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Opal Aged Care, Toongabbie

Acoustic Report for Site Compatibility Certificate for a Residential Aged Care Facility

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DOCUMENT CONTROL REGISTER

Project Number	20160540.1
Project Name	Opal Aged Care, Toongabbie
Document Title	Acoustic Report for Site Compatibility Certificate
Document Reference	20160540.1/0421A/TT/R2
Issue Type	Email
Attention To	Align Projects

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	21/4/2016	20160540.1/0421A/TT/R0	TT	TT	TT
1	21/4/2016	20160540.1/0421A/TT/R1	TT	TT	TT
2	21/4/2016	20160540.1/0421A/TT/R2	TT	TT	TT

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1 INTRODUCTION

Acoustic Logic Consultancy has been engaged by Opal Aged Care to conduct an acoustic assessment to be included in a Site Compatibility Certificate application for a proposed Residential Aged Care Facility at Wentworth Ave, Toongabbie.

In this report we will:

- Identify noise sources which may impact on the site and determine whether there are feasible building treatments to ensure that these impacts can be reduced to suitable levels (compliant with relevant state and Australian Standard acoustic guidelines).

- Identify noise sources generated by the site and determine whether noise emissions from the site are capable of complying with relevant EPA and Council noise emission guidelines.

In the event that compliance with the relevant noise impact and noise emission guidelines referred to above can be achieved, the site would be considered suitable for its intended use with respect to acoustics.

2 SITE DESCRIPTION

The site is located on Wentworth Ave, Toongabbie on Part Lot 30, DP1106209 and Lots 6 (part), 7, 8 and 9 in DP 22506

The proposed development involves the construction of a three-four storey aged care facility for approximately 130 beds.

The proposed development will be sited on land currently owned by the Toongabbie Sports Club, and involves the demolition of three existing residential dwellings.

Significant noise sources at the site consist of:

- Noise from Wentworth Ave, to the south of the site. Wentworth Ave carries medium traffic flows.

- The Western Rail Line, located to the west of the site (with the site approximately 50m from the rail corridor).

- Noise from the Toongabbie Sports Club (car park and operational noise).

Noise sensitive development in the vicinity of the site consists of:

- Residential dwellings adjoining the site to the east and

- Residential Apartments, adjoining the site to the west.

Figure 1 shows the site and the noise measurements conducted as part of a site survey.

Rail Noise and Vibration Measurement

Site

Traffic Noise Measurement

Long Term Noise Monitor

3 NOISE DESCRIPTORS

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 EXTERNAL NOISE INTRUSION ASSESSMENT

4.1 NOISE INTRUSION CRITERIA

The assessment of external noise is conducted with reference to the following documents:

- The Parramatta Council DCP 2011
- NSW State Environmental Planning Policy Infrastructure (2007).
- NSW Planning *Development Near Rail Corridors and Busy Roads Interim Guidelines*.
- Australian Standard 2107

4.1.1 Parramatta Council DCP 2011

Section 3.3.4 of the Parramatta DCP 2011 sets out acoustic performance requirements applicable to development. In addition to stating an overall objective to ensure that building siting and design minimises noise impacts from roads, rail corridors and other noise sources, the DCP identifies the following planning controls:

- The acoustic requirements of SEPP (Infrastructure) and the NSW Planning *Development Near Rail Corridors and Busy Roads Interim Guidelines* are to be achieved.
- Internal Habitable Rooms of dwellings effected by high external noise levels are to be designed to achieved internal noise levels of no greater than 50dB(A).

4.1.2 SEPP (Infrastructure) and Development Near Rail Corridors and Busy Roads (Interim Guideline)

The NSW Department of Planning's policy, Development Near Rail Corridors And Busy Roads – Interim Guideline, sets out internal noise level criteria adapted from the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP') for developments with the potential to be impacted by traffic or rail noise and vibration.

The Infrastructure SEPP defines busy roads that are subject to an acoustic assessment as:

> *"Clause 102: development for any of the following purposes that is on land in or adjacent to a road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data available on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
>
> - *building for residential use*
> - *a place of public worship*
> - *a hospital*
> - *an educational establishment or childcare."*

The Infrastructure SEPP sets out the following criteria for internal noise levels from airborne traffic noise:

"For Clauses 87 (Rail) and 102 (Road):

"If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

in any bedroom in the building : 35dB(A) at any time 10pm–7am

anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."

Internal requirements are for residential spaces and are measured internally with windows closed.

The NSW Department of Planning document *Development Near Rail Corridors and Busy Roads Interim Guidelines* adopts the same criteria as SEPP Infrastructure, and the resultant internal noise goals are as follows:

Table 1 – Internal Noise Level Criteria (SEPP Infrastructure and Development Near Rail Corridors and Busy Roads – Interim Guideline)

Room Type	Time of Day	Criteria
Bedroom	10pm-7am	35 dB(A) $L_{eq(9\ hour)}$
Living Area	7pm-10pm	40 dB(A) $L_{eq(15\ hour)}$

4.1.3 Australian Standard 2107-2000

AS2017 will be adopted for those parts of the development which are located away from the rail line and roadway, however are potentially impacted by noise form the Toongabbie Sports Club.

AS2107 recommended noise levels are as follows:

Table 2 – AS2107 Criteria – Houses and Apartments Near Minor Roads

Room Type	Time of Day	Criteria
Bedroom	10pm-7am	35 dB(A) $L_{eq(1\ hour)}$
Living Area	7pm-10pm	40 dB(A) $L_{eq(1\ hour)}$

4.2 EXTERNAL NOISE MEASUREMENTS

Noise measurements of traffic, train and operational noise from the Toongabbie Sports Club were undertaken as part of the assessment.

Measurements were performed generally in accordance with the Australian Standard AS1055 – "Description and measurement of environmental noise – General Procedures".

4.3 NOISE MEAUSREMENTS

A survey of noise levels impacting the site was conducted using a combination of long term noise logging and attended noise measurements.

Noise measurements were conducted at the locations detailed in section 2.

A noise logger was installed on site between 12 and 19 April 2016 in order to measure rail noise and club operational noise impacting the site. Equipment used consisted of an Acoustic Research Laboratories noise logger set to measure in 15 minute intervals on A-weighted fast response mode. Calibration of the logger was checked at the beginning and end of the measurement period, with no significant drift noted.

In addition to the long term noise logging, attended measurements of road traffic (in Wentworth Ave) and rail noise were made. Measurements were undertaken using a Norsonics Type 140 precision sound level analyser, set to A-weighted fast response. The precision sound level analyser was calibrated before and after the measurements using a Norsonics 1251 sound level calibrator. No significant drift was recorded. See figure 1 above for location of attended noise measurements.

