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Extended Hours Construction Noise Impact Assessment

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EXECUTIVE SUMMARY

A construction noise assessment has been carried out for the proposed extension of construction hours associated with the internal fit out of the residential Building 8 as part of the Frasers Broadway development. The potential impacts from these activities have been assessed based on the requirements of the Council of the City of Sydney. The results of the assessment have been used to develop controls that will be used to manage impacts from these activities.

The report identifies any potential noise impacts from internal construction activities proposed by the site contractor. The objective of this study is to investigate if internal construction works may be undertaken during the after-hours period without having a negative acoustic impact and to protect the amenity of the sensitive receivers surrounding the site.

ALC have concluded from this assessment that based on the construction activities proposed, construction noise emissions during the proposed hours of 24 hour operation can comply with the construction noise emission requirements of Sydney City Council.

1 INTRODUCTION

This report presents the assessment of noise impacts associated with the proposed extended hours of construction works to be carried out within Block 8 as part of the Frasers Broadway development located along O'Connor Street, Chippendale.

This report addresses noise impacts associated with internal fitout works during the evening and night time period (Category 2-4) and the formulation of acoustic treatments to ensure that noise emissions comply with the Council of the City of Sydney's "Construction Hours/Noise Within the Central Business District" Code of Practice (1992).

The proposed construction hours associated with this assessment involve an extension from the approved construction period to 24 hours a day, 7 days a week.

ALC confirms that noise impacts during the extended construction hours period can comply with the Sydney City Council construction noise criteria and will not result in an additional noise impact above the ambient acoustic environment.

Furthermore, ALC notes that with the extension of construction hours, the overall noise exposure for residents surrounding the site will be significantly reduced due to the shortening of the construction program for Block 8 of the Frasers Broadway development.

Noise impacts have been assessed using the SoundPlan noise modelling software which provides a detailed assessment model for evaluating noise associated with the internal fitout works.

2 SITE DESCRIPTION

The proposed works are to be conducted within Block 8 of the Frasers Broadway development located on the corner of Abercrombie and O'Connor Street, Chippendale. (Refer to Figure 1).

2.1 SENSITIVE RECEIVERS

The nearest sensitive receivers in the vicinity of the site are as follows (refer Figure 1):

Receiver 1 (R1)	Student accommodation units within Block 4S across Irving Street to the North.
Receiver 2 (R2)	Residential dwellings located at 13-21 Abercrombie Street approximately 20m to the Northwest.
Receiver 3 (R3)	Residential dwellings located at 23-25 Abercrombie Street approximately 20m to the West.
Receiver 4 (R4)	Residential terraces located at 41-55 Abercrombie Street approximately 26m to the Southwest.
Receiver 5 (R5)	Residential terraces located at 51-75 O'Connor Street, approximately 46m to the Southwest.

These buildings will be used as a basis for this night time assessment as they represent the nearest most potentially affected receivers during the period of operation.

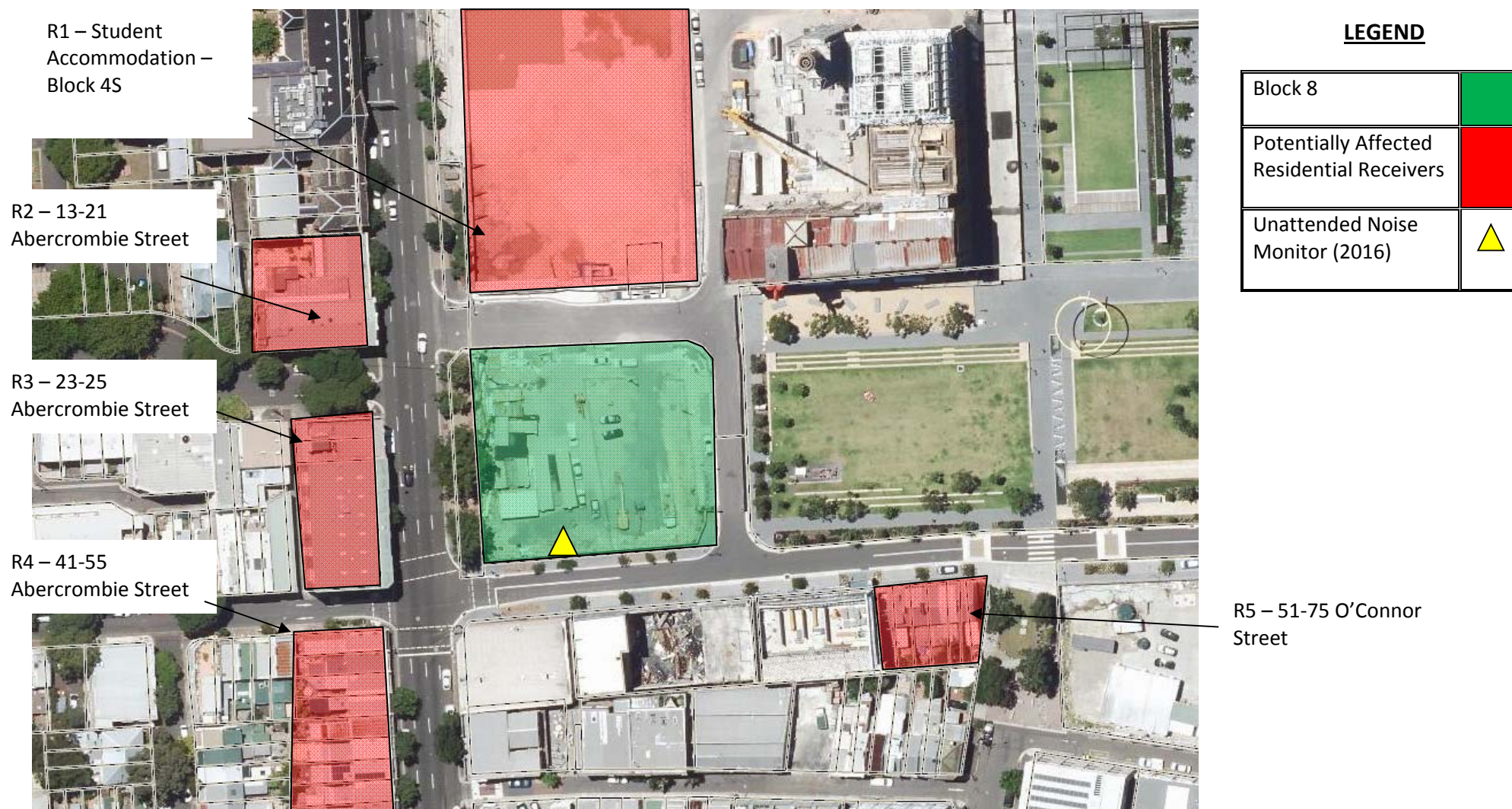


Figure 1: Site Survey and Sensitive Receivers

3 PROPOSED WORKS TO BE CARRIED OUT

This study includes works associated with the internal fitout of the residential levels of Block 8 only. No external construction works are proposed.

3.1 EXTENSION OF CONSTRUCTION HOURS PROPOSAL

The existing approved construction hours for the site are as per the Condition D1 of the project application which references the City of Sydney “Construction Hours/Noise Within the Central Business District” Code of Practice (1992). Construction hours are as follows:

1. Between 7:00 am and 7:00 pm, Mondays to Fridays inclusive;
2. Between 7:00 am and 5:00 pm, Saturdays;
3. No work on Sundays and public holidays unless otherwise approved by the City of Sydney Council.

