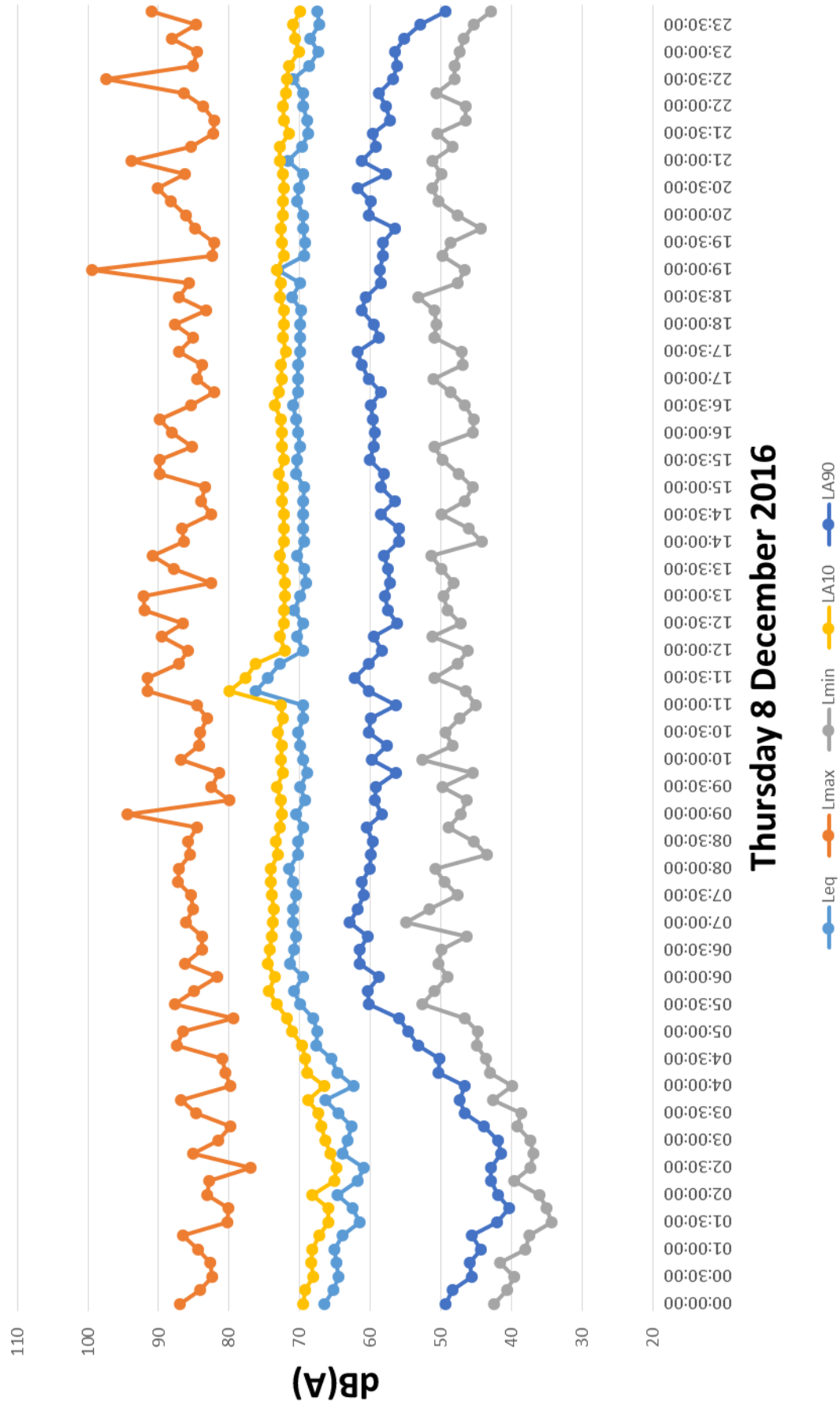
Tuesday 6 December 2016

Logger - Cnr Hume Hwy. and Lang Rd. Casula



