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DA Acoustic Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed mixed-use development to be constructed at The Palms, 167 Hume Highway, Greenacre.

This document addresses noise impacts associated with the following:

- Traffic noise impacts from Hume Highway; and
- Noise emissions in principle from operational noise, mechanical plant and vehicle noise from onsite movements.

ALC have utilised the following documents and regulations in the assessment of noise associated with the developments:

- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'*;
- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'*;
- NSW Department of Planning and Environment's document – *'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007';*
- NSW Department of Planning and Environment's document – '*Developments near Rail Corridors or Busy Roads – Interim Guideline 2008';*
- Australian Standard AS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*;
- Australian and New Zealand Standard AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*;
- NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'*; and
- NSW Environmental Protection Authority (EPA) document – *'Road Noise Policy (RNP) 2011'*.

This assessment has been conducted based on the Urban Design Report prepared by Squillace Architects (dated March 2020). Indicative floorplans have been appended to this report for reference.

2 SITE DESCRIPTION / PROPOSED REDEVELOPMENT

The current site is occupied by The Palms Hotel and associated parking facilities. It is proposed to rejuvenate the existing site with a mixed use development incorporating ground floor commercial/hospitality premises along Hume Highway in Building A & B, with residential development located directly above as well as at the rear of the site in Buildings C & D. The proposed setback of residential apartments in Buildings A & B is 10m from the boundary and 13m from the nearest curb of the Hume Highway.

Onsite acoustic investigation has been carried out by this office in regard to the surrounding acoustic environment around the proposed development, which has been detailed below:

- Existing commercial properties and residential dwelling located along the northern boundary of the site, with Tennyson Road further north;
- Peter Crescent located along the north eastern boundary of the site with residential dwellings located further Peter Crescent;
- Existing residential dwellings located along the south-eastern boundary of the site.
- Existing residential located along the southern boundary of the site, with Cardigan Road further south; and
- Hume Highway located along the north-west, west and south-west boundary of the site, with existing industrial and commercial further west of the Hume Highway.

Hume Highway carries a high volume of traffic, Tennyson Road carries a low to medium volume traffic and Peter Crescent and Cardigan Road carries a low volume of traffic.

The nearest noise receivers around the project site include:

Receiver 1 - Commercial properties located at 165 Hume Highway and 74 Tennyson Road, Greenacre, situated along the northern boundary of site;

Receiver 2 – Residential dwelling located at 72 Tennyson Road, Greenacre, situated to the north east corner of the site, residential receiver is single storey;

Receiver 3 – Residential dwellings located at 1-3 Peter Crescent, Greenacre, situated to the east of the site across Peter Crescent, residential receivers are single storey and multi-storey;

Receiver 4 - Residential dwellings located at 26-27 Peter Crescent, Greenacre, situated

Receiver 5 – Residential dwellings located at 81 Cardigan Road, Greenacre, situated along the eastern boundary of the site, residential receivers are multi-storey;

Receiver 6 – Residential dwellings located at 81A-91A Cardigan Road, Greenacre, situated along the southern boundary of the site, residential receivers are multi-storey;

Receiver 7 – Residential dwellings 1A Hillcrest Avenue and 185 Hume Highway, Greenacre, situated along the south-western boundary of the site, residential receivers are multi-storey;

Receiver 8 – Commercial shopping centre located at 62 Hume Highway, Chullora, situated to the south-west of the site across the Hume Highway; and

Receiver 9 – Industrial properties located at 26 Hume Highway, Chullora, Situated to the north-west of the site across the Hume Highway.

A site map, measurement description and surrounding receivers are presented in below.

Figure 1 – Site Map, Measurement Locations and Receiver Locations
Sourced from SixMaps NSW

3 EXISTING ACOUSTIC ENVIRONMENT

Acoustic monitoring was conducted near the site to establish the background noise levels which will be used as basis for this assessment.

3.1 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-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.

In analysing 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 intervals.

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 15-minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

The L_{max} parameter represents the loudest sound pressure level during a measurement period.

3.2 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

3.2.1 Measurement Equipment

Unattended noise monitoring was conducting using two Acoustic Research Laboratories Pty Ltd noise loggers. The loggers were programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

3.2.2 Measurement Location

As discussed above, two monitors were installed onsite for the measurement of rating background noise levels. Each location is detailed below.

Location 1 - An unattended noise monitor was installed within the existing Chinese restaurant back of house area along the southern façade of the building which is adjacent to the Hume Highway as identified in Figure 1 above.

Location 2 - An unattended noise monitor was installed behind the rear existing hotel building located in the south east corner of the site as identified in Figure 1 above.

3.2.3 Measurement Period

Unattended noise monitoring was conducted from Monday 17th December 2018 to Wednesday 9th January 2019 (Location 1) and Saturday 29th December 2018 (Location 2).

In accordance with the NSW EPA NPfI, unattended noise monitoring was carried out prior to the Christmas/New Year break which begun on the 24th December. Seven days of valid data was collected prior to this period. Additional data has been collected after the 24th as Acoustic Logic Consultancy was closed for the year and the monitors were collected in the new year.

3.2.4 Measured Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed in the tables below.

3.2.4.1 Unattended Noise Measurements

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix A and Appendix B provides detailed results of the unattended noise monitoring. Weather affected data was excluded from the assessment. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in Table below.

Unattended and attended noise measurements have been undertaken as per the procedures outlined in Fact Sheet A and B of the NSW EPA Noise Policy for Industry (*NPfI)*.

Weather affected data (rain fall and wind speeds above 5m/s) have been excluded from the assessment as per Fact Sheet A and B. Where interval periods (day, evening and night) have 18%, 13% and 11% respectively, these periods have been excluded from the assessment.

Table 3-1 – Unattended Noise Monitor – Logger Location 1 – Western Boundary – Rating Background Noise Level – L_{90} Descriptor

Date	dB(A)$L_{90(Period)}$ [1]		
	Day (7:00am-6:00pm)	Evening (6:00pm-10:00pm)	Night (10:00pm-7:00am Next Day)
Monday 17 December 2018	-	54	46
Tuesday 18 December 2018	55	54	48
Wednesday 19 December 2018	56	56	46
Thursday 20 December 2018	55	57	49
Friday 21 December 2018	56	54	49
Saturday 22 December 2018	55	54	48
Sunday 23 December 2018	52	53	48
Monday 24 December 2018	53	54	39
Tuesday 25 December 2018	46	51	41
Wednesday 26 December 2018	49	53	45
Thursday 27 December 2018	52	53	46
Friday 28 December 2018	52	53	46
Saturday 29 December 2018	50	53	45
Sunday 30 December 2018	49	52	45
Monday 31 December 2018	52	53	47
Tuesday 1 January 2019	46	51	43
Wednesday 2 January 2019	52	53	46
Thursday 3 January 2019	54	54	45
Friday 4 January 2019	53	53	46
Saturday 5 January 2019	51	54	45
Sunday 6 January 2019	51	53	44
Monday 7 January 2019	54	52	45
Tuesday 8 January 2019	53	54	47
Wednesday 9 January 2019	-	-	-
Median	**52**	**53** [2] (Resultant Level 52 see below)	**46**

Table Notes:

1. Periods marked "-" above did not collect the noise levels for the entire period and therefore have been excluded.
2. Median result for the evening period (6:00pm-10:00pm) is 1dB(A) higher than the daytime (7:00am-6:00pm) result. In accordance with section 2.3 of the NSW EPA *Noise Policy for Industry (NPfI) 2017* this will be amended to match the measured median noise level during the daytime.

Table 3-2 – Unattended Noise Monitor – Logger Location 1 – Western Boundary– L_{eq} Descriptor – NPfI Hours

Date	dB(A)$L_{eq(Period)}$ [1]		
	Day (7:00am-6:00pm)	**Evening (6:00pm-10:00pm)**	**Night (10:00pm-7:00am Next Day)**
Monday 17 December 2018	-	66	65
Tuesday 18 December 2018	67	66	65
Wednesday 19 December 2018	67	69	66
Thursday 20 December 2018	71	73	65
Friday 21 December 2018	67	67	65
Saturday 22 December 2018	66	66	64
Sunday 23 December 2018	65	66	65
Monday 24 December 2018	66	66	61
Tuesday 25 December 2018	64	65	61
Wednesday 26 December 2018	64	65	64
Thursday 27 December 2018	66	65	64
Friday 28 December 2018	66	65	63
Saturday 29 December 2018	64	64	62
Sunday 30 December 2018	64	65	63
Monday 31 December 2018	65	70	64
Tuesday 1 January 2019	63	64	64
Wednesday 2 January 2019	66	66	64
Thursday 3 January 2019	67	67	64
Friday 4 January 2019	66	65	63
Saturday 5 January 2019	68	70	65
Sunday 6 January 2019	66	66	65
Monday 7 January 2019	67	67	65
Tuesday 8 January 2019	66	67	66
Wednesday 9 January 2019	-	-	-
Logarithmic Average	**66**	**67**	**64**

Table Notes:

1. Periods marked "-" above did not collect the noise levels for the entire period and therefore have been excluded.

Table 3-3 – Unattended Noise Monitor – Logger Location 2 – Southeast Corner – Rating Background Noise Level – L_{90} Descriptor

Date	dB(A)$L_{90(Period)}$ (1)		
	Day (7:00am-6:00pm)	**Evening (6:00pm-10:00pm)**	**Night (10:00pm-7:00am Next Day)**
Monday 17 December 2018	-	44	41
Tuesday 18 December 2018	46	45	42
Wednesday 19 December 2018	45	47	43 (2) (not included)
Thursday 20 December 2018	45	48	43
Friday 21 December 2018	45	44	42
Saturday 22 December 2018	46	46	43
Sunday 23 December 2018	44	44	41
Monday 24 December 2018	44	45	39
Tuesday 25 December 2018	41	44	39
Wednesday 26 December 2018	43	46	40
Thursday 27 December 2018	43	44	42
Friday 28 December 2018	44	45	-
Saturday 29 December 2018	-	-	-
Median	**44**	**45 (3)**	**41**

Table Notes:

1. Periods marked "-" above did not collect the noise levels for the entire period and therefore have been excluded.
2. Measured noise levels between 5:00am and 8:00am on the 20th December 2018 have been excessively affected by local activity and therefore have been removed.
3. Median result for the evening period (6:00pm-10:00pm) is 1dB(A) higher than the daytime (7:00am-6:00pm) result. In accordance with section 2.3 of the NSW EPA *Noise Policy for Industry (NPfI) 2017* this will be amended to match the measured median noise level during the daytime.

Table 3-4 – Unattended Noise Monitor – Logger Location 2 – Southeast Corner – L_{eq} Descriptor – NPfI Hours

Date	dB(A)$L_{eq(Period)}$ (1)		
	Day (7:00am-6:00pm)	**Evening (6:00pm-10:00pm)**	**Night (10:00pm-7:00am Next Day)**
Monday 17 December 2018	-	51	49
Tuesday 18 December 2018	53	51	50
Wednesday 19 December 2018	52	63	84
Thursday 20 December 2018	80	66	51
Friday 21 December 2018	54	51	55
Saturday 22 December 2018	55	52	51
Sunday 23 December 2018	50	50	49
Monday 24 December 2018	52	50	46
Tuesday 25 December 2018	51	50	47
Wednesday 26 December 2018	52	56	49
Thursday 27 December 2018	52	53	49
Friday 28 December 2018	51	51	-
Saturday 29 December 2018	-	-	-
Median	**55**	**54**	**52**

Table Notes:

1. Periods marked "-" above did not collect the noise levels for the entire period and therefore have been excluded.

3.2.4.2 Summarised Rating Background Noise Levels

Site investigations and unattended noise measurements indicate that the acoustic environment for the project site are as below.

Table 3-5 – Summarised Rating Background Noise Level and Equivalent L_{eq}

Location	Time of day	Rating Background Noise Level dB(A)$L_{90(Period)}$	Equivalent Measured L_{eq} Noise Level dB(A)$L_{eq(Period)}$
Location 1 Hume Highway Location (See Figure 1)	Day (7:00am-6:00pm)	52	66
	Evening (6:00pm-10:00pm)	53 (1)	67
	Night (10:00pm-7:00am)	46	64
Location 2 Southeast Corner (See Figure 1)	Day (7:00am-6:00pm)	44	55
	Evening (6:00pm-10:00pm)	45 (1)	54
	Night (10:00pm-7:00am)	41	52

Table Notes:

1. Amended as per section above.

4 EXTERNAL NOISE INTRUSION ASSESSMENT

Site investigation indicates that the major external noise sources around the project site is traffic noise from Hume Highway. Noise intrusion from these sources will be assessed in accordance with criteria nominated section 4.1 of this report. Noise levels at each façade will be determined as part of the analysis, noting that the residential façades of Buildings A & B (being the closest to the Hume Highway) are 10m from the boundary of the site and 13m from the nearest curb of the roadway.

4.1 NOISE INTRUSION CRITERIA

A traffic and surrounding noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria/standards;

- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'*;
- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'*;
- NSW Department of Planning and Environment's document – *'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007';*
- NSW Department of Planning and Environment's document – '*Developments near Rail Corridors or Busy Roads – Interim Guideline 2008';*
- Australian Standard AS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*; and
- Australian and New Zealand Standard AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*.

4.1.1 Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'*

Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'* does not contain any specific internal noise requirements. In the absence of any applicable criteria, the documents outlined below will be adopted.

4.1.2 Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'*

Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'* does not contain any specific internal noise requirements. In the absence of any applicable criteria, the documents outlined below will be adopted.

4.1.3 NSW Department of Planning and Environment's document – *'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007'*

Clause 102

(1) This clause applies to development for any of the following purposes that is on land in or adjacent to the 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 published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

(a) a building for residential use,
(b) a place of public worship,

(c) a hospital,
(d) an educational establishment or child care centre.

(3) If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

(a) in any bedroom in the building--35 dB(A) at any time between 10 pm and 7 am,

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

Based on Clause 102 item 1, we can confirm that the stretch of the Hume Highway in which the project site is adjacent to is a road carrying an annual average daily traffic volume of more than 40,000. Therefore, the project site will be assessed based on the requirements of Clause 102 item 3 above.

4.1.4 NSW Department of Planning and Environment's document – *'Developments near Rail Corridors or Busy Roads – Interim Guideline (2008)'*

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."*

4.1.5 Australian Standard AS/NZS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*

Australian Standard AS 3671-1989 notes the following in relation to traffic noise:

- Internal noise levels should be determined in accordance with AS/NZS 2107:2016 'Acoustics – Recommended design sound levels and reverberation times for building interiors'.
- A suitable descriptor should be adopted relevant to the use of the development. As AS2107:2016 adopts the L_{Aeq} descriptor, ALC shall also use this descriptor.
- AS3671 does not specifically recommend a time interval. On this basis, ALC have adopted the interval used by the EPA Road Noise Policy for main/arterial roads, that being:
  - Day – 7am to 10pm (15 hour); and
  - Night – 10pm to 7am (9 hour).
- ALC have applied the daytime interval to the living areas of the apartment and the night time interval to the bedrooms of the apartment.

Internal noise levels have been selected in accordance with AS 2107:2016, see below.

4.1.6 Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*

AS2107-2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1, in Section 5 of AS2107-2016, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads.

Table 4-1 – Recommended Design Sound Level

Space /Activity Type	Design Sound Level
Bedrooms	35-40dB(A)$L_{eq(10pm-7am)}$
Living Rooms	35-45dB(A)$L_{eq(7am – 10pm)}$
Bathrooms, Toilets, Laundries	45-55dB(A)$L_{eq(7am – 10pm)}$
Commercial	40-45dB(A)$L_{eq(when\ in\ use)}$ (Open Plan Office)
Hospitality	<50 dB(A)$L_{eq(when\ in\ use)}$

4.1.7 Summarised Internal Noise Criteria

Summarised internal noise criteria for each space is summarised below.

Table 4-2 – Summarised Internal Noise Criteria

Space /Activity Type	Internal Noise Requirement
Bedrooms	35dB(A)$L_{eq(10pm-7am)}$
Living Rooms	40dB(A)$L_{eq(7am – 10pm)}$
Bathrooms, Toilets, Laundries	45-55dB(A)$L_{eq(7am – 10pm)}$
Commercial	40-45dB(A)$L_{eq(when\ in\ use)}$ (Open Plan Office)
Hospitality	<50 dB(A)$L_{eq(when\ in\ use)}$

4.2 EXTERNAL NOISE MEASUREMENTS

This section of the report details noise measurements conducted at the site to establish traffic and surrounding environmental noise levels impacting the development.

4.2.1 Measurement Equipment

Attended short term measurements of traffic noise which were undertaken by this office, to supplement the unattended noise monitoring. Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

Unattended noise monitoring was conducting using two Acoustic Research Laboratories Pty Ltd noise loggers. The loggers were programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

4.2.2 Measurement Location

As discussed above, two monitors were installed onsite for the measurement of traffic noise and are detailed below.

Location 1 - An unattended noise monitor was installed within the existing Chinese restaurant back of house area along the southern façade of the building which is adjacent to the Hume Highway as identified in Figure 1 above.

Location 2 - An unattended noise monitor was installed behind the rear existing hotel building located in the south east corner of the site as identified in Figure 1 above.

An attended traffic noise measurement was undertaken the Hume Highway located along the western boundary of site. See Figure 1 for a detailed measurement location. Noise measurement location had a 180° view of the road and was conducted at a distance of 3m from the kerb.

4.2.3 Measurement Period

Unattended noise monitoring was conducted from Monday 17th December 2018 to Wednesday 9th January 2019 (Location 1) and Saturday 29th December 2018 (Location 2).

In accordance with the NSW EPA NPfI, unattended noise monitoring was carried out prior to the Christmas/New Year break which begun on the 24th December. Seven days of valid data was collected prior to this period. Additional data has been collected after the 24th as Acoustic Logic Consultancy was closed for the year and the monitors were collected in the new year.

Attended noise measurements were undertaken between the hours of 4:30pm and 5:30pm on Monday 17th December 2018.

4.2.4 Measured Traffic Noise Measurements

Attended and unattended noise measurements have been summarised below for all locations.

4.2.4.1 Unattended Noise Monitoring

Results of the unattended noise monitoring conducted at site has been summarised below in Table 4-3 and Table 4-4. Further detailed results can be found in Appendix A and B respectively of this report.

Table 4-3 – Unattended Noise Monitor – Logger Location 1 – Western Boundary – Traffic Noise Measurements

Date	Measured Traffic Noise Level dB(A)$L_{eq(Period)}$ [1]	
	Day (7:00am-10:00pm)	Night (10:00pm-7:00am)
Monday 17 December 2018	-	65
Tuesday 18 December 2018	67	65
Wednesday 19 December 2018	68	66
Thursday 20 December 2018	71	65
Friday 21 December 2018	67	65
Saturday 22 December 2018	66	64
Sunday 23 December 2018	65	65
Monday 24 December 2018	66	61
Tuesday 25 December 2018	64	61
Wednesday 26 December 2018	64	64
Thursday 27 December 2018	66	64
Friday 28 December 2018	65	63
Saturday 29 December 2018	64	62
Sunday 30 December 2018	64	63
Monday 31 December 2018	66	64
Tuesday 1 January 2019	63	64
Wednesday 2 January 2019	66	64
Thursday 3 January 2019	67	64
Friday 4 January 2019	66	63
Saturday 5 January 2019	68	65
Sunday 6 January 2019	66	65
Monday 7 January 2019	67	65
Tuesday 8 January 2019	66	66
Wednesday 9 January 2019	-	-
Logarithmic Average	**66**	**64**

Table Notes:

1. Periods marked "-" above did not collect the noise levels for the entire period and therefore have been excluded.

Table 4-4 – Unattended Noise Monitor – Logger Location 2 – Southeast Corner – Traffic Noise Measurements

Date	Measured Traffic Noise Level dB(A)$L_{eq(Period)}$ [1]	
	Day (7:00am-10:00pm)	**Night (10:00pm-7:00am)**
Monday 17 December 2018	-	49
Tuesday 18 December 2018	53	50
Wednesday 19 December 2018	58	84 [2] (not included)
Thursday 20 December 2018	78 [2] (not included)	51
Friday 21 December 2018	54	55
Saturday 22 December 2018	54	51
Sunday 23 December 2018	50	49
Monday 24 December 2018	52	46
Tuesday 25 December 2018	50	47
Wednesday 26 December 2018	54	49
Thursday 27 December 2018	53	49
Friday 28 December 2018	51	-
Saturday 29 December 2018	-	-
Logarithmic Average	**53**	**49**

Table Notes:

1. Periods marked "-" above did not collect the noise levels for the entire period and therefore have been excluded.
2. Measured noise levels between 5:00am and 8:00am on the 20th December 2018 have been excessively affected by local activity and therefore have been removed.

4.2.4.2 Attended Traffic Noise Measurements

Results of the attended noise measurements which were conducted around the project site have been summarised below for each of the measurement locations.

Table 4-5 – Attended Noise Measurements

Location	Time of Measurement	Measured Noise Level $dB(A)L_{eq(1\text{-}hour)}$
Hume Highway (See Figure 1) 3m from kerb 180° view of the road	4:30pm and 5:30pm Monday 17th December 2018	73

4.2.4.3 Summarised External Noise Levels

The existing traffic noise levels listed in the table below were determined based on the unattended noise monitoring and attended noise measurements presented above. Buildings A & B of the development contain residential development closest to the Hume Highway. Apartments are located above the ground floor commercial uses, and are setback 10m from the site boundary and 13m from the nearest curb of the Hume Highway. Indicative façade noise levels for Buildings A & B are presented in Figure 2.

Table 4-6 – Measured Existing Traffic Nosie Levels

Location	Summary of Measured Existing Traffic Noise Level	
	Daytime (7:00am-10:00pm) $dB(A)L_{eq(7:00am\text{-}10:00pm)}$	Night time (10:00pm-7:00am) $dB(A)L_{eq(10:00pm\text{-}7:00am)}$
Hume Highway 3m from kerb	73	71
Southeast Corner of the Site	53	49

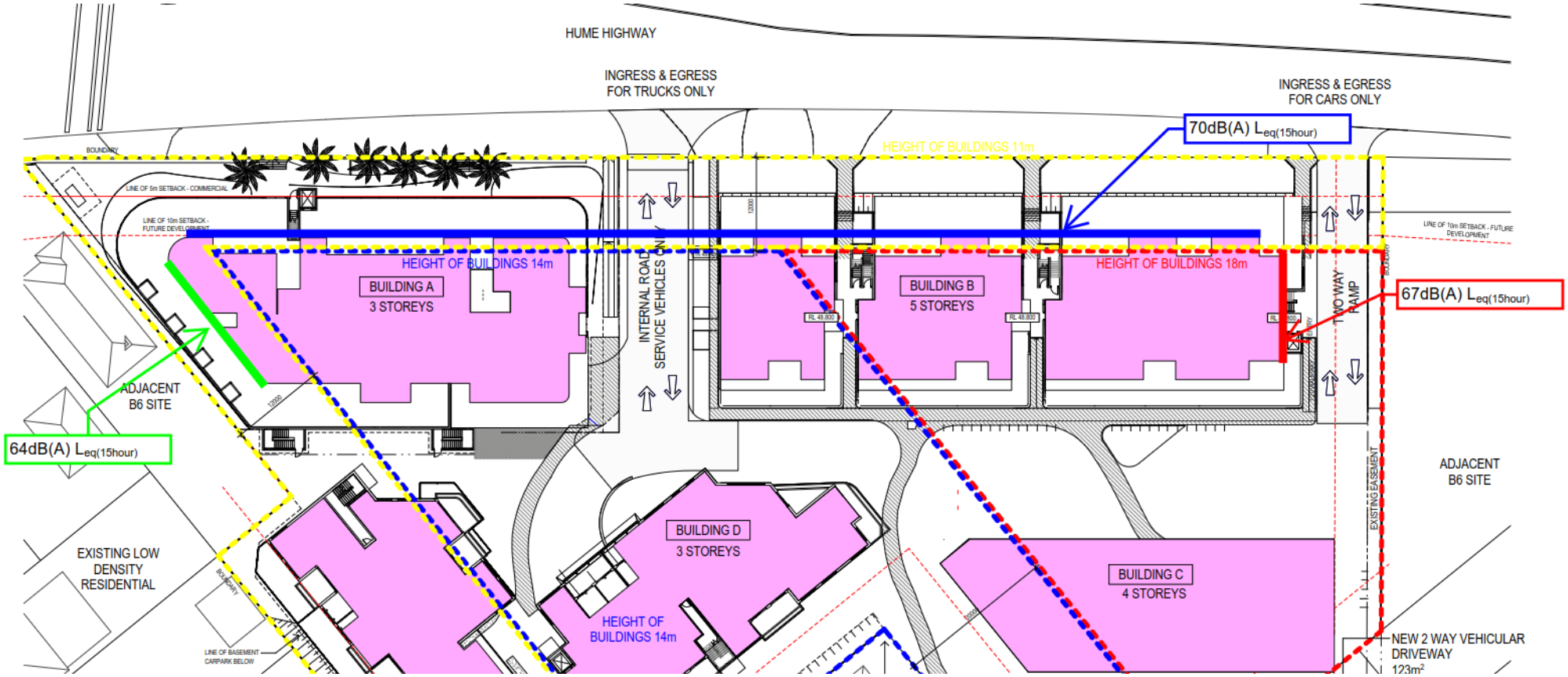


Figure 2 – Façade Noise Levels for Traffic Exposed Elements of Buildings A & B

4.3 NOISE INTRUSION ANALYSIS

Traffic and environmental noise intrusion into the proposed development was assessed using the measured noise levels presented in section 4.2 above.