It is proposed to extend these construction hours to include:

1. 24 hours a day, 7 days a week.

Construction works during this period will be limited to internal fitout of the development.

3.2 FITOUT WORKS

The construction activities which will be assessed in this document are internal fitout and finishes works to residential dwellings within Block 8 of the Frasers Broadway development. Specific works are as described below.

3.2.1 Internal Fitout and Finishes Works

This involves all internal fitout work from the installation of plasterboard ceilings, services installation, painting and joinery. All work covered under this section, will be contained within the building, with the completed facade providing a barrier to the direct transmission of noise to the exterior.

Internal fitout and finishes works are typically to be limited to:

- Fixing, setting & sanding of plasterboard;
- Painting;
- Laying of floor finishes;
- Installation of furniture;
- General fit-off; power points, light fittings, installation of taps, shower screens etc;
- Cleaning; and
- Testing and commissioning of internal plant.

The proposed works associated with the fit out of the residential development are described below.

Table 1 – Proposed Internal Construction Works

Activity	Task Description	Noise Sources
Fitout	Interior fitout including new ceilings and partition walls, surface finishes and services	Power tools (typically drills for plasterboard fixing and furniture), hand tools

3.2.2 Deliveries

All material deliveries are to be conducted during the normal construction period of 7:00am to 7:00pm. There are to be no deliveries to the site during extended hours.

All materials required for the night time works are to be relocated internal to the building during normal construction hours allowing for night time works.

3.2.3 Site Access

Access to the site will be provided by Abercrombie Street and the lane bordering the North of the site. Access during the extended hours works will be limited to personnel entering and exiting the development only.

3.3 CONSTRUCTION NOISE LEVELS

Noise impact will be determined from all processes and equipment, which are involved in the activities outlined above by defining the levels of sound, which they generate.

The A-weighted sound power levels for general component parts of the above-described activities are outlined in the tables below.

Table 2 – Construction Activities – Sound Power Levels

Construction Activity	Equipment / Process	Noise Level – dB(A)
Fitout	Hammering	110 SWL
	Drilling	94 SWL
	Impact drill	112 SWL
	Electric Saw	94 SWL
	Angle Grinders	114 SWL

The noise levels presented in the above table are derived from the following sources, namely:

1. On-site measurements
2. Table D2 of Australian Standard 2436-1981
3. Data held by this office from other similar studies.

Noise monitoring previously conducted by ALC on internal fitout works will be used for the basis of this assessment. Noise monitoring was conducted over a two week period for the internal demolition and fitout works at 420 George Street, Sydney.

The worst case 15 minute measurement period from the two weeks of demolition and fitout works indicated a sound pressure level of 97dB(A) L_{10} within the enclosed reverberant space. The internal works were conducted in a similar sized space to that associated with a bare shell apartment.

This internal noise level will be used as a basis for the assessment of internal construction noise during the proposed extended hours period.

3.4 CONSTRUCTION METHODOLOGY

Fitout works will be conducted using the following strategy:

1. Contractors constructing partitions, lining, joinery and the like. These teams will be using power and hand tools and the like and will generate noise internally within Block 8 (noise levels as detailed above).
2. All equipment and materials will be stored internally before works being on site in the evening.
3. Typically noise will be associated with painting, electrical wiring, flooring and installation of electrical and lighting fittings which are significantly quieter than that used for this assessment which is based on angle grinding and/or circular saw.

4 CONSTRUCTION NOISE OBJECTIVES

4.1 CONSTRUCTION NOISE

Criteria relating to construction noise within the City of Sydney are outlined in the City of Sydney “Construction Hours/Noise Within the Central Business District” Code of Practice (1992). Construction noise during all periods of the day as detailed in the code are as follows:

Table 3 - Categories of Working Hours and Noise Criteria

Day	Time Zone	Category	Noise Criteria
Monday to Friday	00.00 – 07.00	4	Background + 0dB(A)
	07.00 – 08.00	1	Background + 5dB(A)
	08.00 – 19.00	1	Background + 5dB(A) + 5dB(A)
			To be determined on a site basis
	19.00 – 23.00	2	Background + 3dB(A)
	23.00 – 24.00	4	Background + 0dB(A)
Saturday	00.00 – 07.00	4	Background + 0dB(A)
	07.00 – 08.00	1	Background + 5dB(A)
	08.00 – 17.00	1	Background + 10dB(A)
	17.00 – 23.00	2	Background + 3dB(A)
	23.00 – 24.00	4	Background + 0dB(A)
Sundays and Public Holidays	00.00 – 07.00	4	Background + 0dB(A)
	07.00 – 17.00	3	Background + 3dB(A)
	17.00 – 24.00	4	Background + 0dB(A)

In addition, the following requirements are adopted.

- Australian Standard 2436-1981 “Guide to Noise Control on Construction Maintenance and Demolition Site”. The requirements stipulated in Section 3 of the standard will be followed.

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration. For the control and regulation of noise from construction sites AS2436 nominates the following:

- That reasonable suitable noise criterion is established.
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- Noise emissions during the night time period at residential locations should achieve the background + 0dB(A) criteria for Category 4 hours.

4.2 BACKGROUND NOISE MONITORING

Background noise levels have been determined from monitoring on site.

4.2.1 Measurement Equipment

Unattended noise monitoring was conducted using Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was 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.

4.2.2 Measurement Location

Monitoring was conducted at the rear of Block 8 behind solid construction hoarding.

4.2.3 Measurement Period

Monitoring was conducted from Thursday 25th February to Friday 4th March, 2016.

4.2.4 Weather Affected Noise Data and Extraneous Noise Sources

Weather affected noise data (as determined by Sydney Observatory – Observatory Hill) has been used to determine potentially affected weather data.

For the most part, there is negligible difference between the recorded background noise levels during winds exceeding 5m/s and winds less than 5m/s. This is due to the fact that the monitor was shielded from the majority of wind, and there were no trees or vegetation in the immediate vicinity of the logger which may increase background levels due to wind.

Extraneous background noise sources appear in the noise data during the night time period on the following mornings (i.e between 12am-7am):

- Tuesday 1st March;
- Thursday 3rd March; and
- Friday 4th March.

Where typically the background appears to be around 45dB(A) L₉₀ during this period, the aforementioned days appear to be affected by some mechanical plant. ALC was unable to determine the location of this equipment. Notwithstanding, as this does not appear to be a characteristic of the quieter environment as suggested by the remainder of the logging period, these night time background noise levels (generally around 50dB(A) L₉₀) have been excluded from the determination of the RBL.

On this basis, ALC would deem the background noise data acceptable.

4.2.5 Background Noise Levels

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

Table 4 – Measured Background Noise Level

Time of Day	Unattended Noise Monitoring (2016) Background Noise Level dB(A) L₉₀
Night (Category 4)	44

Construction noise affected data has been omitted from the background noise levels established above.

4.3 CONSTRUCTION NOISE OBJECTIVES

The construction noise objectives for this assessment have been established from the background noise monitoring in conjunction with the requirements of City of Sydney Council guidelines.

