NOISE & VIBRATION IMPACT ASSESSMENT

# CABRA-VALE DIGGERS

**CLUB EXTENTSION + HOTEL**

JHA

CONSULTING ENGINEERS

## DOCUMENT CONTROL SHEET

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# 1 INTRODUCTION

JHA have been engaged to prepare an acoustic report for the development application for Cabra-Vale Diggers Club Extension and Hotel Development at 1 Bartley Street, Canley Vale, NSW.

This report forms part of the development application submission to the Fairfield City Council for the development application for the Club Extension and Hotel Development. This report assesses the acoustic requirements for the design of the building, quantifies the existing noise environment and provides the noise criteria for the proposed new development at the boundaries of potentially affected neighbouring properties.

This report also addresses the requirements of the NSW Dept. of Planning "Development near Rail Corridors and Busy Roads – Interim Guideline, 2008", State Environmental Planning Policy (Infrastructure) 2007, NSW Industrial Noise Policy (INP) 2000 and the Fairfield Citywide Development Control Plan 2013.

An acoustic assessment has been undertaken and it is detailed in this report along with the findings and recommendations. The objectives of this acoustic assessment are:

- Identify the external noise and vibration sources that will potentially affect the proposed development.
- Carry out noise surveys to determine existing ambient and background noise levels on site plus external noise sources that will potentially affect the proposed development.
- Establish the appropriate noise level and vibration criteria in accordance with the relevant standards, guidelines and legislation for the following issues:
    - Noise emissions from:
        - Swimming Pool
        - Auditorium
        - Bowling greens
        - Outdoor gaming area
        - New service road
        - Mechanical plant
    - Noise intrusions from rail
- Carry out an acoustic assessment to determine whether the relevant criteria can be achieved and, where applicable, comment on noise control measures required to achieve compliance with the relevant noise level criteria.

This report provides:

- A statement compliance with the relevant statutory criteria for the proposed use development within the vicinity of the potentially affected receivers.
- Recommendations for noise mitigation measures for the proposed development in order to meet the relevant criteria when compliance is not achieved.

This document complies with JHA Consulting Engineers accreditations ISO 9001 Quality Management System and ISO 14001 Environmental Management System.

# 2 PROJECT OVERVIEW

## 2.1 PROJECT DESCRIPTION

The subject property is located at 1 Bartley Street, Canley Vale, NSW 2166. Cabra-Vale Diggers Club is currently preparing a Development Application to redevelop the existing club to include:

- A new Bowler's Club and 2 Greens;
- Two levels of basement car parking (resulting in an estimated addition of 272 car parking spaces);
- A new gaming lounge and alfresco gaming;
- A new entrance, drop-off and foyer area;
- A new hotel (120 rooms) and associated facilities; and
- Function rooms which can accommodate lectures and seminars.

## 2.2 SITE LOCATION

The existing site, as shown below, is bounded by Railway Parade, Phelps Street, Bartley Street and Pevensey Street. It is situated in the suburb of Canley Vale, located approximately 500 metres from two nearby rail stations.

The site location, measurement positions and surrounding noise sensitive receivers are shown in Figure 1.

Figure 1: Site Map and Locations of Measurements

# 3 NOISE SURVEY

## 3.1 INSTRUMENTATION

The following equipment was used for the noise surveys:

- NTI XL2 Class 1 Sound Level Meter
- Rion NL-52 Class 1 noise logging sound level meters
- Brüel&Kjær Sound Calibrator Type 4231

All equipment was calibrated before and after the measurements and no significant drift was found. All equipment carries current traceable calibration certificates that can be provided upon request.

## 3.2 ATTENDED NOISE SURVEY

Operator attended noise measurements of 15-minute duration were conducted on site to characterise the acoustic environment for noise intrusion into the development and to determine any noise impact on the surrounding receivers. A summary of the attended noise measurements taken at site are shown in Table 1. Refer to Figure 1 for measurement locations.

Table 1: Attended noise measurements

| Measurement Location | Measurement Date/Time | $L_{Aeq\ 15mins}$ dB(A) | $L_{A90\ 15mins}$ dB(A) | Comments |
|---|---|---|---|---|
| M1 | 04/07/2017 12:42pm | 59 | 44 | Distant Traffic & Rail Noise |
| M2 | 04/07/2017 12:58pm | 67 | 54 | Traffic & Rail Noise |

Operator attended noise measurements of train pass-bys were conducted on site to characterise the noise emissions from trains to determine the likely noise impact on the proposed development. A summary of the attended noise measurements taken at site are shown in Table 2. Refer to Figure 1 for measurement locations.

The ninety-fifth percentile of the train pass-bys measured noise levels is $L_{A5}$ 78 dB(A) and the average $L_{ASmax}$ is 72 dB(A). For the noise impact assessment the $L_{A5}$ value will be used.

Table 2: Attended rail noise measurements

| Measurement Location | Measurement Date/Time | $L_{ASmax}$ dB(A) | Measurement Date/Time | $L_{ASmax}$ dB(A) |
|---|---|---|---|---|
| 10m from rail tracks | 05/04/2018 2:53pm | 73 | 05/04/2018 3:11pm | 74 |
| | 05/04/2018 2:55pm | 74 | 05/04/2018 3:12pm | 69 |
| | 05/04/2018 2:59pm | 76 | 05/04/2018 3:20pm | 68 |
| | 05/04/2018 3:00pm | 69 | 05/04/2018 3:23pm | 71 |
| | 05/04/2018 3:07pm | 77 | 05/04/2018 3:28pm | 79 |
| | 05/04/2018 3:10pm | 65 | | |

## 3.3 UNATTENDED NOISE SURVEY

The $L_{A90}$ Rating Background Level (RBL) derived from the long-term noise monitoring measurements carried out between Tuesday 4 July 2017 and Thursday 13 July 2017 determined in accordance with the INP guidelines are listed in Table 3 below. Detailed results of the long-term noise monitoring measurements can be found in Appendix 1.

No calibration deviations were recorded. Note that any rain affected data during the period of logging has been excluded from the calculations.

Table 3: Unattended noise measurements

| Location | Equivalent Continuous Noise Level $L_{Aeq,period}$ - dB(A) | | | Background Noise Level RBL - dB(A) | | |
|---|---|---|---|---|---|---|
| | Day | Evening | Night | Day | Evening | Night |
| L1 | 61 | 60 | 53 | 48 | 47 | 40 |

# 4 NOISE AND VIBRATION CRITERIA

## 4.1 NSW INDUSTRIAL NOISE POLICY

The NSW Office of Environment and Heritage (OEH) Industrial Noise Policy (INP) sets out noise criteria to control the noise emission from industrial noise sources. Mechanical and operational noise from the development shall be addressed following the guideline in the NSW INP.

The calculation is based on the results of the ambient and background noise unattended monitoring, addressing two components:

- Controlling intrusive noise into nearby residences (Intrusiveness Criteria)
- Maintaining noise level amenity for particular land uses (Amenity Criteria)

Once both criteria are established the most stringent for each considered assessment period (day, evening, night) is adopted as the project-specific noise level (PSNL).

### 4.1.1 INTRUSIVENESS CRITERIA

The NSW OEH INP states the following:

> *"The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq}$ descriptor), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A)."*

The intrusiveness criterion can be summarised as $L_{Aeq,\ 15\ minute} \leq$ RBL background noise level plus 5 dB(A).

Table 4: OEH INP intrusiveness criteria

| Period | Noise Descriptor – dB(A) | Noise Criteria – dB(A) |
|---|---|---|
| Daytime 7am – 6pm | $L_{Aeq,15min} \leq$ RBL + 5 | 53 |
| Evening 6pm – 10pm | $L_{Aeq,15min} \leq$ RBL + 5 | 52 |
| Night 10pm – 7am | $L_{Aeq,15min} \leq$ RBL + 5 | 45 |

### 4.1.2 AMENITY CRITERIA

The NSW INP states the following:

> *"To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1 of the INP. Meeting the acceptable noise levels in table 2.1 will protect against noise impacts such as speech interference, community annoyance and to some extent sleep disturbance. These levels represent best practice for assessing industrial noise sources, based on research and a review of assessment practices used overseas and within Australia."*

The applicable parts of Table 2.1: Recommended $L_{Aeq}$ Noise Levels from Industrial Noise Sources – dB(A) which are relevant to the project are reproduced below:

Table 5: Amenity criteria for external noise levels

| Type of Receiver | Indicative Noise Amenity Area | Time of Day | Recommended $L_{Aeq}$ Noise Level, dB(A) | | Adjusted Acceptable $L_{Aeq}$ Levels |
|---|---|---|---|---|---|
| | | | Acceptable | Recommended Maximum | |
| Residential | Urban | Day | 60 | 65 | 60 |
| | | Evening | 50 | 55 | 50 |
| | | Night | 45 | 50 | 45 |
| Commercial | All | When in use | 65 | 70 | 65 |

*Urban area as defined in EPA INP 2. 2.1.6.