Calculations were undertaken taking into account the orientation of windows, barrier effects *(where applicable)*, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

4.3.1 Recommended Constructions

4.3.1.1 Glazed Windows and Doors

The following constructions are recommended to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. (**Mohair Seals are unacceptable**).

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

The recommended constructions are listed in the table below.

Table 4-7 – Recommended Indicative Glazing Construction

Building	Façade	Level	Space	Recommended Construction	Acoustic Seals
Building A and B (Along Hume Highway)	Northern and Southern	All	Bedrooms	12.38mm Laminate	Yes
			Living Rooms	12.38mm Laminate	
			Bathrooms, Toilets, Laundries	5mm Float	
			Commercial	10.38mm Laminate	
			Hospitality	10.38mm Laminate	
	Eastern (Facing Building C and D	All	Bedrooms	6.38mm Laminate	
			Living Rooms	6..38mm Laminate	
			Bathrooms, Toilets, Laundries	4mm Float	
			Commercial	4mm Float (1)	
			Hospitality	4mm Float (1)	
	Western (Facing Hume Highway	All	Bedrooms	10.38mm Laminate / 100mm Airgap / 6mm Float	
			Living Rooms	10.38mm Laminate / 100mm Airgap / 6mm Float	
			Bathrooms, Toilets, Laundries	6.38mm Laminate	
			Commercial	12.38mm Laminate	
			Hospitality	12.38mm Laminate	

Table Notes:

1. Recommended glazing construction above is for the purpose of traffic noise intrusion only, an increased construction may be required for noise emissions control.

Table 4-7 – Recommended Indicative Glazing Construction

Building	Façade	Level	Space	Recommended Construction	Acoustic Seals
Building C and D	North-East	All	Bedrooms	6mm Float	Yes
			Living Rooms	6mm Float	
			Bathrooms, Toilets, Laundries	4mm Float	
	South East	All	Bedrooms	6mm Float	
			Living Rooms	6mm Float	
			Bathrooms, Toilets, Laundries	4mm Float	
	Western (towards Building A and B)	All	Bedrooms	6.38mm Laminate	
			Living Rooms	6..38mm Laminate	
			Bathrooms, Toilets, Laundries	4mm Float	

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

In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in Table 4-8 for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

Table 4-8 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
4mm Float	27
5mm Float	28
6mm Float	29
6.38mm Laminate	31
10.38mm Laminate	35
12.38mm Laminate	37
10.38mm Laminate / 100mm Airgap / 6mm Float	44

4.3.1.2 External Roof/Ceiling Construction

External roof construction will be constructed from concrete elements. For external roof systems which are constructed with concrete no further acoustic upgrading is required. In the event that any penetrations are required thru the external skin, an acoustic sealant should be used to minimise all gaps.

4.3.1.3 External Wall Construction

External wall construction will be constructed from a combination of concrete and light weight elements. For external wall systems which are constructed with concrete no further acoustic upgrading. In the event that any penetrations are required thru the external skin, an acoustic sealant should be used to minimise all gaps.

For external wall constructions which are constructed from lightweight materials the following construction is recommended.

Table 4-9 – Recommended Indicative External Light Weight Wall Construction

Building	Space	Internal Lining	Studwork System	External Lining
Building A & B (Specifically along the Hume Highway)	Bedroom	2 x 13mm Plasterboard	150mm Metal Studwork with 75mm thick 11kg/m^3 glasswool insulation in cavity	2 x 9mm Fibre Cement Sheeting + Cladding as per Architects Detail
	Living Space			
	Bathroom, Ensuite and Laundry	1 x 13mm Plasterboard **OR** 1 x 9mm Fibre Cement Sheeting		
	Commercial			
	Hospitality			
All other areas in conjunction with above.	Bedroom	2 x 13mm Plasterboard		
	Living Space			
	Bathroom, Ensuite and Laundry	1 x 13mm Plasterboard **OR** 1 x 9mm Fibre Cement Sheeting		
	Commercial			
	Hospitality			

4.3.2 Entry Doors

Entry doors will be via internal corridors and as such, constructions will be formulated pursuant to the Building Code of Australia.

4.3.3 Mechanical Ventilation

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 (i.e. – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

In principle, all habitable spaces which face the Hume Highway or have a direct line of sight will require to have their windows closed to meet acoustic requirements. A mechanical engineer is to confirm if supplementary ventilation will be required to these rooms, and it is recommended that the detailed design of ventilation to each apartment be undertaken during the detailed design phase of the project once apartment layouts/orientation is finalised.

Where it is not possible for apartment ventilation to be drawn from windows/doors open to a minimum of 5% of floor area within recommended noise levels, the following options may be considered to achieve acoustic requirements for the site:

- Outside air fans or air conditioning to provide ventilation to the space. Acoustic design considerations would need to include:
  - Acoustically treated façade penetrations (where required)
  - Fan noise level and location, to ensure that a reasonable level of acoustic amenity is maintained. If required, acoustic treatment may need to be provided (internally lined ductwork, attenuators etc.) to achieve appropriate internal noise levels and compliance with Council noise emission requirements.
- Internally lined plenums – acoustically treated plenums connected to the façade can provide outside ventilation to habitable rooms. Where this strategy is implemented, the following would need to be considered:
  - Required opening to façade to achieve ventilation requirements (subject to ventilation consultant requirements);
  - Length and sizing of rigid ductwork;
  - Weatherproofing and operability.
- Operable proprietary trickle vents.
- Borrowed ventilation through less noise exposed facades.

Where an alternative ventilation path is implemented (i.e. plenums/trickle vent/borrowed ventilation or other method which incorporates opening within the façade), the required internal noise level is equivalent to 'windows/doors open', or 45dB(A) $L_{eq(9hr)}$ for bedrooms and 50dB(A) $L_{eq(15hr)}$ for living rooms.

5 NOISE EMISSION ASSESSMENT

A noise emission assessment has been carried out to ensure noise emitted from the use of the site is in accordance with the requirements listed below.

5.1 NOISE EMISSION CRITERIA

Noise emissions from the operation of the site have been assessed in accordance with the following documents:

- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'*;
- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'*
- NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'*; and
- NSW Environmental Protection Authority (EPA) document – *'Road Noise Policy (RNP) 2011'*.

5.1.1 Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'*

Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'* does not contain any specific noise emission requirements. In the absence of any applicable criteria, the documents outlined below will be adopted.

5.1.2 Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'*

Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'* does not contain any specific noise emission requirements. In the absence of any applicable criteria, the documents outlined below will be adopted.

5.1.3 NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI)'*

The NPfI 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.

5.1.3.1 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).

Table 5-1 – NPfI Intrusiveness Criteria

Receiver	Time of day	Background Noise Level dB(A)$L_{90(Period)}$ [1]	Intrusiveness Criteria (Background + 5dB(A)$L_{eq(15\text{-}minutes)}$)
Residential Receiver 2, 3, 4, 5 and 6 [1]	Day (7:00am-6:00pm)	44	49
	Evening (6:00pm-10:00pm)	44	49
	Night (10:00pm-7:00am)	42	47
Residential Receiver 7 [2]	Day (7:00am-6:00pm)	52	57
	Evening (6:00pm-10:00pm)	52	57
	Night (10:00pm-7:00am)	44	49

Table Notes:

1. Background noise levels for this receiver(s) presented above have been adopted from unattended noise monitor location 2 which was located in the rear of the site as outlined in section 3.2.4.2 of this report.
2. Background noise levels for this receiver presented above have been adopted from unattended noise monitor location 1 which was located in the rear of the site as outlined in section 3.2.4.2 of this report.

5.1.3.2 Amenity Criterion

Project amenity criteria are determined based on the land use in the area (residential/commercial/industrial). The residential land use is then further categorised into rural, sub-urban, urban areas and areas highly traffic affected.

For determining the project amenity noise level for each receiver, we have assumed the following categories:

- Receiver 1 - (Commercial) – Suburban classification.
- Receiver 2 – (Residential) – Suburban classification.
- Receiver 3 – (Residential) – Suburban classification.
- Receiver 4 - (Residential) – Suburban classification.
- Receiver 5 – (Residential) – Suburban classification.
- Receiver 6 – (Residential) – Suburban classification.
- Receiver 7 – (Residential) – Highly traffic noise affected.
- Receiver 8 – (Commercial) – Commercial.
- Receiver 9 – (Industrial) – Industrial.

Based on the above, project amenity noise levels applicable to each receiver are outlined below.

Table 4 - NPfI Project Amenity Criteria

Noise Receiver	Receiver Number (See Figure 1)	Amenity Noise Level – dB(A)$L_{eq(15\text{-}minutes)}$		
		Day (7:00am-6:00pm)	Evening (6:00pm-10:00pm)	Night (10:00pm-7:00am Next Day)
Suburban	Receiver 2, 3, 4, 5 and 6	53	43	38
Highly Traffic Noise Affected	Receiver 7	51 (Table 3-2 – 15dB(A)$L_{eq(Period)}$)	52 (Table 3-2 – 15dB(A)$L_{eq(Period)}$)	49 (Table 3-2 – 15dB(A)$L_{eq(Period)}$)
Commercial	Receiver 8	65		
Industrial	Receiver 9	70		

5.1.4 Summarised Noise Emission Criteria

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

Table 5-2 – Summary of Noise Emission Criteria

Receiver	Time of day	Background Noise Level dB(A)$L_{90(Period)}$	Project Amenity Criteria dB(A)$L_{eq(15mins)}$	Intrusiveness Criteria (Background + 5dB(A)$L_{eq(15mins)}$)
Receiver 2, 3, 4, 5 and 6 Receiver 2, 3, 4, 5 and 6	Day (7:00am-6:00pm)	44	53	49
	Evening (6:00pm-10:00pm	44	43	49
	Night (10:00pm-7:00am)	42	38	47
Receiver 7	Day (7:00am-6:00pm)	52	51	57
	Evening (6:00pm-10:00pm	52	52	57
	Night (10:00pm-7:00am)	44	49	49
Commercial	When in Use	N/A	65	N/A
Industrial	When in Use	N/A	70	N/A

5.2 MECHANICAL PLANT NOISE

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services plant to the closest residential receiver should comply with the noise emission criteria in section 5.1 of this report.

5.3 OPERATION OF LOADING DOCK

Loading dock activities associated with the hospitality/pub located within Building A are to be undertaken in the eastern corner on ground level. Details regarding the operation of the hospitality/pub facility are not known at this stage and therefore a detailed assessment cannot be undertaken at this stage. It is recommended once detail information is known (i.e. number of deliveries, size of trucks, length of deliveries etc.) a detailed assessment is undertaken. However, in principle to ensure acoustic amenity is maintained within the development we would recommend the following:

- Deliveries occur only between 7:00am and 8:00pm, with trucks not permitted to enter the site prior to 7:00am.
- No more than one (1) delivery occurs within a single 15-minute interval.
- Unloading activities are only undertaken within the loading dock.

5.4 GARBAGE COLLECTION

Similar to above, detailed information regarding garbage collection are not known at this stage and an assessment cannot be undertaken. However, we would recommend the following:

- Garbage collection only to occur between 7:00am and 8:00pm, with trucks not permitted to enter the site prior to 7:00am.
- No more than one (1) garbage collection to occur within a single 15-minute interval.

5.5 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS

The NSW EPA *Road Noise Policy* provides a target noise abatement levels for existing roads not subject to redevelopment, in which should be adopted in the assessment of additional noise associated with traffic increase. The noise abatement levels are set out in table 8 of the policy and are provided below.

Table 3 – NSW EPA *Road Noise Policy – Target noise abatement levels (Table 8, page 30)*

Existing road category	Target noise level – dB(A)	
	Day (7 a.m.-10 p.m.)	Night (10 p.m.- 7 a.m.)
Freeway/arterial/sub-arterial road	$L_{Aeq, (1\ hour)}$ 60 (External)	$L_{Aeq, (1\ hour)}$ 55 (External)
Local road	$L_{Aeq, (1\ hour)}$ 55 (External)	$L_{Aeq, (1\ hour)}$ 50 (External)

Traffic associated with the proposal is proposed to access the site via Hume Highway which is defined as an arterial road.

However, unattended noise measurements which have been undertaken onsite along the Hume Highway already exceed the target noise levels outlined above (refer to section 4.2.4.3). In this instance, the NSW EPA *RNP* states that in the event existing noise levels exceed these target levels a new objective should be adopted. This objective is existing measured noise levels (i.e. measured noise levels onsite: 73dB(A)$L_{eq(7:00am-10:00pm)}$ and 71dB(A)$L_{eq(10:00pm-7:00am)}$) + 2dB(A)$L_{eq(1hour)}$.

Predicted noise levels from the additional traffic generation by the site does not exceed the target levels (i.e. onsite measured noise levels + 2dB(A))., compliance is achieved.

5.6 INTERNAL TRANSMISSION BETWEEN HOSPITALITY AREAS AND RESIDENTIAL AREAS

Based on the current design, residential apartments are located directly above the double storey hospitality/pub first floor within Building A. To ensure airborne and structure borne noise does not transmit to the residential apartments located above we recommended the following constructions are incorporated into the building:

- Floor/ceiling construction between the hospitality/pub areas and the residential apartments above should be constructed from a minimum 250mm thick reinforced concrete. An isolated suspended ceiling is to be installed in the hospitality/pub below, this ceiling should be constructed from 2 x 16mm fire rated plasterboard. Isolated ceiling hangers are to be installed similar to Embelton DWCH ceiling hangers. The ceiling cavity between the plasterboard and the concrete is to be a minimum of 300mm airgap with 75mm thick 11kg/m^3 is to inserted into the ceiling cavity for the entire footprint of the ceiling.
- All penetrations through the plasterboard ceiling for building services shall be acoustically treated to ensure the overall performance is downgraded due to a penetration.
- All columns are to be lined with a 13mm plasterboard installed on an isolated furring channel to prevent impact noise from knocking or bumping.

5.7 DISCUSSION OF BUILDING SETBACK REQUIREMENTS

Buildings A and B are located along the Hume Highway and will be subject to noise levels exceeding 65dB(A) at all times along the western façade across all levels, including at residences which include a setback of 10m from the boundary and 13m from the nearest curb of the Hume Highway. With regards to the noise impacts from the operation of the hospitality/pub impacting the façade of residential apartments located directly above, this will be negligible in comparison to traffic noise from the adjacent roadway.

As outlined section 4.3.1.1 of this report the western façade of residential apartments located along the Hume Highway are required to have a façade with minimum acoustic performance of R_w 44 (indicatively a 100mm airgap system), which provides a noise reduction of 35-37dB(A). In addition it has been recommended that the licensed premised have a minimum façade construction of R_w 37 (indicatively 12.38mm glazing), which will be providing a 25-30dB(A) noise reduction.

A combination of these two noise reductions for both facades (hospitality/pub and the residential apartments) will therefore reduce noise levels from the operation of the hospitality/pub to the façade of the residential apartments above to adequate levels. Internal transmission between the two floors are discussed above (section 5.6).

With regard to noise separation between the proposed hospitality venue and residential apartments, it is not required to provide a further residential setback other than currently proposed, being 10m from the boundary and 13m from the nearest curb of the Hume Highway.

6 SUMMARY OF RECOMMENDATIONS

We recommend the following acoustic treatments/management controls are implemented to mitigate acoustic impact as much as practicable:

- Façade design for all residential components of the development is to be reviewed as part of the detailed design stage of the project. Preliminary recommendations of likely façade treatments have been provided in Section 4.3.1.
- Detailed acoustic review of all external plant items should be undertaken following equipment selection and duct layout design. All plant items will be capable of meeting noise emission requirements of Council and the EPA Noise Policy for Industry (2017), with detailed design to be done at CC stage.
- For the loading dock: (except where subject to a supplementary acoustic assessment detailing the proposed use)
    - Deliveries occur only between 7:00am and 8:00pm, with trucks not permitted to enter the site prior to 7:00am.
    - No more than one (1) delivery occurs within a single 15-minute interval.
    - Unloading activities are only undertaken within the loading dock.
- Waste removal times should be scheduled between 7:30am and 8pm, with garbage collection to be scheduled such that only one collection occurs during a given 15 minute period.

7 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed mixed-use development to be located at The Palms, 167 Hume Highway, Greenacre.

Based on the information and recommendations outlined above we conclude that the proposal capable of achieving the acoustic requirements in the following documents:

- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Local Environmental Plan (LEP) 2015'*;
- Canterbury Bankstown Council document (Formerly Bankstown City Council) – *'Bankstown Council Development Control Plan (DCP) 2015'*;
- NSW Department of Planning and Environment's document – *'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007';*
- NSW Department of Planning and Environment's document – '*Developments near Rail Corridors or Busy Roads – Interim Guideline 2008';*
- Australian Standard AS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*;
- Australian and New Zealand Standard AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*;
- NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'*; and
- NSW Environmental Protection Authority (EPA) document – *'Road Noise Policy (RNP) 2011'*.

Recommendations have been made in Section 4.3.1 to ensure that internal noise levels within the proposed development achieve statutory requirements. Noise emissions goals for future mechanical plant have been established with reference to the NSW EPA *Noise Policy for Industry*. It is recommended that any proposed mechanical plant be assessed with reference to the established noise goals during the detailed design phase of the project.

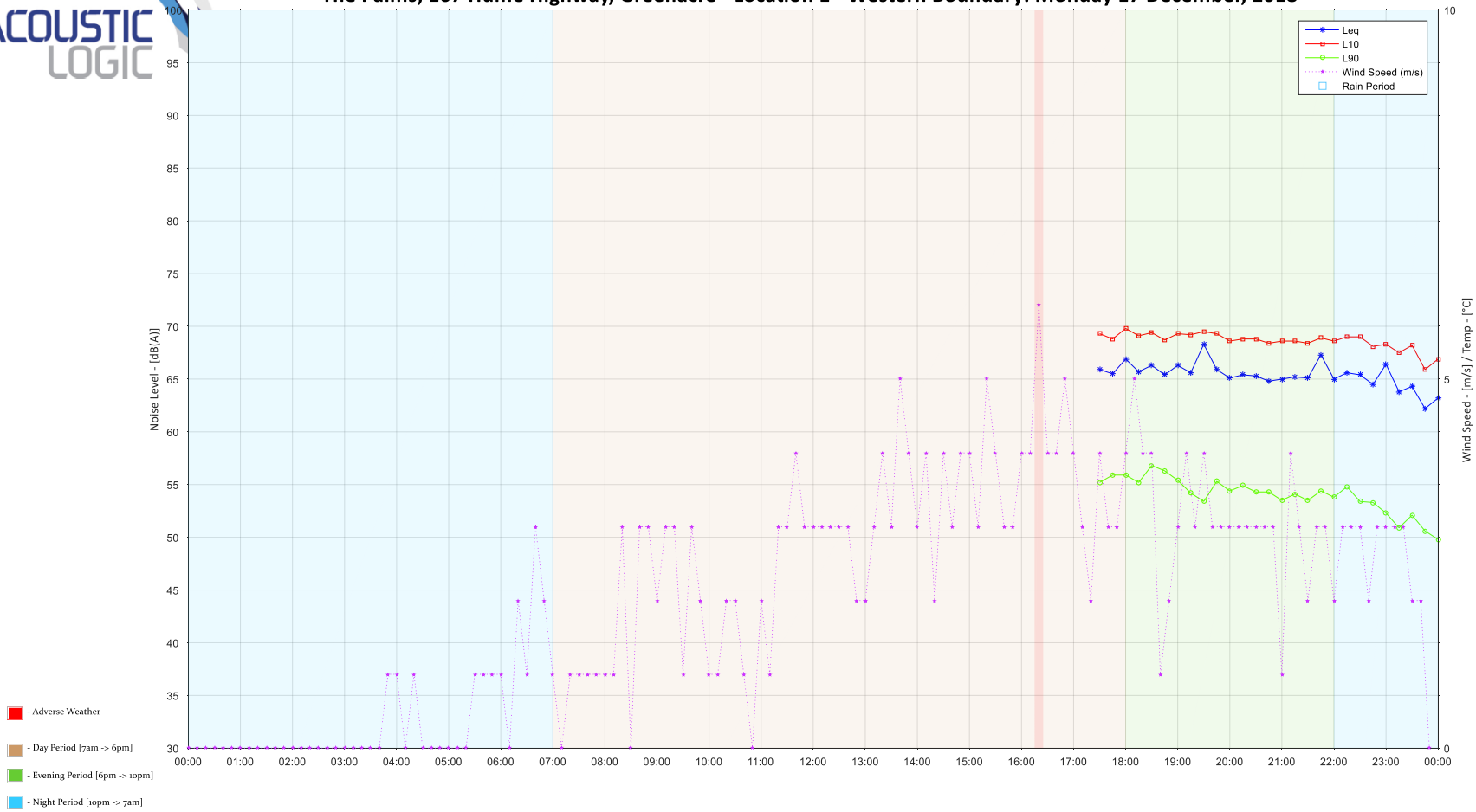
Any potential noise impacts from the specific use of retail/commercial development (i.e. ground floor of Buildings A & B) should be considered as part of any future planning approval.

Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Alex Washer

APPENDIX A – NOISE MONITORING LOCATION 1 - HUME HIGHWAY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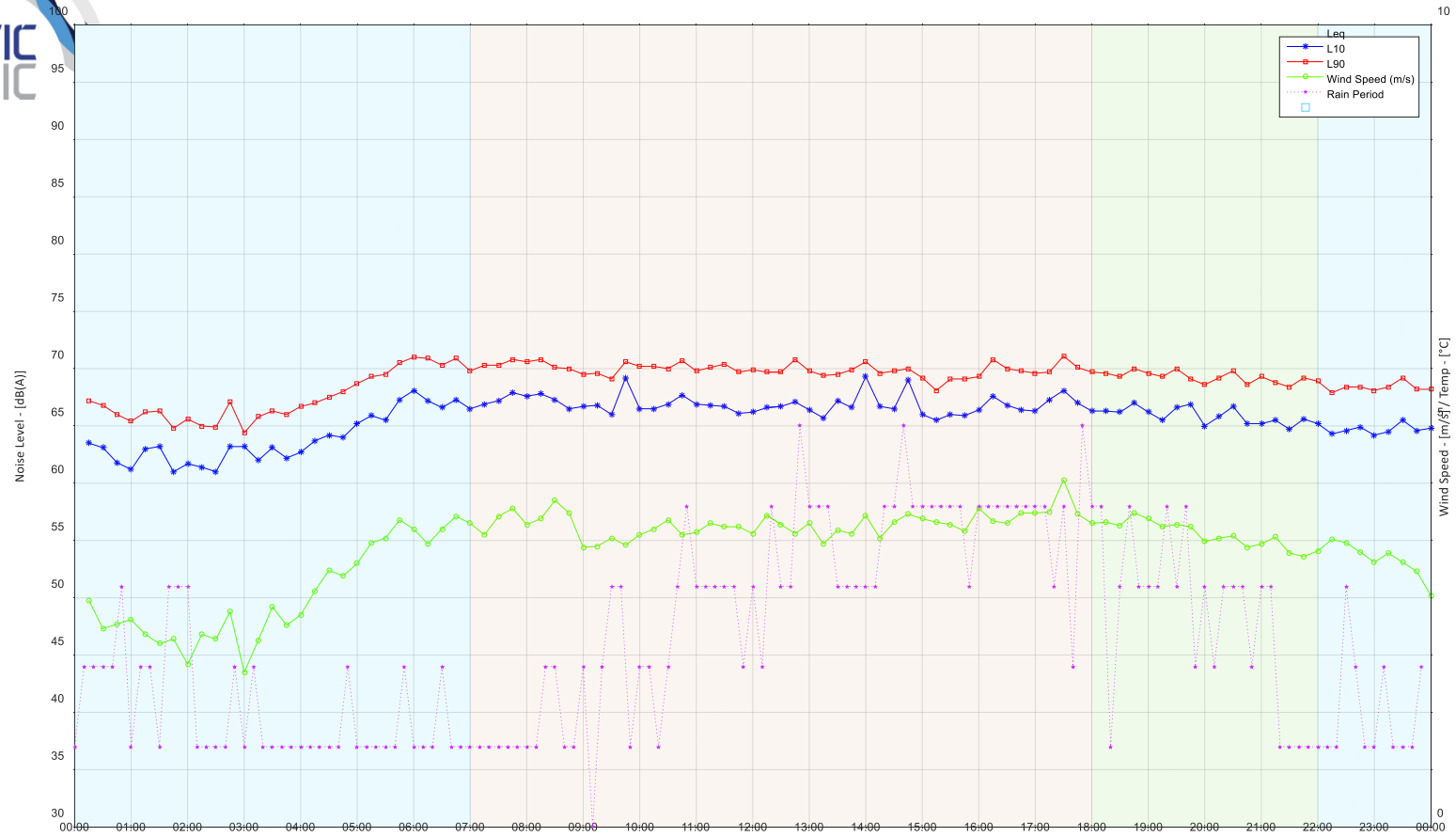
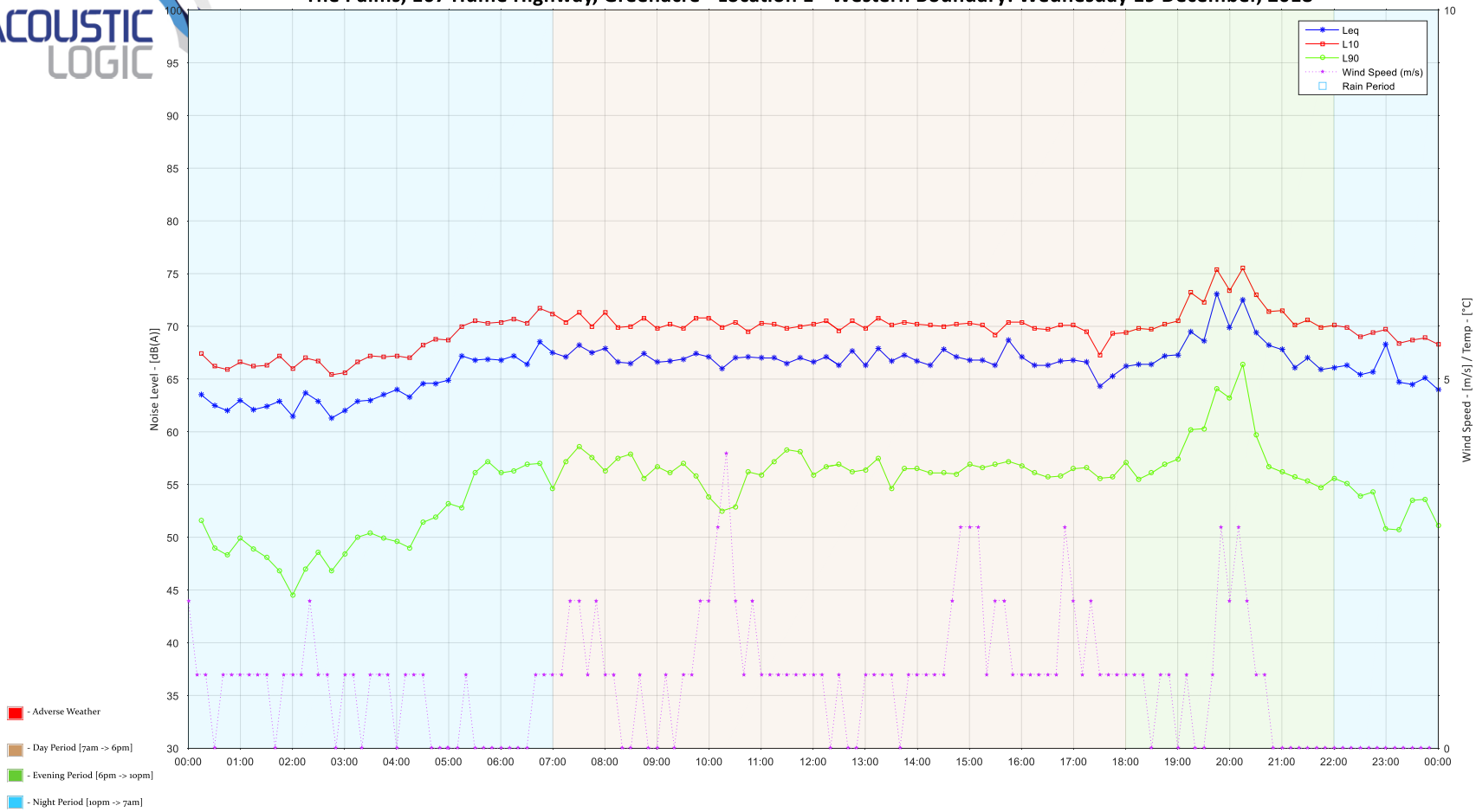
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Tuesday 18 December, 2018

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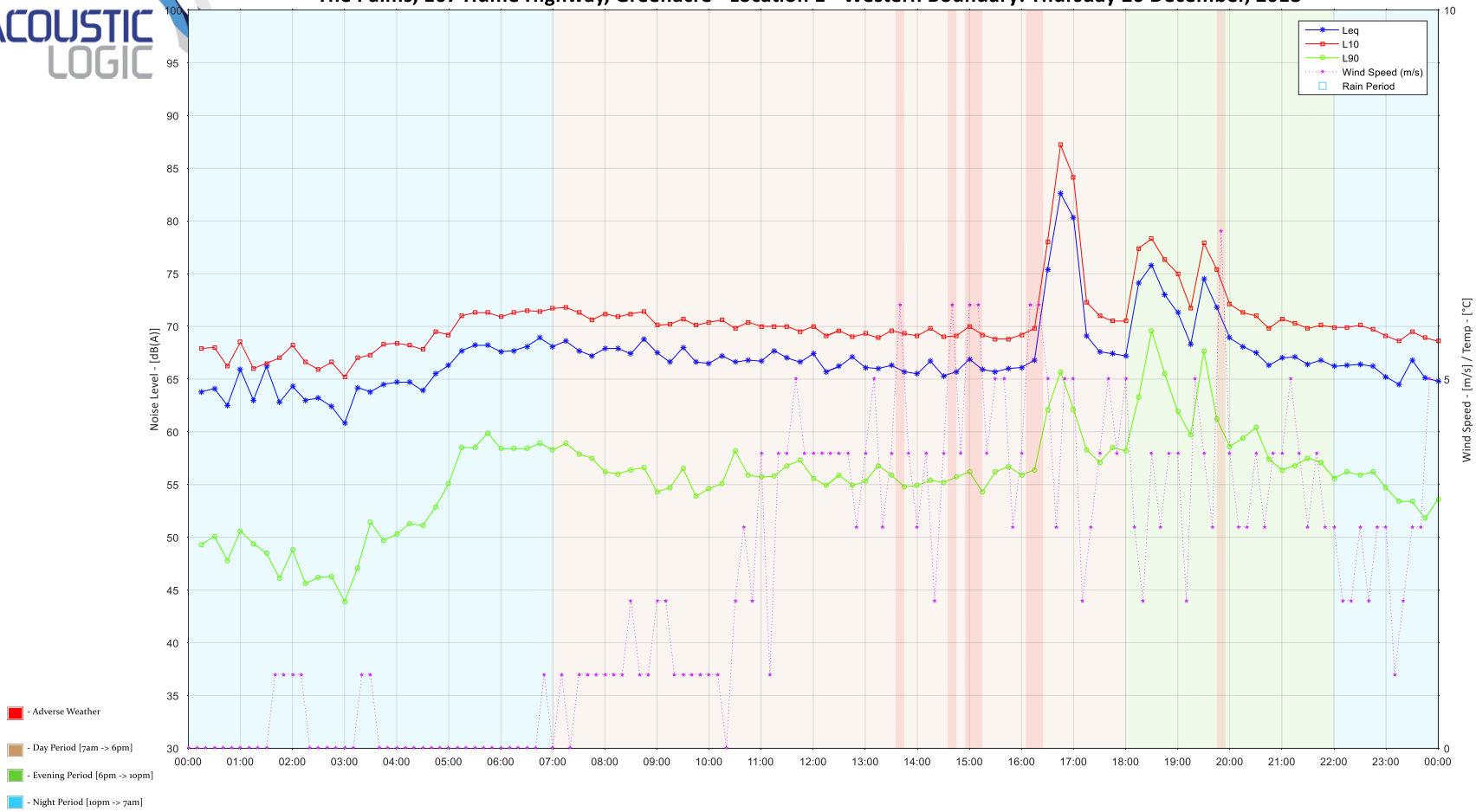
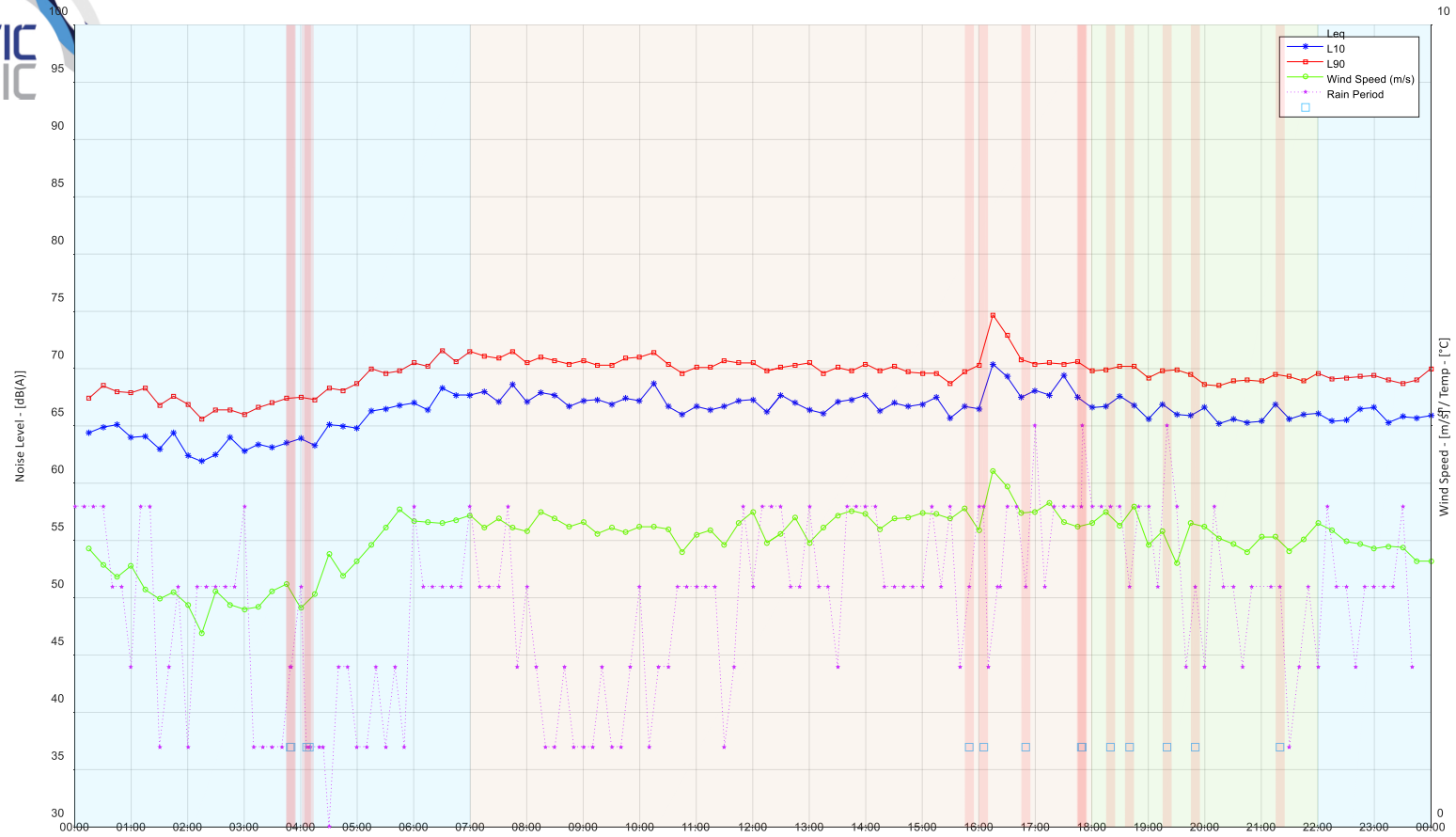
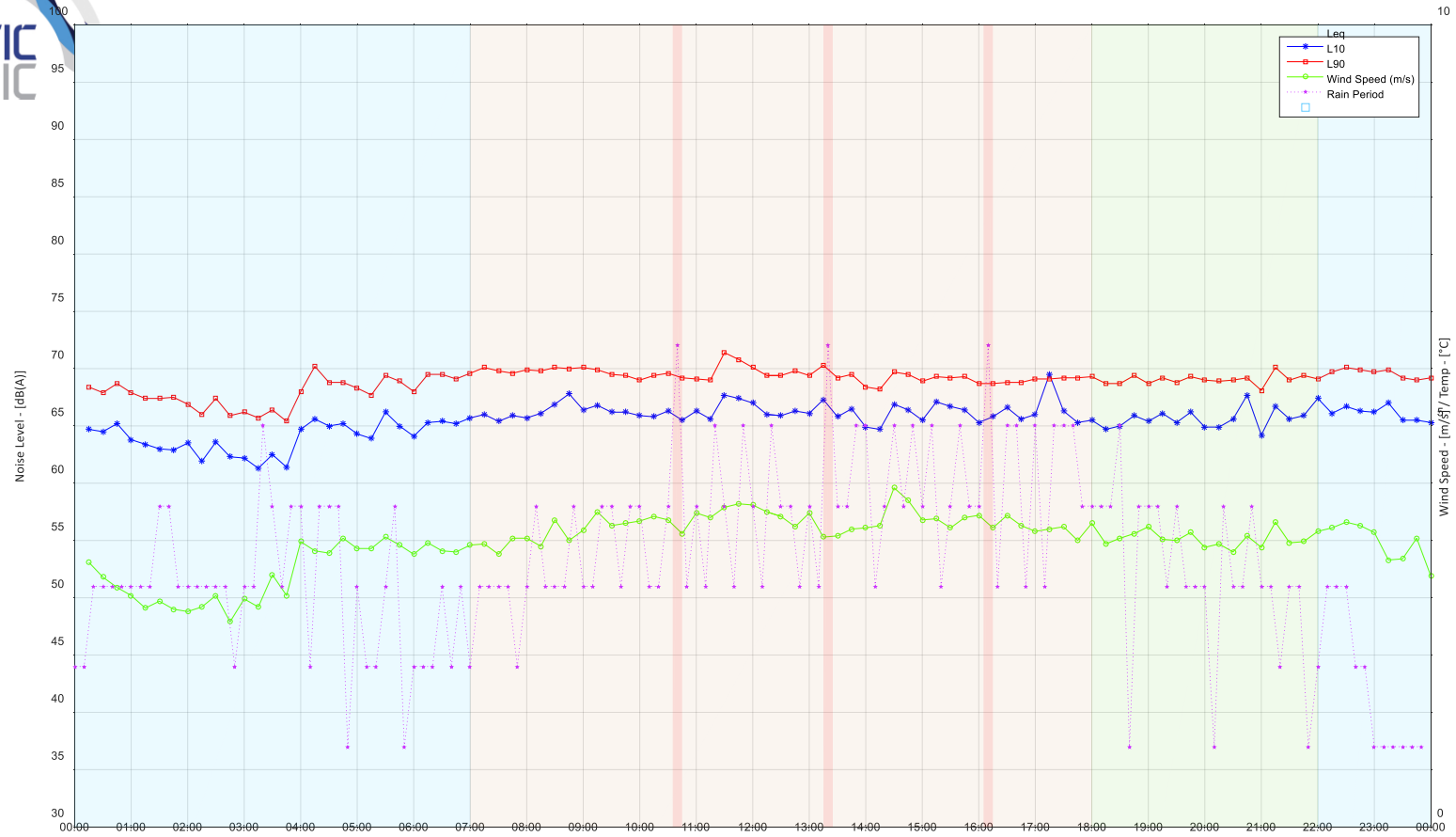
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Thursday 20 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Friday 21 December, 2018



The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Saturday 22 December, 2018



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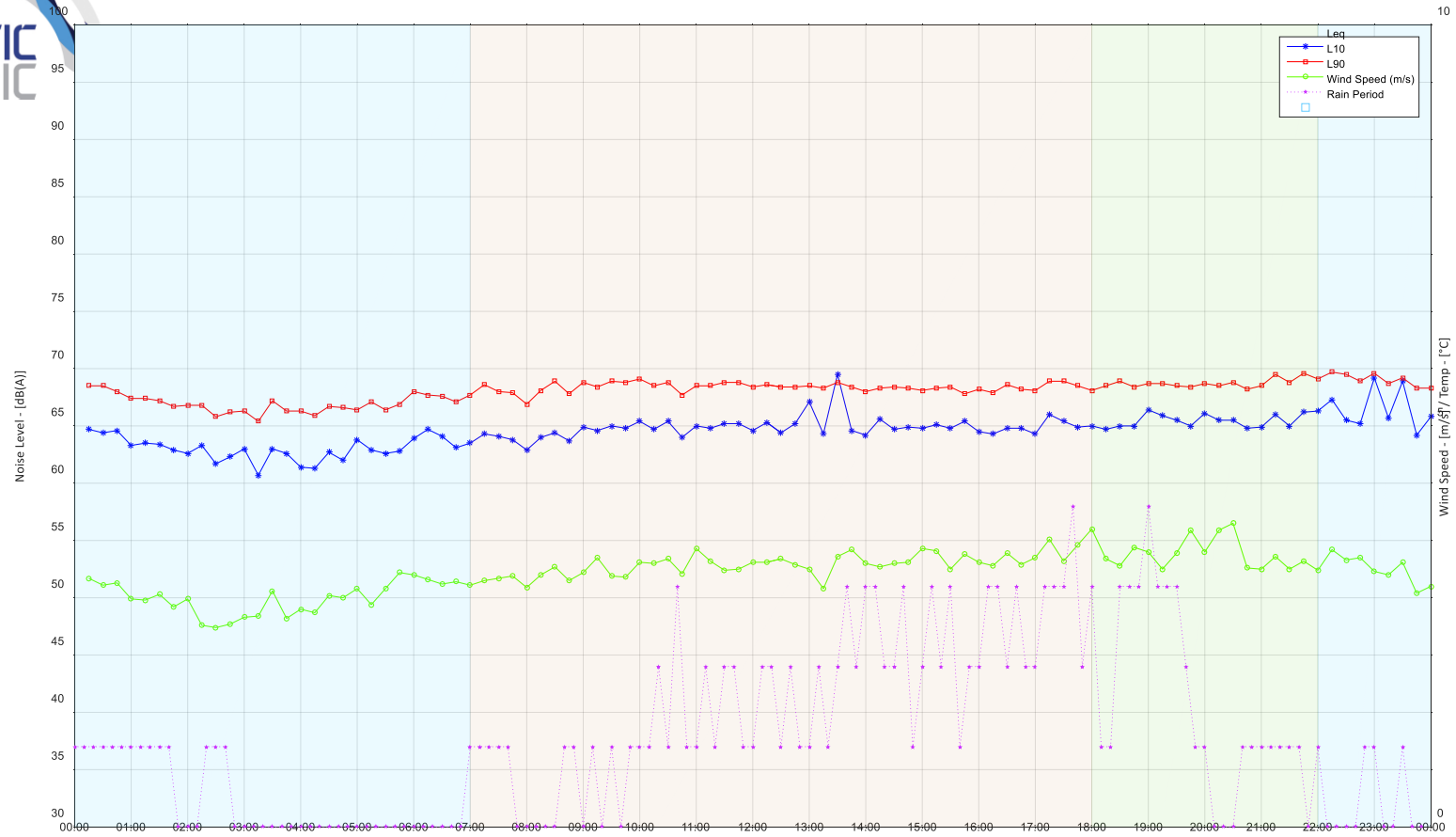

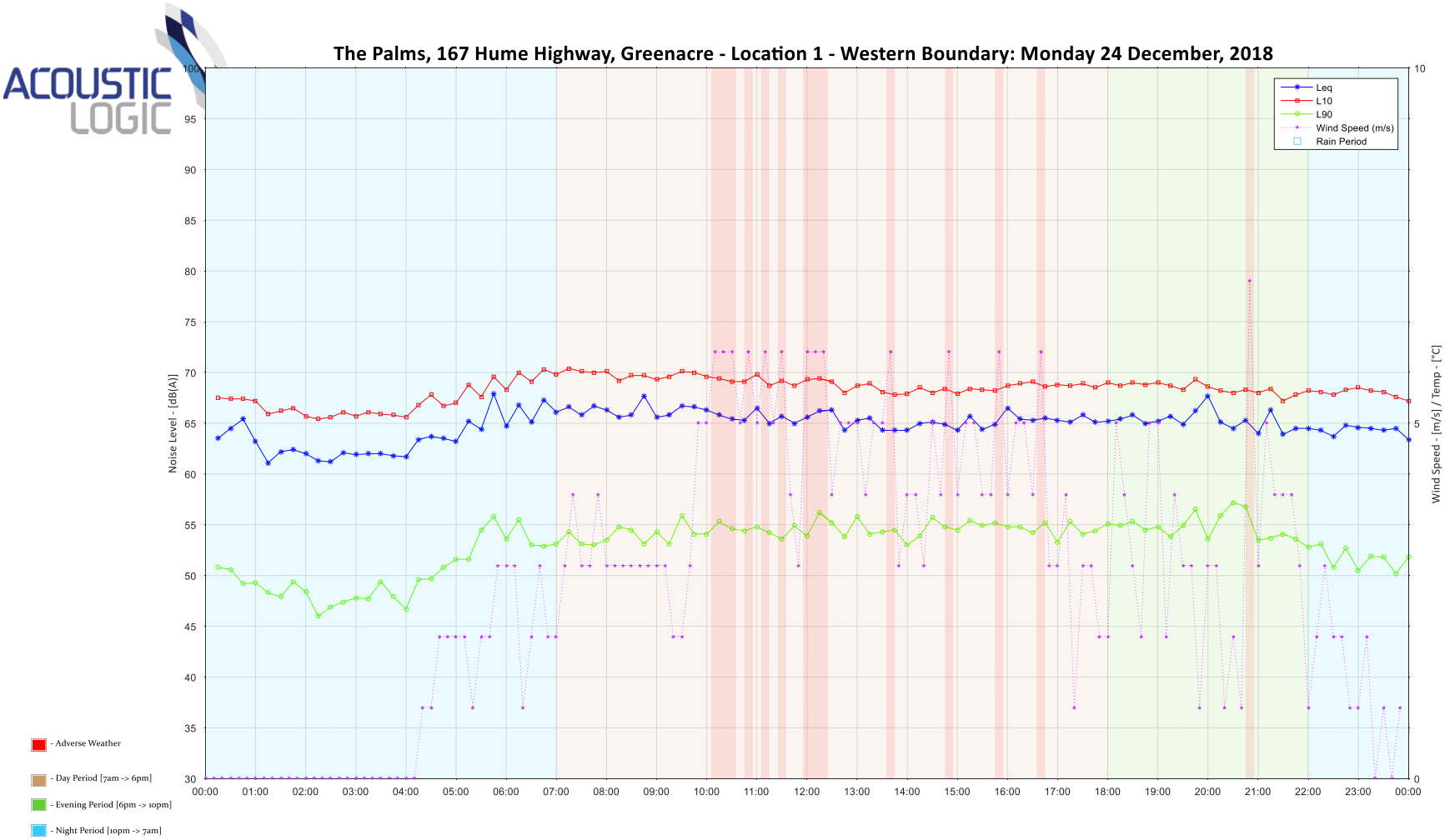
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Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

