54 Terry Road, Rouse Hill

DA Acoustic Assessment

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1 INTRODUCTION

This report presents an analysis of noise impacts associated with the proposed residential development at 54 Terry Road, Rouse Hill.

In this report we will assess:

- Traffic noise from surrounding roadways.
- Train noise from the future railway line within proximity of the site to the south.
- Noise emission criteria of mechanical plant to surrounding properties.

Environmental noise intrusion into the development has been assessed in accordance with;

- Blacktown City Council DCP 2015
- Australian Standard AS2107:2000

Noise emission criteria from the development will be set based on;

- Blacktown City Council DCP 2015
- The Environmental Protection Authority *Industrial Noise Policy.*
- The PEOA Act 1997
- PEOA Act Regulation 2000

The noise assessment is based on the architectural drawings supplied by Caverstock Group to this office.

2 SITE DESCRIPTION / PROPOSED DEVELOPMENT

The site is located at 54 Terry Road, Rouse Hill and the development will comprise of a subdivision of the site to include 43 Townhouses.

Potential noise impacts on the site are primarily traffic noise from surrounding roadways, and the future railway line operations which is located to the south of the site. The development is bounded as follows;

- To the south by existing land including residential use.
- Terry Road to the east of the site which carries low volumes of traffic flow.
- To the south by vacant existing land.
- Railway line within proximity to the site to the south which is approximately 45m from the site.
- To the west by vacant land.

Figure 1 below, which is an aerial photo of the existing development.

Figure 1 – Site Map

Unattended Noise Measurements
Attended Noise Measurements

3 NOISE DESCRIPTORS

Environmental noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

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 NOISE INTRUSION ASSESSMENT

Significant noise sources in the vicinity of the site are as follows:

- Surrounding noise from traffic on surrounding roadways.
- Future railway line within proximity to the site to the south.

Noise impacts should comply with the requirements of Blacktown City Council and AS2107:2000, as listed below.

4.1 INTERNAL NOISE CRITIERA

4.1.1 Blacktown City Council DCP 2015

There are no specific noise intrusion requirements set within the Blacktown DCP 2015. As such, we will reference Australian Standard AS2107:2000.

4.1.2 AS2107:2000

Australian Standard AS2107:2000 recommends the following internal noise levels within habitable spaces:

Table 1 – AS2107 Acoustic Criteria

Location	Room Type	Time Period	Criteria/Descriptor
Dwellings Near Major Roads	Bedroom	10:00pm – 7:00am	35 dB(A) $L_{eq(Worst\ 1\ hour)}$
	Living Areas	7:00am – 10:00pm	40 dB(A) $L_{eq(Worst\ 1\ hour)}$

4.1.3 Summary of Noise Intrusion Criteria

This assessment shall be conducted in accordance with the most stringent criteria specified above, which is summarised below:

Table 2 - Internal Noise Level Criteria

Location	Criteria
Residential Bedroom/Sleeping Areas	35 dB(A) $L_{eq(Worst\ 1\ hour)}$
Residential Living Areas	40 dB(A) $L_{eq(Worst\ 1\ hour)}$

4.2 ENVIRONMENTAL NOISE MONITORING

As part of this investigation, environmental noise from the surrounding perimeter roadways has been measured. The results of this measurement will be used to determine the treatments required to reduce noise levels to within the project acoustic objectives.

Noise levels measurements conducted at the location as detailed in Figure 1 above.

4.2.1 Unattended Noise Measurements

Unattended noise measurements were obtained using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noises monitors were calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator. No significant drift was detected. All measurements were taken on A-weighted fast response mode. There were no significant periods of adverse weather conditions during the measurement period.

The noise monitor was set up on the site from the 28th of June to the 4th July 2018. Refer to Appendix 1 for unattended noise monitoring data.

4.2.2 Attended Noise Measurements

Attended noise measurements were carried out to supplement unattended noise monitoring between the hours of 4:00pm-5:30pm on the 4th July 2018. 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 precision sound level calibrator. No significant drift was recorded.

4.2.3 Environmental Noise Levels

The following table presents the resultant noise levels from undertaken measurements.

Table 3 - Environmental Noise Levels at Proposed Building Facade

Location	7am to 10pm dB(A)	10pm-7am-dB(A)
At proposed east façade facing Terry Road	63 dB(A)$L_{eq(Worst\ 1\ Hour)}$	56 dB(A)$L_{eq(Worst\ 1\ Hour)}$
At proposed south western Façade	64 dB(A)$L_{eq(Worst\ 1\ Hour)}$	58 dB(A)$L_{eq(Worst\ 1\ Hour)}$
At proposed south eastern Façade	65 dB(A)$L_{eq(Worst\ 1\ Hour)}$	59 dB(A)$L_{eq(Worst\ 1\ Hour)}$