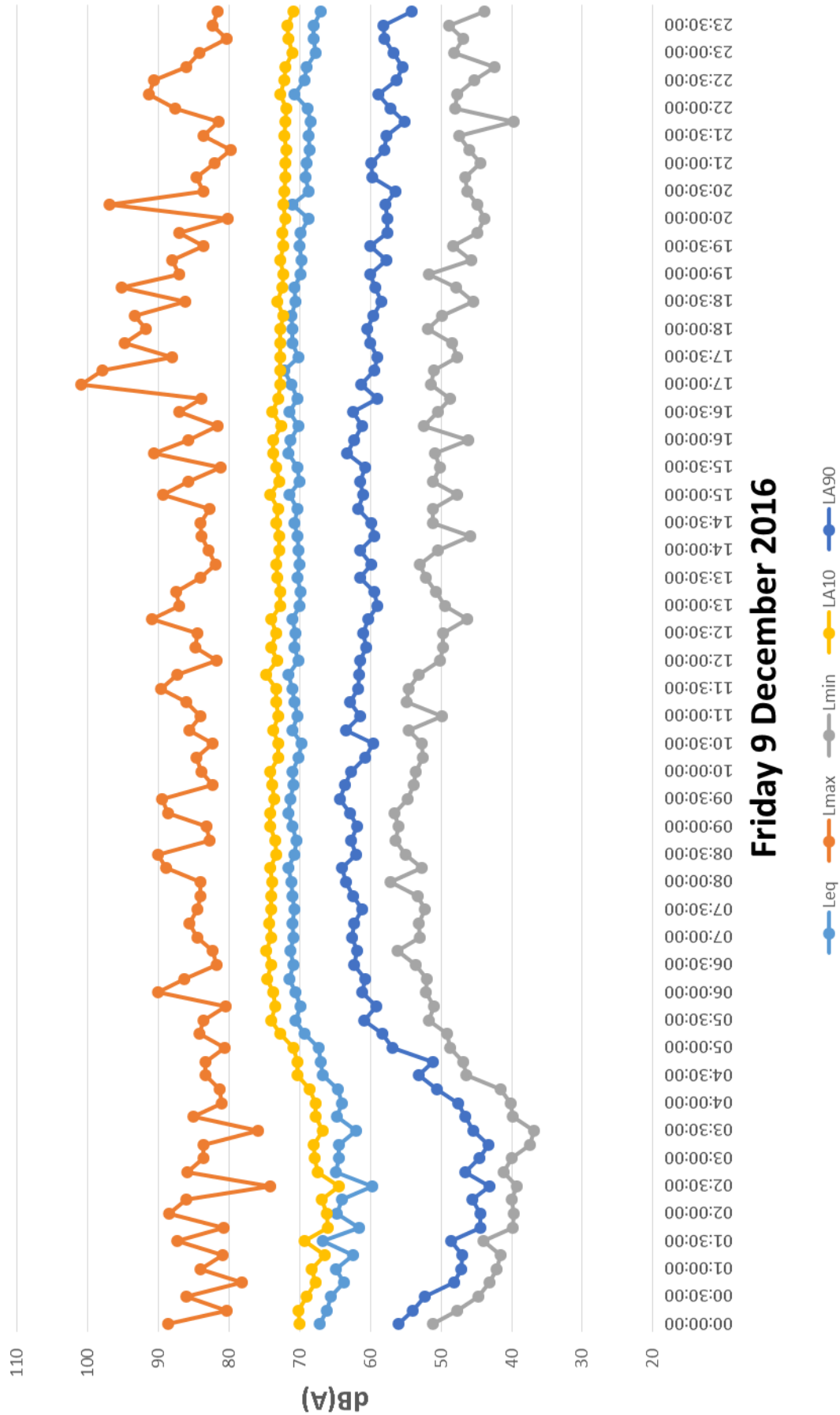
Wednesday 7 December 2016

Logger - Cnr Hume Hwy. and Lang Rd. Casula