#### 4.1.2.1 'Modifying Factor' Adjustments

The NSW INP also states:

> *"Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level."*

In order to take into account the potential annoying character of the noise an adjustment of 5 dB(A) for each annoying character aspect and cumulative of up to a total of 10 dB(A), is to be added to the measured value to penalise the noise for its potentially greater annoyance aspect.

Table 4.1 of Chapter 4 of the NSW OEH INP provides procedures for determining whether an adjustment should be applied for greater annoyance aspect. No adjustments have been made within the criteria.

### 4.1.3 PROJECT SPECIFIC NOISE LEVELS (PSNL)

The following criteria is applicable for the external noise emissions from the development, as detailed below in Table 6. These project specific noise levels are in accordance with the requirements of the NSW INP, and shall be assessed to the most affected point on or within the residential boundary.

Table 6: Project specific noise levels

| Period | Descriptor | PSNL dB(A) |
|---|---|---|
| Residential receivers | | |
| Day (7:00am to 6:00pm) | $L_{Aeq,15min}$ | 53 |
| Evening (6:00pm to 10:00pm) | $L_{Aeq,15min}$ | 50 |
| Night (10:00pm to 7:00am) | $L_{Aeq,15min}$ | 45 |
| Commercial receivers | | |
| When in use | $L_{Aeq,15min}$ | 65 |

### 4.1.4 SLEEP DISTURBANCE

Some short-duration noises that occur at night may comply with the criteria described above, and yet be undesirable because of the sleep arousal effect, particularly between the hours of 10.00pm and 7.00am.

The NSW INP application notes consider potential for sleep disturbance for residential receivers from noise during night periods between 10.00pm and 7.00am, which states the following:

*"…OEH reviewed research on sleep disturbance in the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999). This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.*

*From the research, OEH recognised that current sleep disturbance criterion of an $L_{A1,1minute}$ not exceeding the $L_{A90,15minute}$ by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, OEH will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.*

*The detailed analysis should cover the maximum noise level or $L_{A1,1minute}$, that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the appendices to the ECRTN. Other factors that may be important in assessing the extent of impacts on sleep include:*

- *how often high noise events will occur*
- *time of day (normally between 10:00pm and 7:00am)*
- *whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).*

*The $L_{A1,1minute}$ descriptor is meant to represent a maximum noise level measured under 'fast' time response. OEH will accept analysis based on either $L_{A1,1minute}$ or $L_{Amax}$…"*

Based on this methodology and the background noise levels measured, Table 7 details the correspondent sleep disturbance noise criteria for this project.

Table 7: Project sleep disturbance noise criteria

| Period | Background Noise Level $L_{A90}$ dB(A) | Sleep Disturbance Criteria dB(A) |
|---|---|---|
| Residential receivers | | |
| Night (10:00pm to 7:00am) | 40 | $L_{Amax} = L_{A90} + 15$<br>55 |

It shall be noted that the project sleep disturbance noise criteria shall be achieved external to the bedroom window of the nearest sensitive residential receiver.

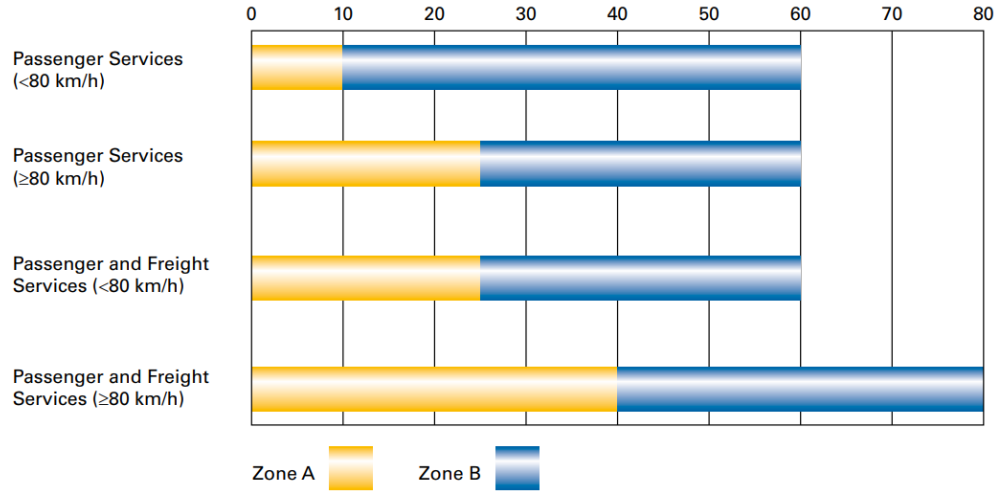
## 4.2 DEVELOPMENT NEAR RAIL CORRIDORS AND BUSY ROADS – INTERIM GUIDELINE

### 4.2.1 RAIL NOISE CRITERIA

As the development is located within 25m of a rail corridor, the recommendations as presented in the NSW Department of Planning 'Development Near Rail Corridors and Busy Roads' has been considered.

A graphical representation of the acoustic assessment zones for noise sensitive developments in close proximity to rail corridors is shown below.

Figure 2: Summary of Acoustic Assessment Zones




The recommended internal noise limits applicable for the proposed development are summarised below

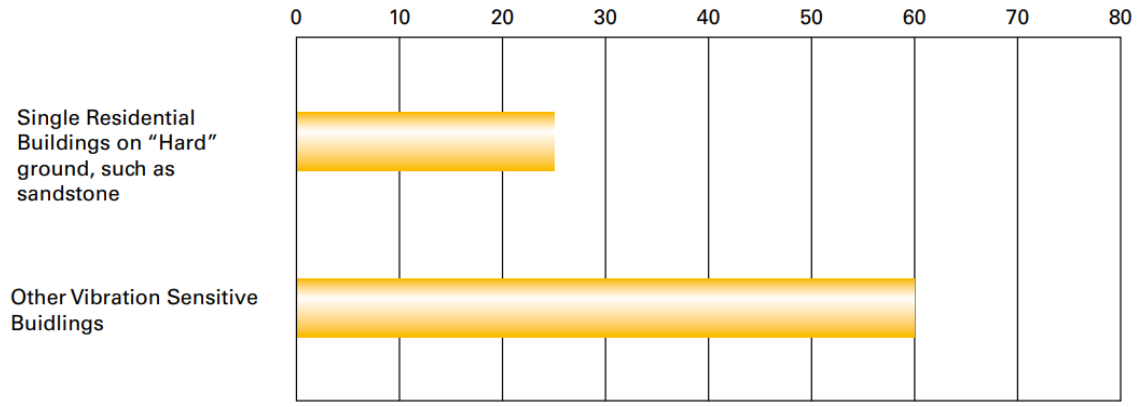
Table 7: Recommended Internal Noise Criteria for Rail Noise

| Occupancy | Natural Ventilation | Design Noise Level | |
|---|---|---|---|
| | | Day, $L_{Aeq\ (15\ Hour)}$ dB(A) | Night, $L_{Aeq\ (9Hour)}$ dB(A) |
| Bedrooms | Closed Windows | - | 35 |
| | Open Windows | - | 45 |
| All Other Habitable Areas | Closed Windows | 40 | 40 |
| | Open Windows | 50 | 50 |

### 4.2.2 RAIL VIBRATION CRITERIA

Further to the above, the proposed development also resides within the assessable zone for rail vibration. A summary of the vibration assessment zones and acceptable vibration limits are provided below.

Figure 3: Summary of Vibration Assessment Zones




Based on the recommended standards and guidelines nominated within the Development Near Rail Corridors And Busy Roads – Interim Guideline, the vibration limits are presented below in Table 8.

Table 8: Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

| Location | Daytime (7:00am to 10:00pm) | | Night-time (10:00pm to 7:00am) | |
|---|---|---|---|---|
| | Preferred value | Maximum value | Preferred value | Maximum value |
| Residences | 0.20 | 0.40 | 0.13 | 0.26 |

# 5 OPERATIONS NOISE IMPACT ASSESSMENT

## 5.1 NOISE FROM SWIMMING POOL

A noise impact assessment of the proposed swimming pool has been carried out. The expected noise levels generated by a typical medium sized public swimming pool have been obtained and adopted from previous measurements carried out for similar nature projects.

Table 9: Expected Sound Pressure Levels of Swimming Pool

| Activity | $L_{Aeq}$ @ 5m |
|---|---|
| Recreational Swimming | 65 dBA |

The following table details the predicted noise levels at 141 Railway Parade associated with the operation of the swimming pool for the worst-case scenario.