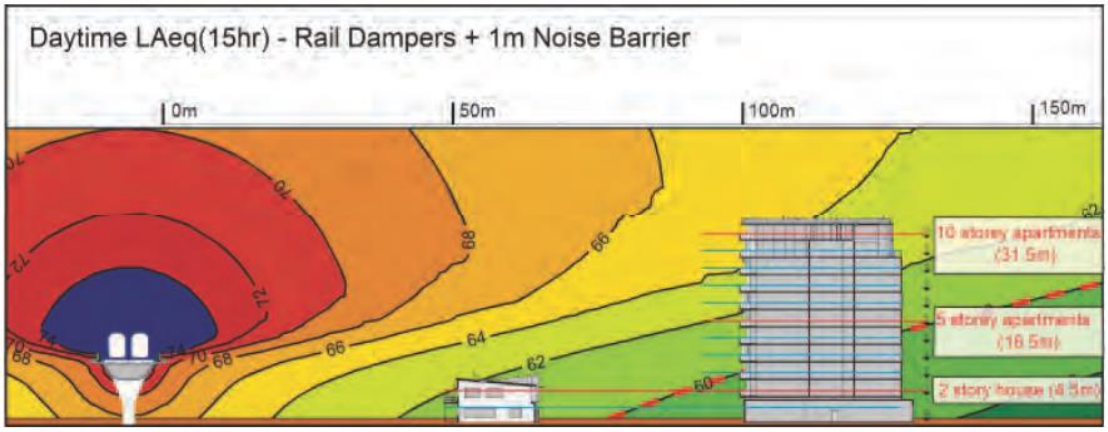
4.3 FUTURE RAIL LINE NOISE LEVELS

This section of the of the report details the assessment of future noise levels from the proposed above ground train line to the south of the site as detailed in figure below.

4.4 FUTURE OPERATIONAL NOISE LEVELS FROM NORTHWEST RAIL LINK

The following noise data has been detailed in " North West Rail Link Noise and Vibration Technical Paper for Operations and Additional Construction Works" prepared by SLR dated 17th October 2012.

Figure 5.6 Indicative Impacts with Source Control and 1 m Noise Barriers at Edge of Viaduct



Note: Sound pressure levels include 2.5 dB facade reflection. The dashed red line shows the daytime L_{Aeq} noise trigger level 60 dBA.

The proposed building enclosure is approximately 45 metres from the viaduct parapet of the rail link and the noise levels to the nearest location of the site from the operation of the railway line is 62 dB(A)$L_{eq,\ 15\ hour}$ based on graph above.

4.4.1.1 NSW Department of Planning and Environment's Document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline'

Section 3.5 of the NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)' states:

"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

- *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."*

4.5 RECOMMENDATIONS

Environmental noise intrusion into the proposed development was assessed using the measured external noise levels reported above as a basis.

Calculations were performed taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. Acoustic treatment required to ensure compliance with the assessment criteria are detailed in this section.

Internal noise levels will primarily be as a result of noise transfer through the windows and doors as these are relatively light building elements that offer less resistance to the transmission of sound. Noise transfer through the masonry elements will not be significant and need not be considered further.

The constructions necessary to achieve the noise levels are detailed below. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to environmental noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

4.5.1 Glazed Windows and Doors

The recommended glazing constructions are outlined below in the following table. The glazing thickness recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations for all the proposed 45 subdivisions on the site.

Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria listed below.

Table 4 - Minimum Glazing Recommendations

Façade Location	Room Type	Glazing Assembly	Acoustic Seals Required
All sub divisions on the site Locations	Living Room	6mm Float	Yes
	Bedroom	6mm Float	

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in the table below. Note that mohair type seals will not be acceptable for the windows requiring acoustic seals.

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum listed STC requirements. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

Table 5 - Minimum STC of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum STC of Installed Window	Acoustic Seals Required
6mm float	29	Yes

4.5.2 External Walls

External walls of masonry or light weight construction will be acrostically acceptable without additional acoustic treatments.

4.5.3 Roof / Ceiling Construction

The proposed concrete or light weight roof/ceiling constructions are acoustically acceptable without additional acoustic treatments.

4.5.4 Ventilation Requirements

With respect to natural ventilation of the dwelling, the NSW Department of Planning document “Development near Busy Roads and Rail Corridors - Interim Guideline” dictates that:

- *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (ie – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

All subdivisions of the site will achieve the required internal noise levels with the windows open for ventilation and an alternative outside air source is not required.

5 FUTURE TRAIN PASSBY VIBRATION

Train induced 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.

5.1 PROJECT VIBRATION OBJECTIVES

5.1.1 Tactile Vibration

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

The Interim Guideline references the OEH *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 10. For this project the aim will be for a low probability of adverse comment.

Table 6 - 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

5.1.2 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.

As a general guide, ground borne noise may be an issue in habitable rooms which are shielded from airborne noise from the railway. Examples are rooms that are not facing the railway, and where cuttings or noise barriers block the line of sight between the receiver room and the rail line. In addition, some structures such as suspended slabs can lend to vibration amplification."

In this case, the proposed development is not located over or adjacent to a railway tunnel, from the vibration testing conducted on site we found that the predicted structure borne noise are compliant and the results are presented in Section 4.2.2.

5.2 RAIL VIBRATION MEASUREMENTS

5.2.1 Vibration Dose Values

Rail noise measurements were conducted at a position of a similar above ground railway line with proximity to the proposed development.

The measured vibration levels, duration of train passby 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 7 - Vibration Dose Values

Time Period	Calculated VDV $m/s^{1.75}$	Criteria VDV $m/s^{1.75}$	Complies
Day (7am – 10pm)	0.07	0.2 to 0.4	Yes
Night (10pm -7am)	0.04	0.13	Yes

Based on the result of this assessment vibration isolation is not required for the future buildings on the site to comply with the relevant tactile or structure bone noise criteria.