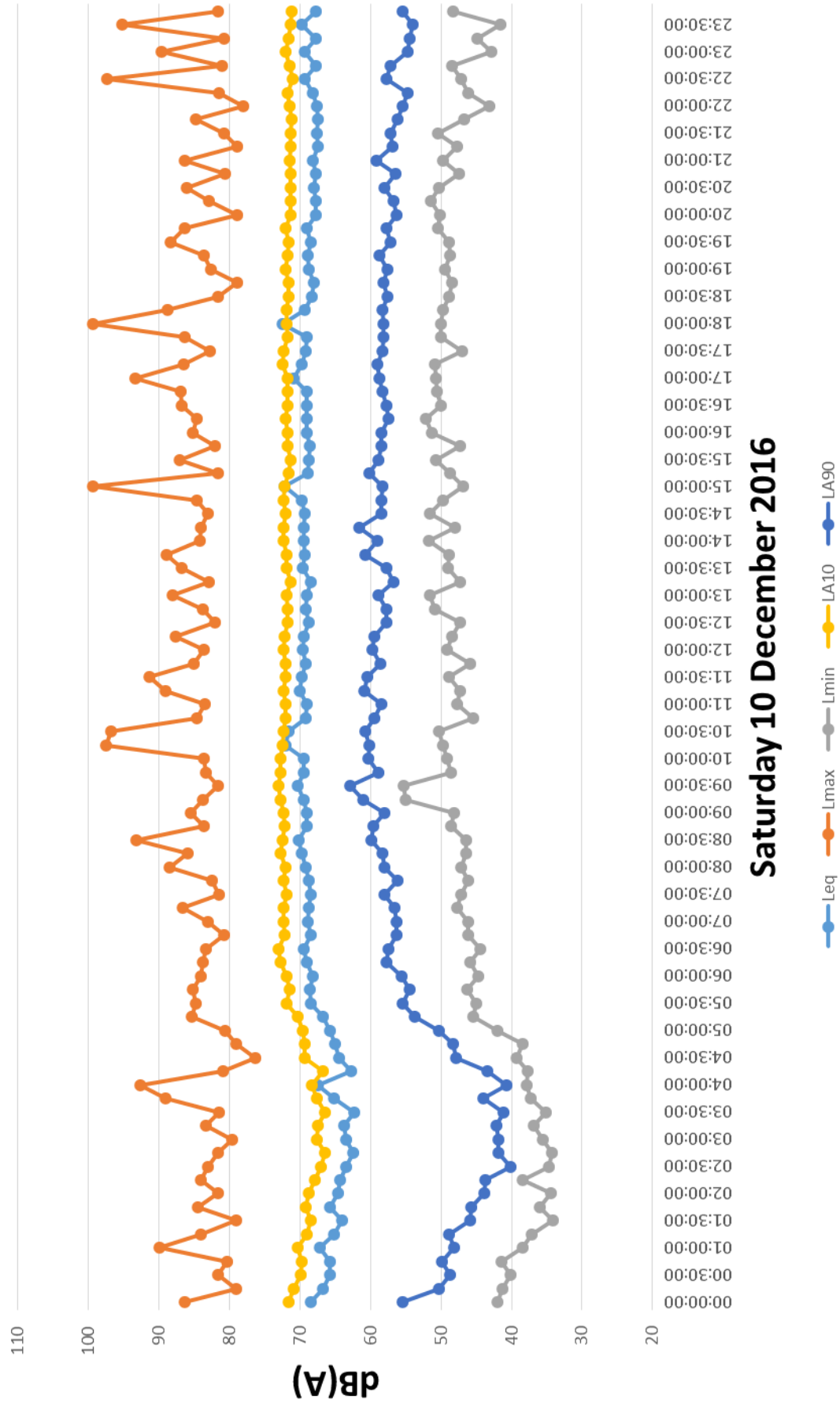


Thursday 8 December 2016

Logger - Cnr Hume Hwy. and Lang Rd. Casula