The results of the noise survey are presented below:

Table 3 – External Noise Levels

Location	Noise Source	Noise Level	
		Daytime (7am-10pm)	Evening (7am-10pm)
Wentworth Ave (7m from kerb)	Road Traffic	66dB(A)$L_{eq(15hr)}$	62dB(A)$L_{eq(9hr)}$
Western Property Boundary (50m from Rail Corridor)	Rail Noise	<55dB(A)$L_{eq(15hr)}$ and 65dB(A)L_{max} during train passby	<55dB(A)$L_{eq(15hr)}$ and 65dB(A)L_{max} during train passby
Club Car Park (porposed northern boundary of site)	Club Operational Noise	Up to 64dB(A)L_{eq} during peak periods	Up to 64dB(A)L_{eq} during peak periods

4.4 EVALUATION OF NOISE INTRUSION AND RECOMMENDATIONS

Internal noise levels will primarily be as a result of noise transfer through the windows and doors and roof, as these are relatively light building elements that offer less resistance to the transmission of sound.

Analysis indicates that through appropriate building shell design, external noise impacts can be reduced such that suitable internal noise levels can be achieved.

Indicative building shell systems are outlined below. Final acoustic design of the building shell should be conducted once all window sizes and building shell materials are finalised.

In determining these acoustic treatments we have taken into account the measured noise level and spectral characteristics of the external noise, the area of building elements exposed to the noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

4.4.1 Glazing Constructions

Indicative glazing assemblies are shown below. The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 4 – Indicative Glazing Requirements

Façade	Room Type	Glazing Thickness	Acoustic Seals
Northern	Bedrooms	6.38mm laminated	Yes
	Dining, Quiet Room	6mm	Yes
Western	Bedrooms	10.38mm laminated	Yes
	Quiet Room , Dining	6mm	Yes
Southern and Eastern	Bedrooms, Quiet Room	6mm	Yes
	Dining	6mm	Yes

In addition to complying with the minimum scheduled glazing thickness, the STC/R_w rating of the glazing fitted into operable frames and fixed into the building opening should not be lower than the values listed in the Table below.

Where nominated, this will require the use of acoustic seals equal to Schlegel Q-lon series *(acoustic bulb seal)* around the full perimeter of operable frames. The frame will need to be sealed into the building opening using a flexible 100% polyurethane sealant equal to Selley's Proseries Fireblock. Note that mohair seals and/or mohair/plastic fin combination seals in windows and doors are **not** acceptable where acoustic seals are required.

It is recommended that only window systems have test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

Table 5 – Minimum STC/R_w of Glazing Requirements

Glazing Assembly	Acoustic Seals	Minimum STC/R_w of Installed Window
6mm float	Yes	29
6.38mm laminated	Yes	31
10.38mm laminated	Yes	35

4.4.2 External Walls and Roof/Ceiling

Any external wall or roof element constructed of masonry will not require additional upgrading for acoustic purposes.

In the event that light weight external wall/roof elements are adopted, detailed acoustic review should be conducted once material selections are finalised. Compliant internal noise levels will be capable of being achieved through appropriate using of wall/ceiling insulation and plasterboard internal lining.

4.4.3 Ventilation

The development site is affected by external noise. Due to the fact that the recommended internal noise levels cannot be achieved with windows open it is required that an alternative outside air supply system or air conditioning be installed in accordance with AS 1668.2 requirements. Should a mechanical ventilation system be installed, it should be acoustically designed such that the acoustic performance of the recommended constructions are not reduced by any duct or pipe penetrating the wall/ceiling/roof. Noise emitted to the property boundaries by any ventilation system shall comply with Council requirement.

5 NOISE EMISSION ASSESSMENT

The main noise emitted from the project site will be those from mechanical plant, the carpark and loading dock.

The nearest sensitive receivers are:

- Residential houses to the east of the site (potentially impacted by plant noise, the car park and vehicles moving to and from the loading dock).
- Residential apartments to the west of the site (potentially impacted by plant noise).

5.1 BACKGROUND NOISE MONITORING

A noise logger was installed on site between 12 and 19 April 2016 in order to measure ambient noise at the site. Equipment used consisted of an Acoustic Research Laboratories noise logger set to measure in 15 minute intervals on A-weighted fast response mode. Calibration of the logger was checked at the beginning and end of the measurement period, with no significant drift noted.

Although operational noise (vehicles, patrons) from the Sports Club was intermittently audible at the noise logging location, the logger was positioned away from any constant noise sources (such as refrigeration equipment). By examining the logging periods when the club is not in operation, background noise levels in the vicinity of the site could be determined.

The measured background noise levels have been corrected for meteorological conditions (excessive wind and/or rain), as required by section 3.4 of the EPA Industrial Noise Policy. Exceedances of the 5m/s average wind speed limit of the EPA were noted and corrected for in determining the background noise levels. These areas are highlighted in the logging data in Appendix 2.

The measured background noise levels based on the long term noise monitoring installed on site and are presented in the table below.

Table 6 – Measured Background Noise Levels

Location	Period/Time	Rating Background Noise Level dB(A)L_{90}
Dietrich Close, Rutherford	Day (7am-6pm)	46
	Evening(6pm-10pm)	45
	Night(10pm-7am)	42

5.2 NOISE EMISSION OBJECTIVES

We note that although the Parramatta DCP identifies that noise from non-residential land uses should not adversely impact the amenity of nearby residents, it does not state a numerical noise emission goal.

In the absence of this, the NSW EPA Industrial Nosie Policy will be adopted in order to determine noise emission goals.

Noise sources covered by this code will include vehicle noise (generated on the site) and mechanical services noise. Both the Intrusiveness and the Amenity criteria (as set out below) must be complied with.

5.2.1 INP - Intrusiveness Assessment

Intrusiveness criteria permit noise generation to be no more than 5dB(A) above existing background noise levels. The criteria are as follow:

Table 7 – EPA Industrial Noise Policy – Intrusiveness Criteria

Location	Time of Day	Background noise Level - dB(A)L_{90}	Intrusiveness Noise Objective dB(A)$L_{eq(15min)}$ (Background + 5dB)
Nearby Residences	Day Time (7am - 6pm)	46	51
	Evening (6pm - 10pm)	45	50
	Night (10pm - 7am)	42	47

5.2.2 INP - Amenity Assessment

The Amenity criteria set additional criteria based on the land use of the noise sensitive receivers.