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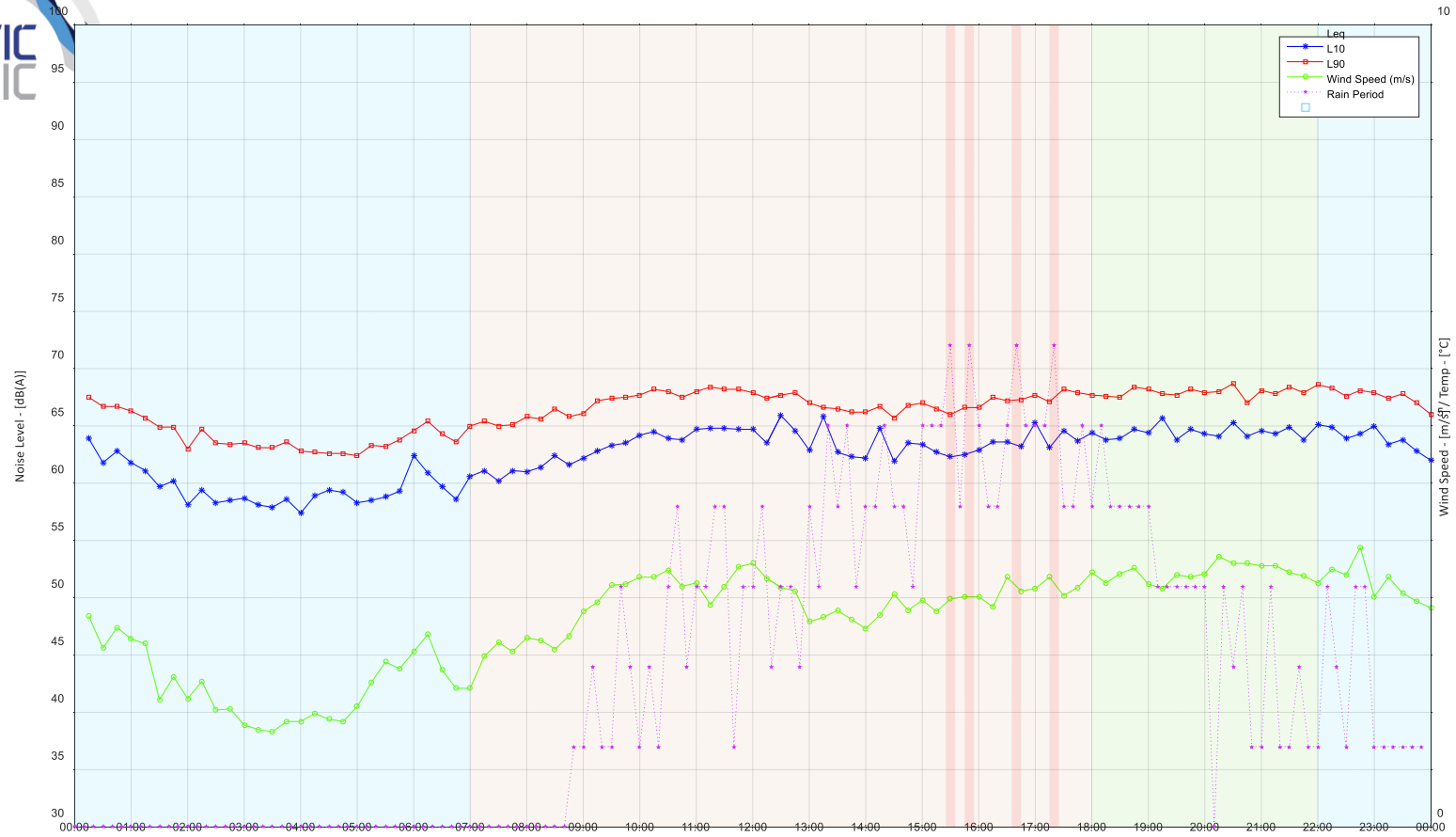

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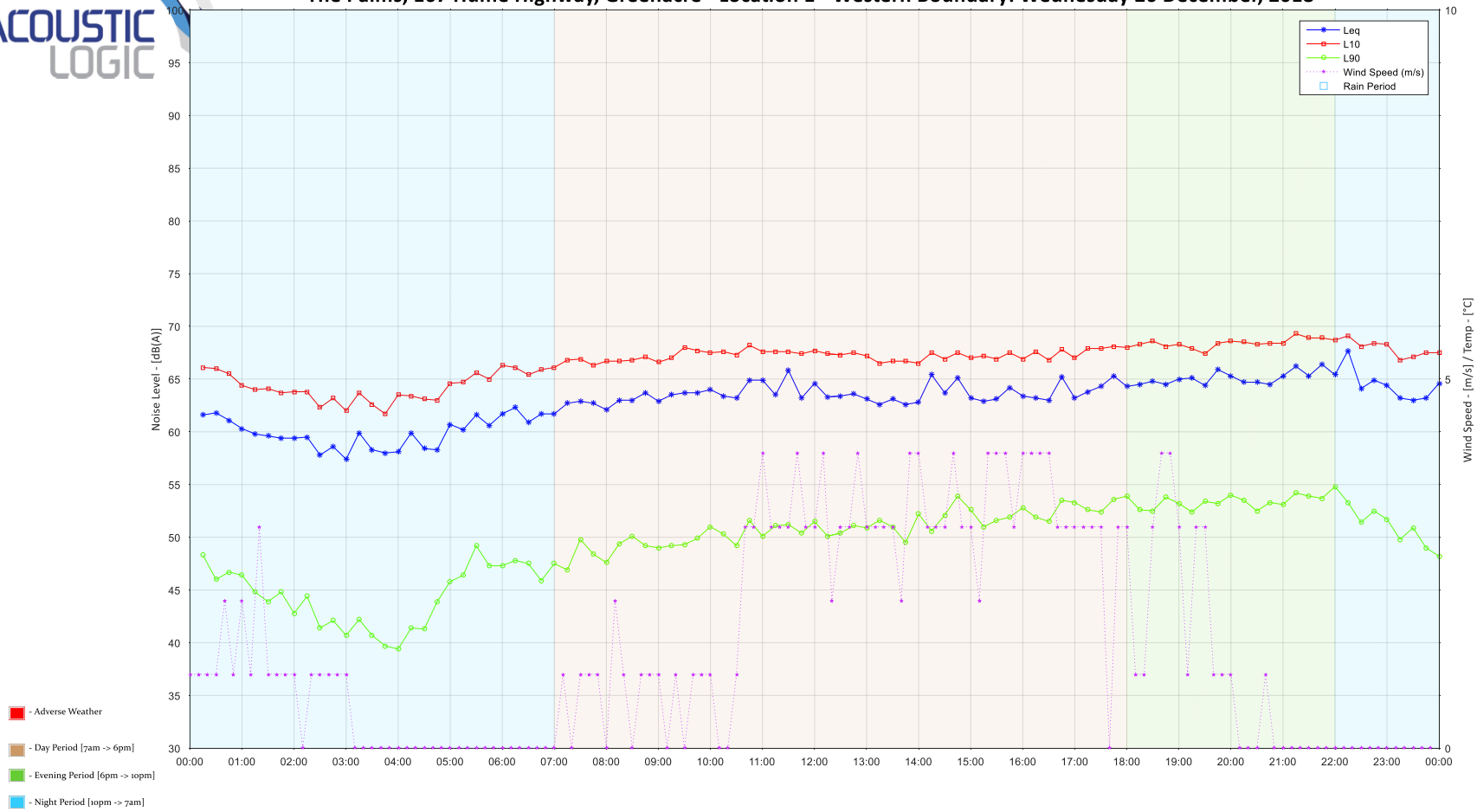

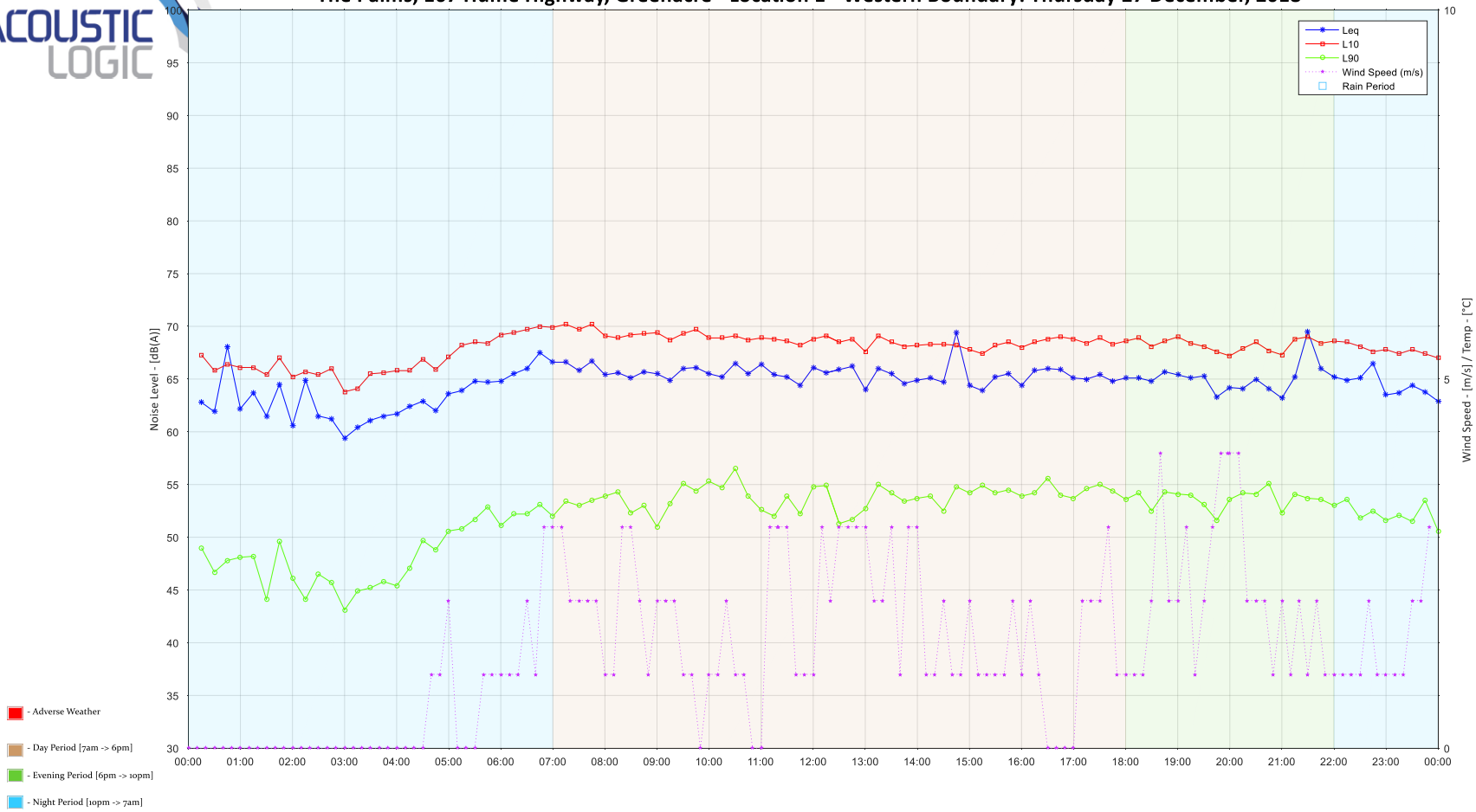
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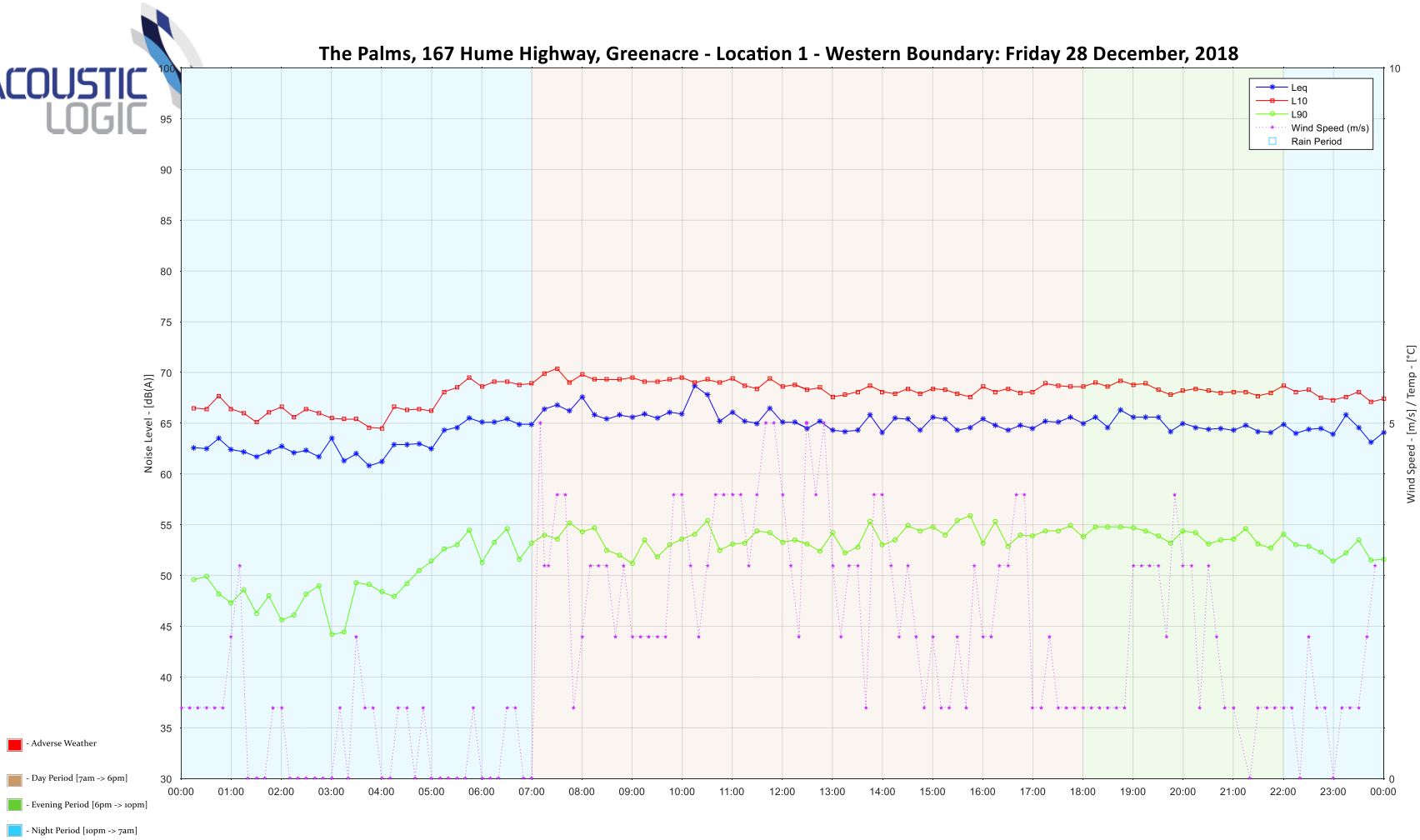
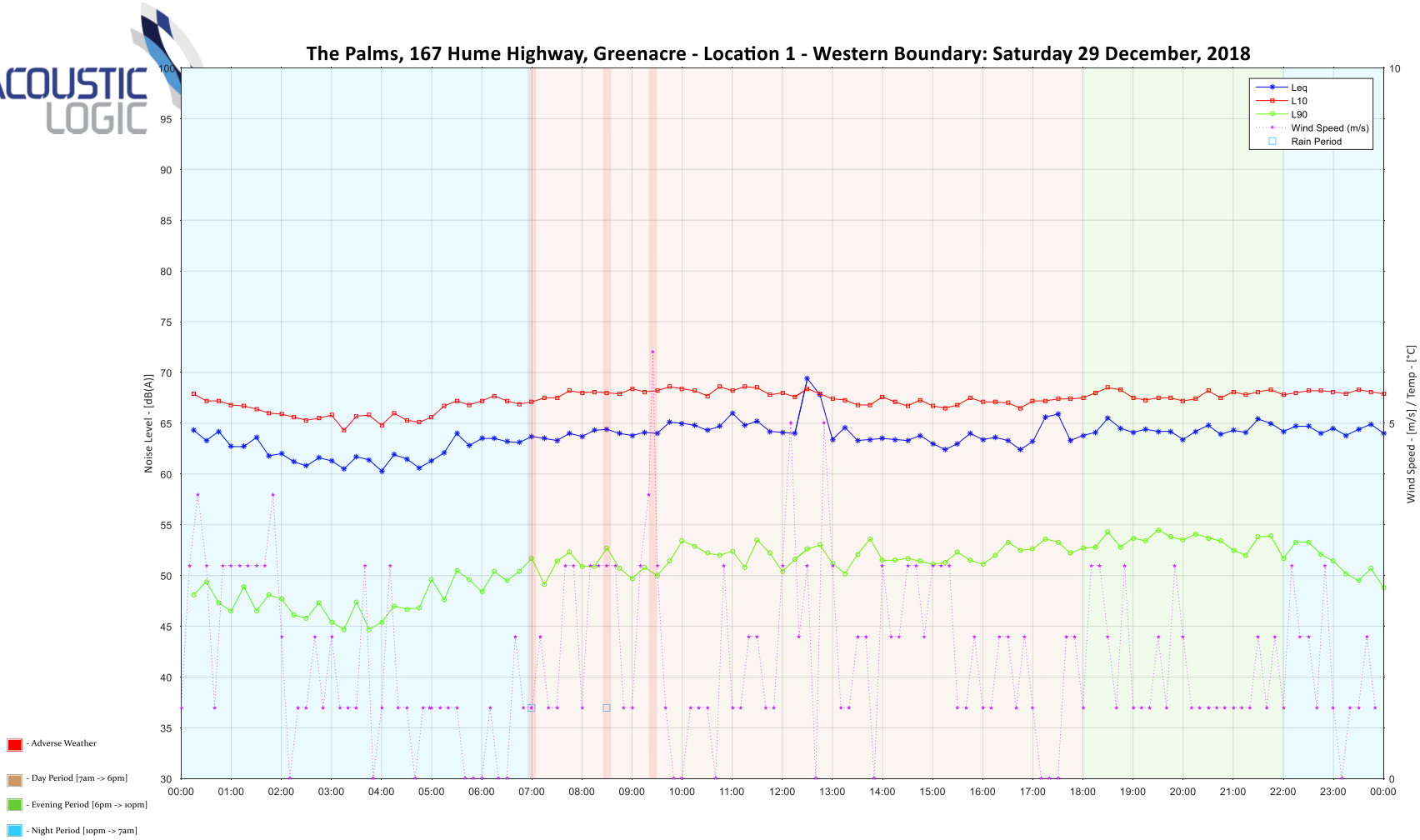
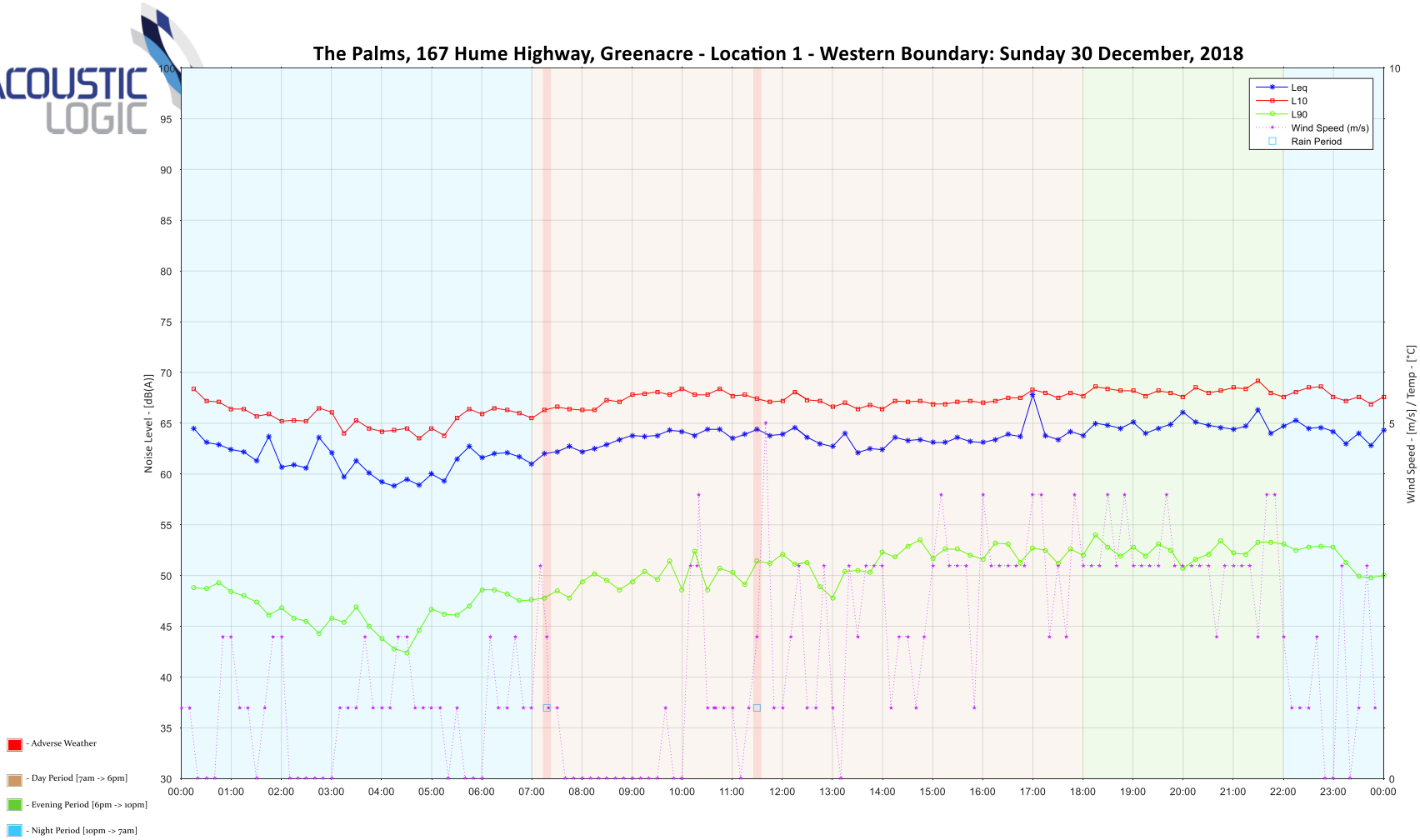
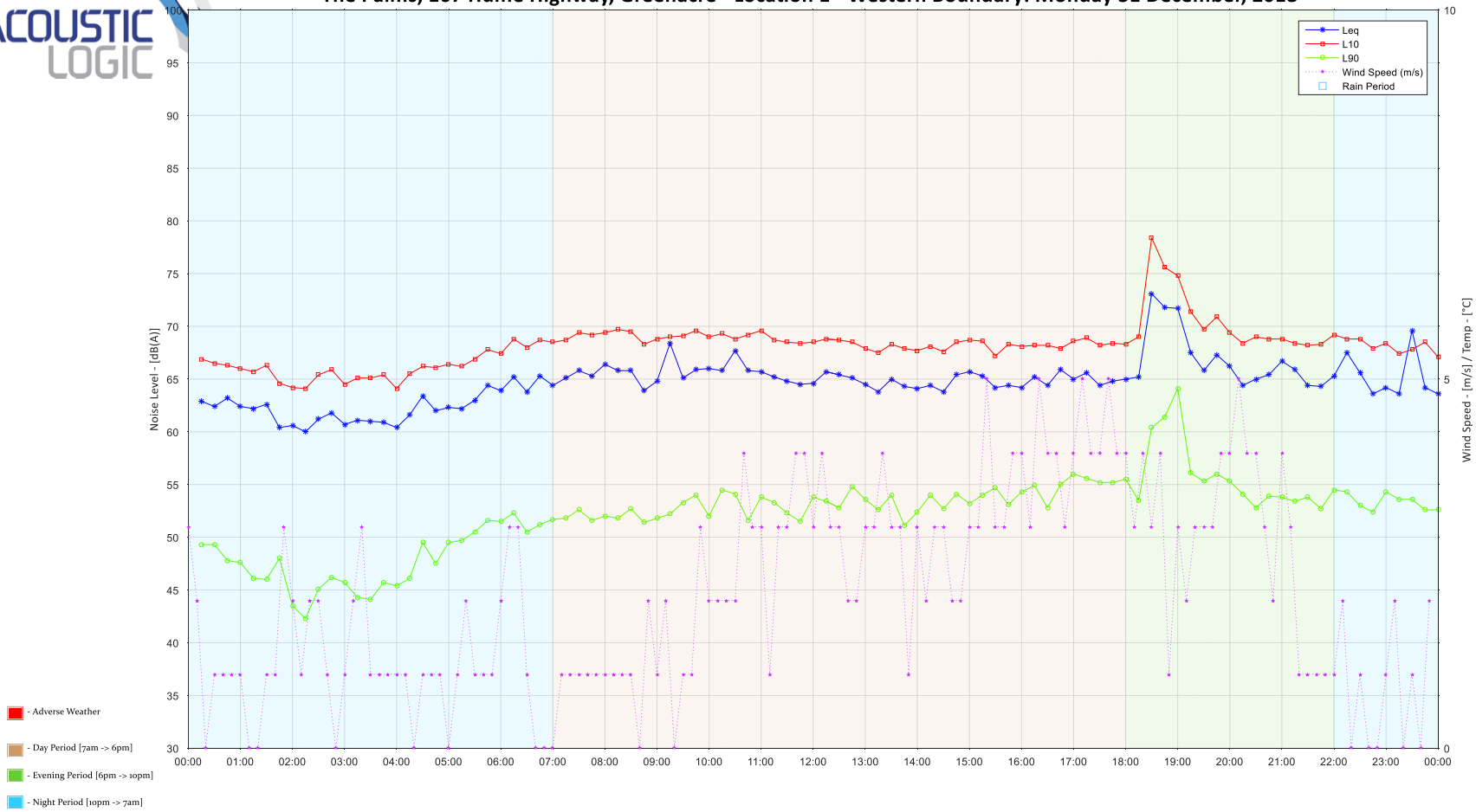
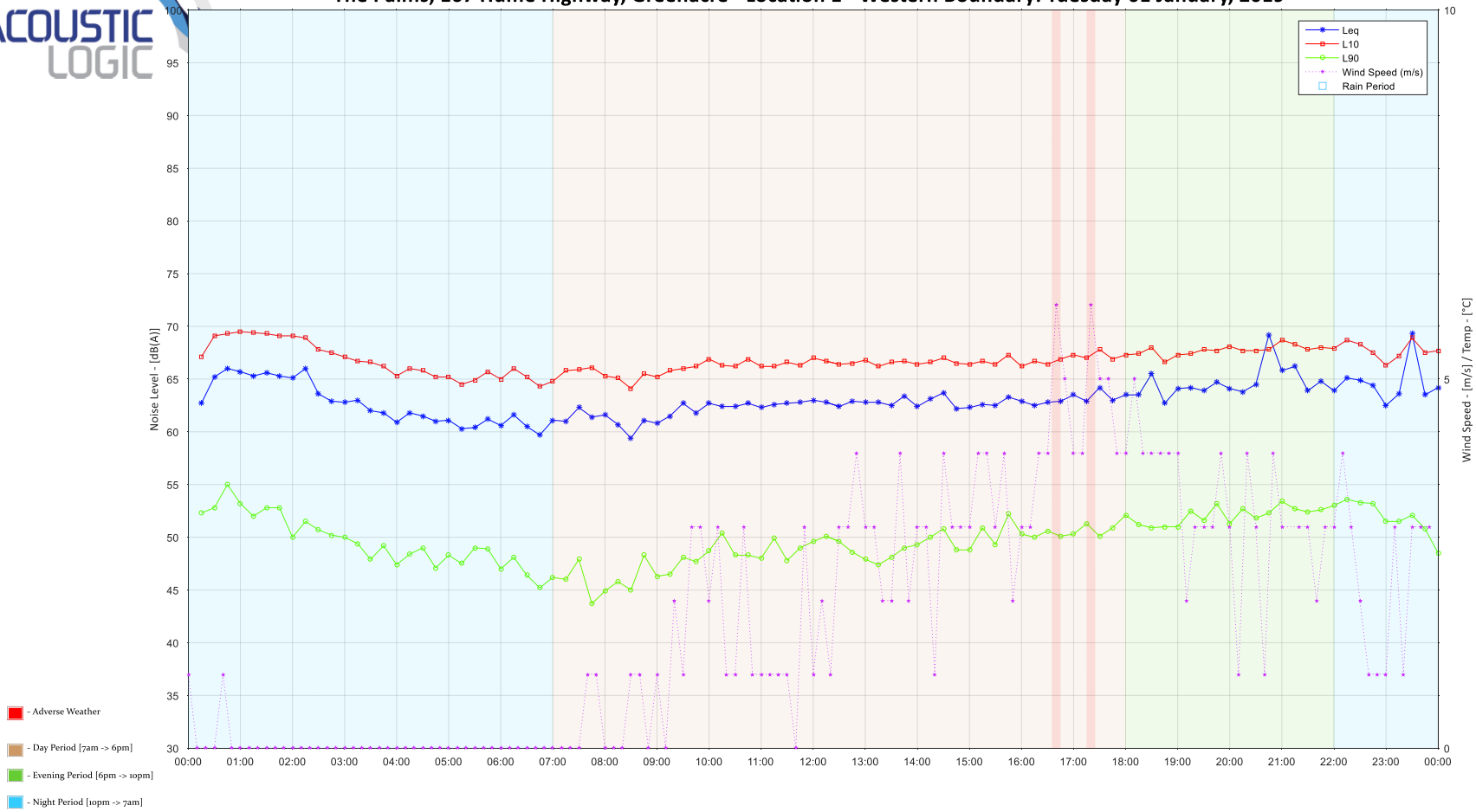
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