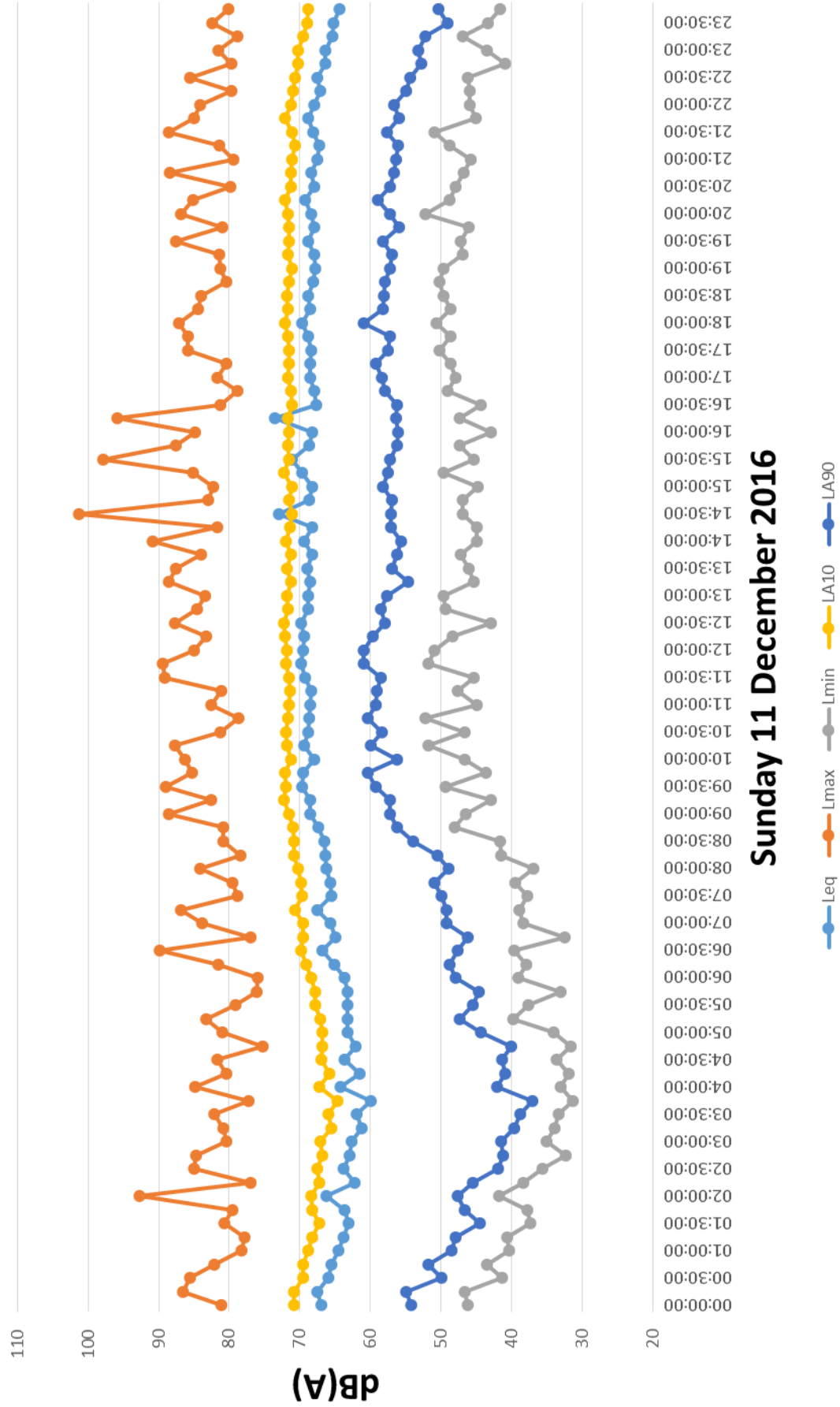


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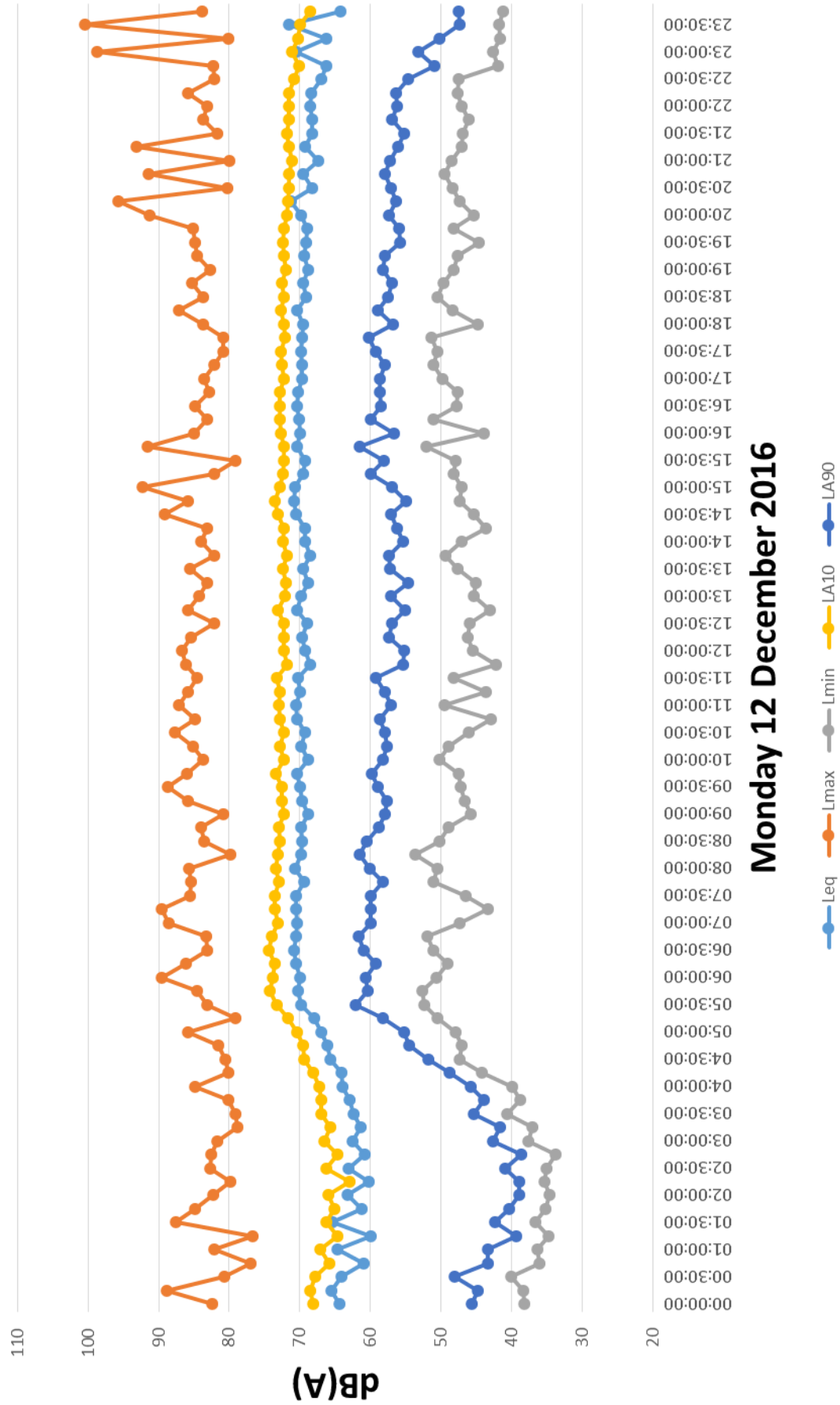