Table 5 – Construction Noise Objectives

Category	Background Noise Level dB(A) L₉₀	Construction Noise Objective dB(A) L_{Av max}
4	44	44

5 CONSTRUCTION NOISE MODELLING

Construction noise emissions associated with internal activities have been predicted using the SoundPlan noise modeling software. Hand calculations were incorporated to ratify predicted noise levels established from the SoundPlan noise model.

5.1 SOUNDPLAN NOISE PREDICTIONS

Modelling was conducted to investigate the potential for noise impact from internal fitout works during the extended hour's period of the surrounding receivers for the Frasers Broadway development.

Input information which has been used in the development of the model included the following:

1. The model assumed that the loudest typical works were being conducted simultaneously on a particular floor level (Level 2) within Block 8. This assumes that:
 - o The building is split into eight components around the core and there are no partition walls between each unit. This means that a uniform sound pressure level will be being emitted from each window on each façade, which will provide the most conservative assessment.
 - o The internal sound pressure level of 97dB(A) $L_{10\ 15min}$ has been adopted for general fitout and construction works. The sound pressure level assumes it is emanating out of each apartment window.
 - o The general works will be attributed to partition sheeting, finishes and floor installation which will not be typically loud works and will be significantly less than that assumed generally.
2. Details of the noise modelling are included in Appendix A.
3. The ISO9613-3:1996 method was used in SoundPlan to calculate noise propagation.
4. The transmission loss of the residential façade used was R_w 31 for 6.38mm laminated glazing. It should be noted that in most circumstances glazing exceeds this rating

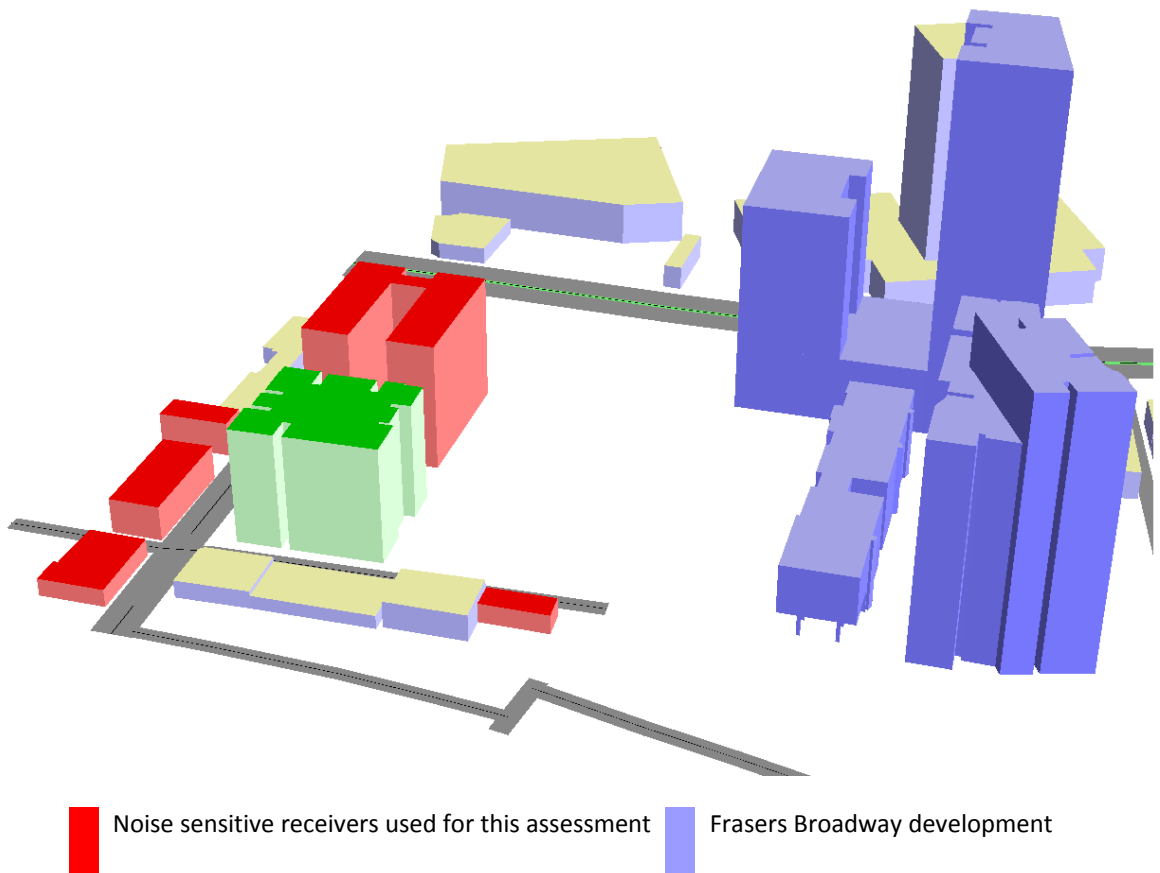


Figure 2: SoundPlan Base 3D Model – South-East View

5.2 SCENARIO ONE – INTERNAL FITOUT OF THE BUILDING WITH INSTALLED FAÇADE

Internal noise levels during the fitout have been based on the worst case internal noise level from the loudest piece of plant.

- The worst case internal sound pressure level of 97dB(A) based on monitoring previously conducted by ALC within each building component as detailed above;
- The building façade is closed and constructed as per the project acoustic requirements for external noise intrusion into the building. This constitutes a minimum glazing specification of 6.38mm laminated glazing suites.

5.3 PREDICTED NOISE LEVELS

Noise emissions from internal construction activities have been modelled using the SoundPlan noise modelling software. Predicted noise levels are presented at the nearest potentially affected residential receivers.

Table 6 – Predicted Construction Noise Levels (*Category 4*)

Activity	Receiver Location	Predicted Noise Level dB(A) L _{av max} 15min	Construction Noise Criteria dB(A) L _{av max} 15min	Complies
Internal Fitout	1	40	44	Yes
	2	39	44	Yes
	3	41	44	Yes
	4	38	44	Yes
	5	36	44	Yes

6 SAMPLE NOISE CALCULATIONS

In addition to the noise modelling detailed in the section above a number of sample calculations have been presented in this section of the report.

Sample calculations of the potentially worst case noise level sources associated with the fitout works and resulting noise levels at receivers are detailed below:

The following is a sample calculation used to predict the noise level at the worst affected residence; that being the residences at 23-25 Abercrombie Street from the operation of the internal works.

- | | | |
|----|---|--------------|
| 1. | Noise source (Fitout Sound Pressure Level): | 97 dB(A) SPL |
| 2. | Area correction (1 apartment facade) | +4 dB |
| 3. | Number of apartments (x 8) | +9 dB |

Note: Area and number of windows approximates the amount of glazing on one floor directly facing the receiver.

- | | | |
|----|--|--|
| 4. | Façade noise reduction of One Central Park (6.38mm Laminated): | -36 dB |
| 5. | Distance Correction (23m): | -35 dB |
| 6. | Resultant Noise level at receiver façade: | 39 dB(A) |

7 RECOMMENDED MANAGEMENT CONTROLS

The following management controls are recommended to ensure that noise emanating from the site during construction works comply with the noise emission criteria.

- The façade is to be entirely closed during extended construction hours works.
- No external construction works are to be conducted during the extended construction hours period.
- Access to the site during the extended hours period will be from Abercrombie Street for site personnel only. Deliveries are to be undertaken during normal construction hours.
- Personnel working during the proposed period are to be appraised of the noise restrictions. Good site practices should be employed to reduce noise as practically possible. This includes:
 - Not using raised voices external to the building;
 - Being careful not to drop tools into flat beds or the like when transporting tools from work vehicles after shift change.
- No radios (cars or otherwise) are to be played external to the building envelope.