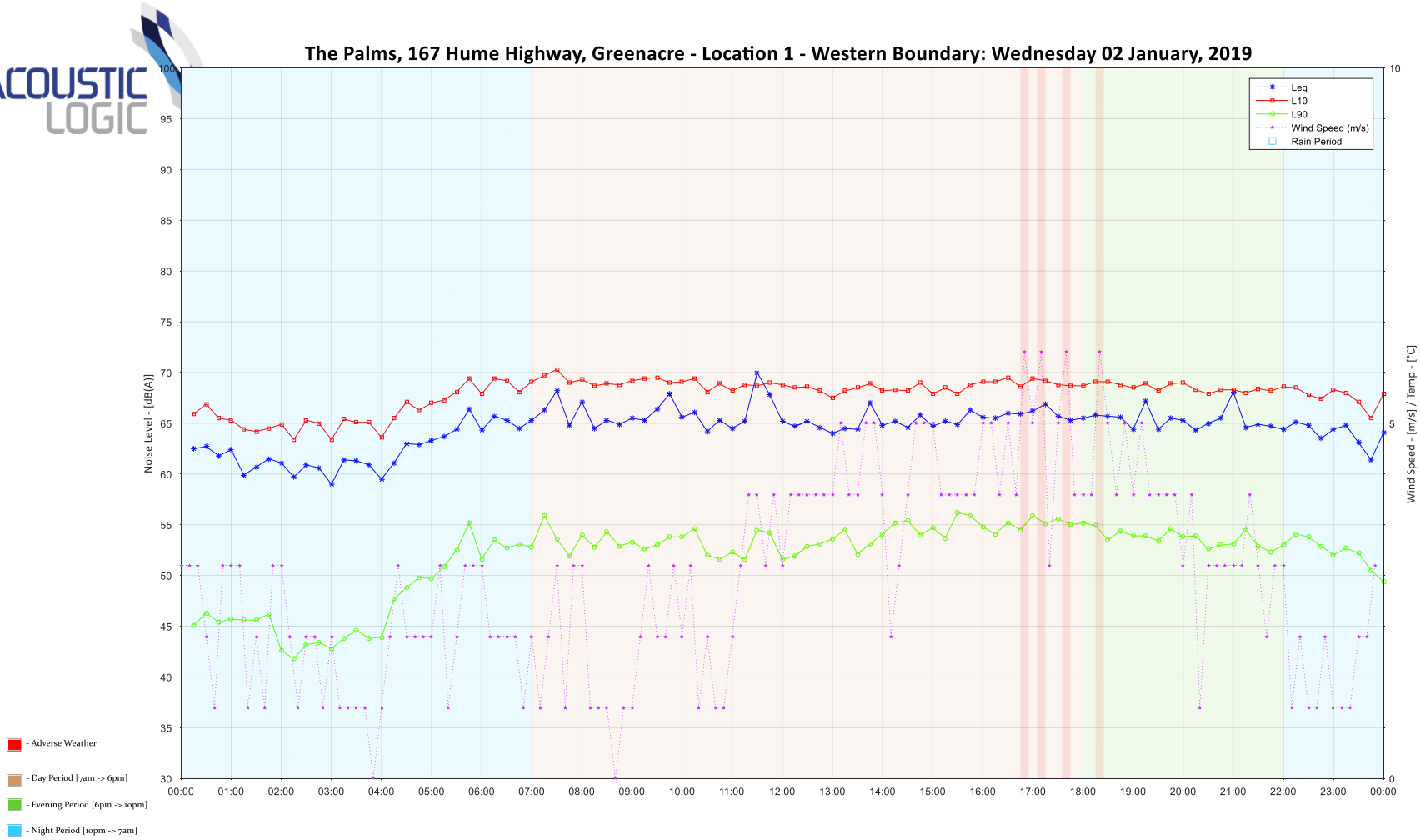

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Friday 28 December, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

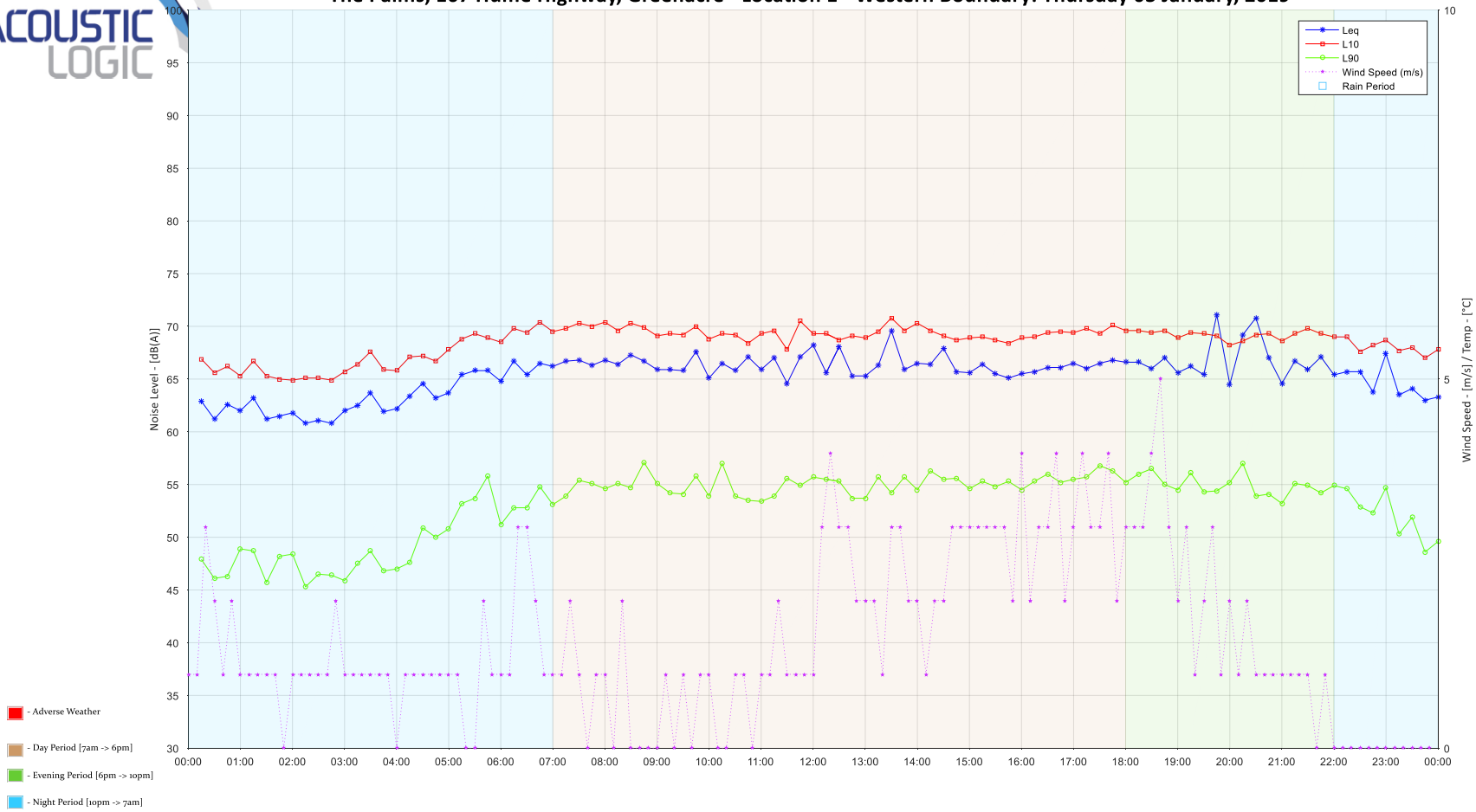

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Saturday 29 December, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

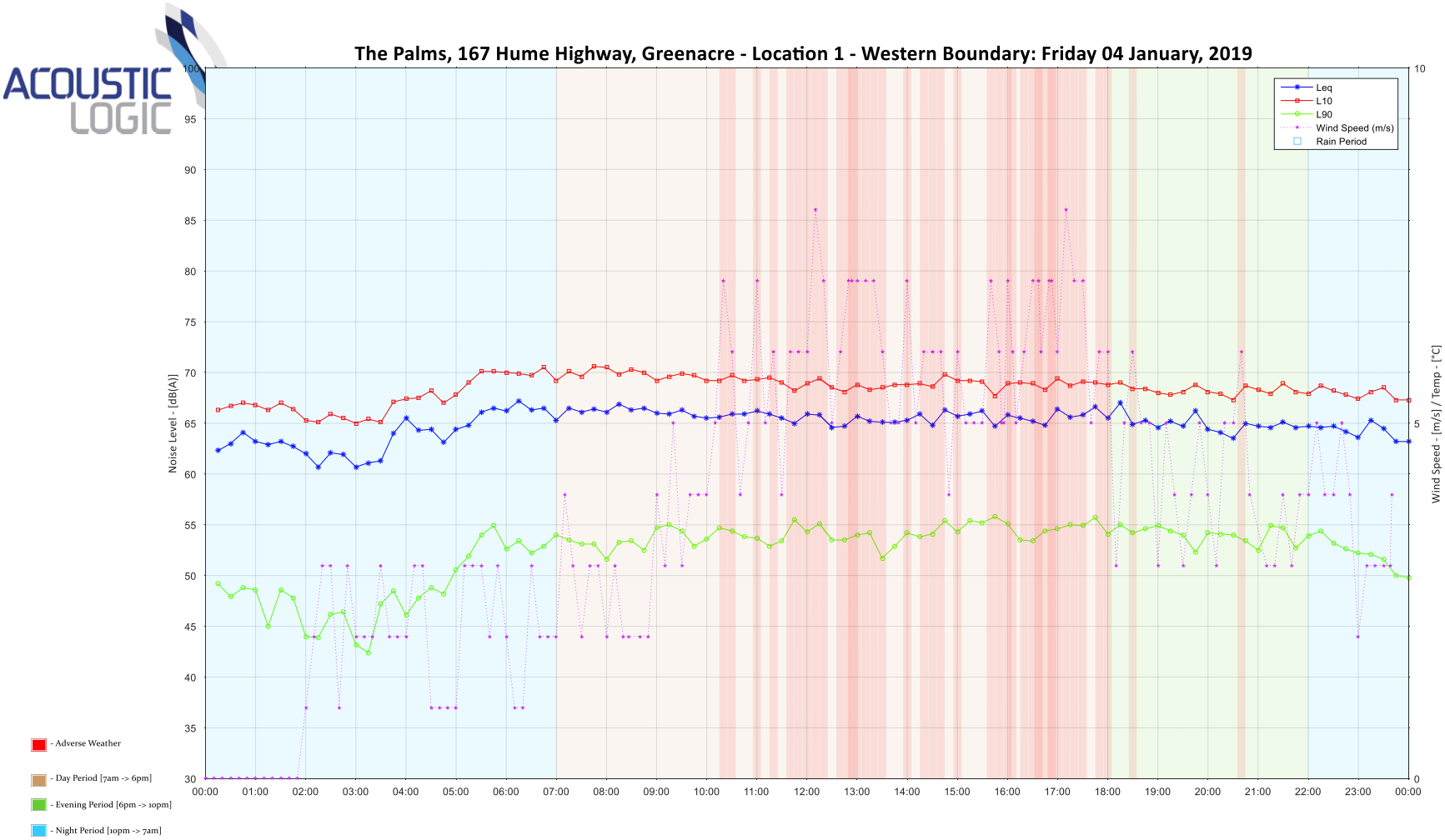

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Sunday 30 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

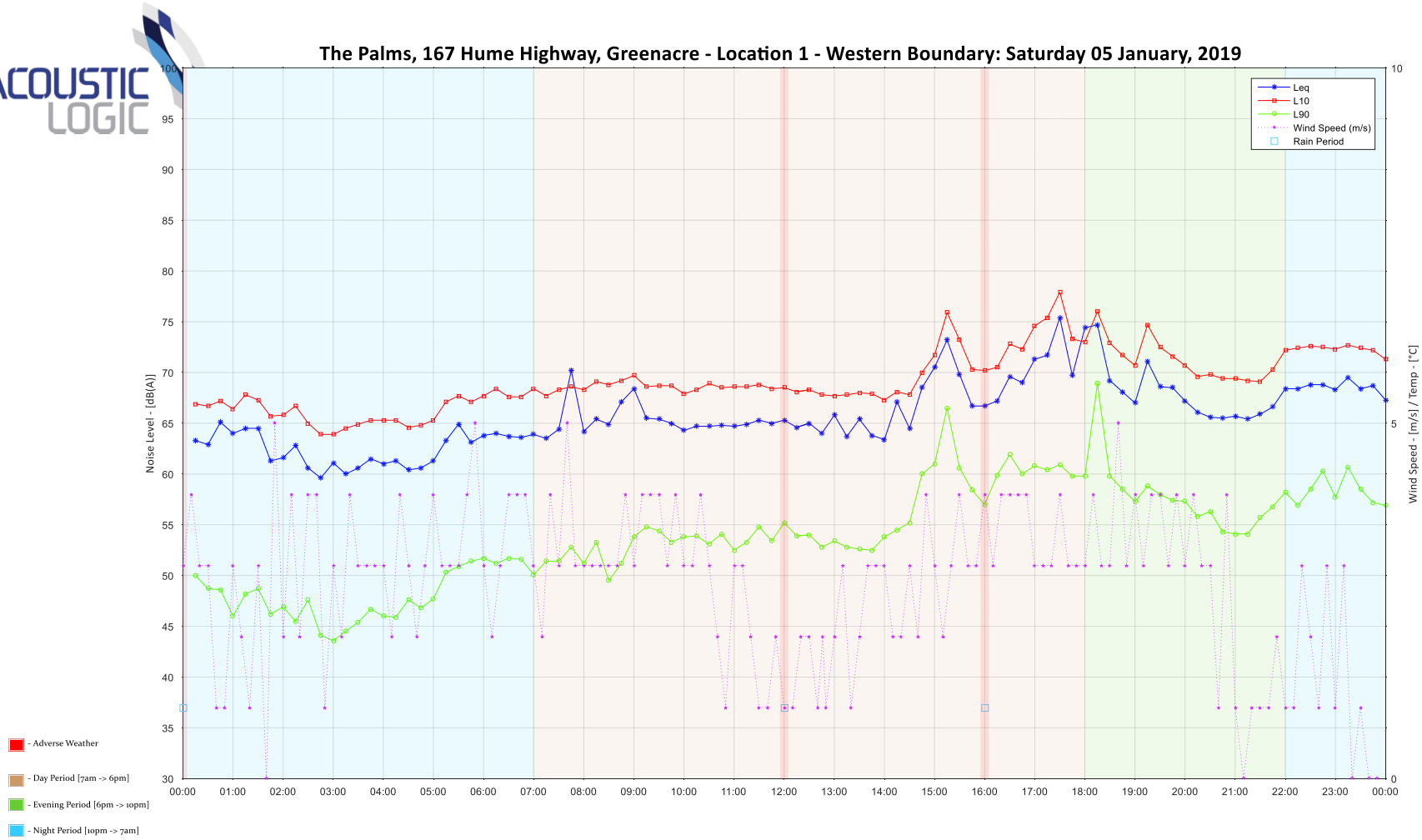

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Monday 31 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

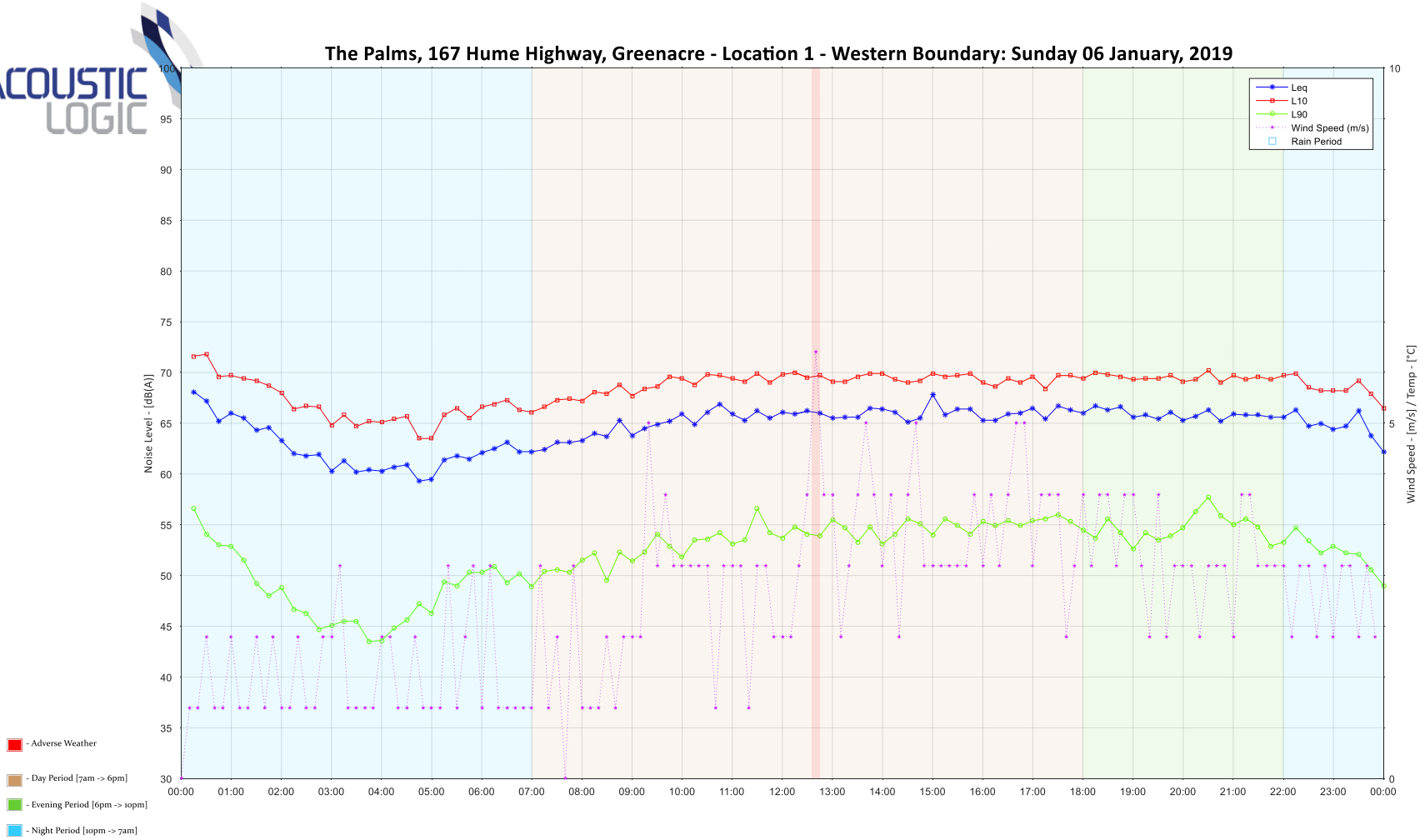

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Tuesday 01 January, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Wednesday 02 January, 2019
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

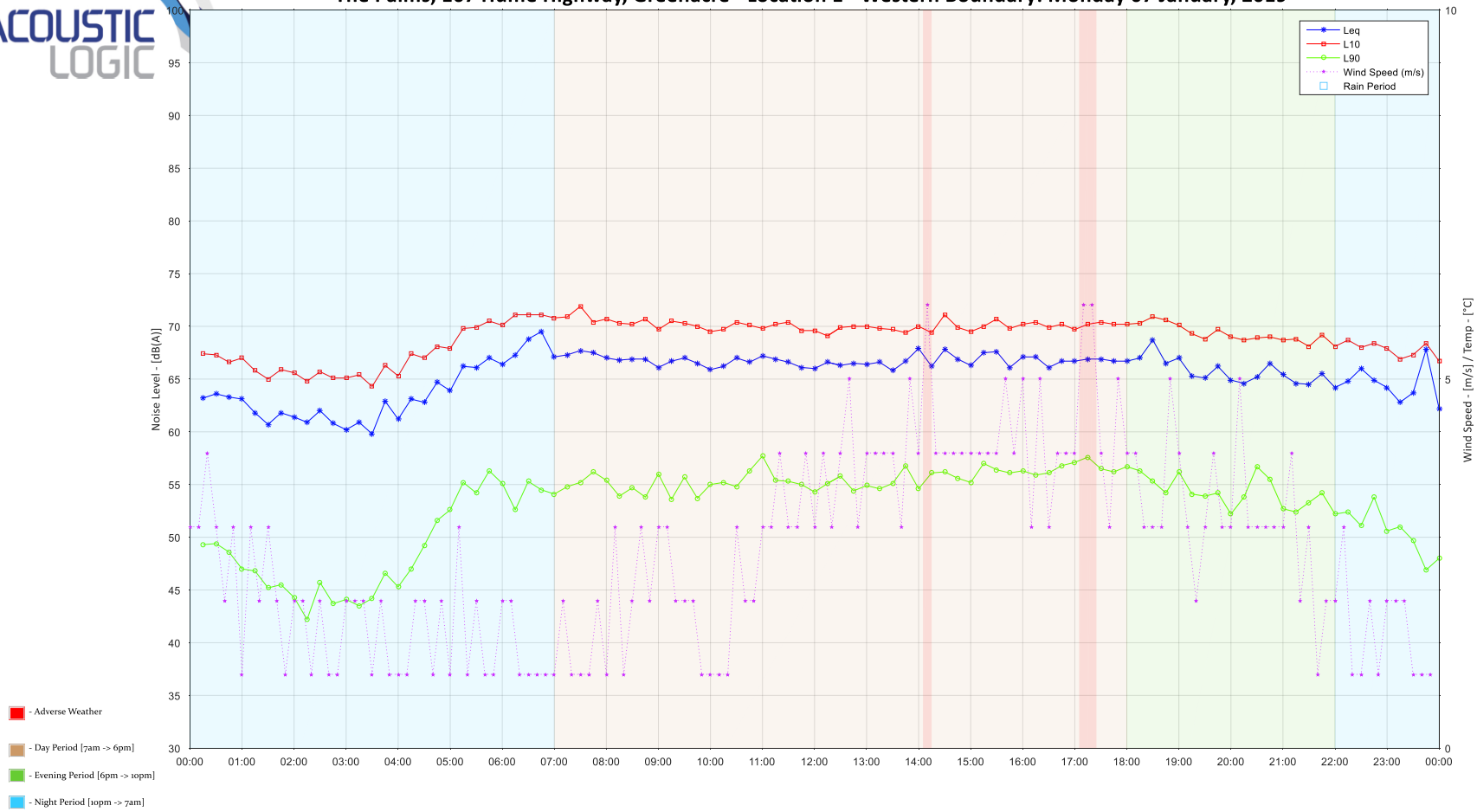

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Thursday 03 January, 2019
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Friday 04 January, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