Amenity criteria are as follows:

Table 8 – EPA Industrial Noise Policy – Amenity Criteria

Receiver Location	Land Type	Time of Day	Amenity Noise Objective dB(A)$L_{eq(Period)}$
All Potentially Affected Residential Properties	Suburban	Day Time (7am – 6pm)	55
		Evening (6pm – 10pm)	45
		Night (10pm-7am)	40

5.3 NOISE EMISSION ASSESSMENT

5.3.1 Carpark and Loading Dock Noise

The noise emission from vehicles on the site is predicted and assessed below

The modelling is based on the following assumptions:

- Carpark Movements:
    - Peak hour operation happens during day (7am-6pm) period only
    - The site generates an assumed 76 vehicle movements per hour (equivalent to the entire car park filling, and emptying in a one hour period).
    - The sound power level of a passenger car moving within the car park is 84dB(A).
- Loading Dock Movements:
    - Typical vehicle consists of a large rigid truck (sound power of 95dB(A).
    - No more than one truck movement into or out of the loading dock in any fifteen minute period.

The predicted noise emissions are set out below.

In all cases, noise emissions are predicted on the assumption that the noise control recommendations set out in section 5.4 are adopted.

Table 9 – Predicted Noise Level from Carpark and Loading Dock Movements

Noise Receiver	Noise Source	Predicted Noise Level $dB(A)L_{eq(15min)}$	Comment
Residence to the East	Loading Dock noise, Car park noise	45	Yes – complies with daytime and evening criteria in tables 7 and 8.
	Car park noise	<35	Yes – complies with daytime, evening and night criteria in table 7 and 8.
Apartments to the South/West	Car park noise	<35	Yes – complies with daytime, evening and night criteria in table 7 and 8.

5.3.2 Mechanical Plant and Equipment

Detailed review of all external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the levels set out in section 3 of this report.

While compliance with noise emission requirements will be achievable with appropriate acoustic treatment, it is highly likely that any roof top equipment which operates 24 hours per day (such as refrigeration plant) will require either enclosure in plant rooms or acoustic screens to provide a line of sight break between the equipment and any existing or future residences.

Other equipment external items (fans) would be expected to be capable of compliance through use of internal duct lining and/or in-duct attenuators.

5.4 RECOMMENDATIONS

Analysis indicates that the site is capable of complying with typically adopted noise emission goals.

In order to ensure compliance with noise emission requirements, we recommend:

- Noise management measured may be required for the loading dock in order to mitigate against noise impacts to the residential development to the east. Suitable mitigation measures may include limiting truck delivery times and, if necessary, through use of boundary fencing to act as a noise screen.

- Detailed acoustic review of all external plant items should be undertaken following equipment selection and duct layout design (typically conducted at Construction Certificate Stage).

6 RAILWAY VIBRATION ASSESSMENT

Trains induce ground borne vibration that is transmitted through the subsoil. These vibrations can be perceptible close to railways, as tactile vibrations and as structure borne noise.

6.1 PROJECT VIBRATION OBJECTIVES

6.1.1 Tactile Vibration

Human comfort is typically assessed with reference to the British Standard BS 7385 Part 2 1993 or Australian Standard AS 2670.2 1990.

The Interim Guideline references the NSW EPA document *Assessing Vibration- A technical guideline* which recommends that habitable rooms should comply with the criteria therein which is in line with the requirements of British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)".

British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)" is recommended by the RIC's and SRA's Interim Guidelines for Councils "Consideration of rail noise and vibration in the planning process" as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies, which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 "Evaluation of Human Exposure to Vibration and Shock in

Buildings (1 to 80Hz)" which represents the worst case of the X, Y and Z axes. Filtered measurements are made in all three co-ordinate axes and the highest value axis used.

This standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively the VDV may be estimated by the eVDV which is derived by a simpler calculation using an empirical factor. The VDV or eVDV is calculated for the two periods of the day being the "Daytime" (6am-10pm) and "Night time" (10pm-6am). The overall value is then compared to the levels in Table 5. For this project the aim will be for a low probability of adverse comment.

Table 1 - Vibration Dose Values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in residential buildings.

Place	Low Probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings 16hr day (Daytime)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr night (Night time)	0.13	0.26	0.51

6.1.2 Structure Borne Noise

The Department of Planning 'Development Near rail Corridors and Busy Road – Interim Guideline' only requires structure borne noise assessment to be conducted where buildings or adjacent lands are over railway tunnels. Section 3.6.2 of the standard states the following:

"…Where building are constructed over or adjacent to land over tunnels, ground-born noise may be present without the normal masking effects of air born noise. In such cases, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-born LAmax noise limit of 40 dB(A)(daytime and 35 dB(A) (nigh time)measured using the "slow" response time setting on a sound level meter."

6.2 RAIL VIBRATION MEASUREMENTS

Rail noise measurements were conducted in line with the proposed western façade, which is the potentially worst affected façade.

Attended train vibration measurements were conducted on the 19th April 2016, between the hours of 8:00am and 10:00am. A Svan 958 Vibration Analyser was used for the vibration measurements. The analyser was fitted with a Dytran triaxial accelerometer.

The measured vibration levels, duration of train pass by and the number of rail movements per hour were used to determine the overall vibration dose (VDV) at the proposed development for both daytime and night time periods. The results are presented the table below.

Table 2 - Vibration Dose Values

Time Period	Calculated VDV m/s$^{1.75}$	Criteria VDV m/s$^{1.75}$	Complies
Day (7am – 10pm)	<0.1	0.2 to 0.4	Yes
Night (10pm -7am)	<0.05	0.13	Yes

In the event the future train use increases, say by 10%, predicted eVDV will not increase significantly (no more than approximately 0.007 more than the levels predicted in the table above) and will not impact recommended vibration isolation treatments.

The calculated levels comply with the tactile vibration requirements listed in section 6.1.1..

7 CONCLUSION

This report presents an acoustic assessment for inclusion in a Site Compatibility Certificate application for a proposed residential aged care facility at Wentworth Ave, Toongabbie.

Acoustic analysis of the site indicates that:

- Although the site is impacted by external noise (road, rail and the Toongabbie Sports Club), suitable internal noise levels within the proposed development can still be achieved with an appropriately designed building shell (with some degree of acoustic upgrade compared to standard building construction, as outlined in section 4.4).

- The site is not likely to generate significant noise, and the noise sources are in keeping with typical aged care development (plant noise, vehicle noise). Compliance with EPA noise emission controls can be achieved through adoption of the recommendations set out inspection 5.4.