Table 10: Noise assessment of swimming pool use

| Calculation | Overall Sound Pressure Level dB(A) |
|---|---|
| $L_{eq}$ of Recreational swimming at 1 meter | 79 |
| Barrier attenuation / reflections / directivity | -11 |
| Distance (21 m) attenuation | -26 |
| Resulting level at 141 Railway Parade | 42 |
| Noise Level Criterion Evening / Complies? | 50 / Yes |
| Noise Level Criterion Night / Complies? | 45 / Yes |

Predicted noise levels from the use of the swimming pool at 141 Railway Parade is 42 dB(A) which is below evening and night-time noise level criteria. Therefore, it can be stated that the noise emissions from the swimming pool to the nearest noise sensitive receivers will meet the noise level criteria.

Although the noise emissions from the proposed pool are expected to meet the noise criteria, it is recommended to use appropriate signage, for example, having signs reminding patrons to consider neighbours and avoid excessive noise.

## 5.2 AUDITORIUM NOISE

The auditorium is anticipated to host events that include amplified music/public address system internally. The expected noise impacts have been assessed at the nearest sensitive receivers, using the methodology and assumptions given below.

The assessment was made considering the proposed layout as shown on the architectural drawings. The following assumptions have been made for the assessment:

- Events occurring during night time hours (most stringent noise criteria)
- Doors and windows shut during events
- Typical façade transmission loss values
- Typical sound power levels for large concerts and events

Based on the assumptions provided above, the predicted noise levels at the nearest sensitive receiver are summarised below in Table 11.

Table 11: Noise assessment of auditorium use

| Calculation | Overall Sound Pressure Level dB(A) |
|---|---|
| $L_{eq}$ of amplified music at 1 meter | 105 |
| Building façade attenuation / reflections / directivity | -40 |
| Distance (23 m) attenuation | -27 |
| Resulting level at 12 Pevensey Street | **38** |
| Noise Level Criterion Night / Complies? | 45 / Yes |

As shown above in Table 11 the noise associated with the use of auditorium is anticipated to comply with the night-time noise criteria.

## 5.3 BOWLING GREENS NOISE

The new bowling greens will be located at the corner of Phelps Street and Bartley Street. It is expected that use of the bowling greens will have an impact in the residential receivers at Phelps Street.

The key noise source it will be the players in the bowling greens. It is assumed that the vocal effort of the players communicating will be generally 'normal' speech.

The assessment was made considering the proposed layout as shown on the architectural drawings. The following assumptions have been made for the assessment:

- Events occurring during evening time hours (most stringent noise criteria)
- Full occupancy of the rinks in the bowling greens
- For every two players only one will be speaking at any given time with a 'normal' voice

Based on the assumptions provided above, the predicted noise levels at the nearest sensitive receiver are summarised below in Table 12.

Table 12: Noise assessment of bowling green use

| Calculation | Overall Sound Pressure Level dB(A) |
|---|---|
| $L_{eq}$ of 28 players playing | 69 |
| Building attenuation / reflections / directivity | 6 |
| Distance (29 m) attenuation | -29 |
| Resulting level at Phelps Street | **46** |
| Noise Level Criterion Evening / Complies? | 50 / Yes |

As shown above in Table 12 the noise associated with the use of the bowling greens is anticipated to comply with the evening-time noise criteria.

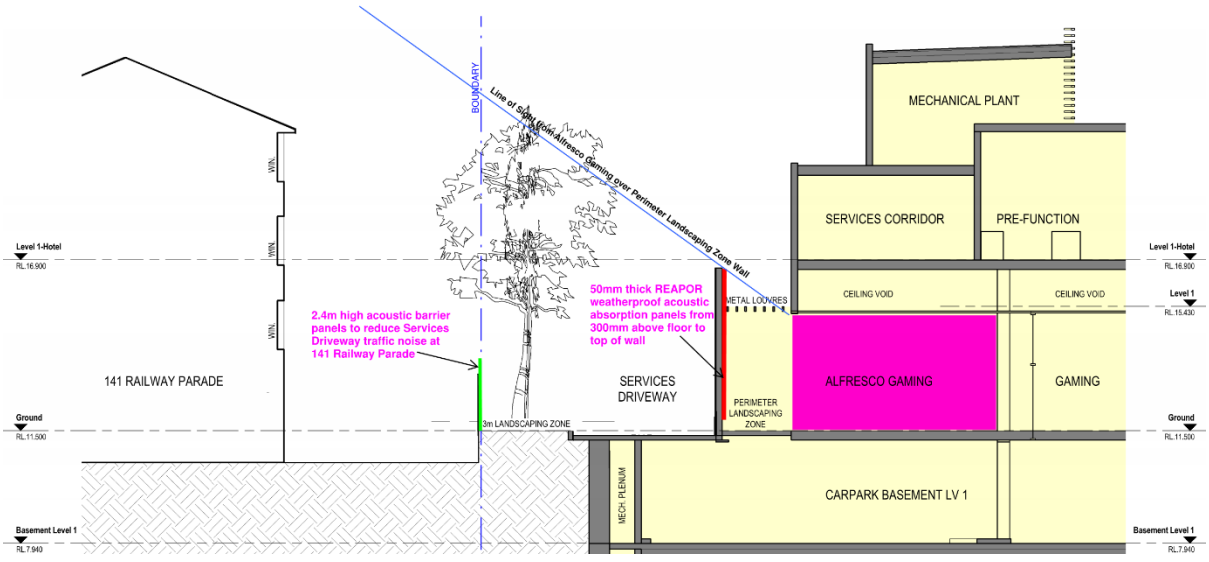
## 5.4 OUTDOOR GAMING AREA NOISE

The outdoor gaming area will be located at the ground level at the northern boundary. It is expected that use of the outdoor gaming area will have an impact in the residential receivers at 141 Railway Parade.

The key noise source it will be the users in the outdoor gaming are. It is assumed that the vocal effort of the users communicating will be generally 'normal' speech.

Figure 5 shows a section view of site showing the relative locations of the proposed outdoor gaming area, nearest sensitive receiver at 141 Railway Parade and the barrier wall between the outdoor gaming area and the receivers.

Figure 5: Section view of site and Proposed Recommendations



The assessment was made considering the proposed layout as shown on the architectural drawings. The following assumptions have been made for the assessment:

- Events occurring during night time hours (most stringent noise criteria)
- Full occupancy of the outdoor gaming area (200 person)
- For every two persons only one will be speaking at any given time with a 'normal' voice
- Acoustic recommendations as per Figure 5

Based on the assumptions provided above, the predicted noise levels at the nearest sensitive receiver are summarised below in Table 13.

Table 13: Noise assessment of outdoor gaming area use

| Calculation | Overall Sound Pressure Level dB(A) |
|---|---|
| $L_{eq}$ of typical gaming noise levels and general crowd and activity noise | 75 |
| Building attenuation / reflections / directivity | -15 |
| Distance (21 m) attenuation | -26 |
| Resulting level at 141 Railway Parade | **34** |
| Noise Level Criterion Night / Complies? | 45 / Yes |

As shown above in Table 13 the noise associated with the use of the outdoor gaming area is anticipated to comply with the night-time noise criteria.

It is recommended to display signs at the outdoor gaming area to remind patrons about the need to minimise noise when they are in the area and to be considerate of the neighbours.

## 5.5 NEW SERVICE ROAD NOISE

It is being proposed a one way new service road from Railway Parade to Pevensey Street. Based on the traffic engineer report, the estimated car movements during a peak hour is 66 vehicles.

For the sleep disturbance assessment, it is assumed that a car pass-by is the main noise contributor. The $L_{Amax}$ sound level of a car pass-by is assumed to be approximately 10 dB higher than the $L_{Aeq}$ level

Based on the assumptions provided above, the predicted noise levels at the nearest sensitive receiver are summarised below in Table 14.

Table 14: Sleep disturbance noise assessment of car pass-by in the new service road

| Calculation | Overall Sound Pressure Level dB(A) |
|---|---|
| $L_{Aeq}$ of car pass-by at 1 meter | 62 |
| $L_{Amax}$ of car pass-by at 1 meter | 72 |
| Building attenuation / reflections / directivity | 3 |
| Distance (9m) attenuation | -22 |
| Resulting $L_{Amax}$ level at 141 Railway Parade | **53** |
| Sleep Disturbance Noise Level Criterion / Complies? | 55 / Yes |

As shown above in Table 14 the noise associated with a car pass-by in the new service road is anticipated to comply with the sleep disturbance noise criteria. Further to the above the Sound Exposure Level of the pass-by vehicles at the nearest sensitive receiver has been assessed and is not expected to exceed the night time noise criteria as shown in Section 4.1.

## 5.6 MECHANICAL SERVICES NOISE

At this stage, final mechanical plant selections have not been made; therefore, it is not possible to undertake a detailed assessment of the mechanical plant noise emissions. A preliminary review has been undertaken for the building services / plant rooms.