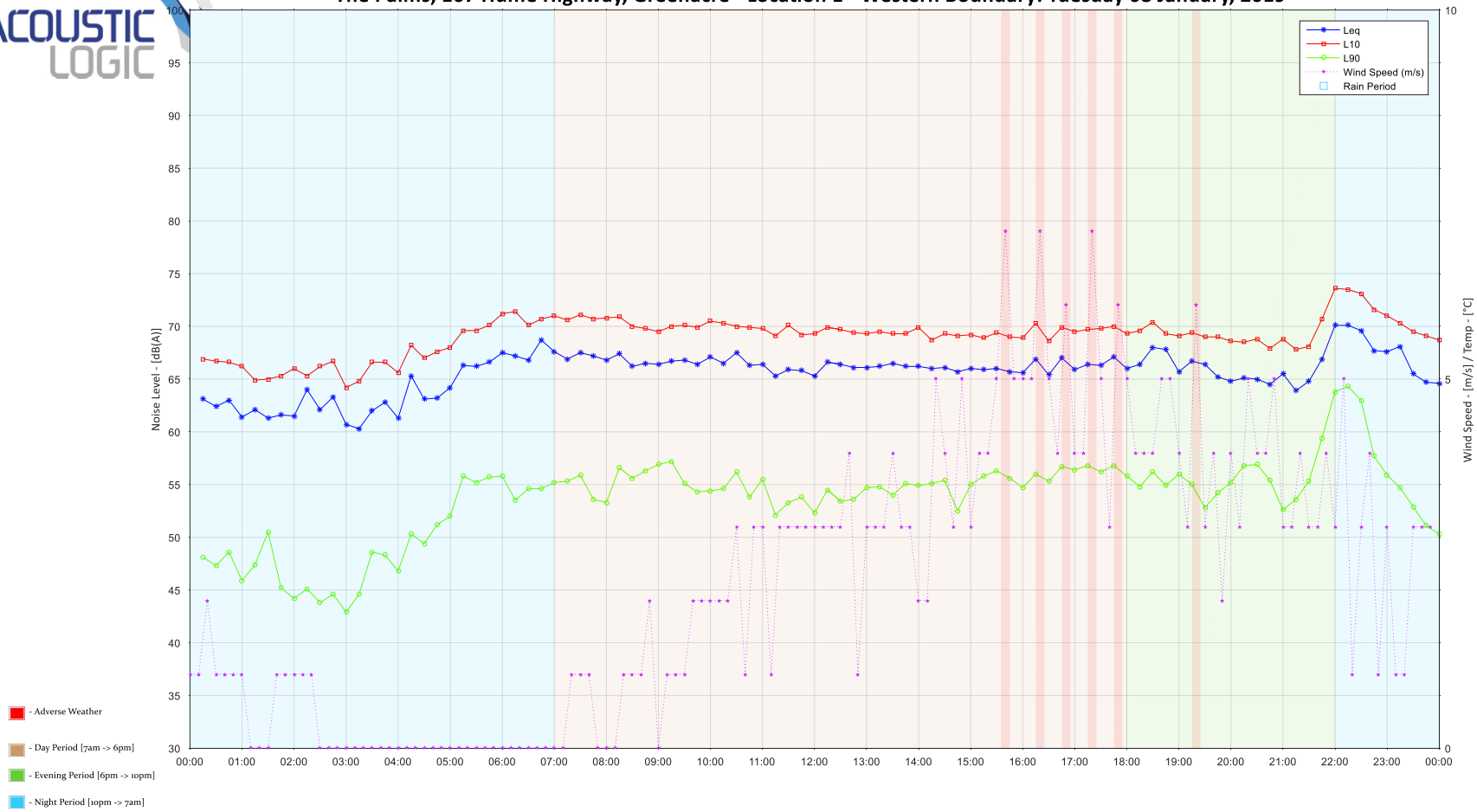

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Saturday 05 January, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

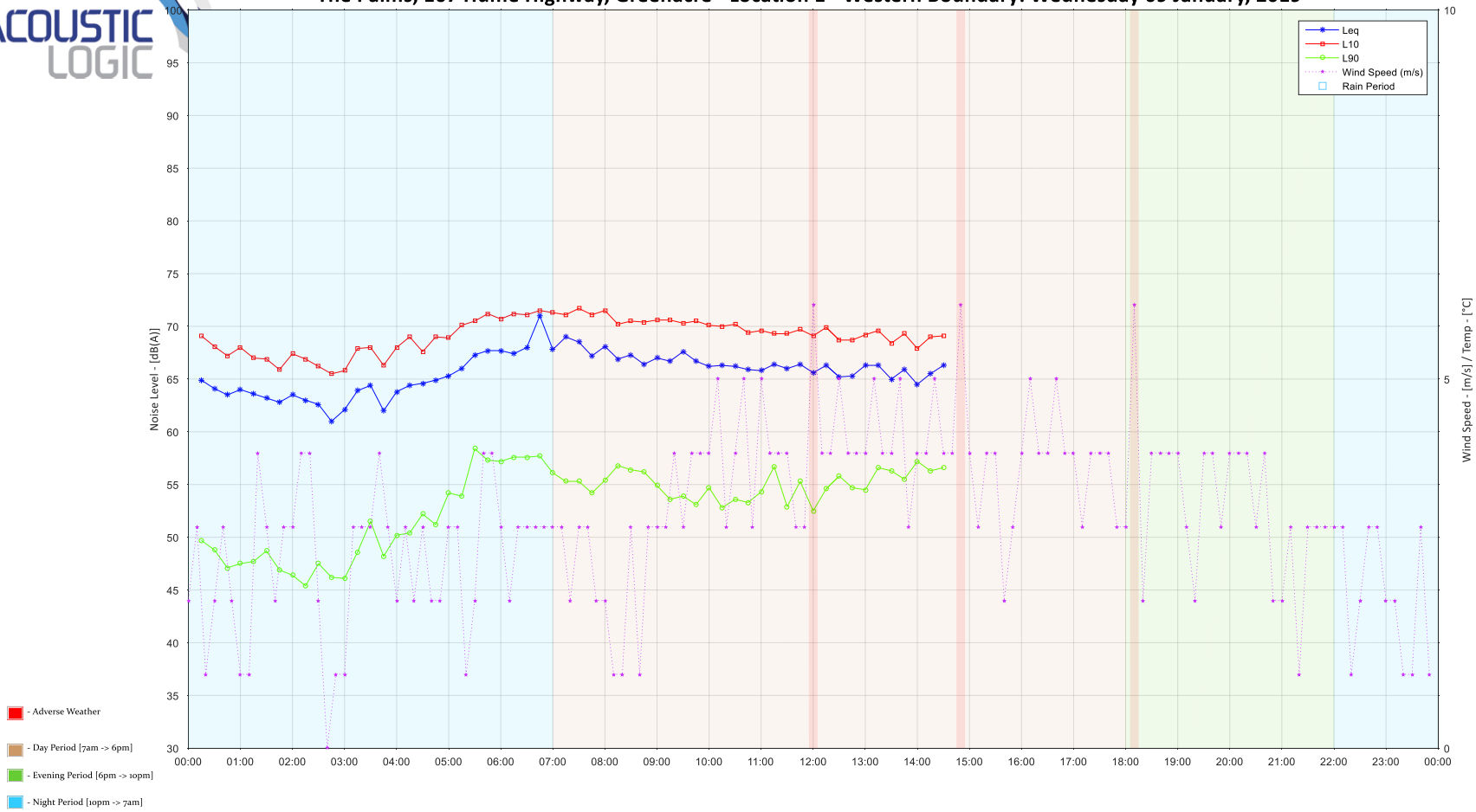

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Sunday 06 January, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Monday 07 January, 2019



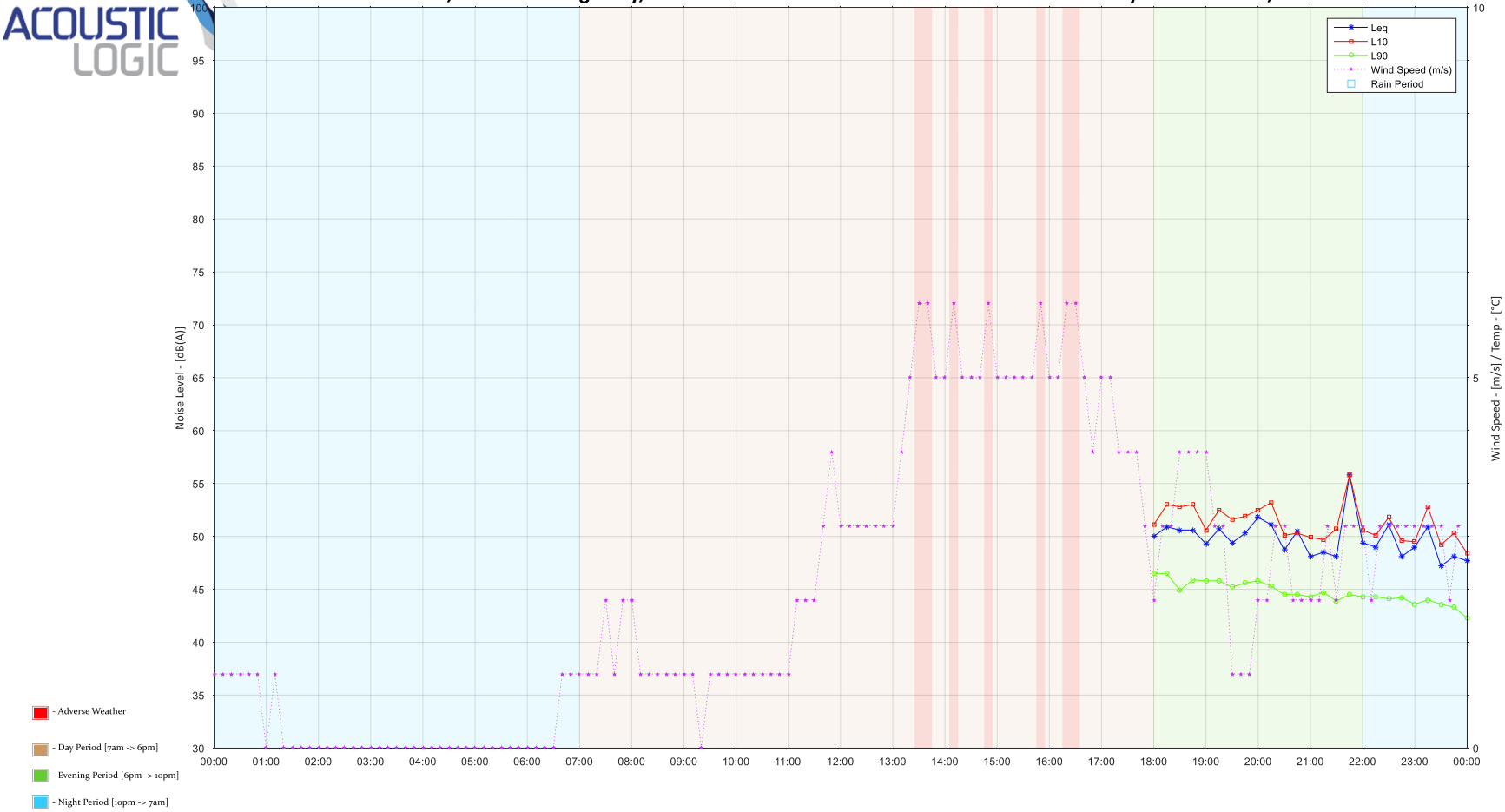
The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Tuesday 08 January, 2019

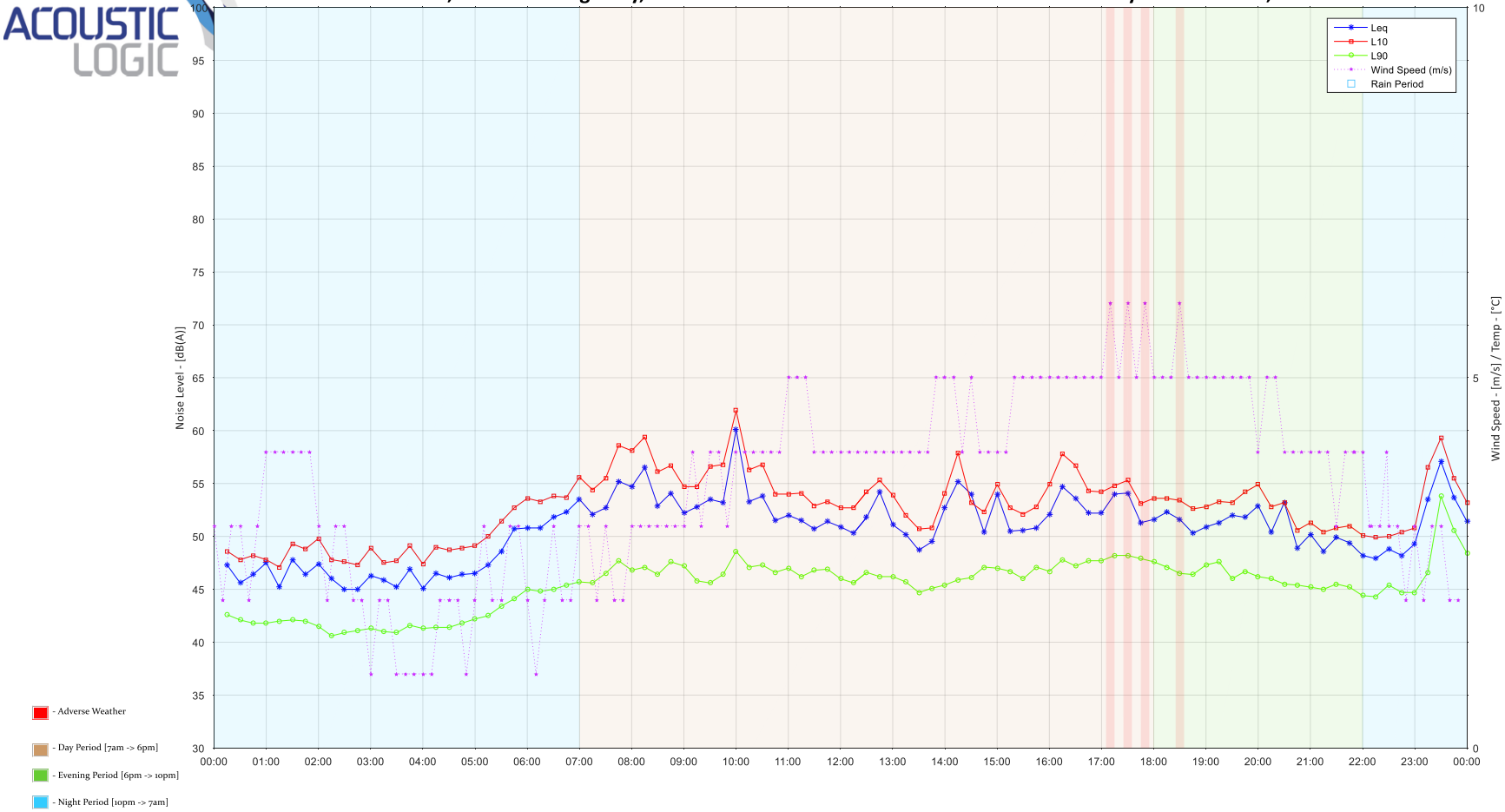


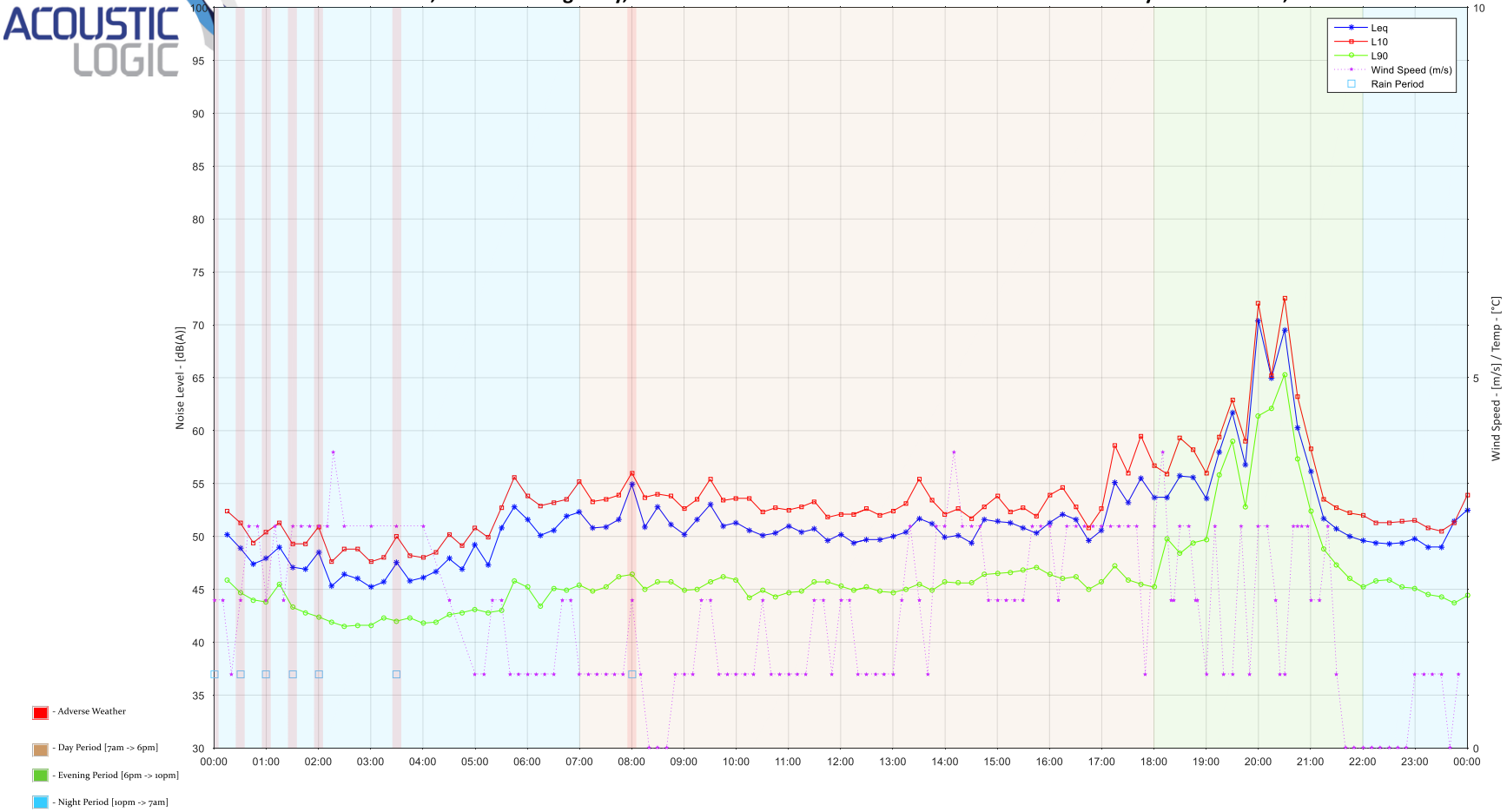

The Palms, 167 Hume Highway, Greenacre - Location 1 - Western Boundary: Wednesday 09 January, 2019
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

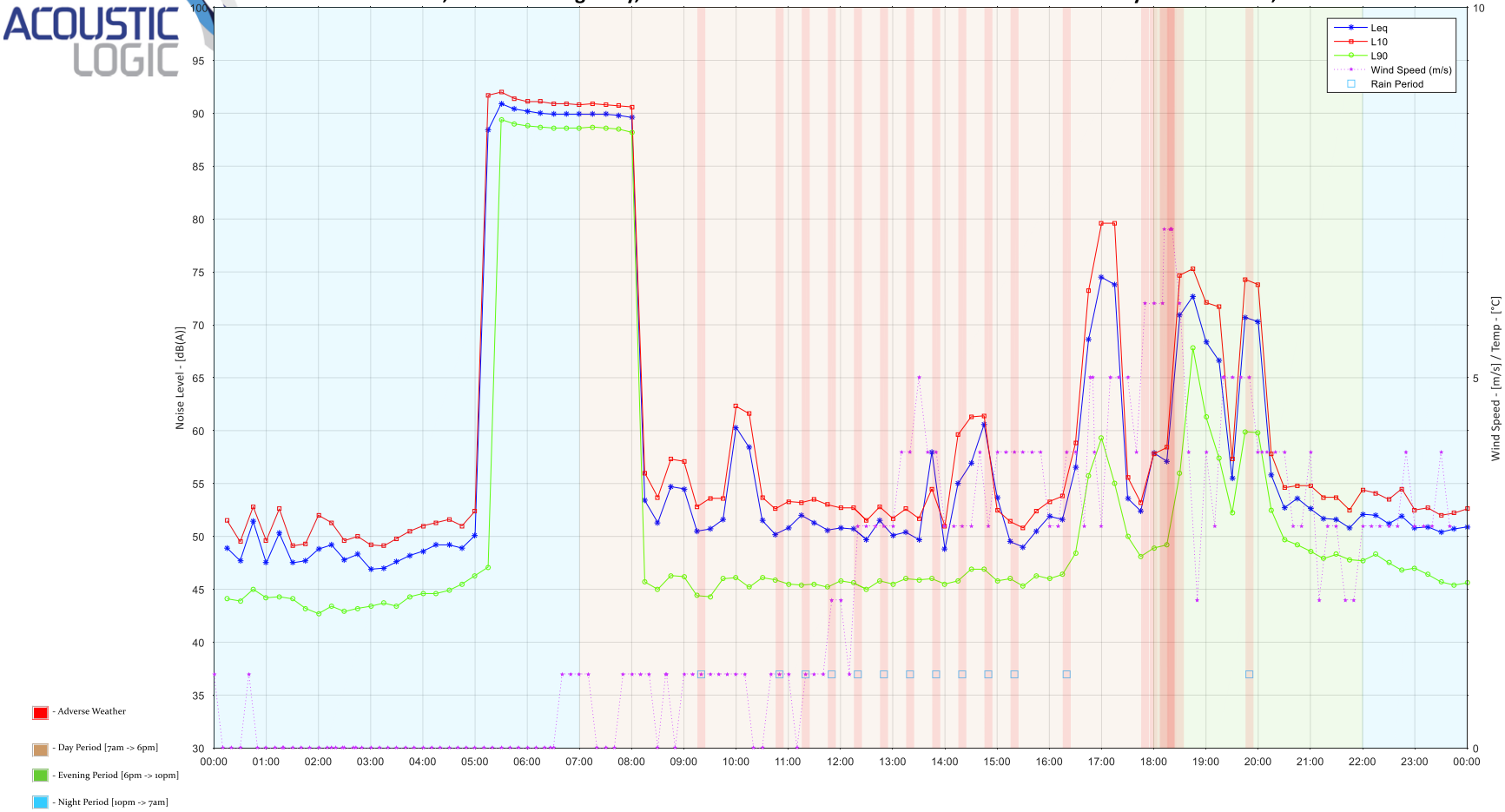
APPENDIX B – NOISE MONITORING LOCATION 2 - REAR OF SITE

s

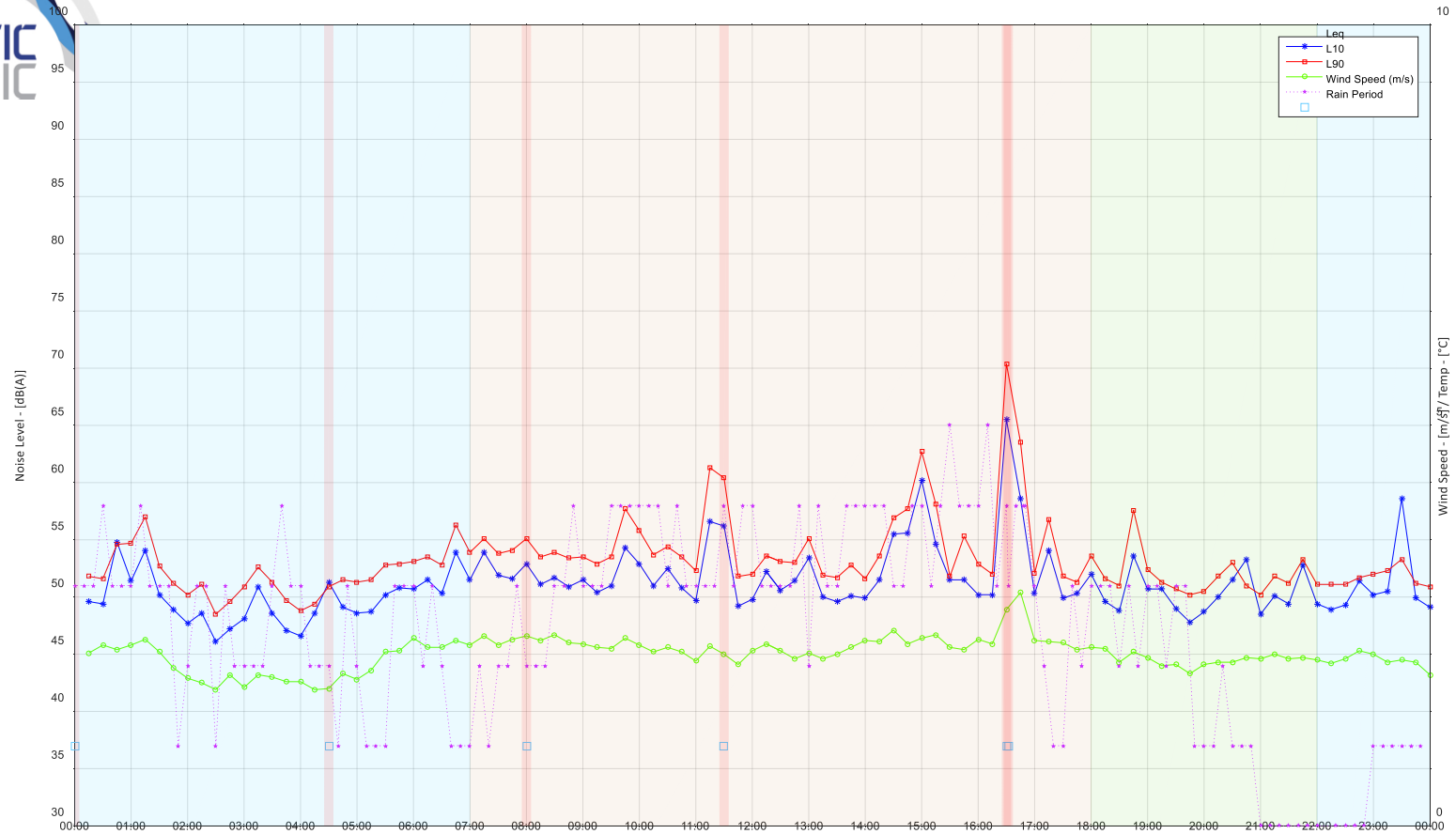

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Monday 17 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