8 DISCUSSION

Noise associated with internal fitout works during extended construction hours have been found to comply with the Category 4 noise emission criteria based on the worst case scenario of an internal sound pressure level of 97dB(A) as discussed in Section 5.1.

It should be noted that the assessment scenario is unlikely to occur in practice as it is unlikely that all sections of the floor plate would be worked on simultaneously with the loudest items of plant as is assumed in our predictions. In practice, ALC would expect that the majority of fitout works would typically produce noise levels significantly lower than that predicted.

It should also be noted that the noise logger was screened from direct traffic noise which occurs along Abercrombie Street due to the hoarding surrounding the site. Background noise levels, particularly for receivers along Abercrombie Street are expected to be considerably higher.

On this basis, internal fitout works will comply with the Sydney City Council noise emission criteria on the proviso that all works are conducted behind a closed façade.

9 CONCLUSION

This report presents the assessment of construction noise impacts associated with the proposed extension of construction hours for internal works within Block 8 of the Frasers Broadway development.

Predicted noise levels from the worst case internal construction works in conjunction with external lift operation indicate that noise emissions will comply with the Council of the City of Sydney's "Construction Hours/Noise Within the Central Business District" Code of Practice (1992).

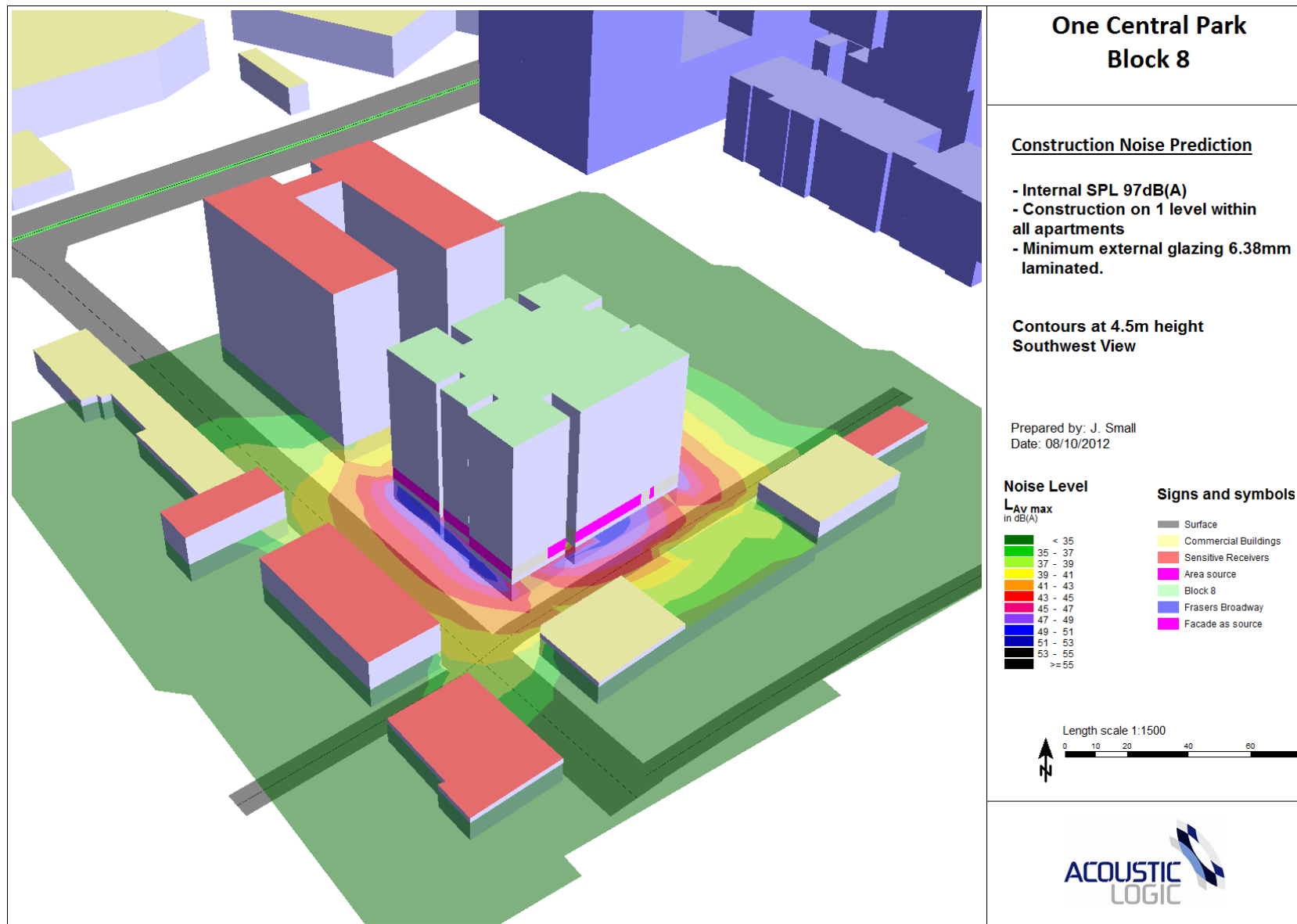
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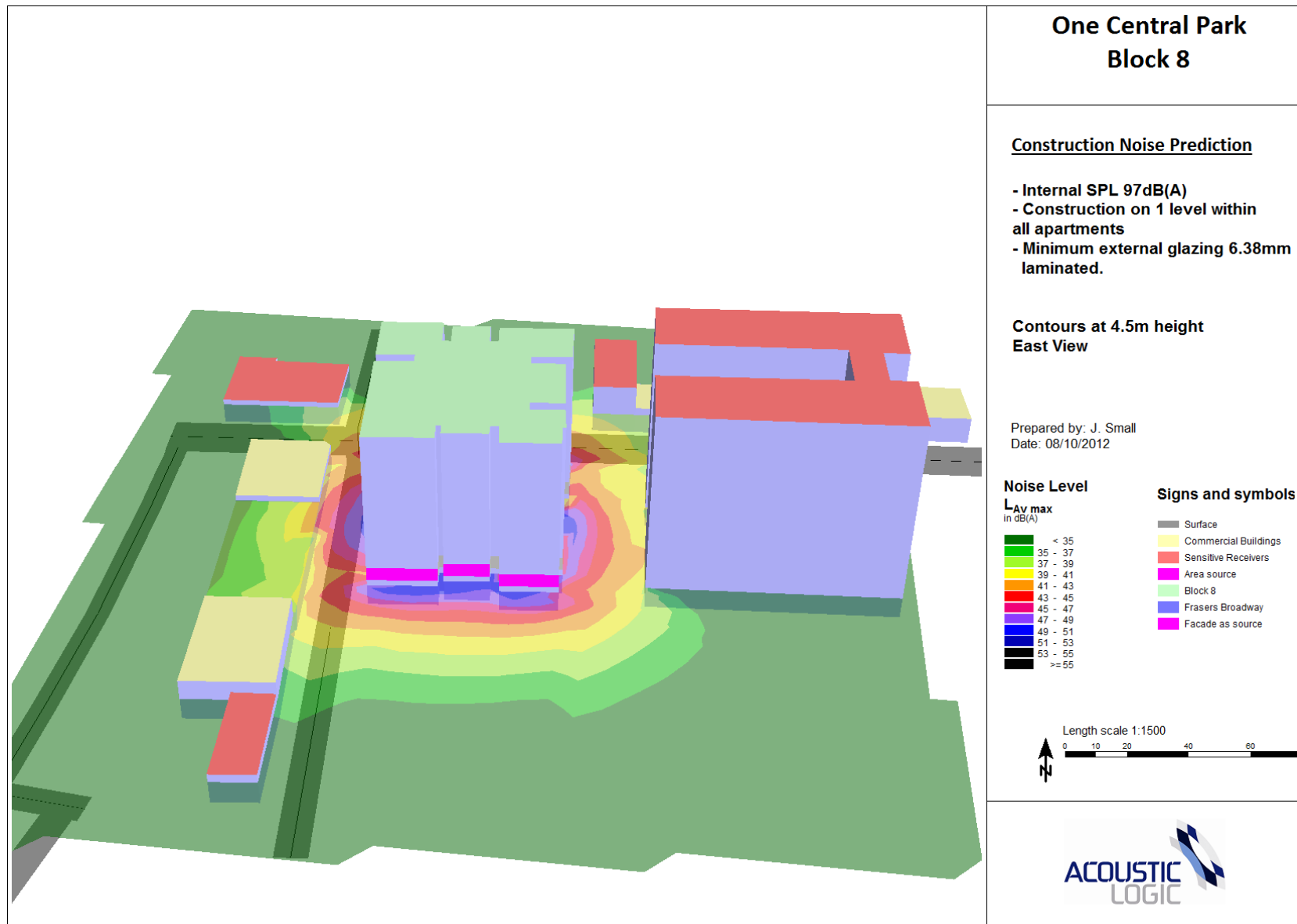
Yours faithfully,