Noise controls will need to be incorporated with the design of the mechanical plant rooms to ensure that the cumulative noise levels from plant to the nearest sensitive receivers meets the noise level criteria.

Usual design noise controls that may need to be implemented will typically include, but are not limited to:

- Strategic location and selection of plant to ensure the cumulative noise levels at the receiver boundaries is met.
- Selection of appropriate quiet plant.
- Acoustic noise control measures to be put in place to minimise noise impacts such as:
    - In-duct attenuation
    - Noise enclosures as required
    - Sound absorptive panels
    - Acoustic louvres as required
    - Noise barriers as required

Acoustic assessment of all mechanical plant shall continue during the detailed design phase of the project in order to confirm any noise control measures.

# 6 RAIL IMPACT ASSESSMENT

## 6.1 RAIL NOISE INTRUSION

The proximity of the rail corridor will require an acoustic assessment in order to predict the noise impact to the hotel guest rooms.

The general limiting factor of the performance of a building façade in terms of noise attenuation is the glazing. The proposed acoustic requirements for the external glazing in order to meet the internal noise levels in Section 4.2.1 are presented below in Table 15. The $L_{A5}$ value of the measured train pass-bys has been considered as the estimated noise emission from trains.

Table 15: Sleep disturbance noise assessment of car pass-by in the new service road

| Calculation | Overall Sound Pressure Level dB(A) |
|---|---|
| $L_{A5}$ of train pass-by at 10 meter | 78 |
| Building attenuation / reflections / directivity | 6 |
| Distance (24 m) attenuation | -28 |
| Resulting noise level at hotel façade | 56 |
| Noise level criterion inside hotel guest room | 35 |
| Required sound insulation performance | $R_w$38 |

This recommended sound insulation performance applies to the hotel guest room with direct line sight of the rail tracks. Greater glazing thicknesses may be required for structural loading, wind loading, thermal requirements etc. The required acoustic rating, refers to the acoustic performance on site.

# 7 CONCLUSION

An acoustic assessment for the proposed Cabra-Vale Diggers Club Extension and Hotel Development has been conducted. This report forms part of the documentation package to be submitted to local authorities as part of the DA process.

This report establishes relevant noise level criteria, details the acoustic assessment and provides comments and recommendations for the proposed development.

Ambient and background noise surveys have been undertaken at the existing site to establish the appropriate noise criteria in accordance with the relevant guidelines.

The noise assessment has adopted methodology from relevant guidelines, standards and legislation to assess noise impact. The noise impacts have been predicted at the nearest noise sensitive receiver boundaries, taking in account distance attenuation, building reflections and directivity.

The use of the proposed swimming pool will not have an impact in the nearest residential receivers at 141 Railway Parade due to the barrier between the swimming pool and the residential receivers.

Events will be held at the Auditorium and is expected that noise level criterion at the closest residential receiver – 12 Pevensey Street – will be met if normal façade elements are used for the building envelope.

Noise impact of the bowling green players into the residential receivers at Phelps Street has been assessed as marginal due to the nature of the game.

The outdoor gaming area use will not have an impact to the nearest residential receivers.

At this stage, mechanical plant selections have not been made. Therefore, recommendations have been provided to minimise the impact of external noise emissions associated with the mechanical plant of the proposed development to the nearest sensitive receivers.

The final façade composition is not yet resolved. A minimum sound insulation performance has been carried out for those façades overlooking rail tracks in order to meet the relevant internal noise levels within the hotel guest rooms.

Even though no assessment can be considered as being thorough enough to preclude all potential environmental impacts, having given regard to the above listed conclusions, it is the finding of this assessment that the development application should not be refused on the grounds of excessive noise generation.

The information presented in this report shall be reviewed if any modifications to the features of the development specified in this report occur, including and not restricted to selection of mechanical plant, modifications to the building and introduction of any additional noise sources.

# APPENDIX 1 – UNATTENDED NOISE MONITOR GRAPHS

The details are 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. Data collected during inclement weather conditions are shaded blue and excluded in the assessments. These descriptors, which are demonstrated in the graph below, are here defined.

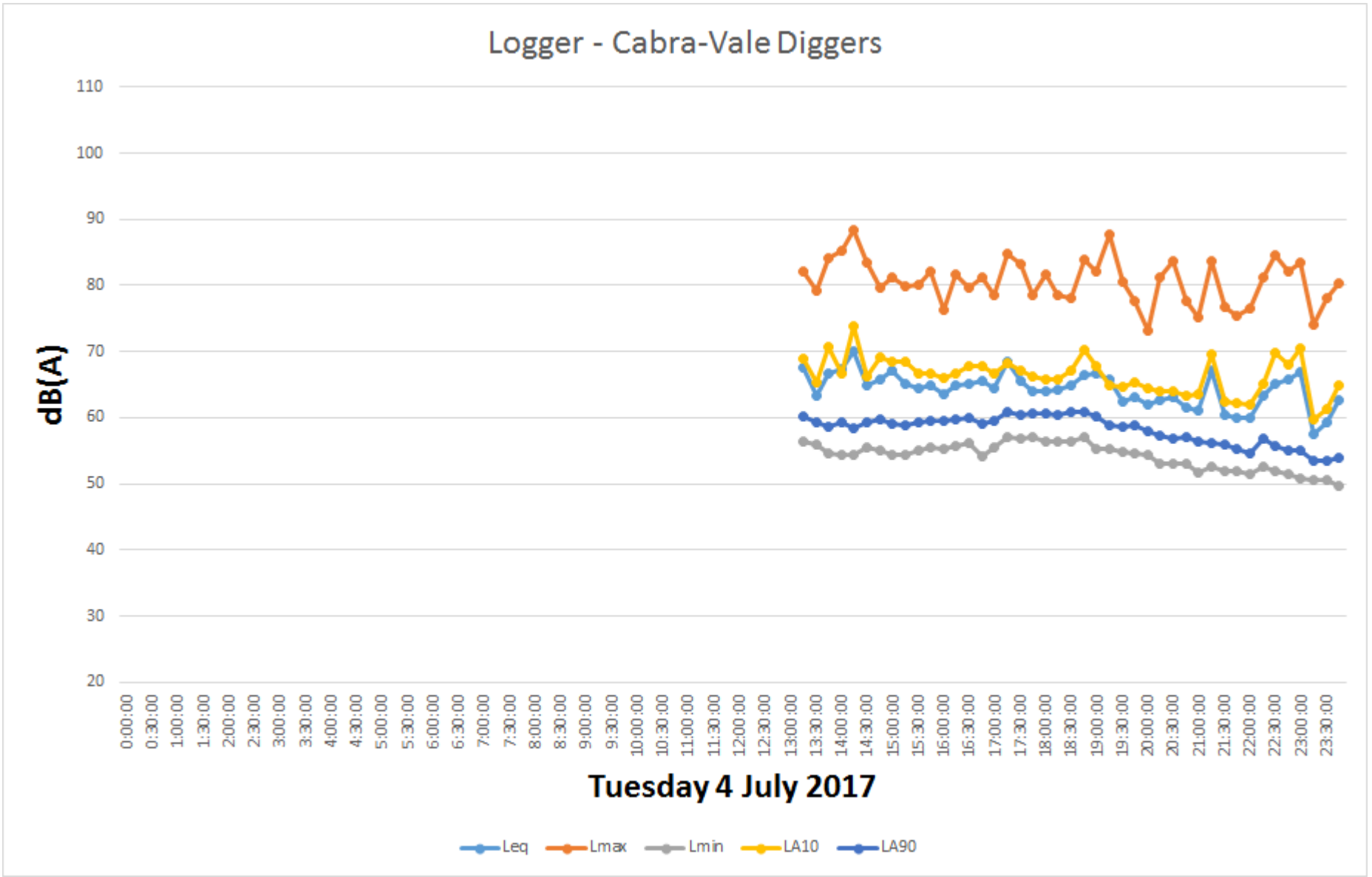
**Maximum Noise Level ($L_{Amax}$)** – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