6 NOISE EMISSION ASSESSMENT

6.1 BACKGROUND NOISE MONITORING

Measured background noise levels are presented below. Refer to Appendix 1 for noise logging data.

Table 8 – Measured Background Noise Levels

Location	Period/Time	Background Noise Level dB(A) L_{90}
54 Terry Road, Rouse Hill	Day (7am-6pm)	35
	Evening(6pm-10pm)	35
	Night(10pm-7am)	30

6.2 ACOUSTIC OBJECTIVES

Acoustic objectives will be based on;

- Blacktown DCP 2015
- The EPA Noise Policy for Industry
- The Protection of the Environment Operations Act 1997
- The Protection of the Environment Operations Regulation Act 2000

6.2.1 Blacktown DCP 2015

Blacktown DCP has the following with reference to noise emissions of residential properties;

Section 6.9.3 – Visual and Acoustic Privacy

No electrical, mechanical or hydraulic plant or equipment shall generate a noise level greater than 5dB(A) above the ambient L90 sound level at the boundaries of any allotment at any time of day.

6.3 NSW ENVIRONMENTAL PROTECTION AGENCY (EPA) DOCUMENT – *'NOISE POLICY FOR INDUSTRY (NPFI)'*

The NPfI 2017 provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The NPfI has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion.

6.3.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A).

6.3.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The Industrial Noise Policy sets out acceptable noise levels for various land uses. Table 2.1 on page 16 of the policy has four categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

For the purposes of a conservative assessment, ALC will assess noise emissions in accordance with the 'Urban' category.

Table 9 – NPfI Project Amenity Criteria

Type of Receiver	Time of day	Recommended Project Acceptable Noise Level dB(A)$L_{eq(15mins)}$
Residential (Suburban)	Day	53
	Evening	48
	Night	43
Commercial	When in Use	65

6.3.3 Summarised Plant Noise Emission Criteria

Summary for noise emission criteria for all plant associated with the development has been summarised below.

Table 10 – Summary of Noise Emission Criteria (Plant Noise)

Receiver	Time of day	Background Noise Level dB(A)L_{90}	Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria (Background + 5dB(A)
Residential Receivers	Day	35	53	**40**
	Evening	35	48	**40**
	Night	30	43	**35**
Commercial	When in Use	N/A	**65**	N/A

6.3.4 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act stipulates that a site should not emit "offensive noise" to a residential receiver, where "offensive noise" is defined as background + 5dB(A), once penalties for tonality, intermittence etc have been taken into account.

In our opinion, compliance with the Industrial Noise Policy is satisfactory to demonstrate that a particular noise is not offensive.

6.3.5 Protection of the Environmental Operation Act Regulation 2000

Protection of the Environmental Operations regulation limits the noise levels associated within the operation of domestic air conditioning criteria during night time periods which is presented below:

Protection of the Environmental Operations (Noise Control) Regulation 2000-Sect 52

52 Air Conditioners

(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or
(b) before 7 am or after 10 pm on any other day.

6.3.6 Mechanical Plant

Mechanical plant items are not typically selected at DA stage.

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 5.2 of this report.

All plant can be satisfactorily attenuated to levels complying with noise emission criteria through appropriate location and (if necessary) standard acoustic treatments such as noise screens, enclosures, in-duct) treatments (silencers/lined ducting or similar.)

7 CONCLUSION

Noise intrusion impacts on the proposed residential development at 54 Terry Road, Rouse Hill have been assessed.

Provided that the acoustic treatments set out in Section 4.3 of this report are adopted, environmental noise impacts on the development will comply with the requirements of;

- Blacktown DCP 2015
- Australian Standard AS2107:2000.

External noise emission criteria has been setup in Section 5 of this report based on the requirements of the;

- Blacktown DCP 2015
- EPA Noise Policy for Industry
- The PEOA Act 1997 and
- PEOA Act Regulation 2000.

Based on this assessment the proposed site is acoustically acceptable for the proposed town house sub divisions and all both noise intrusion into the residential buildings as well as noise generated on the site can be acoustically treated to ensure all acoustic criteria are achieved.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Ben White