Acoustic Logic Consultancy Pty Ltd
James Small

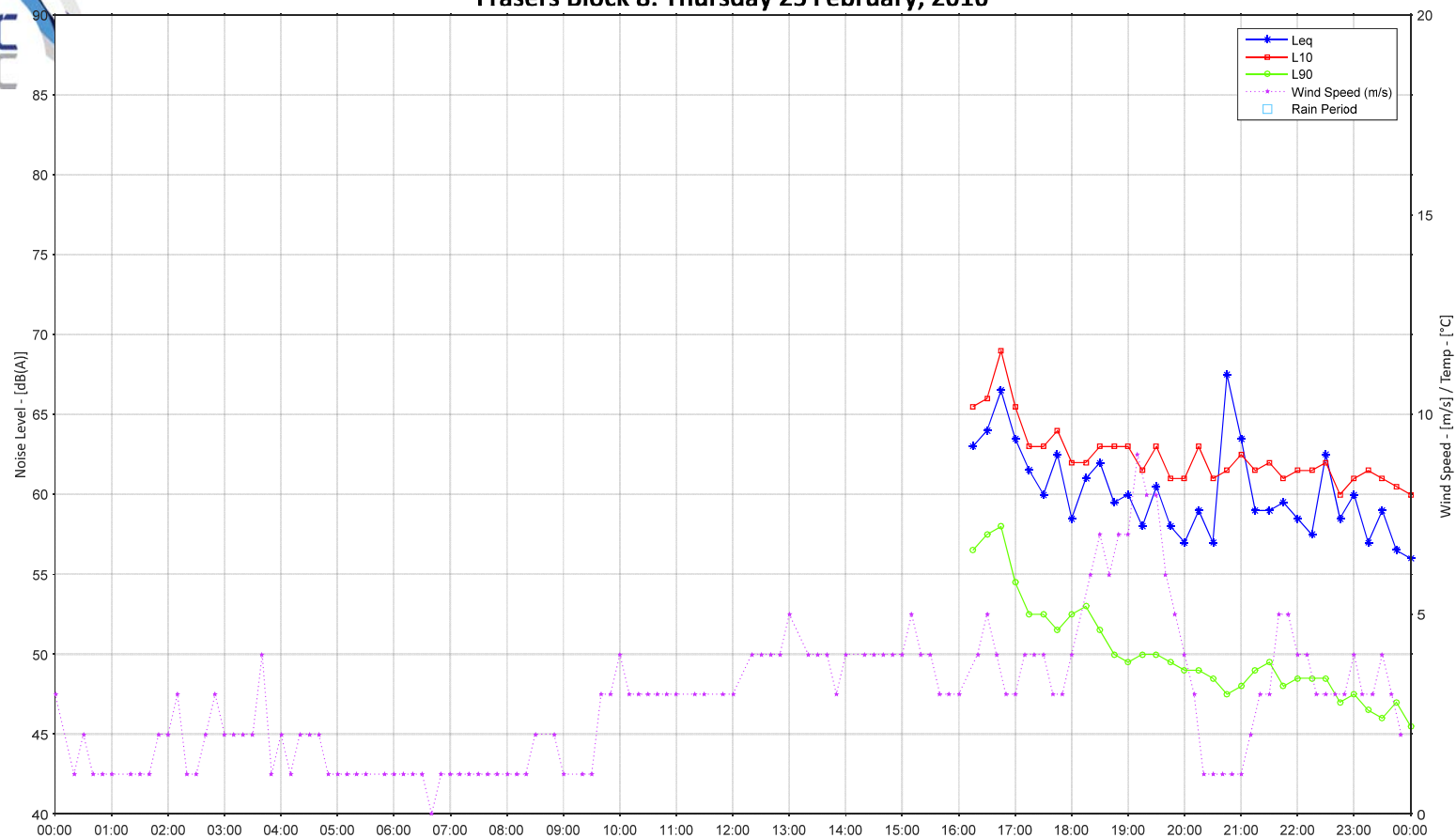
APPENDIX ONE – SOUNDPLAN NOISE PLOTS



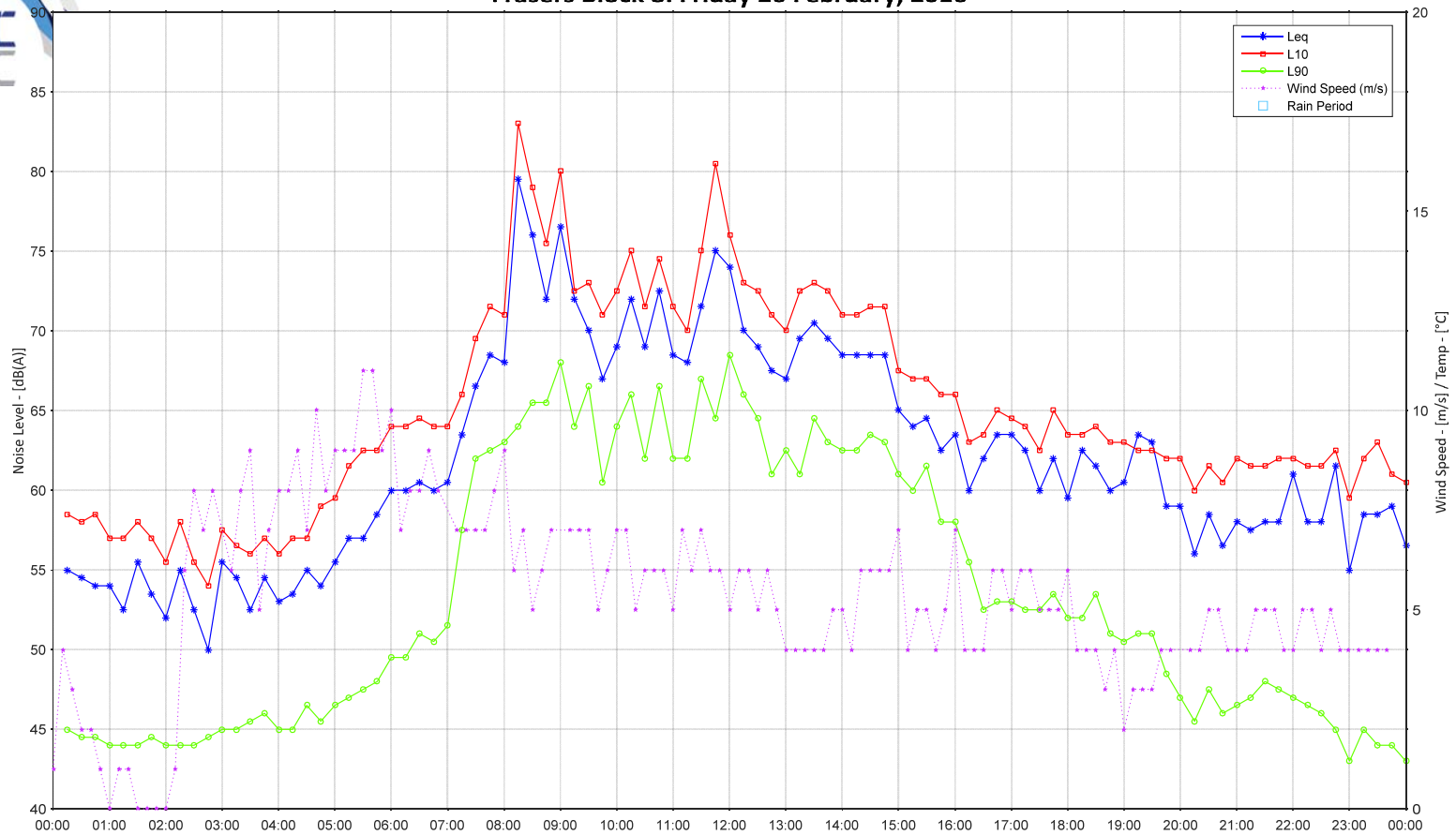