- Although the site lies in the vicinity of a rail corridor, no building vibration isolation is required to ensure that vibration levels in the development are compliant with relevant EPA vibration guidelines.

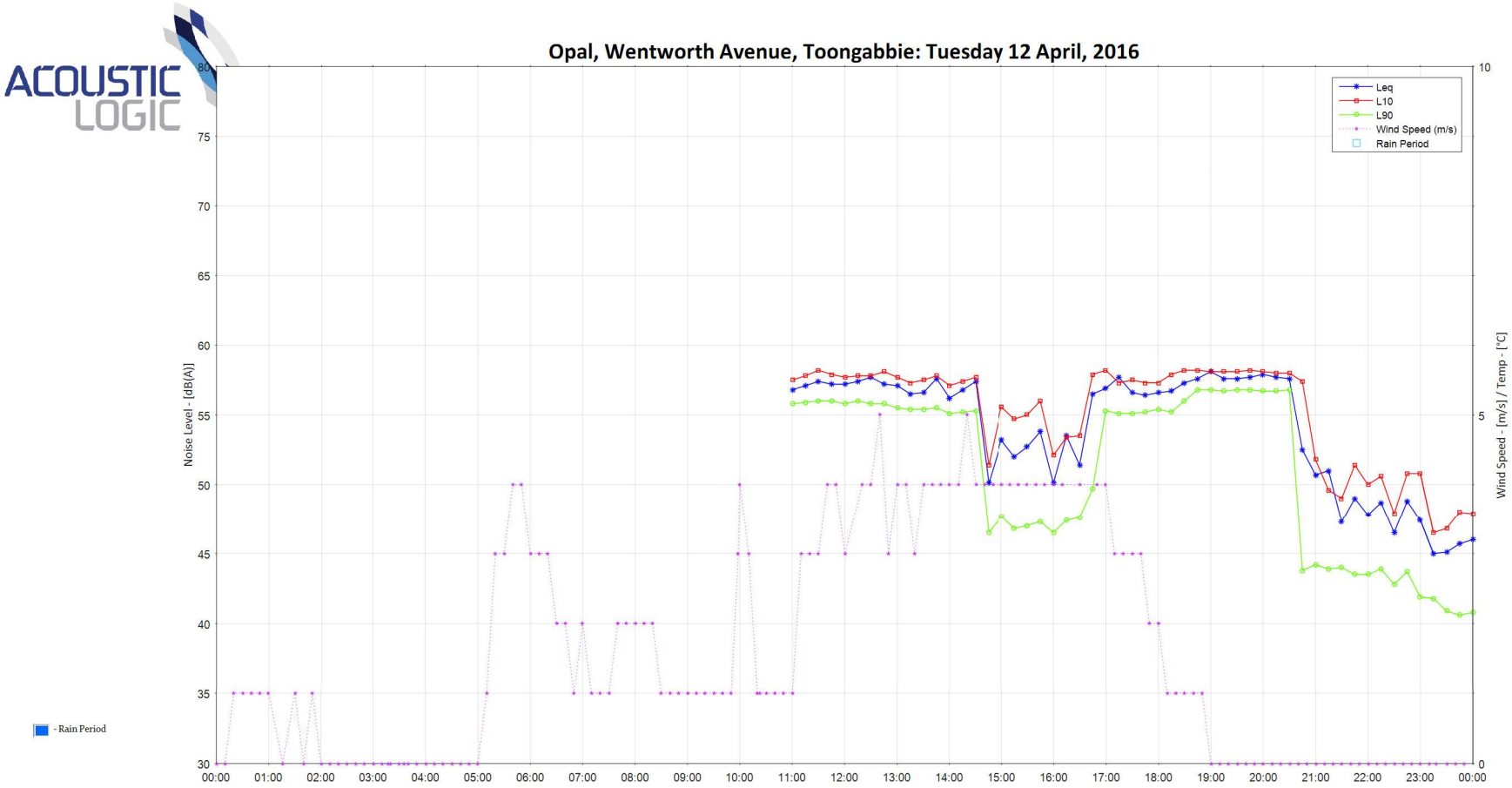
As such, in our opinion the site is suitable for its proposed use as a residential aged care facility with respect to acoustics.

Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Thomas Taylor

APPENDIX 1: NOISE LOGGING DATA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Leq
L10
L90
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Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
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75
70
65
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55
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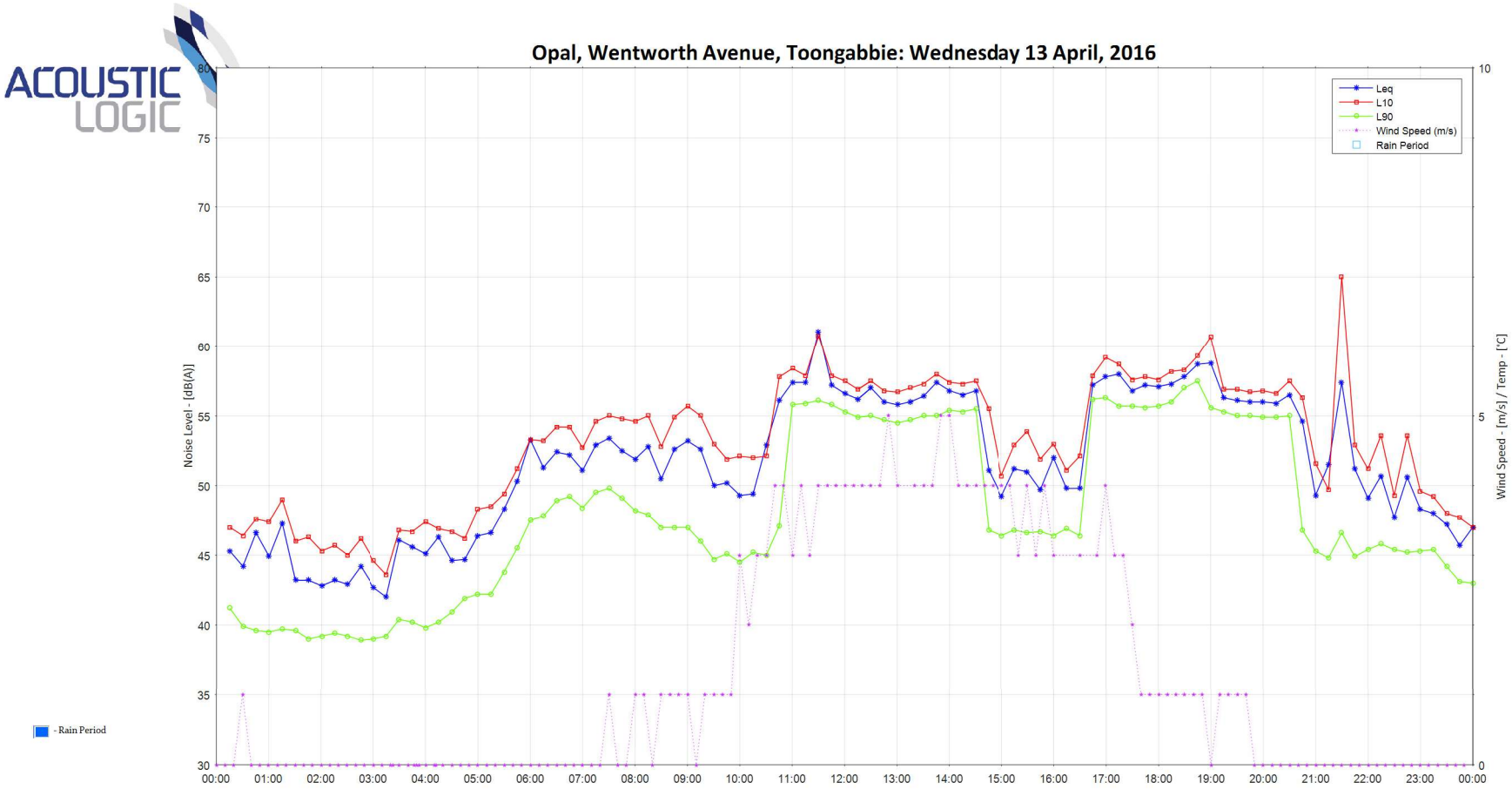
- Rain Period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Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