Appendix 1
Unattended Noise Data

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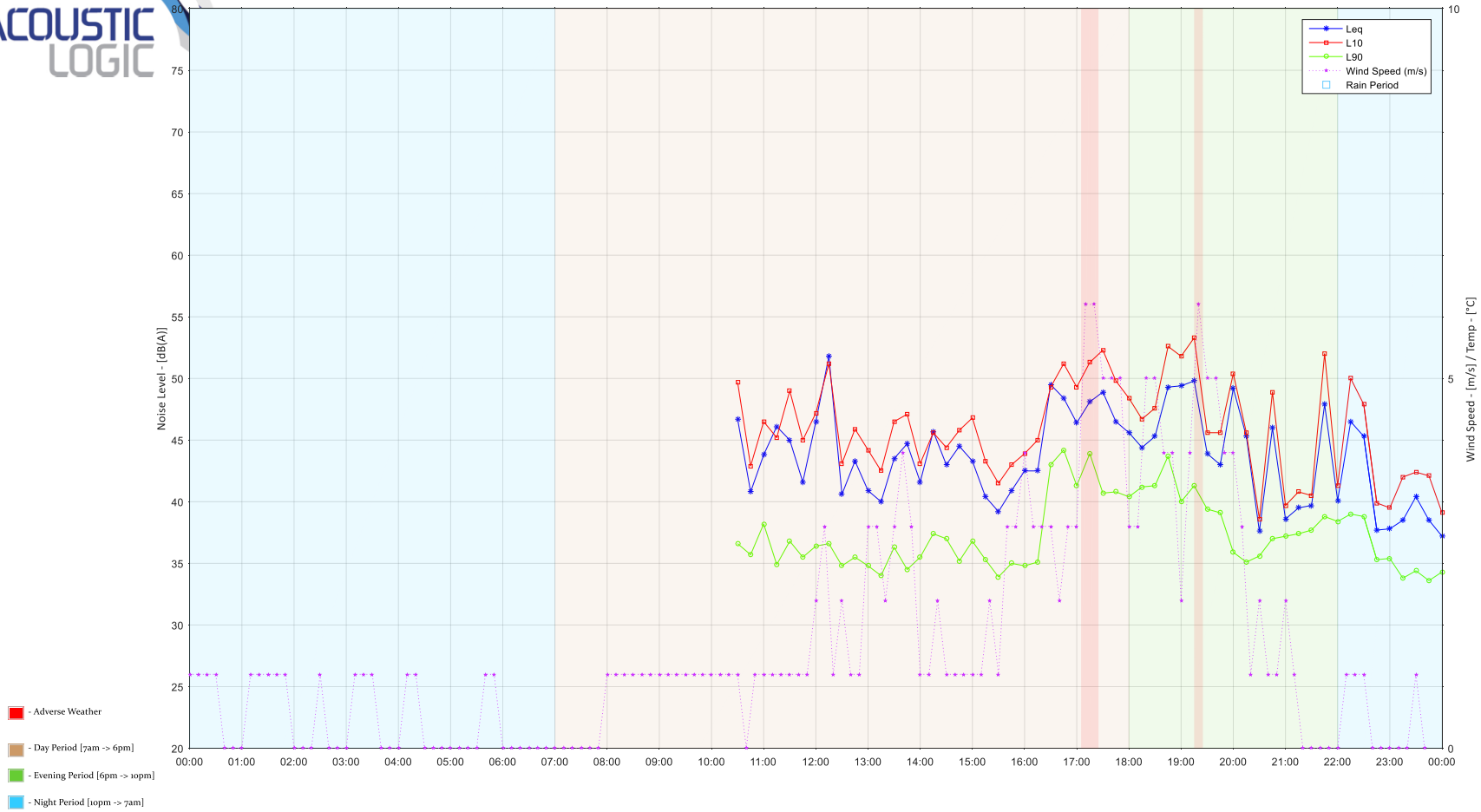
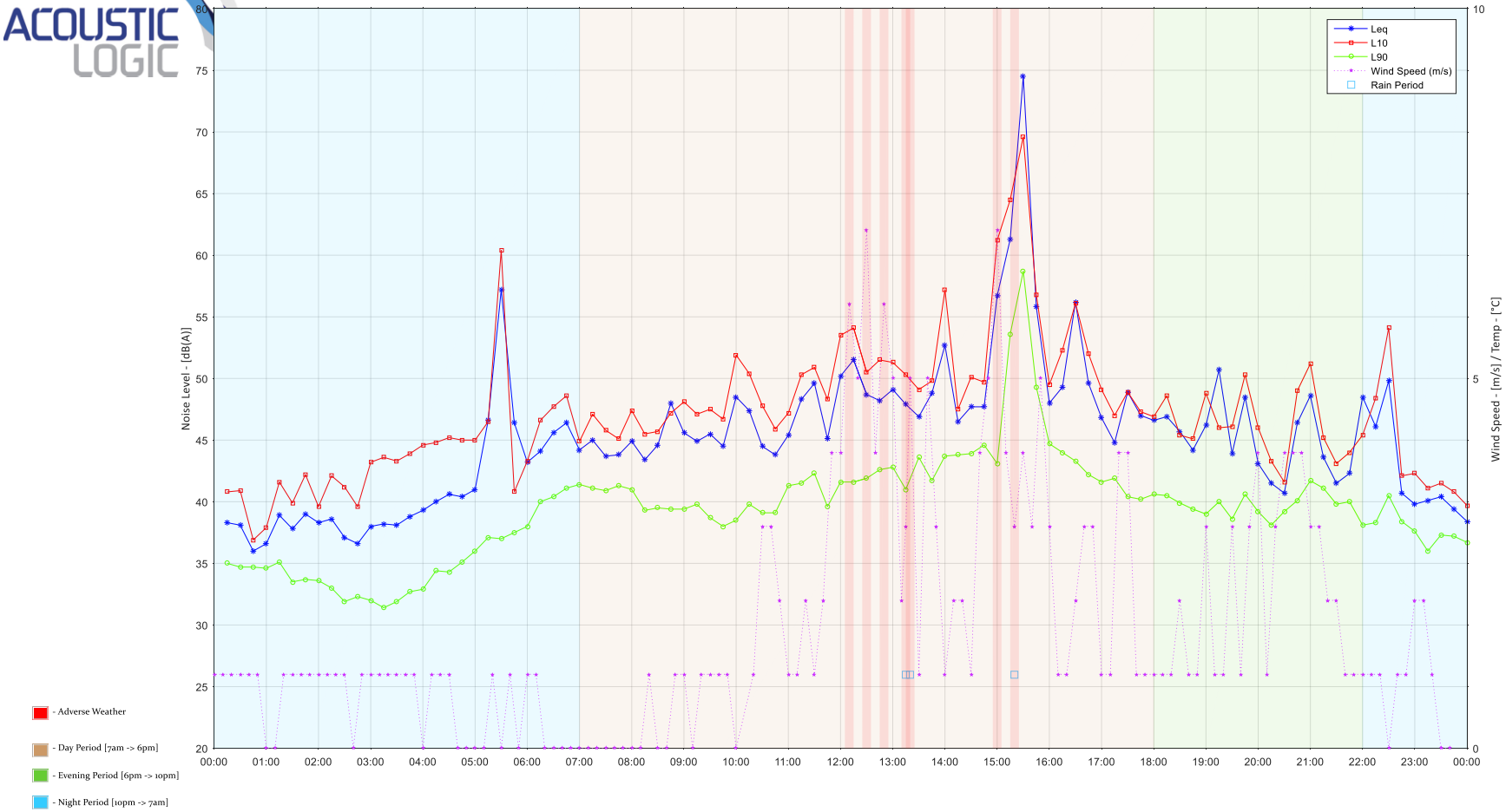
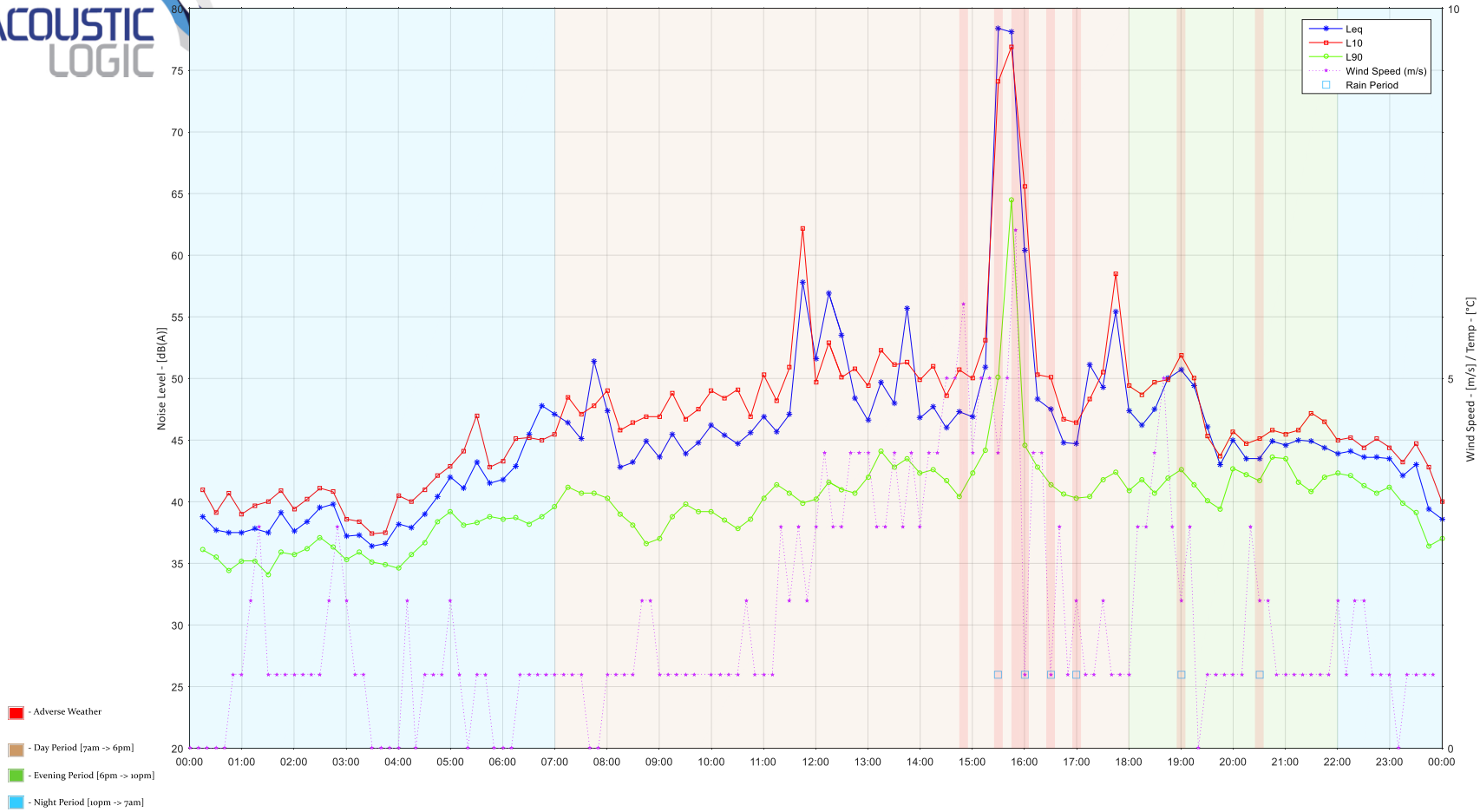
54 Terry Rd Rouse Hill: Thursday 28th June, 2018