APPENDIX ONE - UNATTENDED NOISE MONITORING DATA

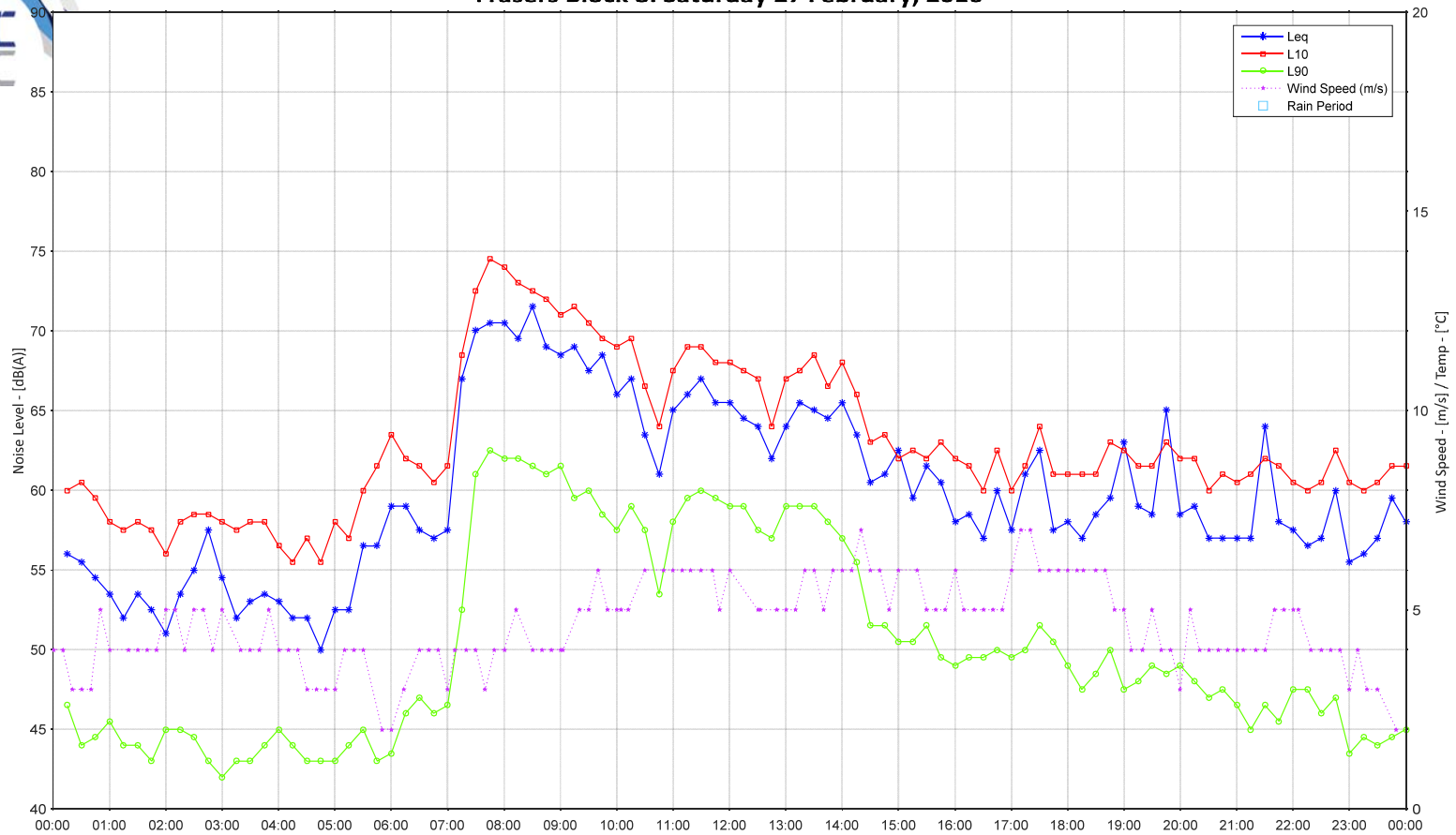
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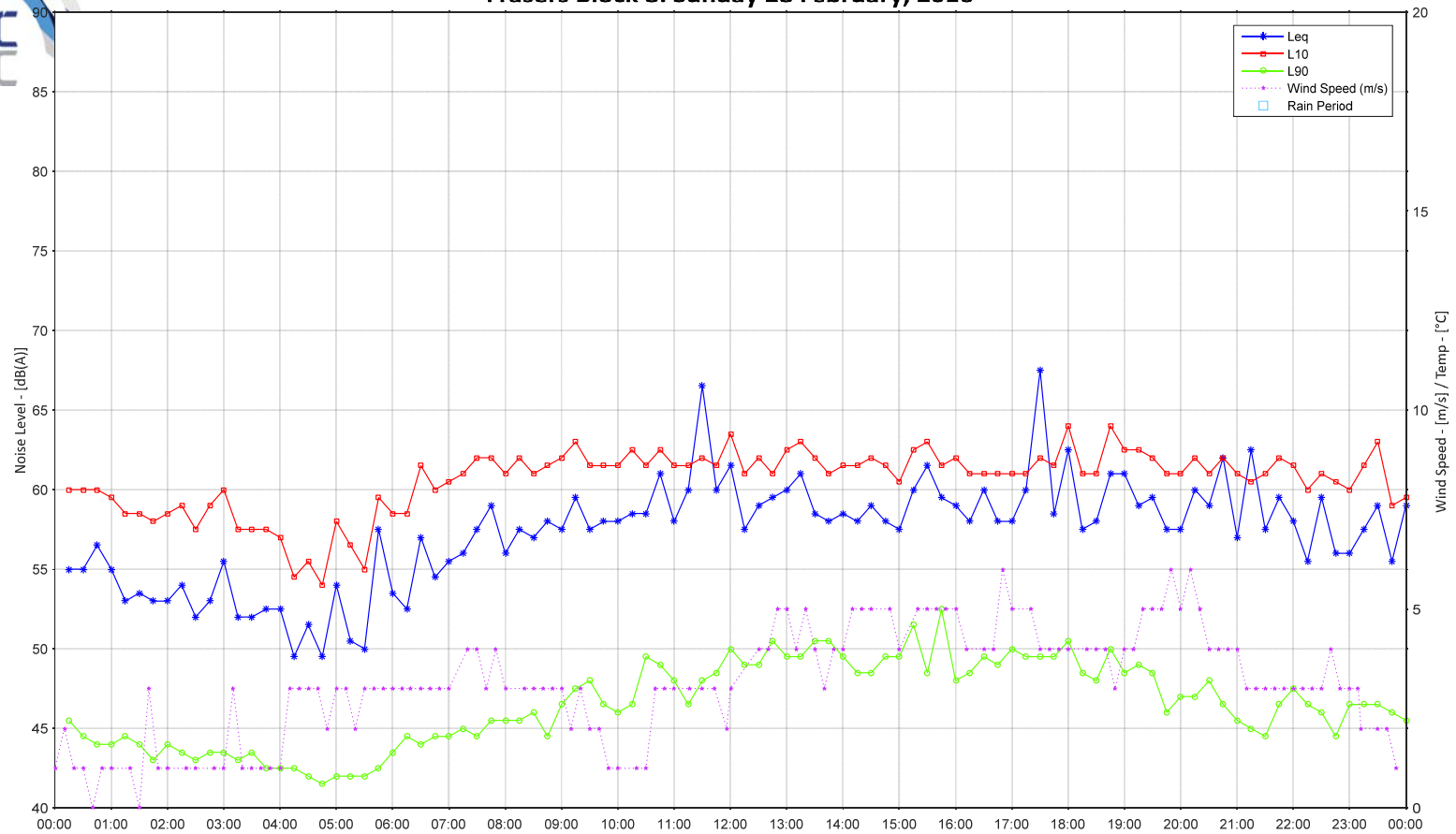
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