Saturday 10 December 2016

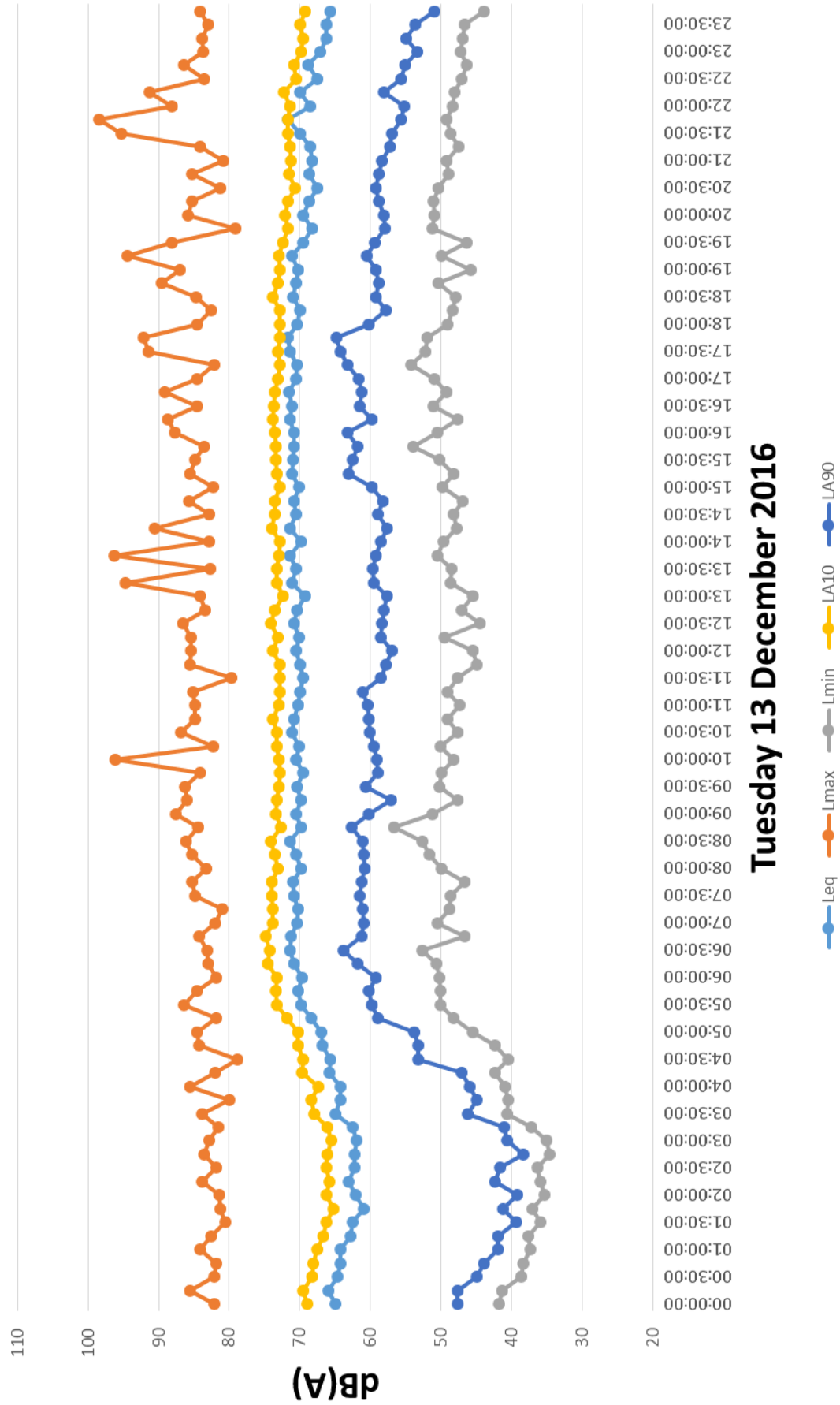
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