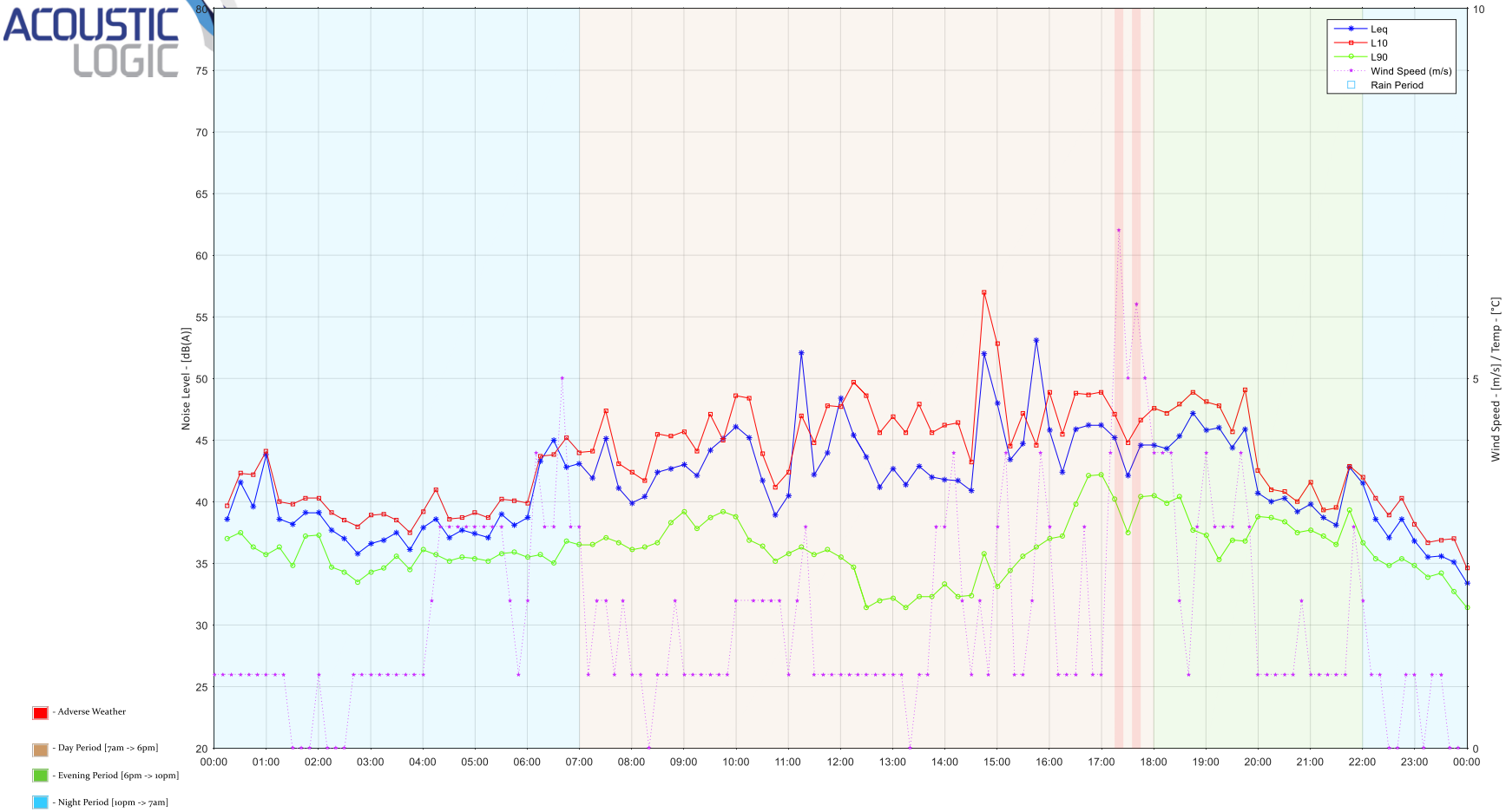
54 Terry Rd Rouse Hill: Friday 29th June, 2018