**$L_{A10}$** – 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 - Cabra-Vale Diggers
dB(A)
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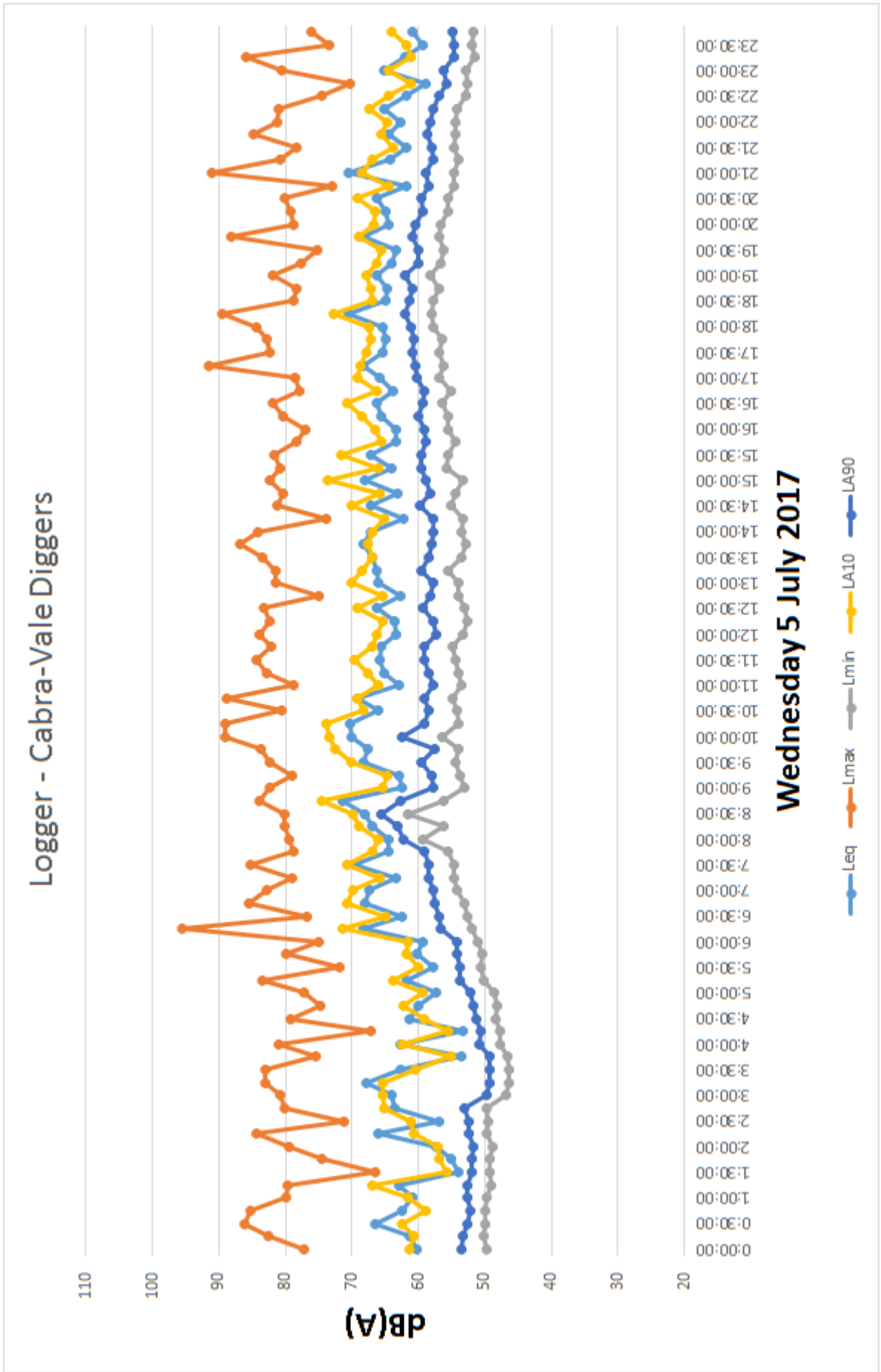
Tuesday 4 July 2017
Leq
Lmax
Lmin
LA10
LA90