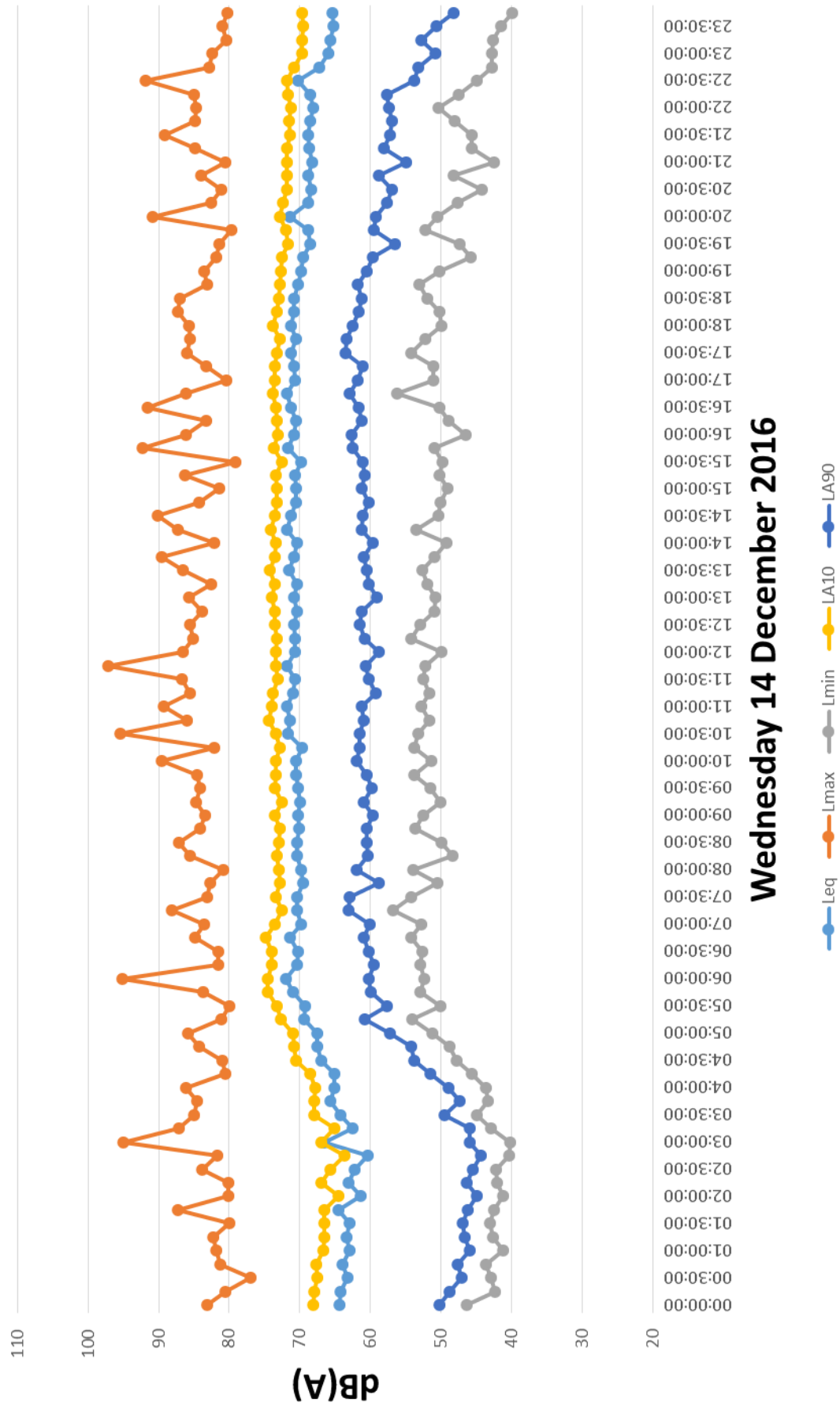
Logger - Cnr Hume Hwy. and Lang Rd. Casula