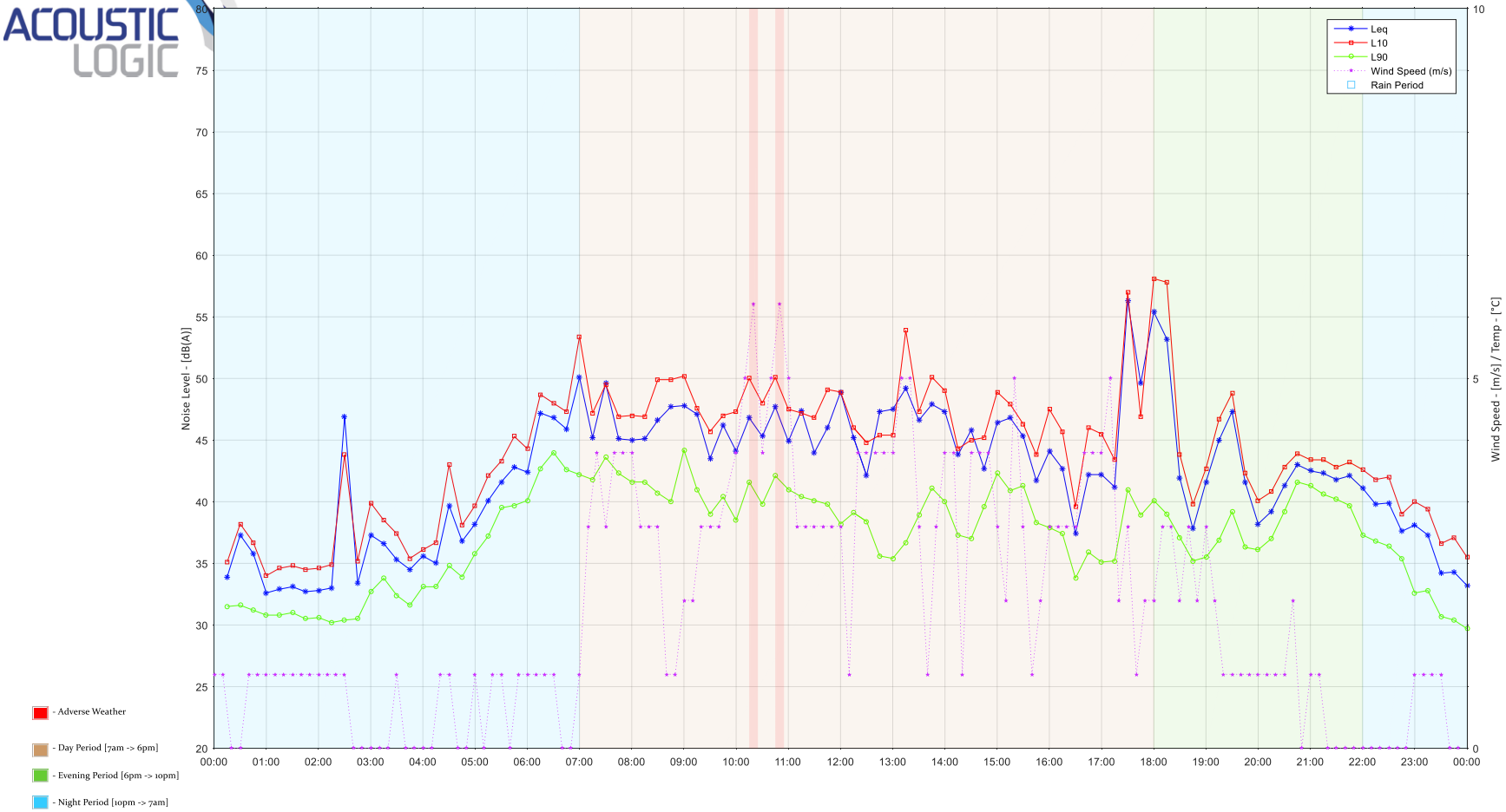
54 Terry Rd Rouse Hill: Saturday 30th June, 2018