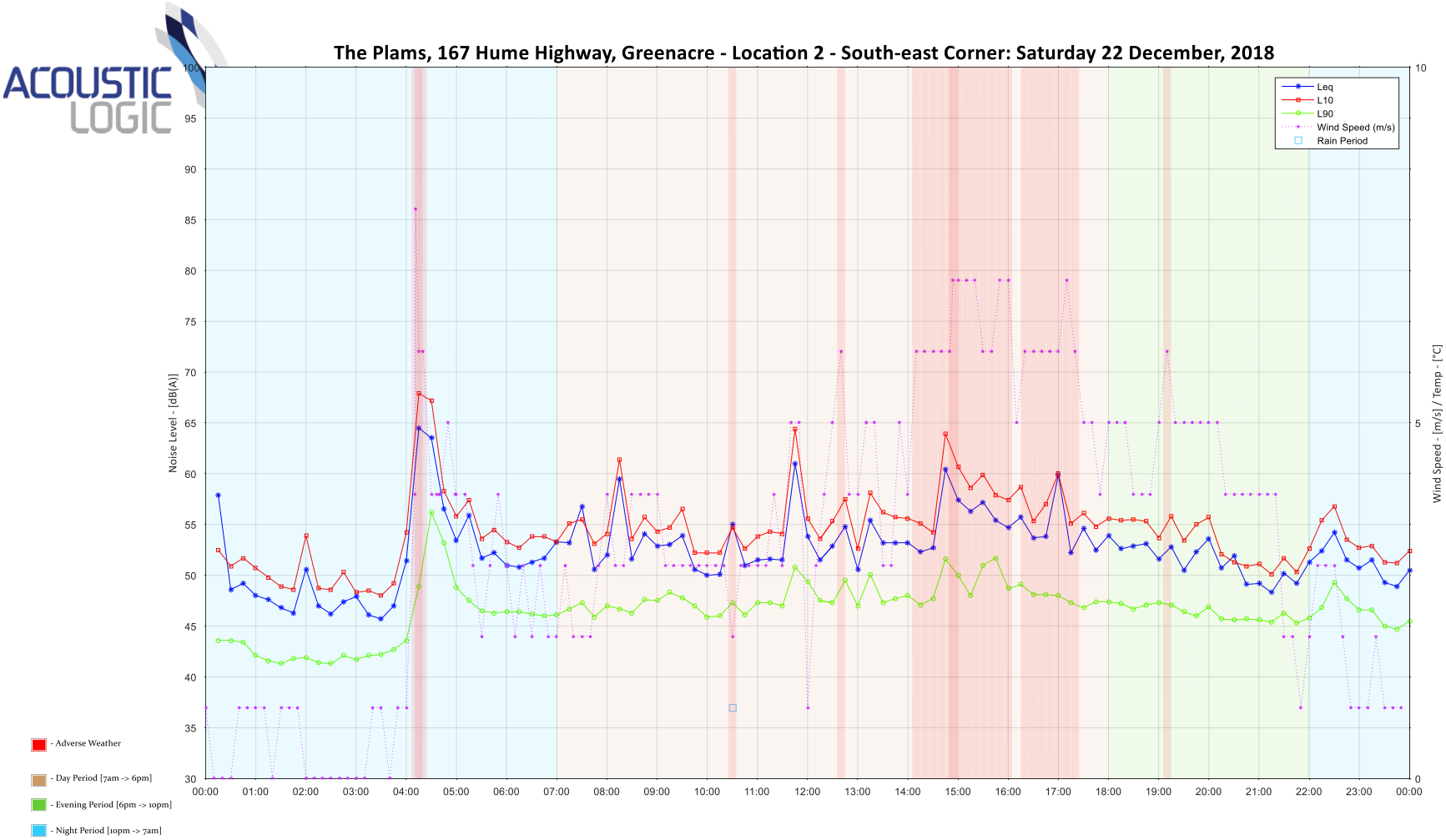

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Tuesday 18 December, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

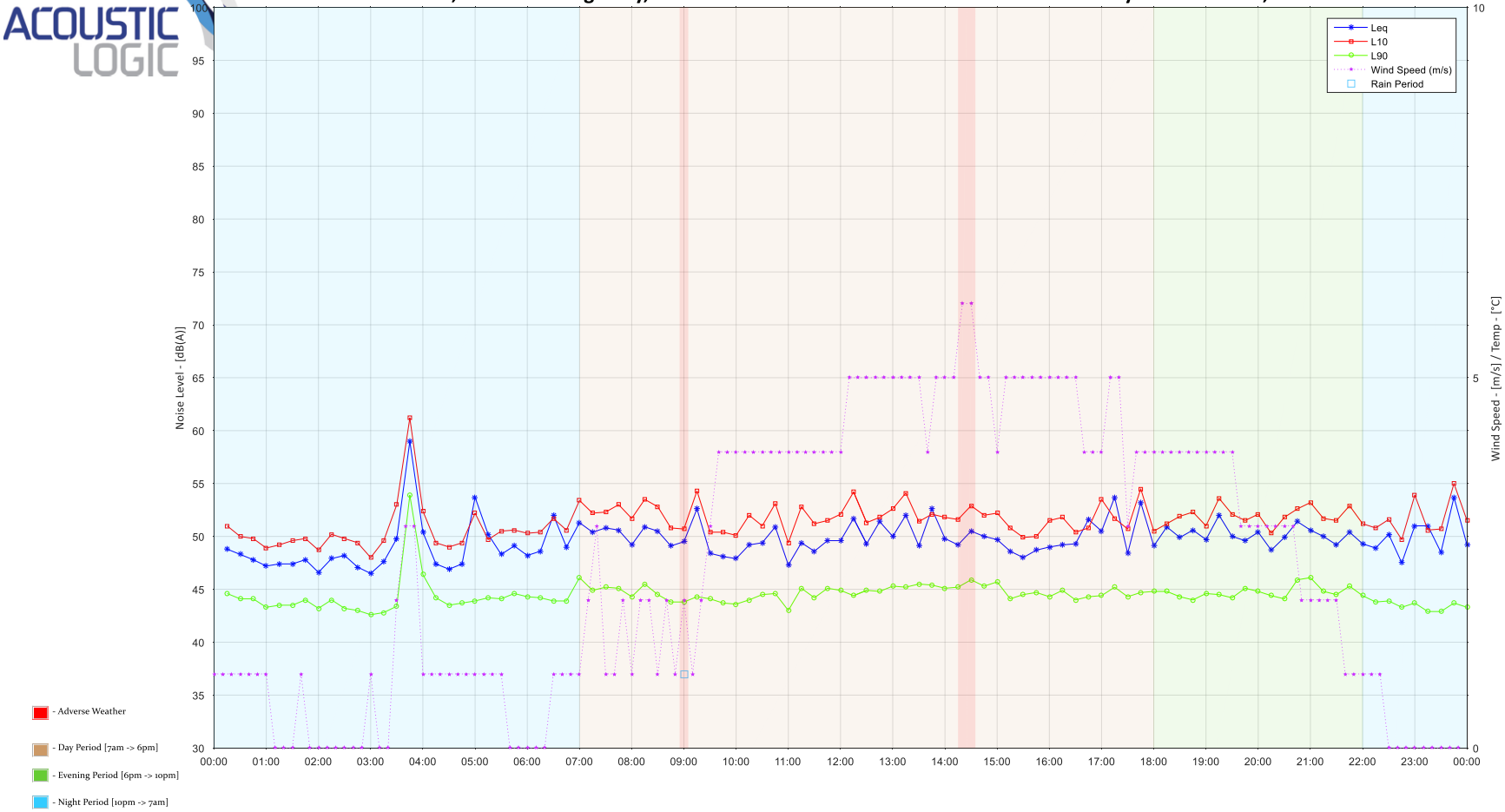

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Wednesday 19 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

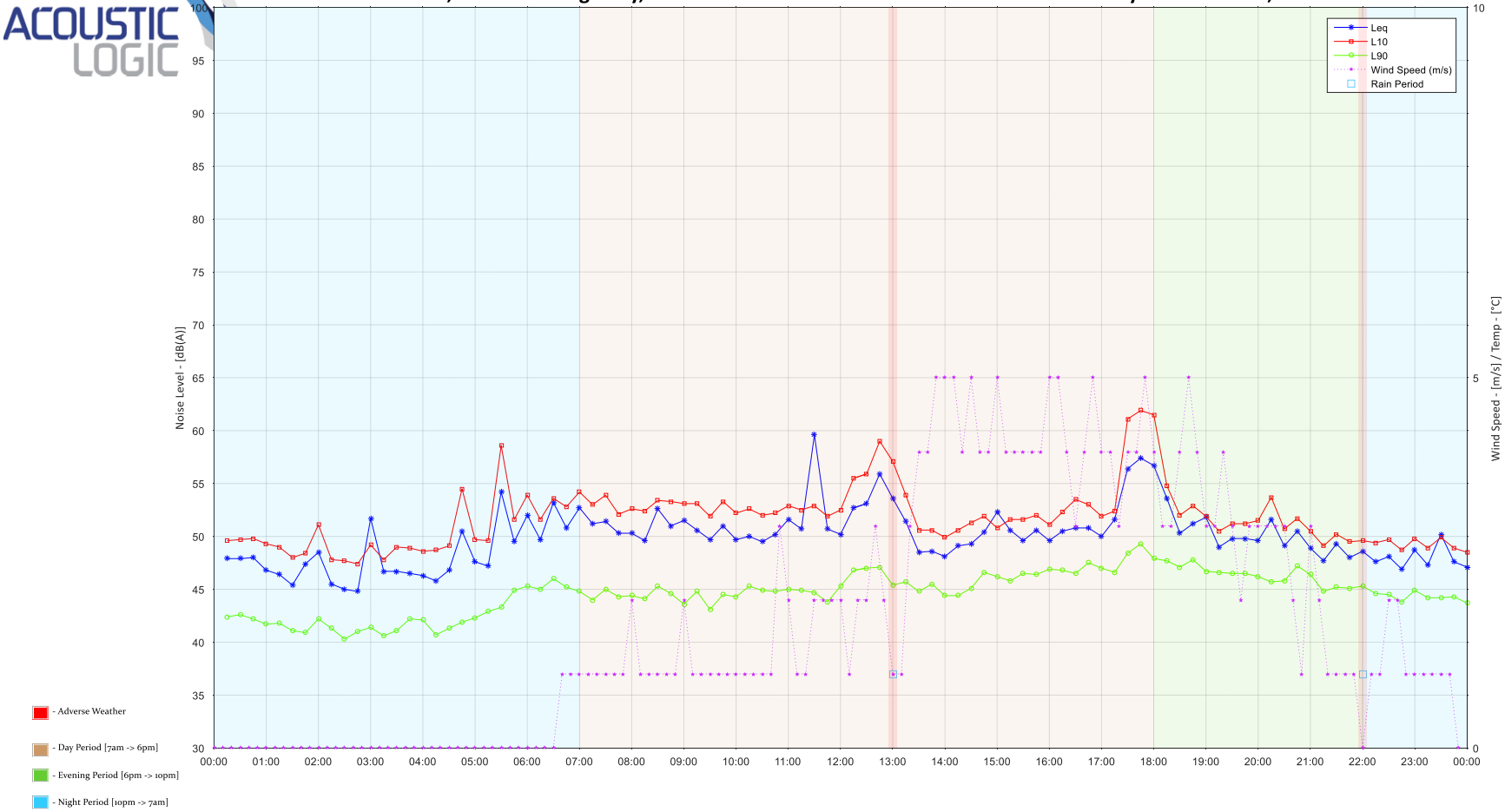

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Thursday 20 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

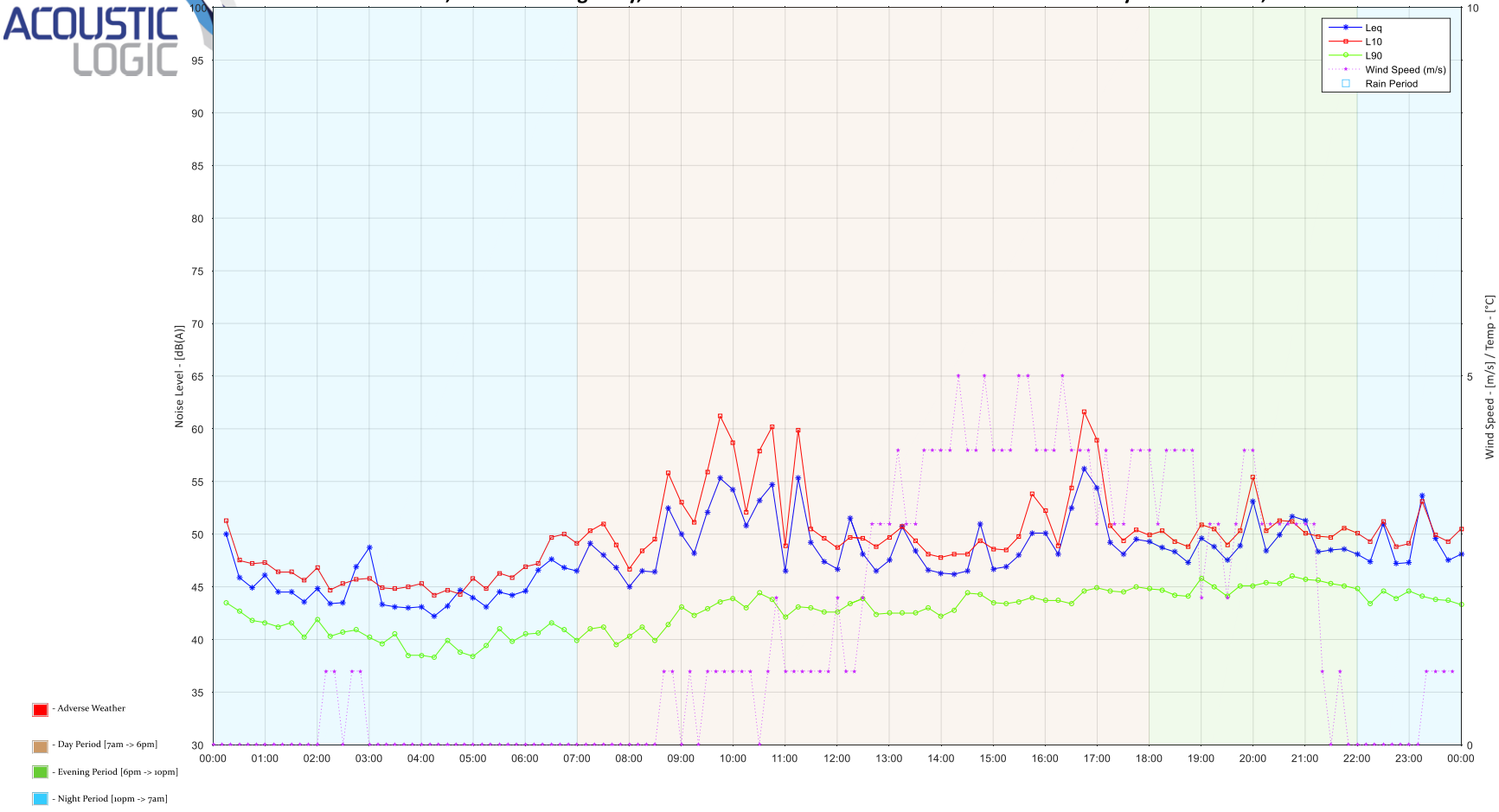
The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Friday 21 December, 2018

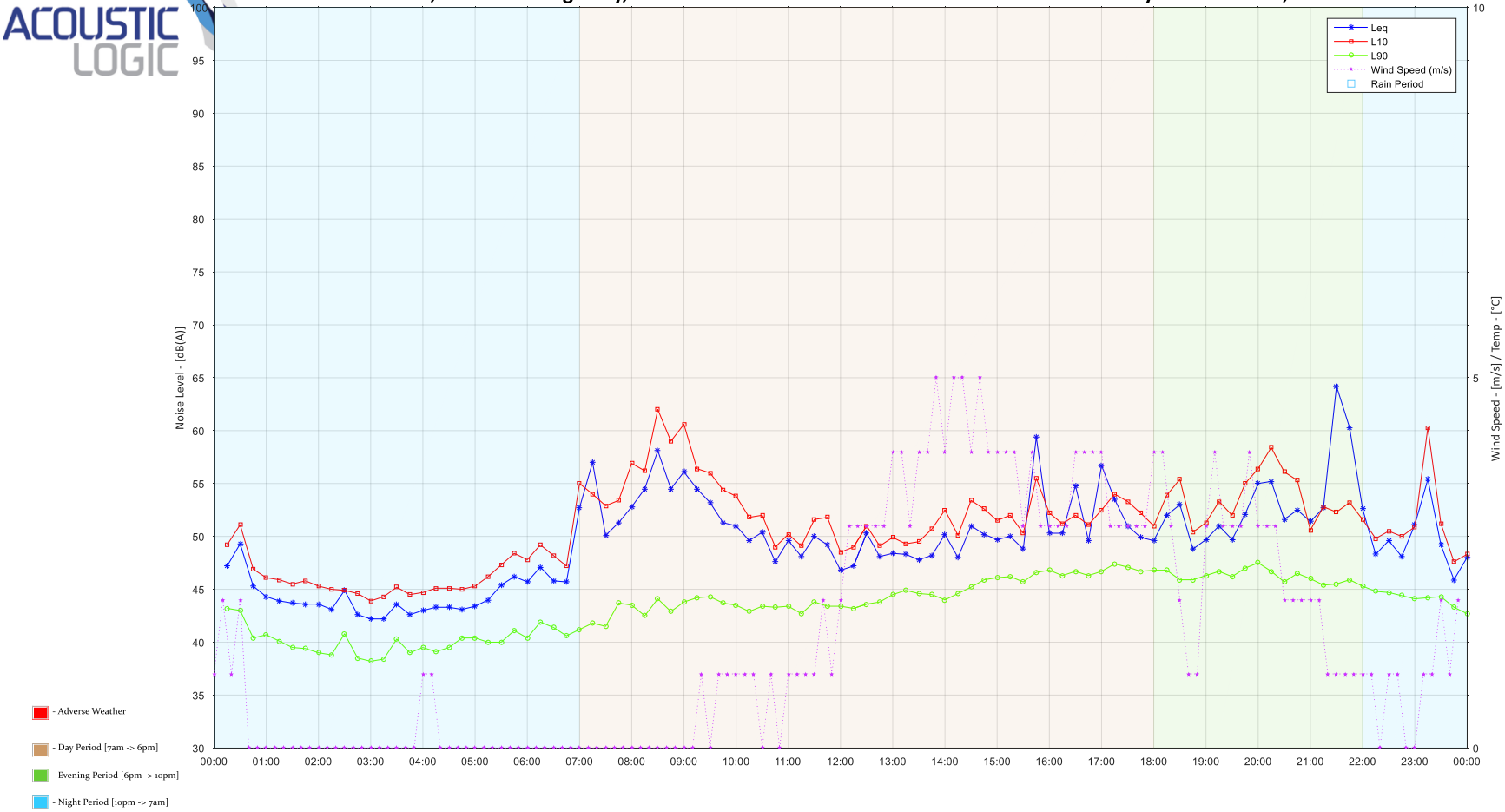


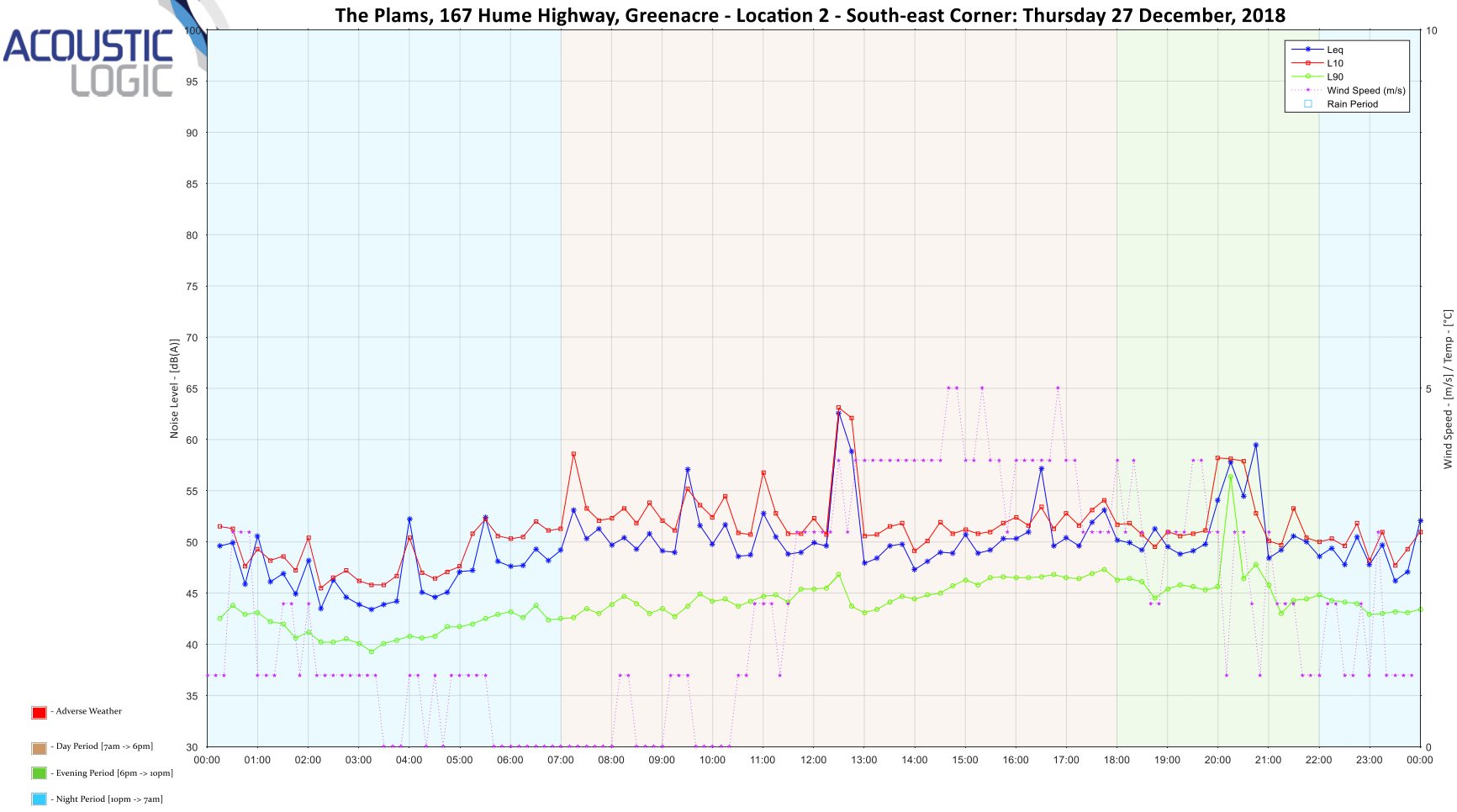

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Saturday 22 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