Logger - Cnr Hume Hwy. and Lang Rd. Casula

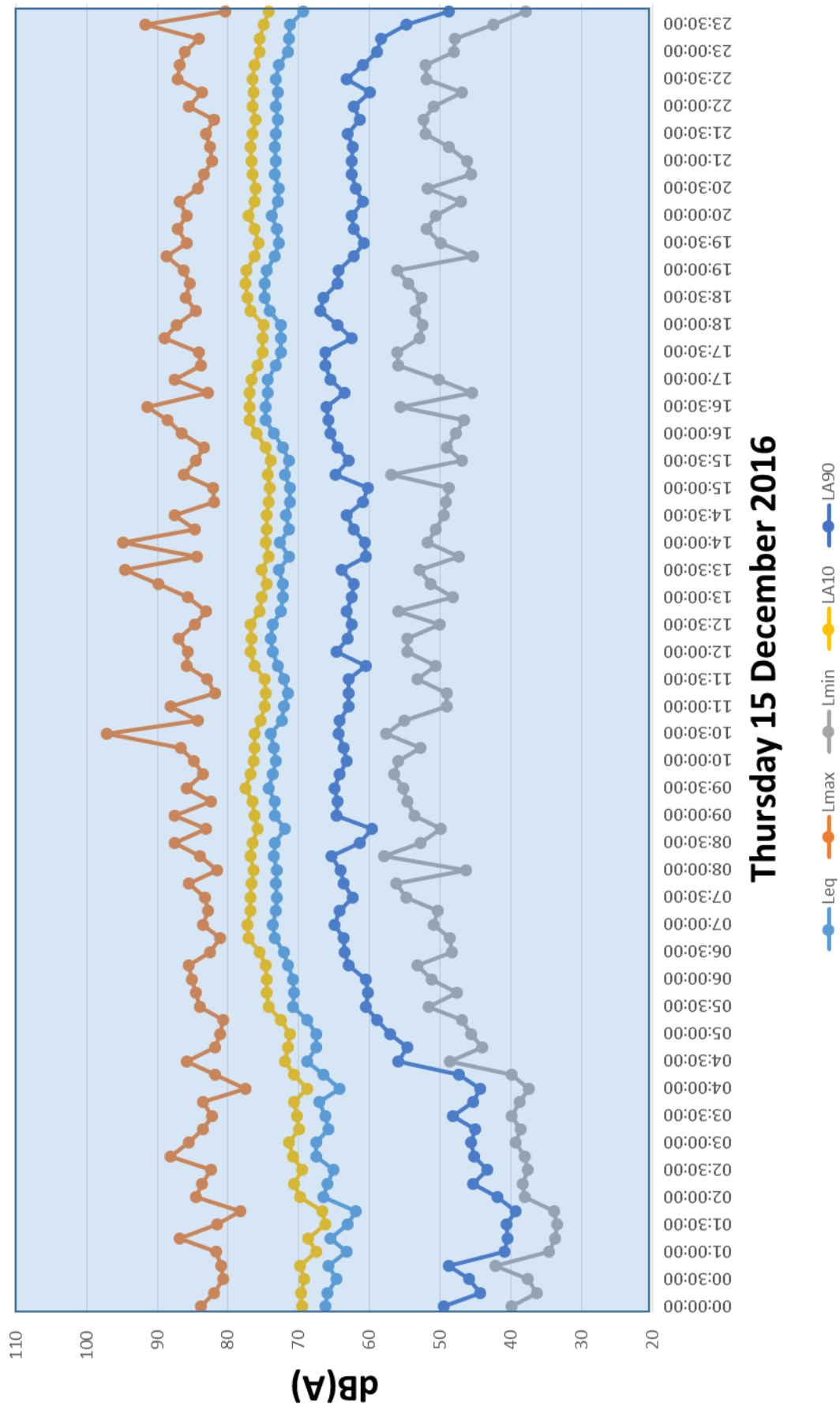


Logger - Cnr Hume Hwy. and Lang Rd. Casula

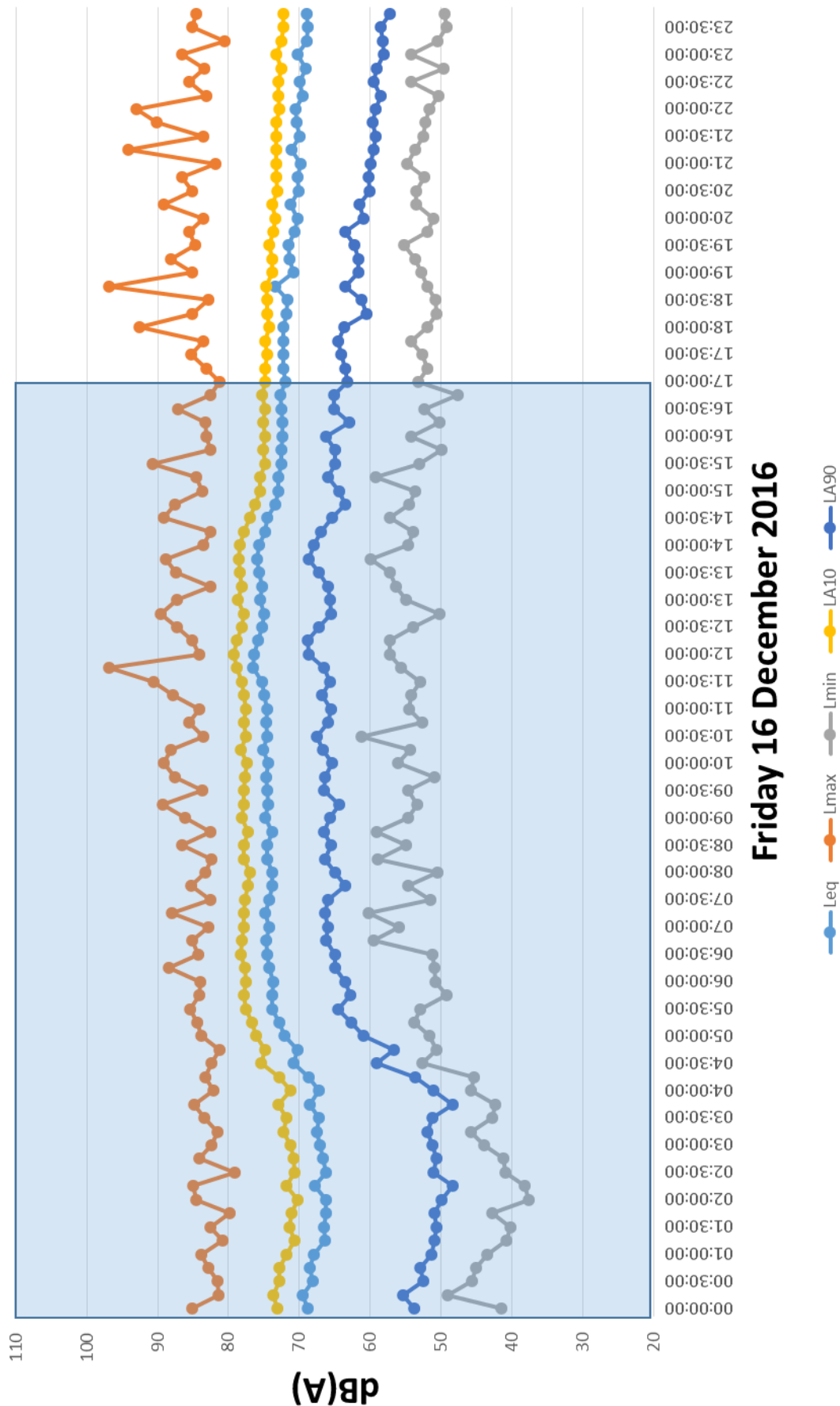


Wednesday 14 December 2016

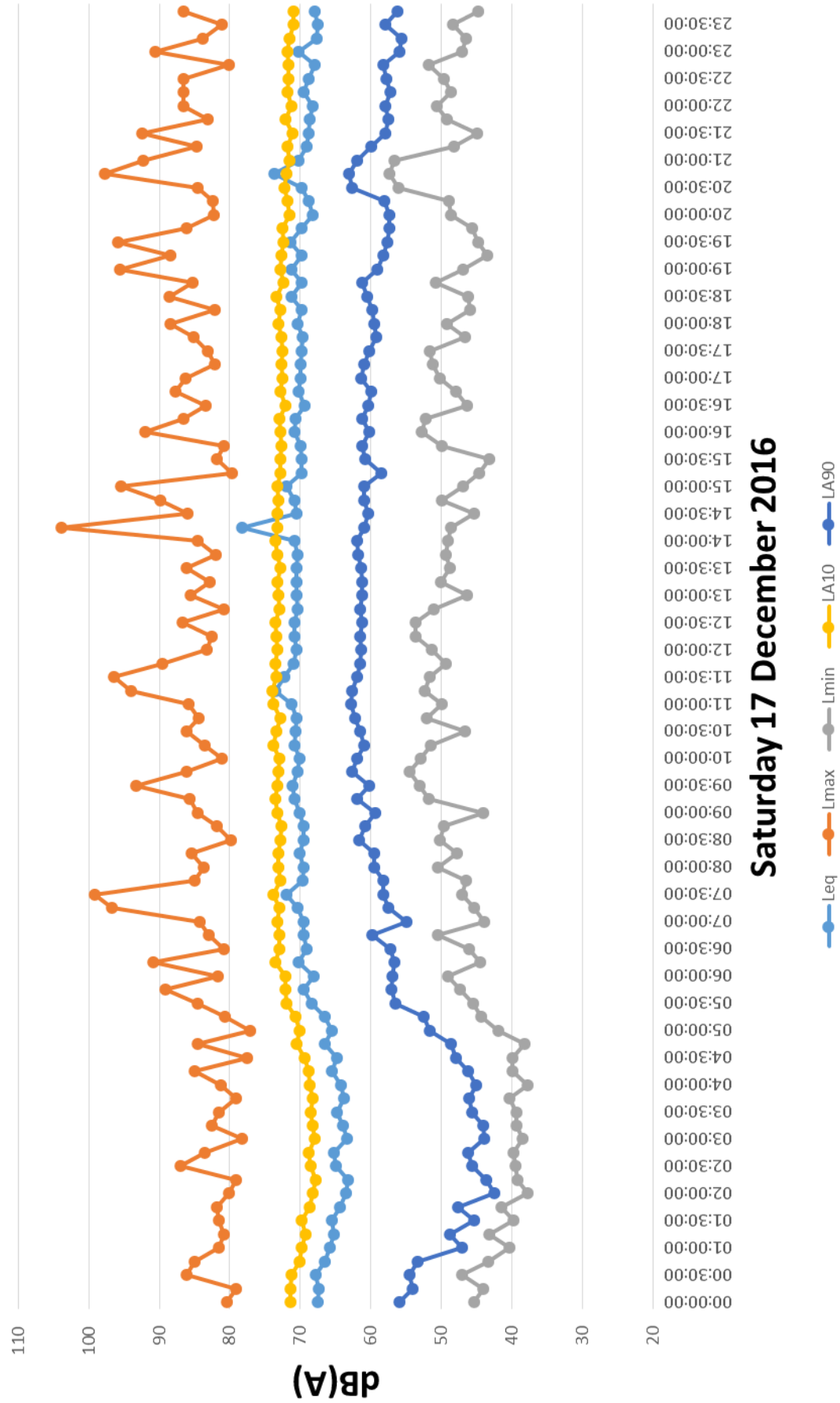
Logger - Cnr Hume Hwy. and Lang Rd. Casula



Logger - Cnr Hume Hwy. and Lang Rd. Casula



Logger - Cnr Hume Hwy. and Lang Rd. Casula



Saturday 17 December 2016

Logger - Cnr Hume Hwy. and Lang Rd. Casula