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70
65
60
55
50
45
40
35
30
10
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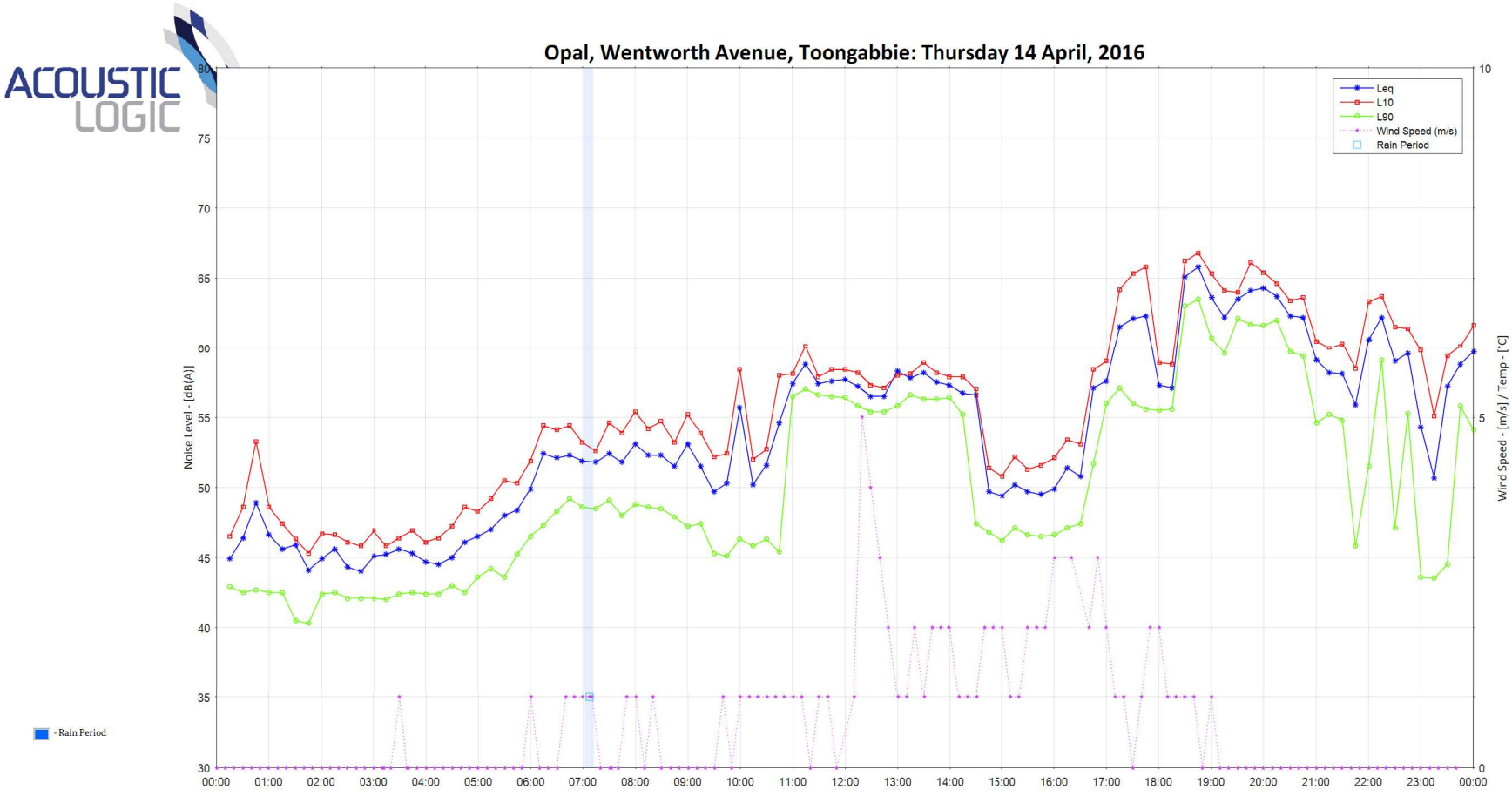
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L10
L90
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Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
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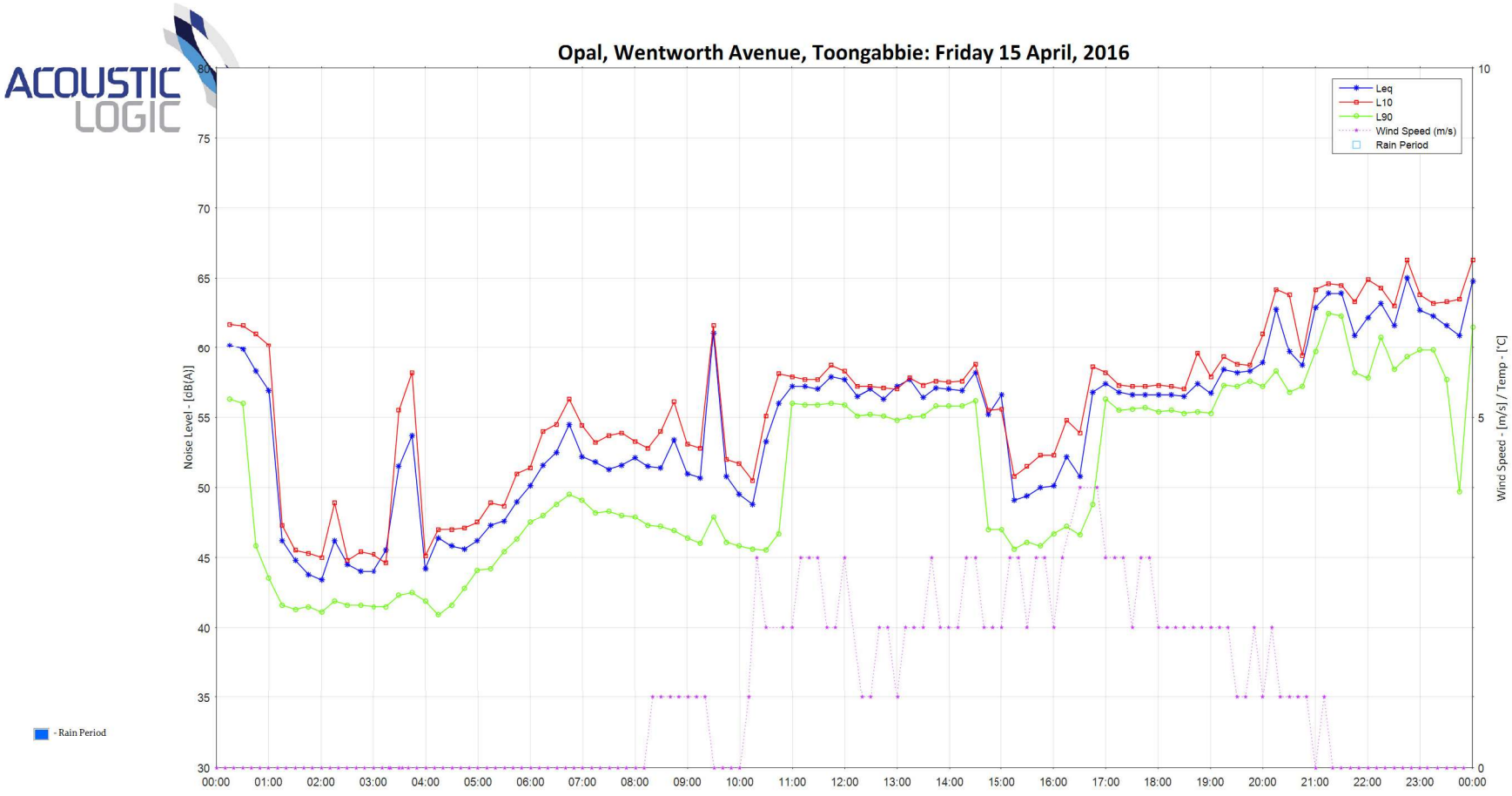
Opal, Wentworth Avenue, Toongabbie: Friday 15 April, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
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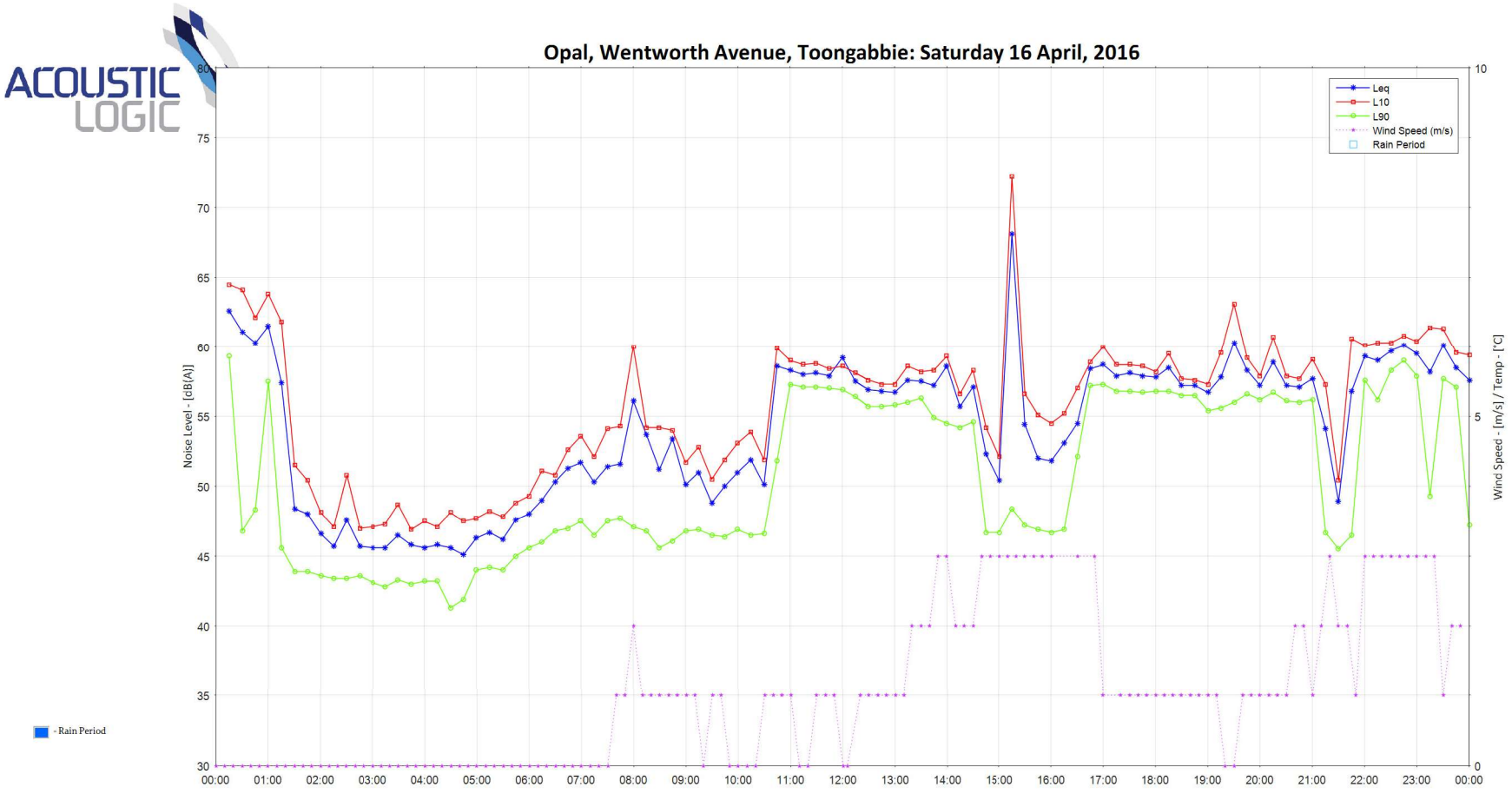