Logger - Cabra-Vale Diggers
Wednesday 5 July 2017
dB(A)
110
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Leq
Lmax
Lmin
LA10
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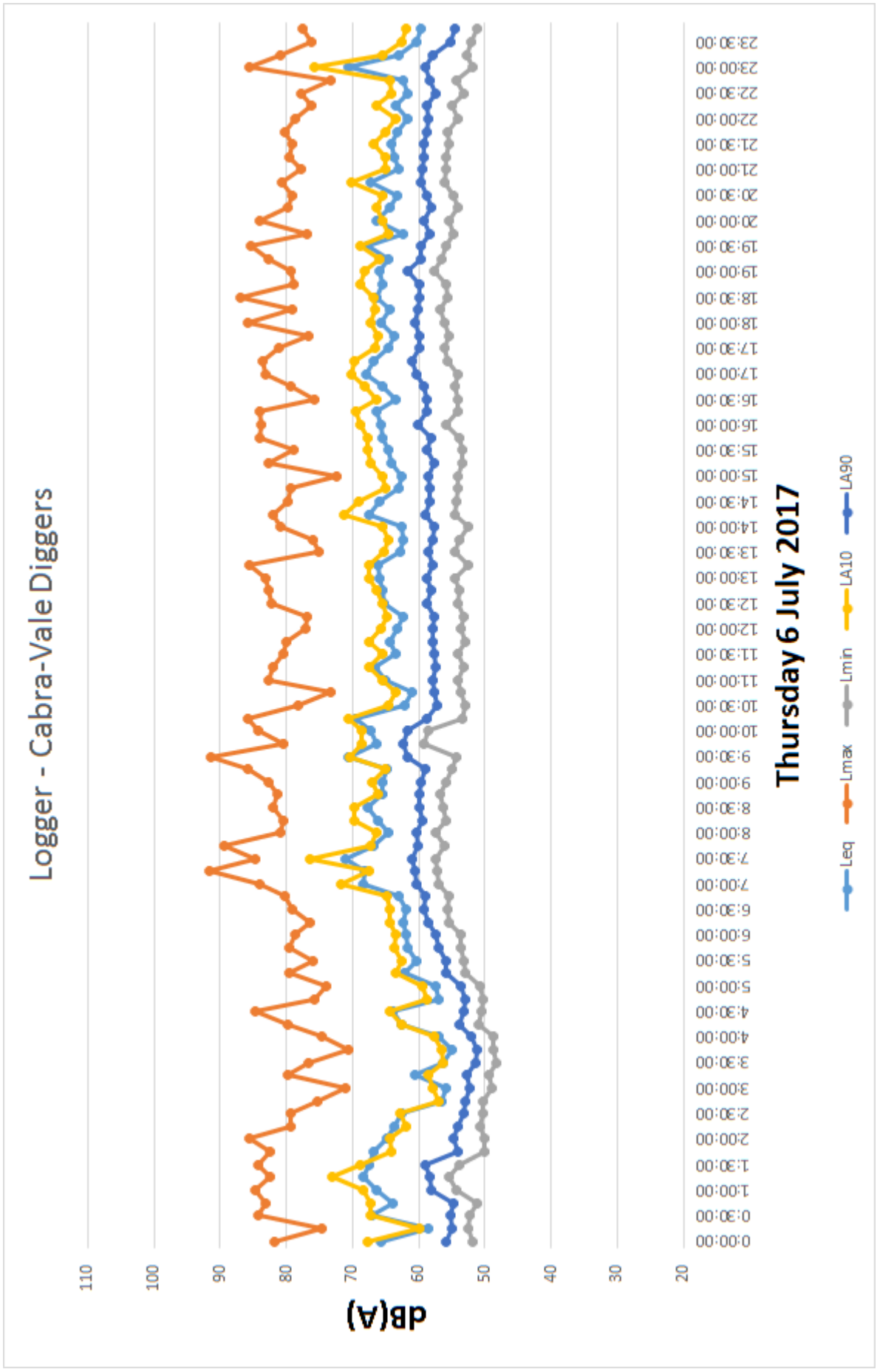
Logger - Cabra-Vale Diggers
dB(A)
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Thursday 6 July 2017
Leq
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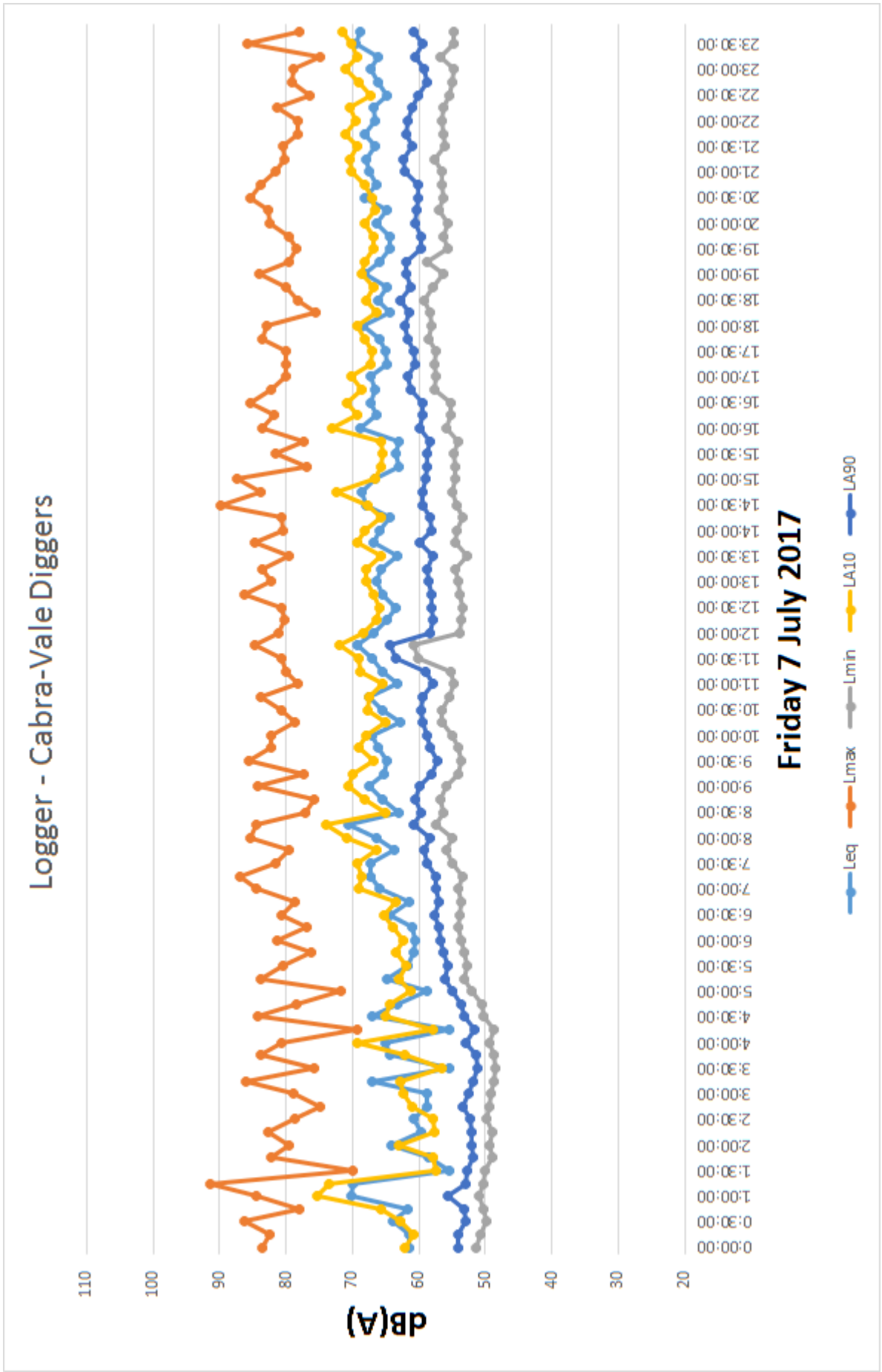
Logger - Cabra-Vale Diggers
dB(A)
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Friday 7 July 2017