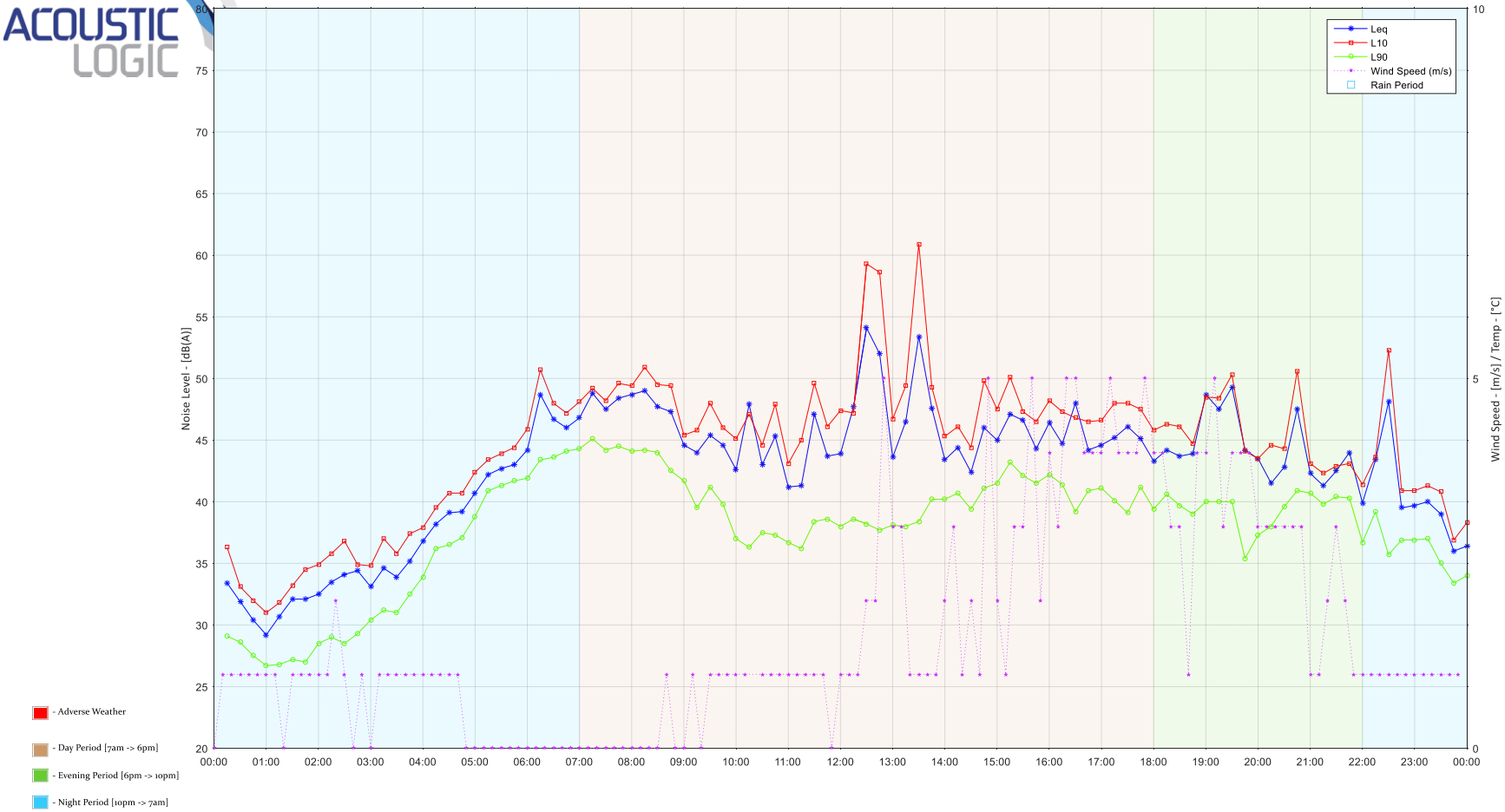
54 Terry Rd Rouse Hill: Sunday 1st July, 2018