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Leq
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L90
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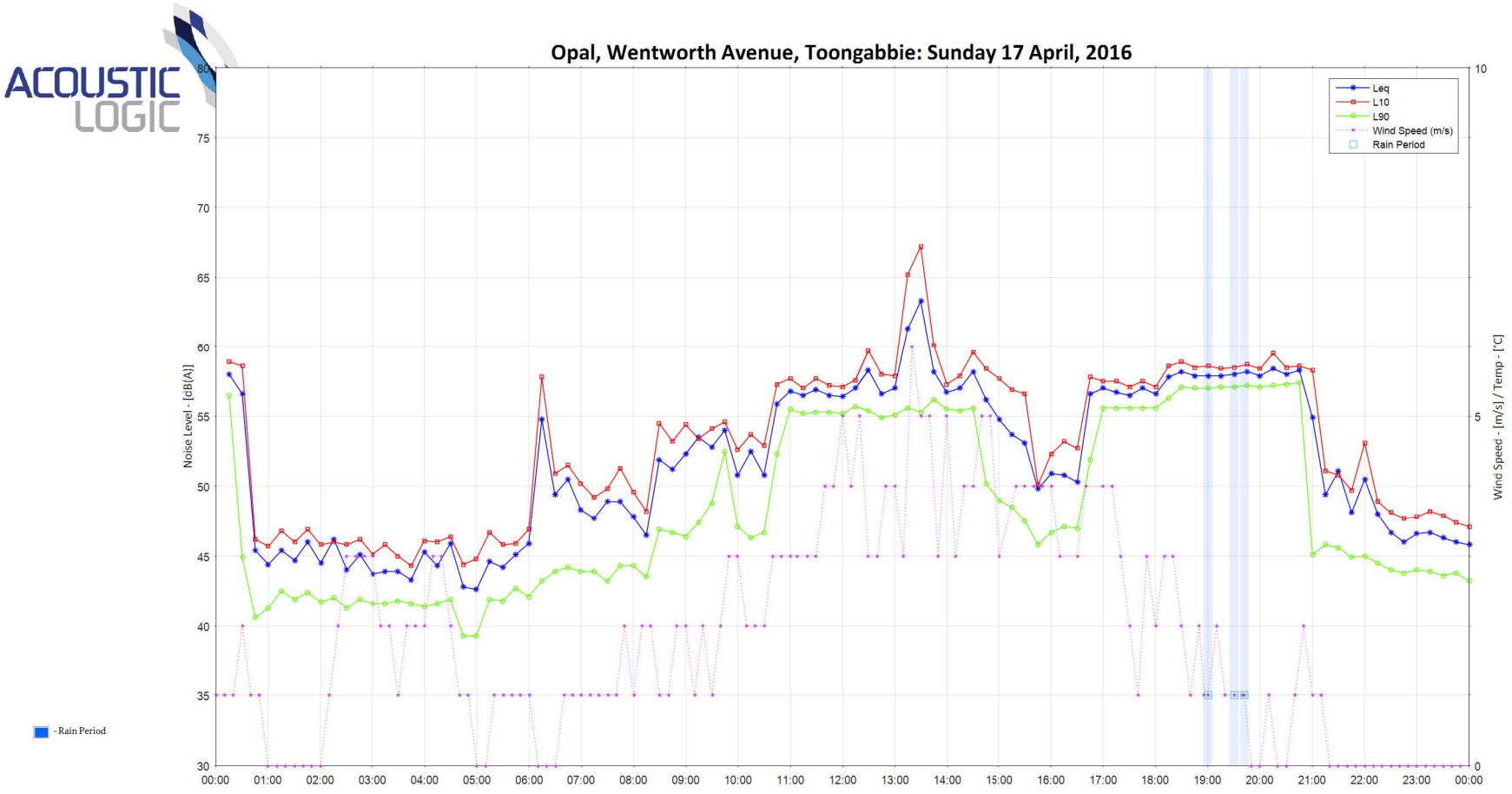
Opal, Wentworth Avenue, Toongabbie: Sunday 17 April, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
80
75
70
65
60
55
50
45
40
35
30
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
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20:00
21:00
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23:00
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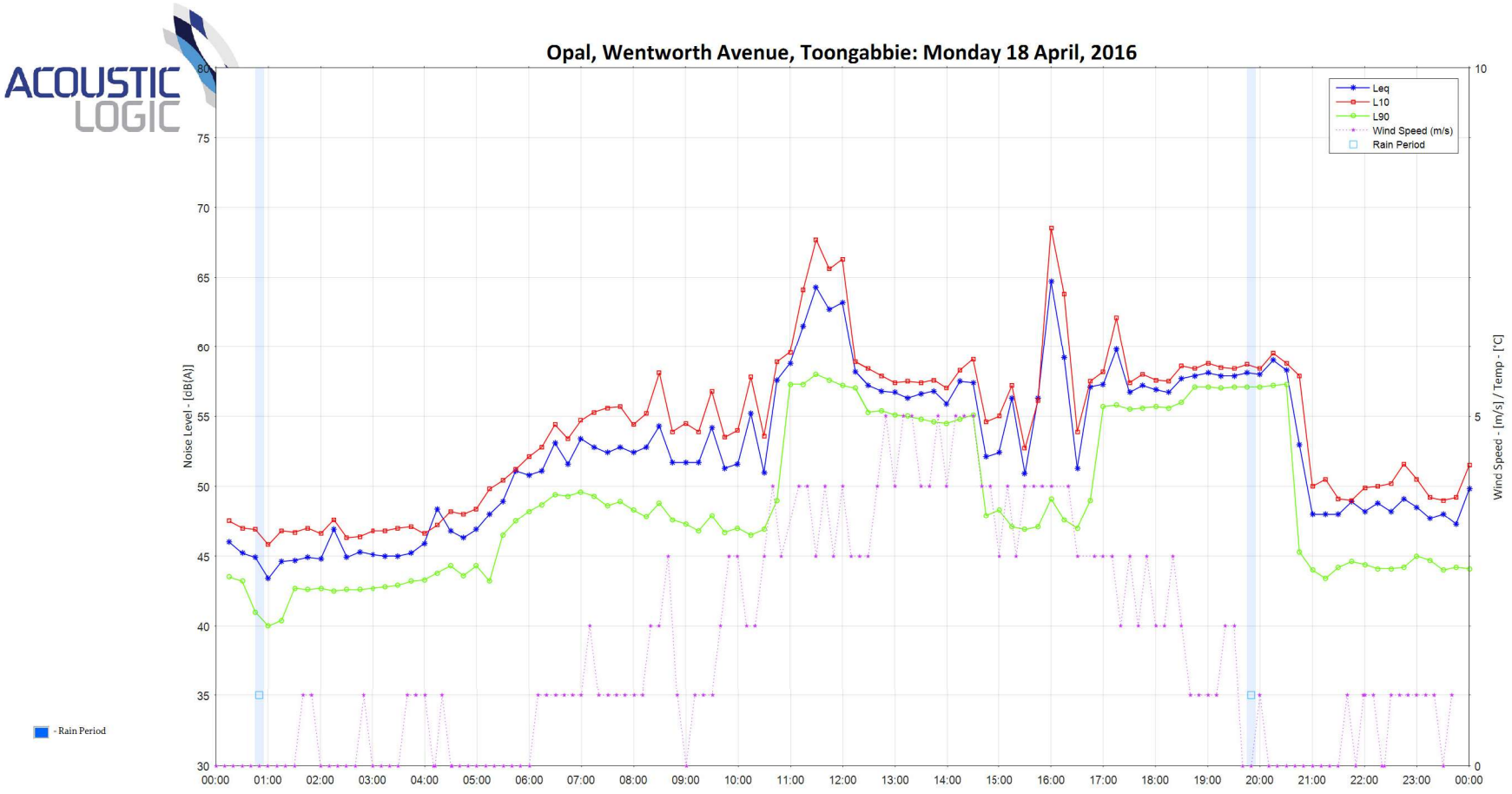
- Rain Period