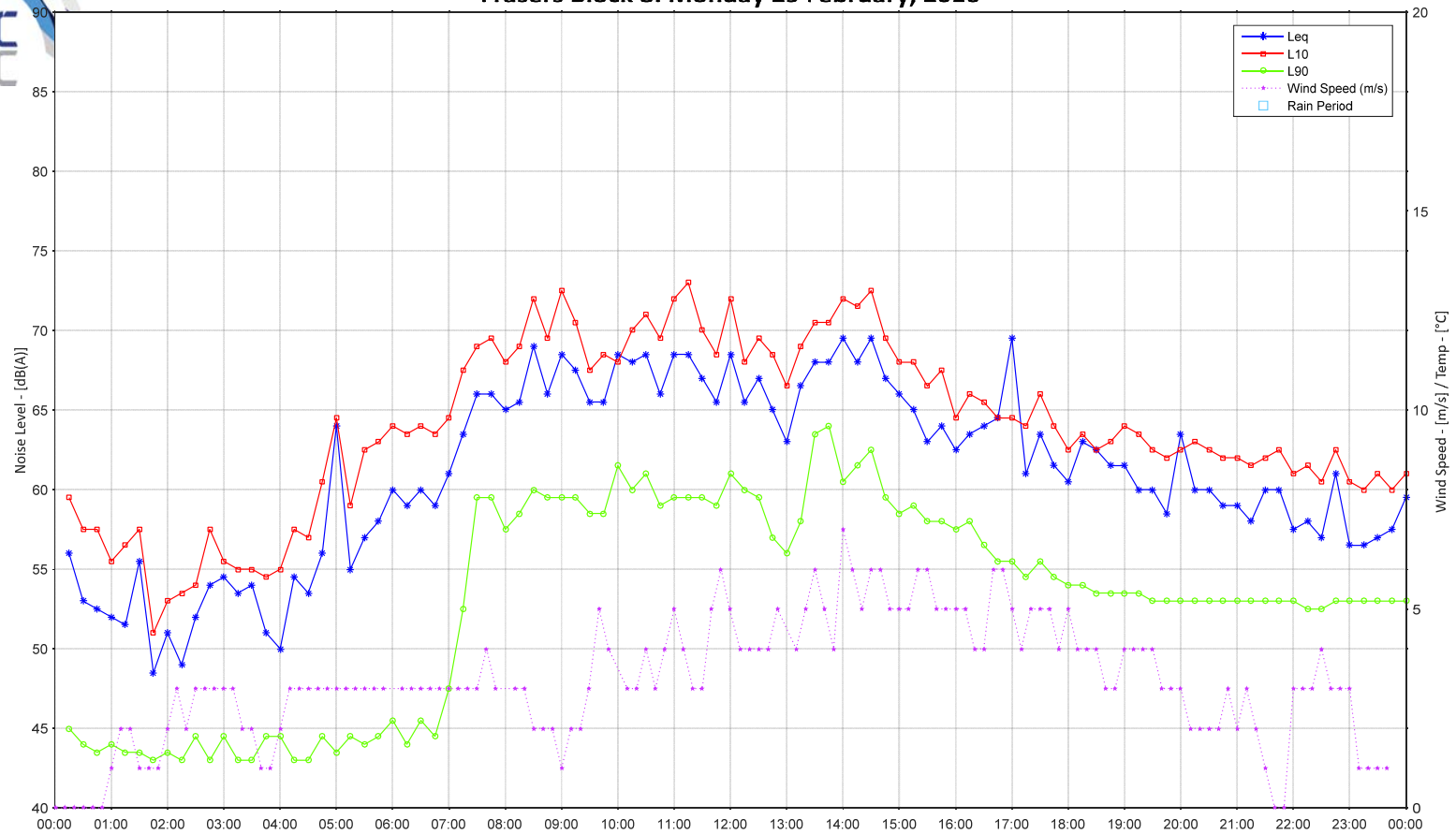
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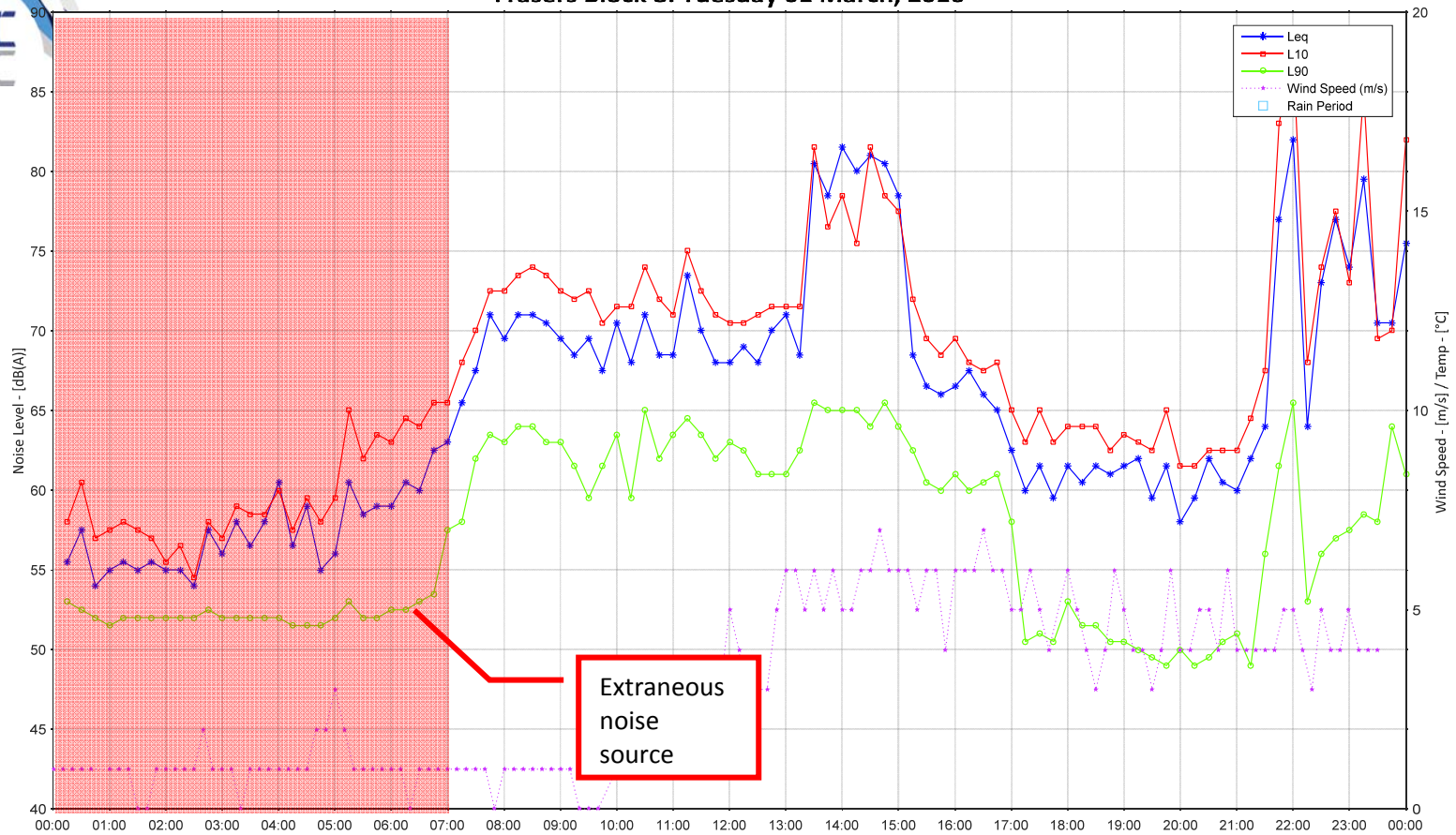
Frasers Block 8: Sunday 28 February, 2016