54 Terry Rd Rouse Hill: Monday 2nd July, 2018



54 Terry Rd Rouse Hill: Tuesday 3rd July, 2018



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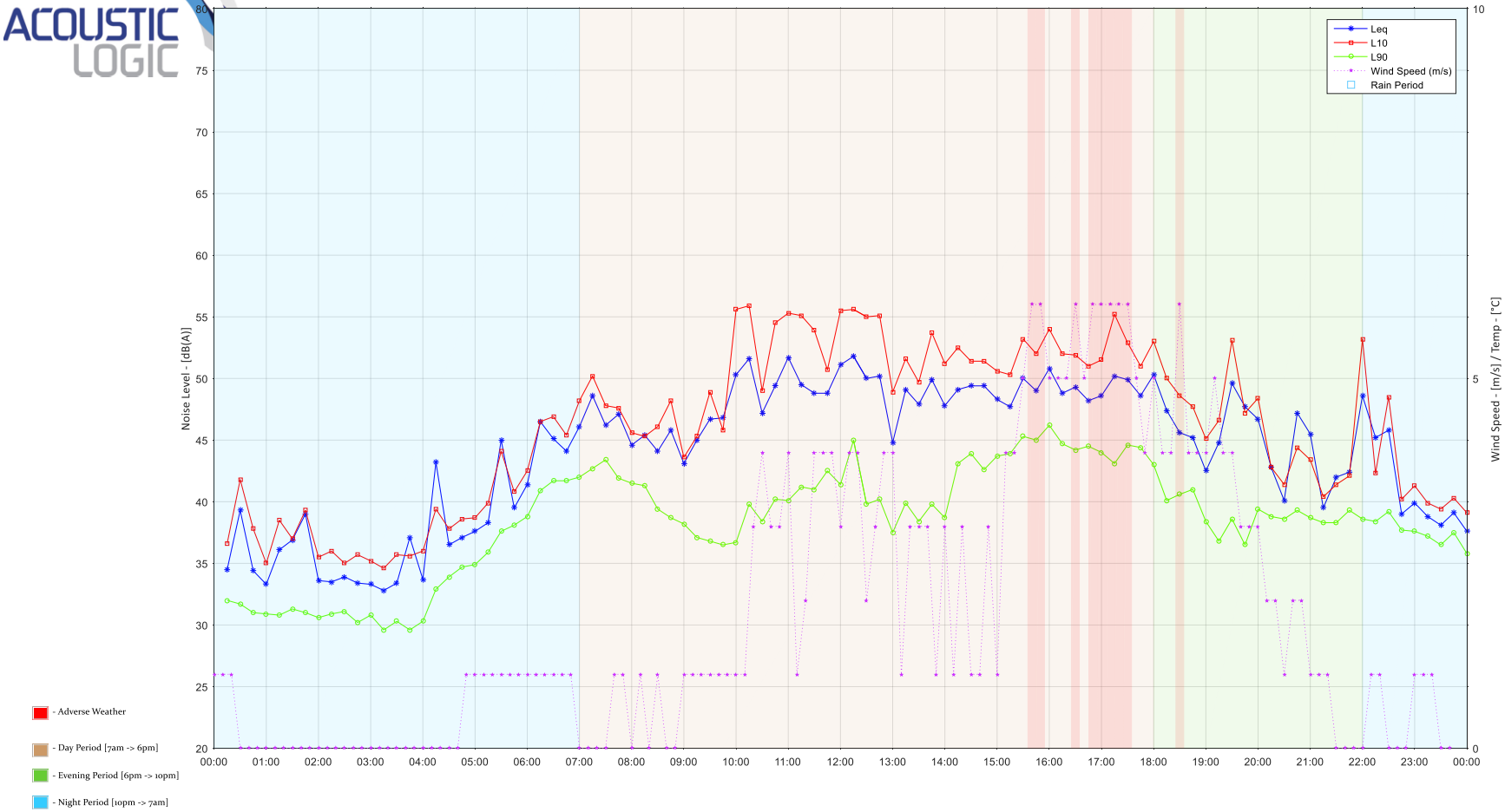

54 Terry Rd Rouse Hill: Thursday 5th July, 2018