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Lmax
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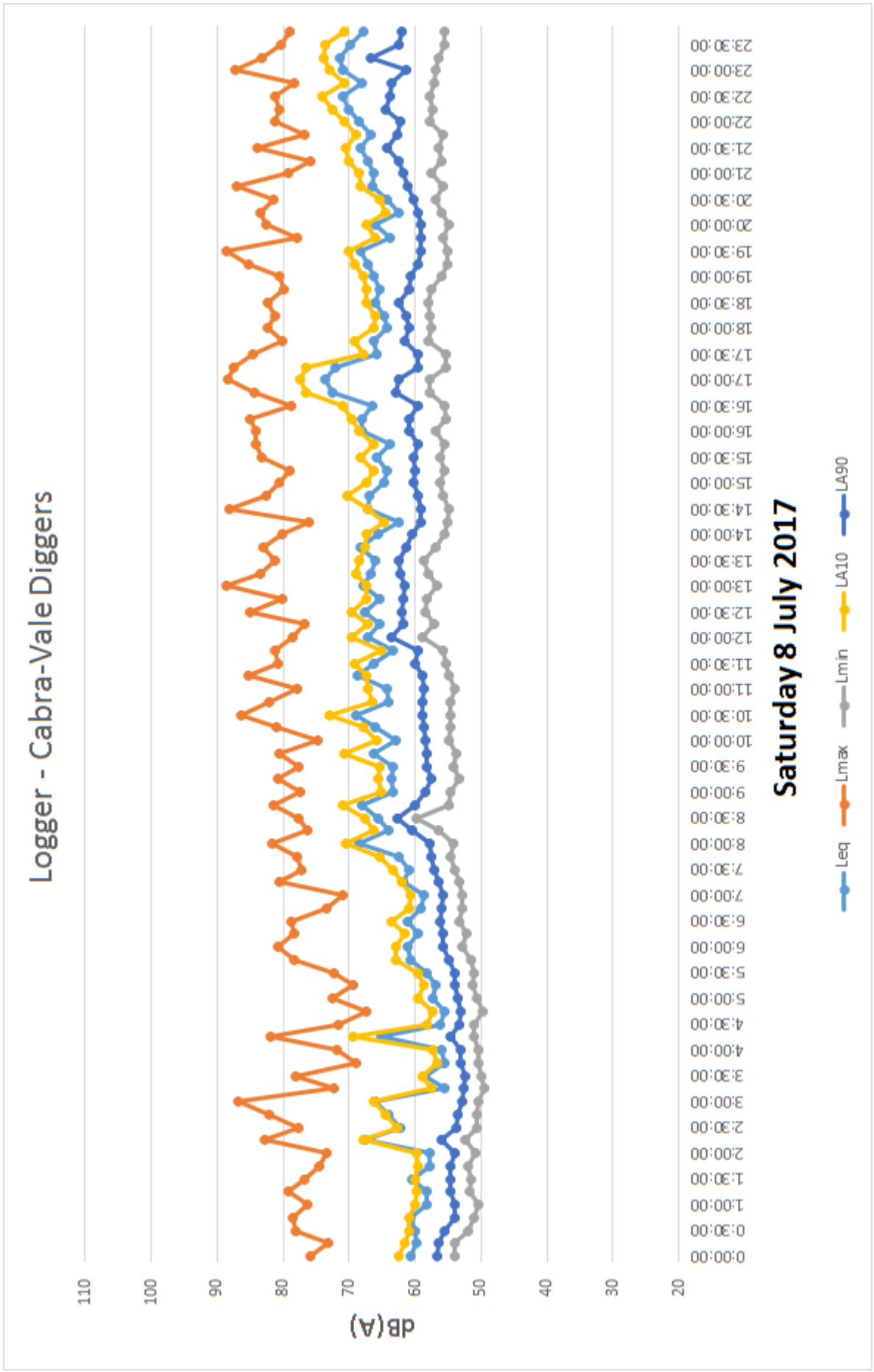
Logger - Cabra-Vale Diggers
Saturday 8 July 2017
dB(A)
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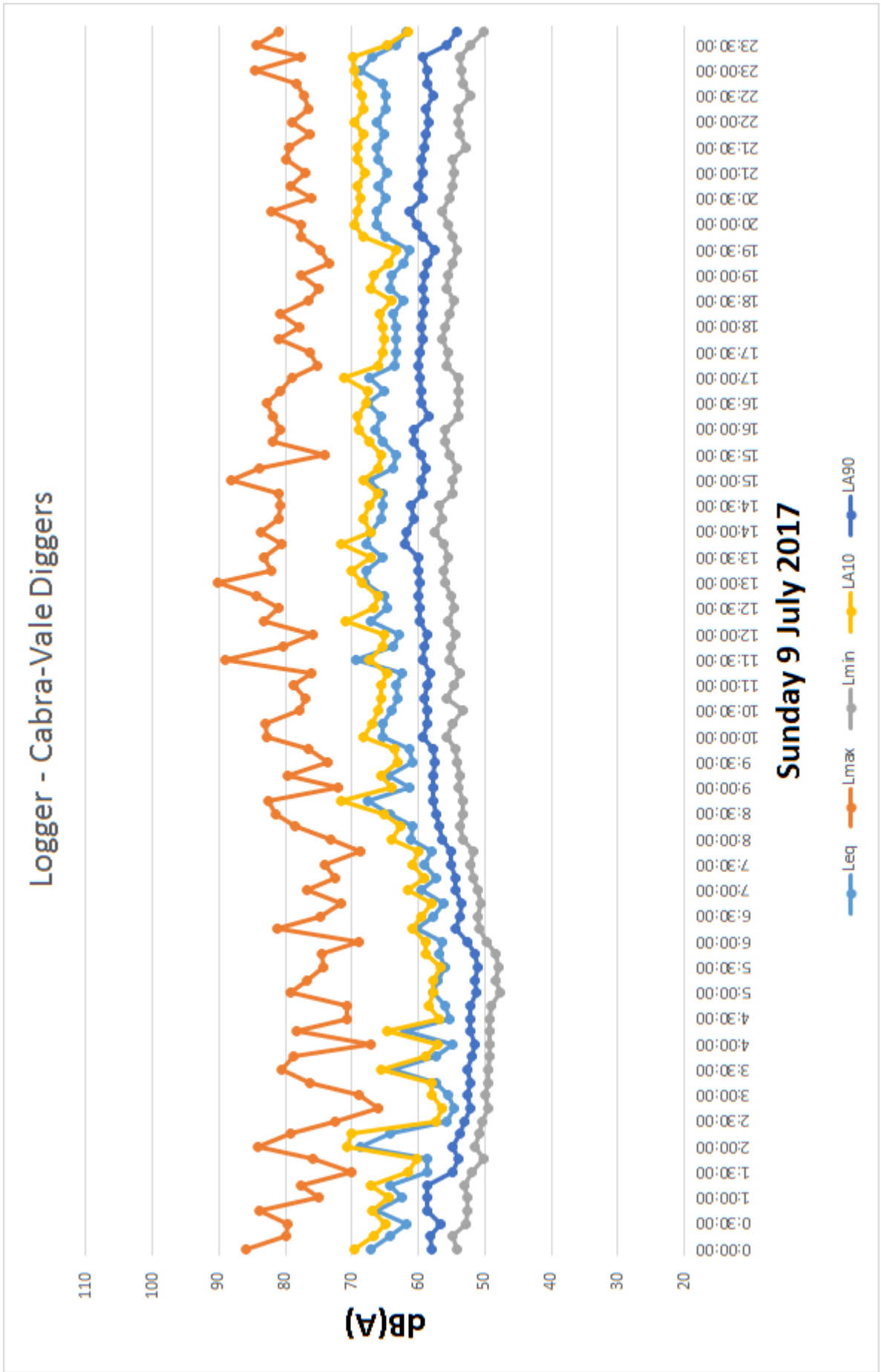
Logger - Cabra-Vale Diggers
Sunday 9 July 2017
dB(A)
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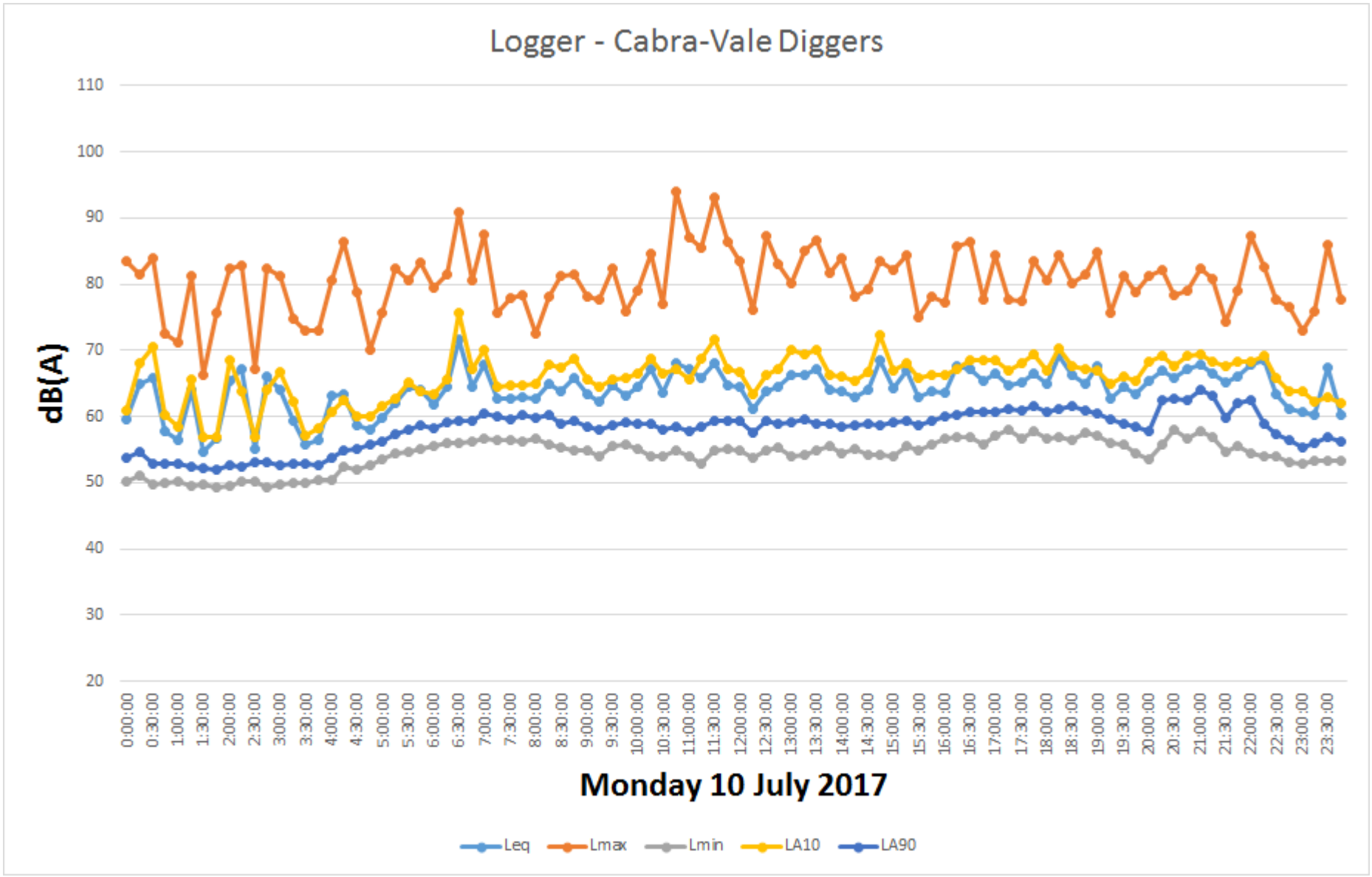
Logger - Cabra-Vale Diggers
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Monday 10 July 2017