Opal, Wentworth Avenue, Toongabbie: Monday 18 April, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Rain Period
80
75
70
65
60
55
50
45
40
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30
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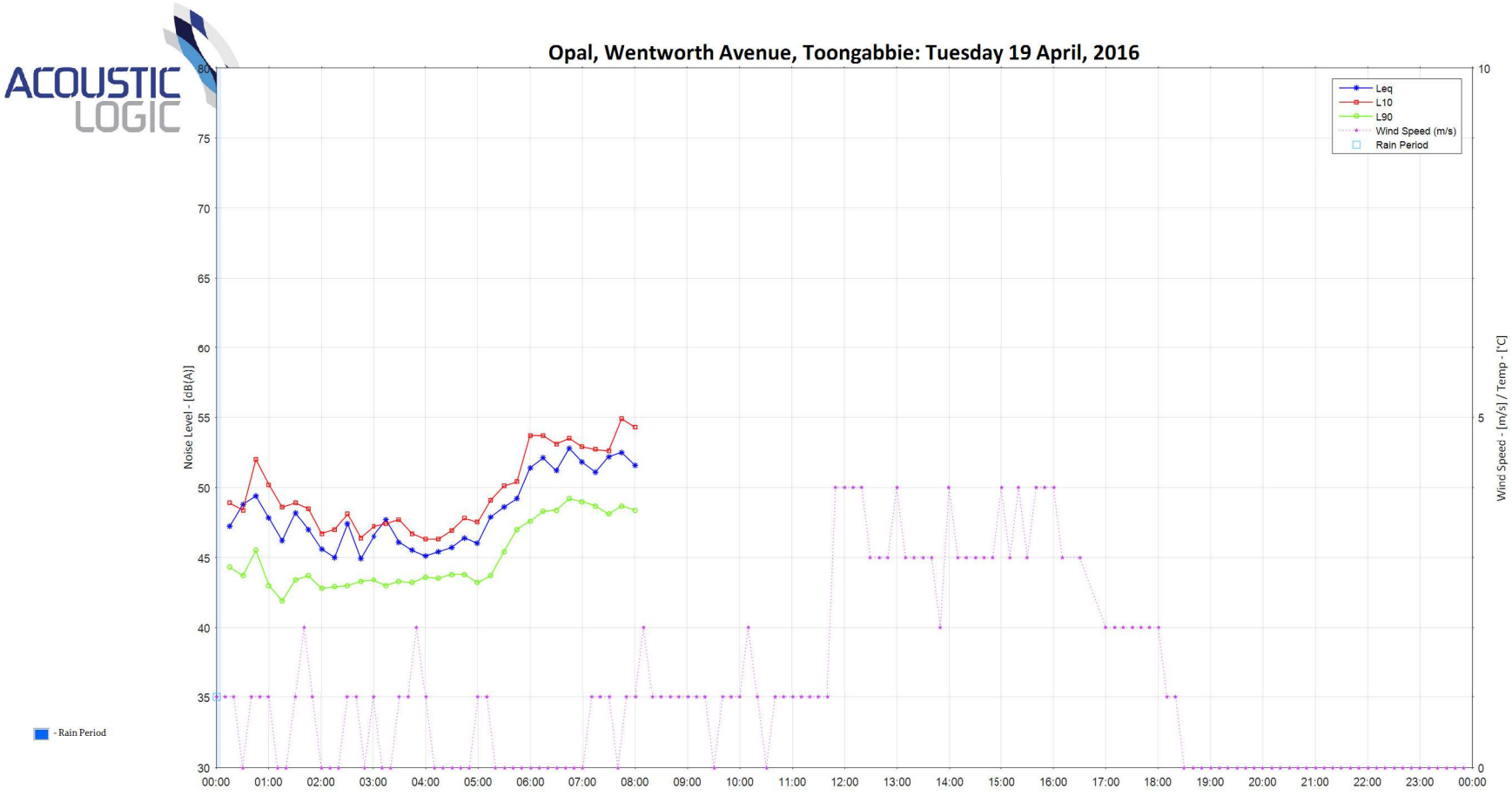
Opal, Wentworth Avenue, Toongabbie: Tuesday 19 April, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
80
75
70
65
60
55
50
45
40
35
30
10
5
0
00:00
01:00
02:00
03:00
04:00
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00:00
- Rain Period