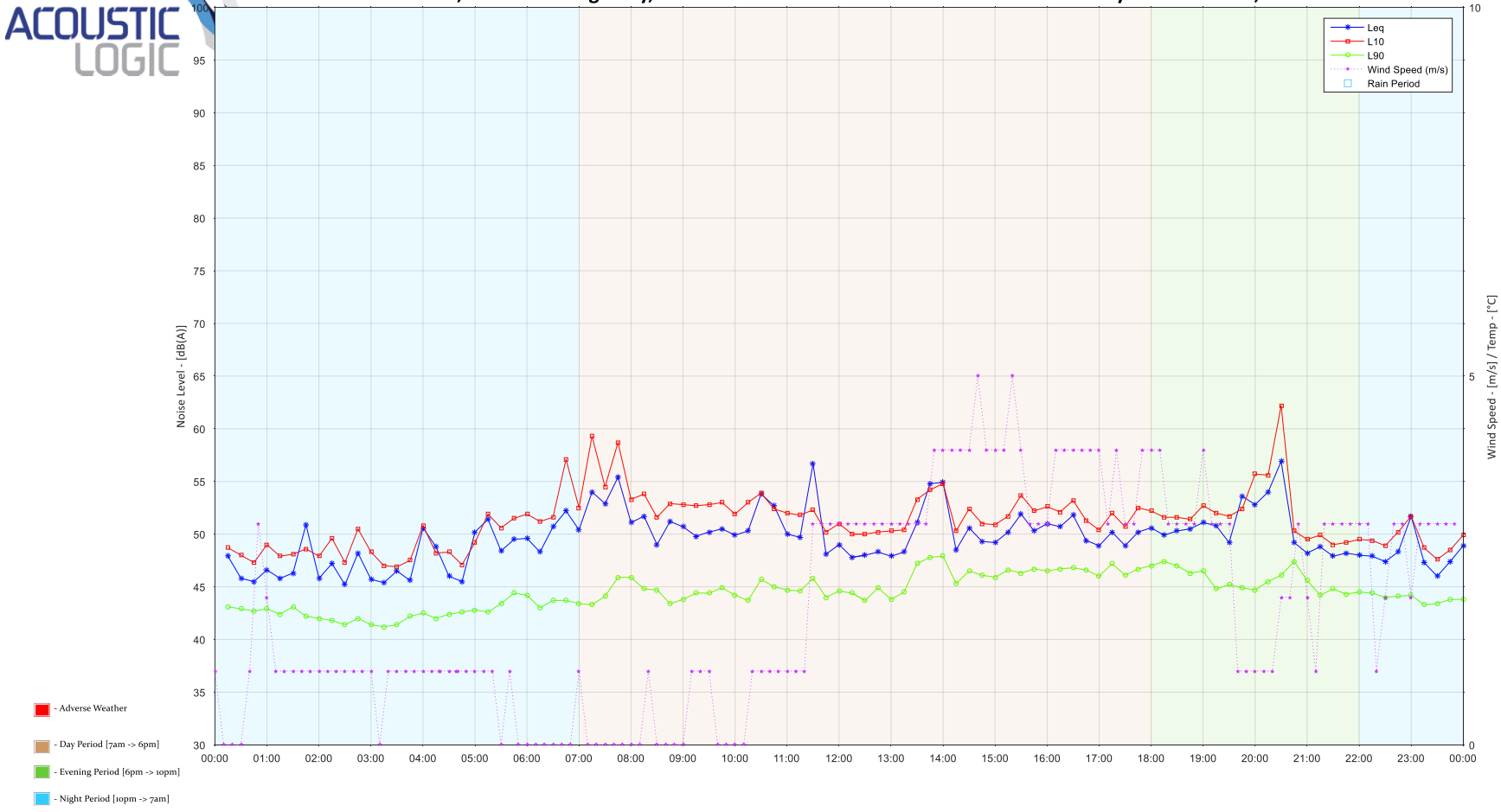

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Sunday 23 December, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

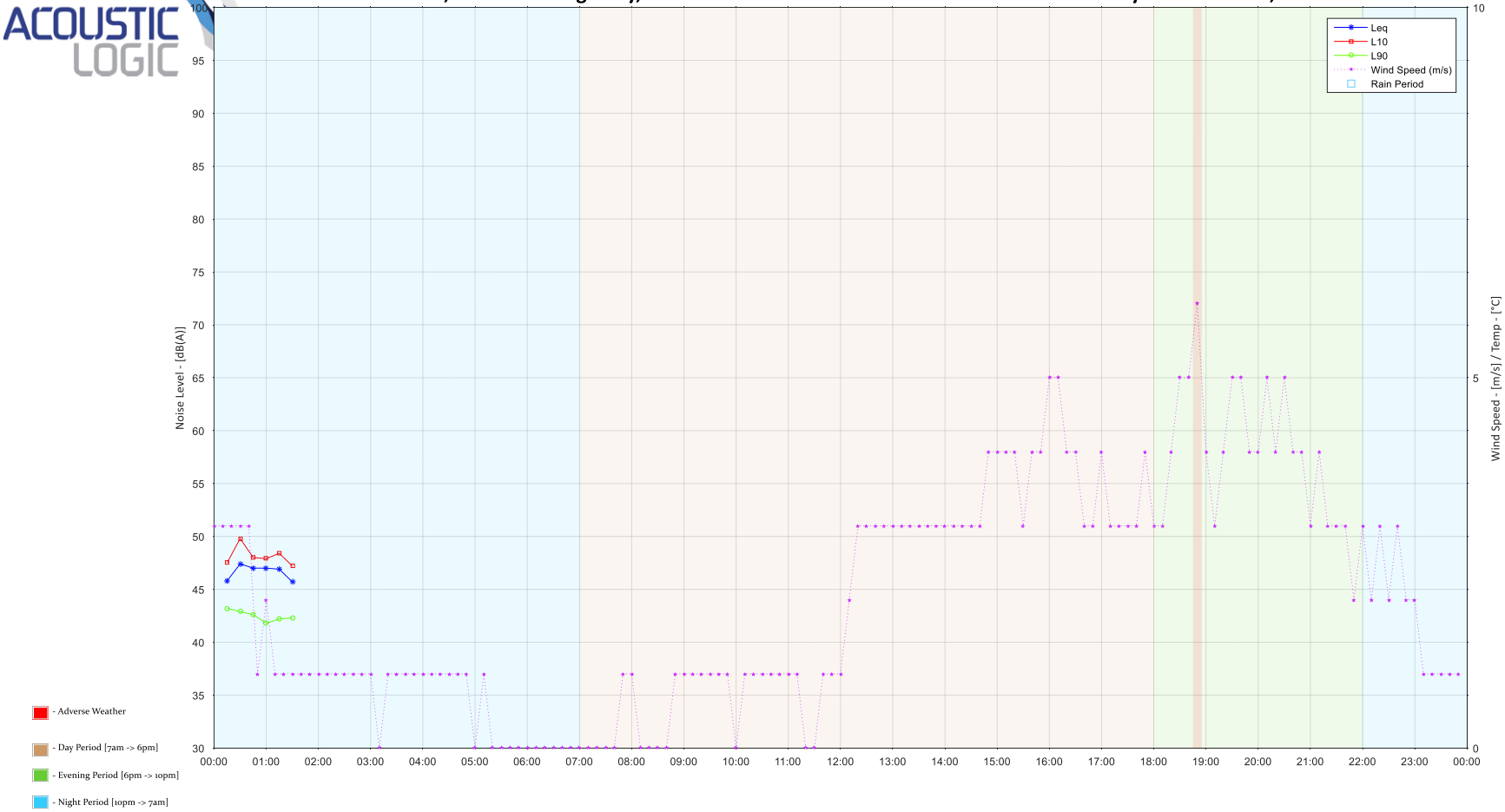

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Monday 24 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Tuesday 25 December, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Wednesday 26 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

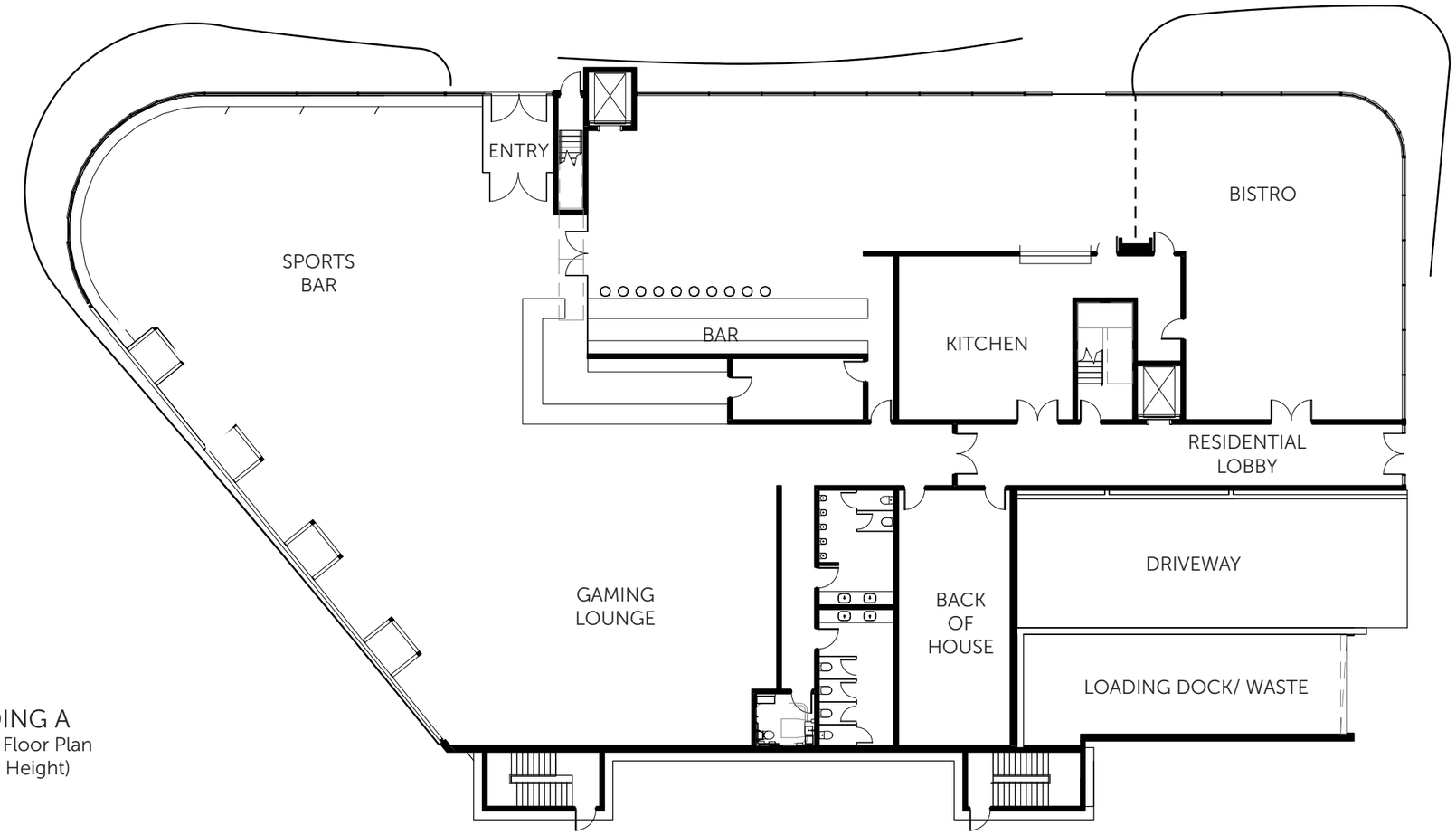

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Thursday 27 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Friday 28 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

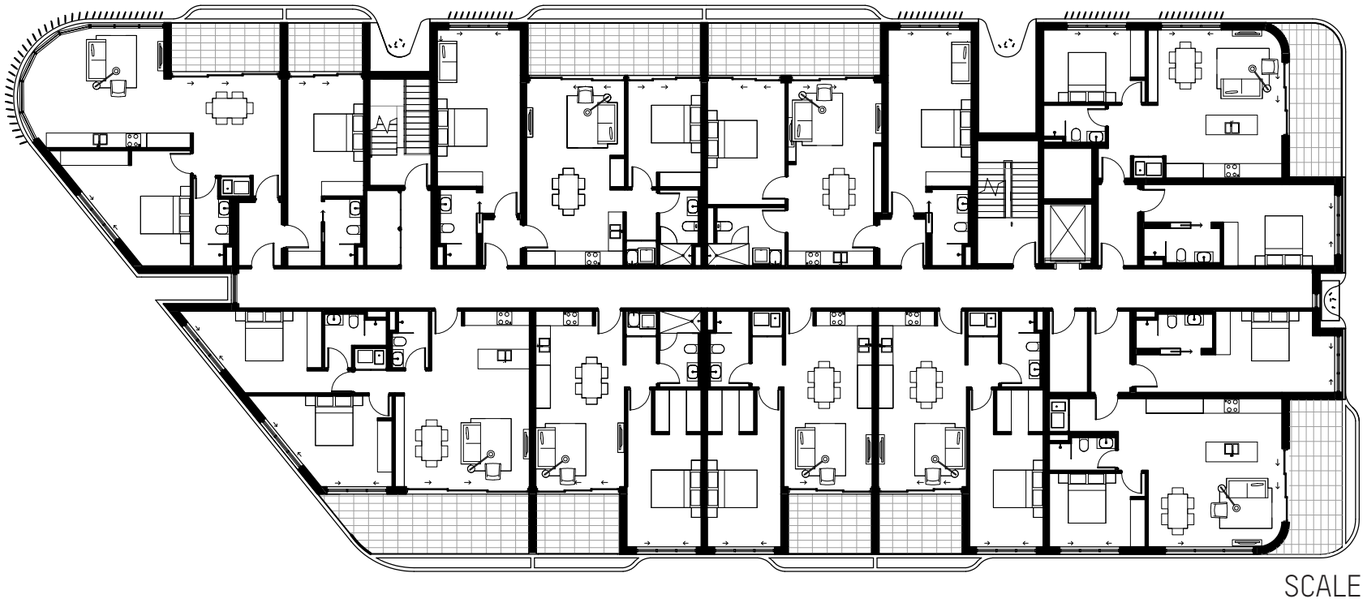

The Plams, 167 Hume Highway, Greenacre - Location 2 - South-east Corner: Saturday 29 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

4

INDICATIVE FLOOR PLANS

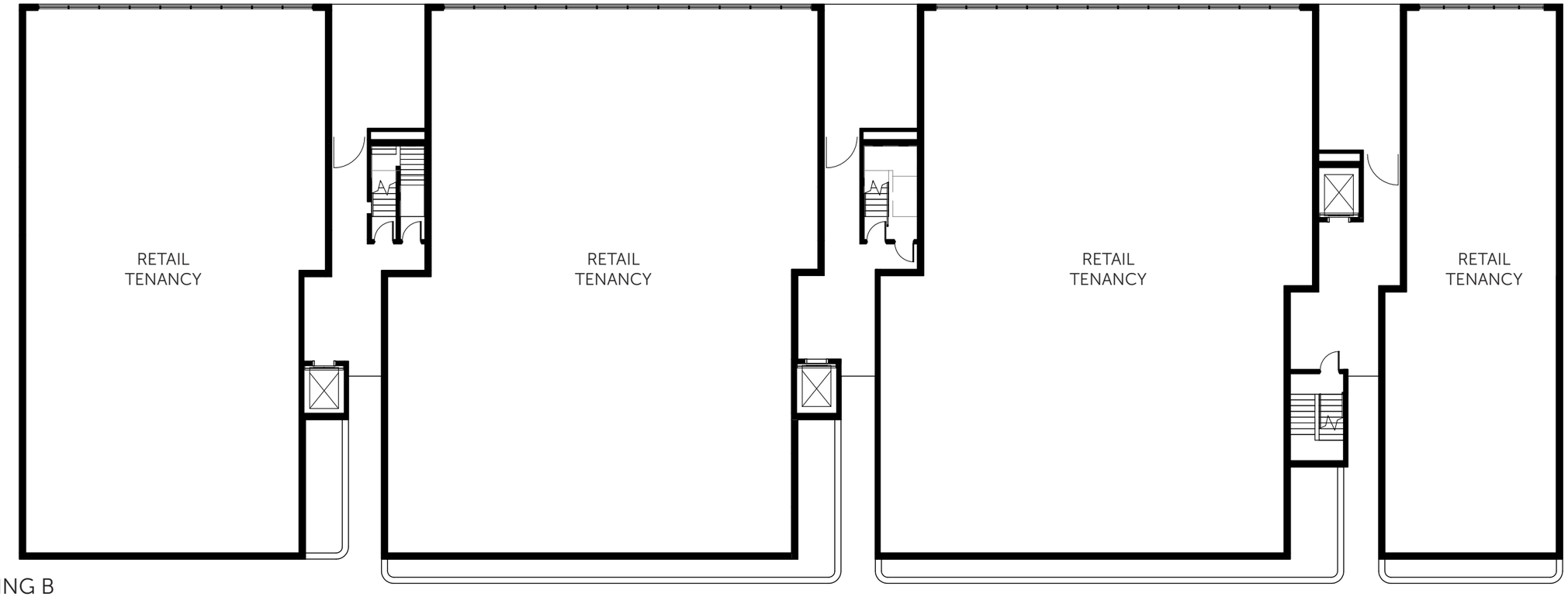


BUILDING A
Ground Floor Plan
(Double Height)

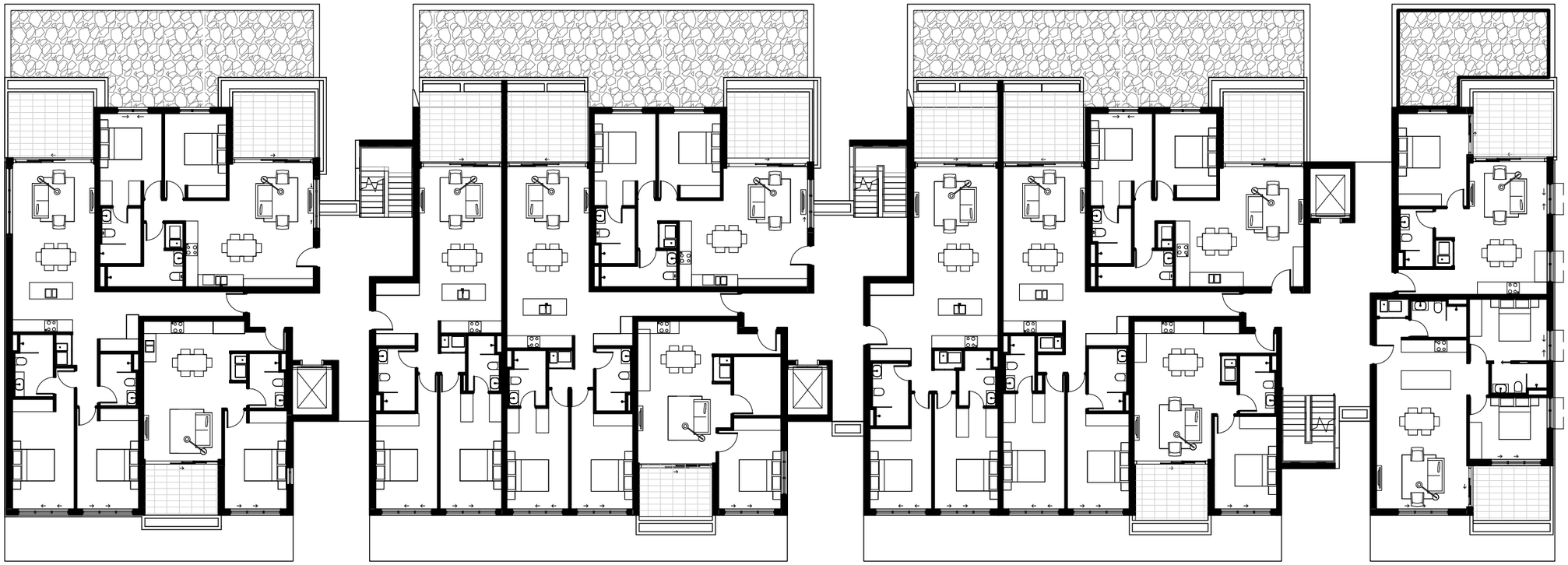


BUILDING A
First Floor Plan

SCALE BAR
0 5 10M



BUILDING B
Ground Floor Plan



BUILDING B
First, Second & Third Floor Plan

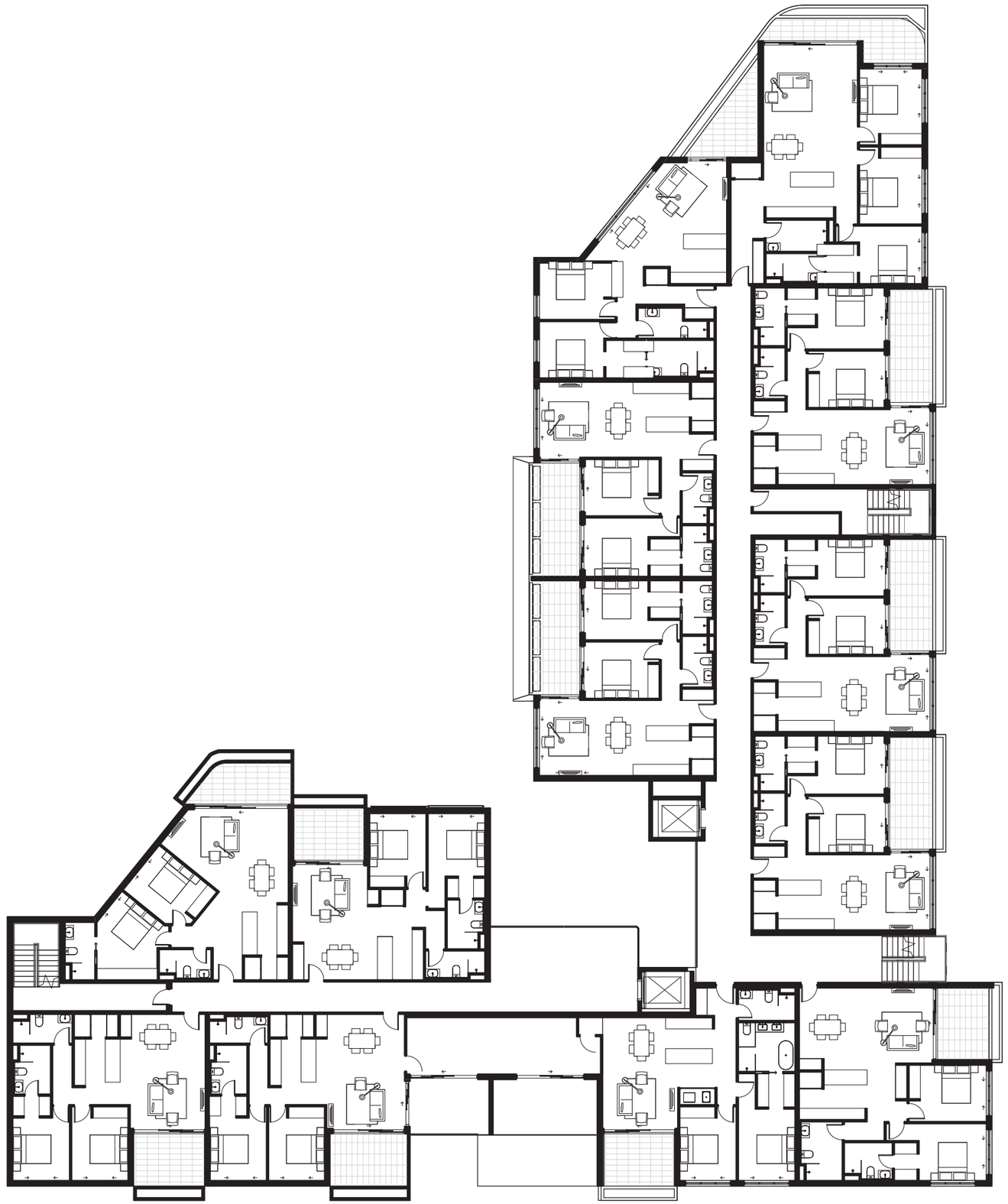
SCALE BAR
0 5 10M

BUILDING B
Fourth Floor Plan

SCALE BAR
0 5 10M

BUILDING C
Typical Floor Plan

SCALE BAR
0 5 10M



BUILDING D
Typical Floor Plan

SCALE BAR
0 5 10M