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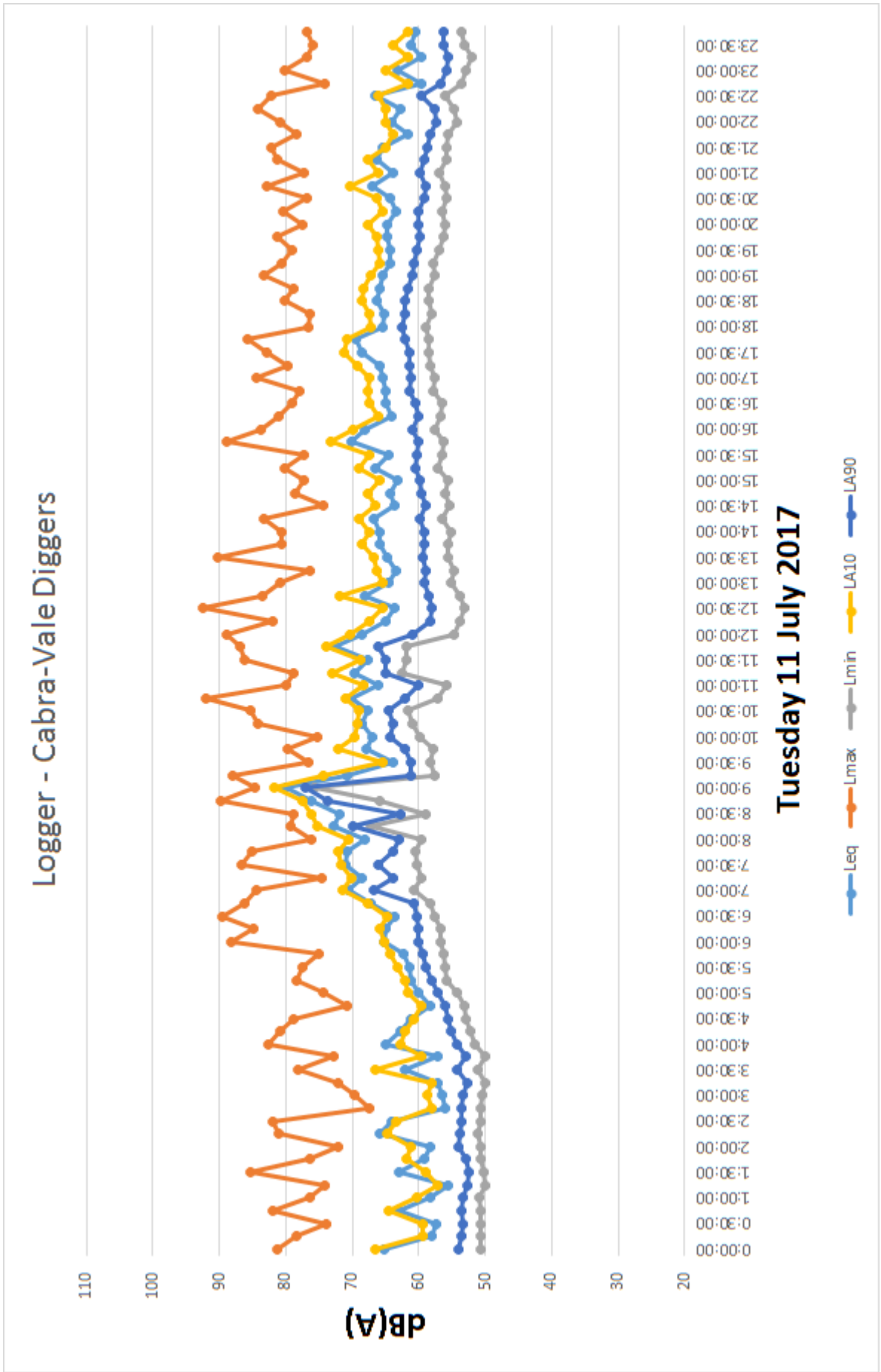
Logger - Cabra-Vale Diggers
Tuesday 11 July 2017
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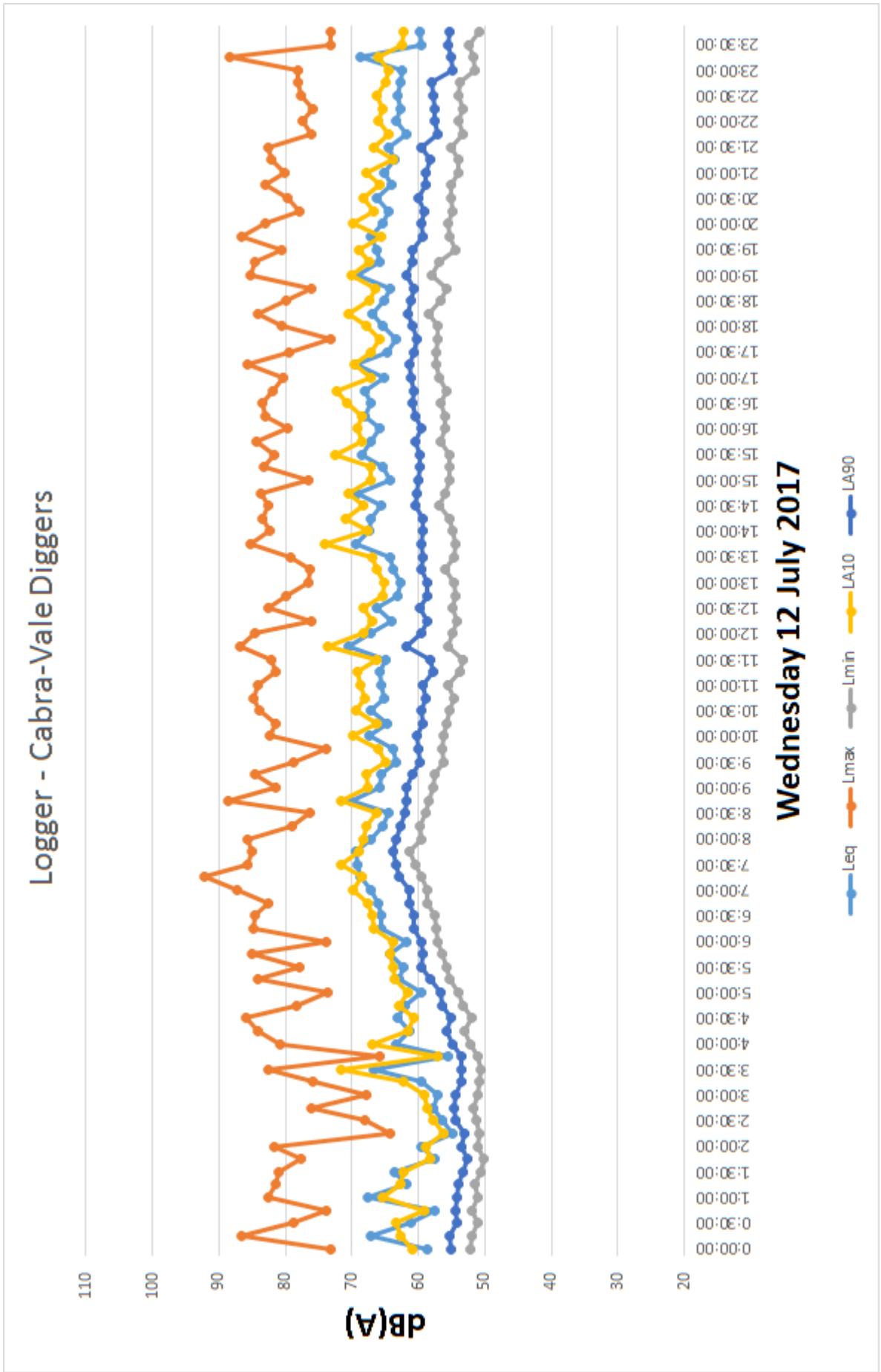
Logger - Cabra-Vale Diggers
Wednesday 12 July 2017
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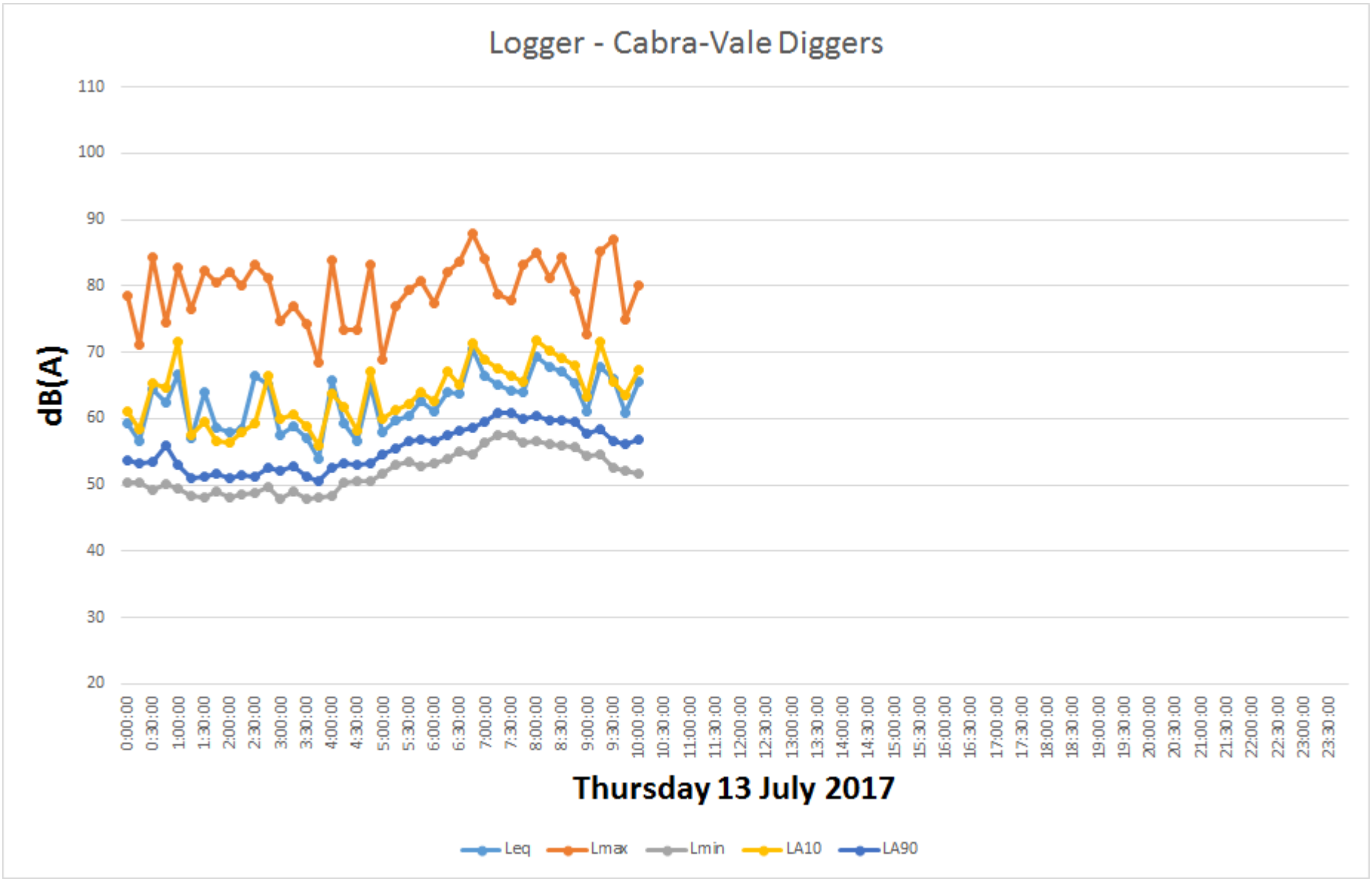
Logger - Cabra-Vale Diggers
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Thursday 13 July 2017
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