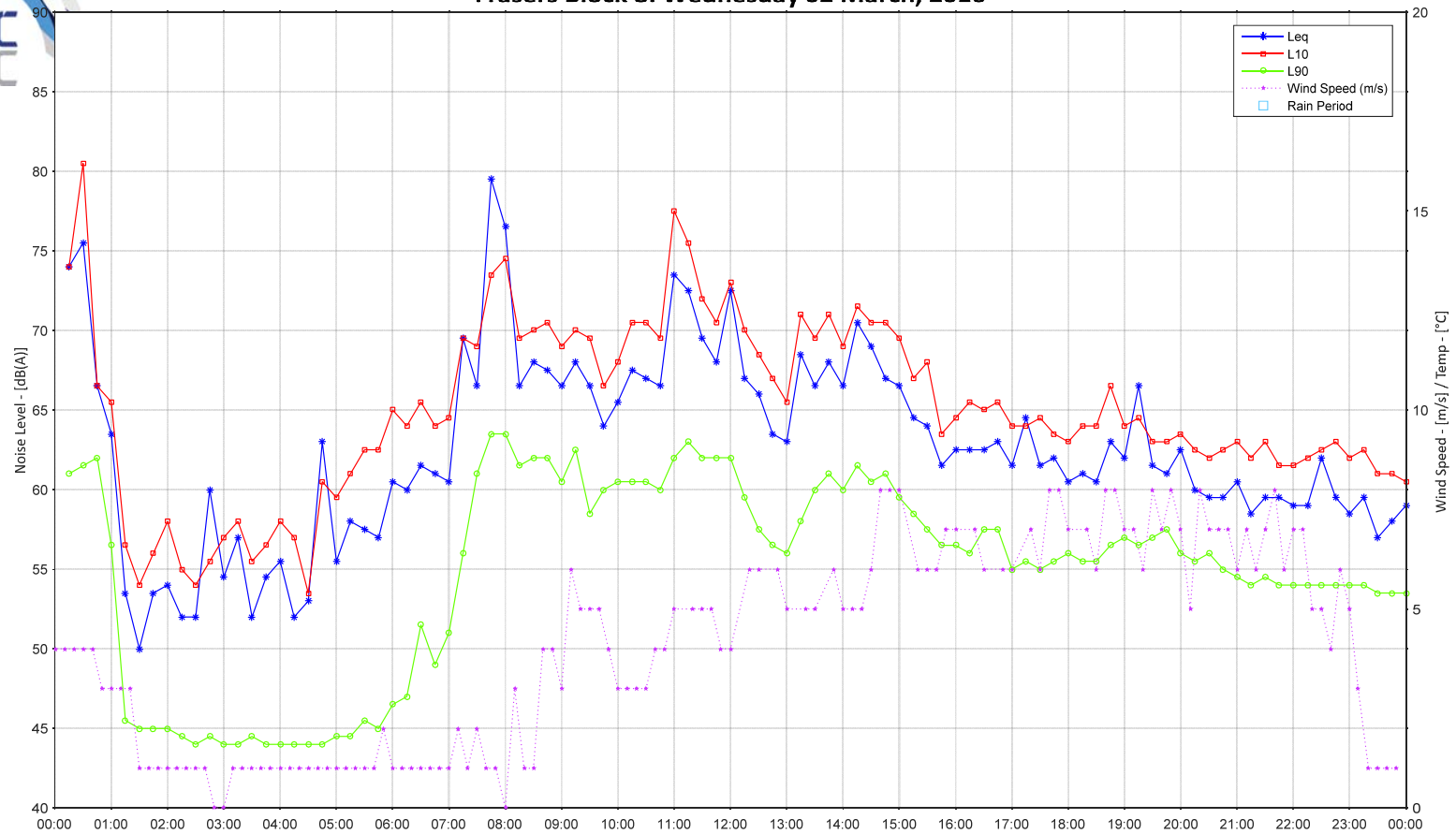
Fraser's Block 8: Monday 29 February, 2016



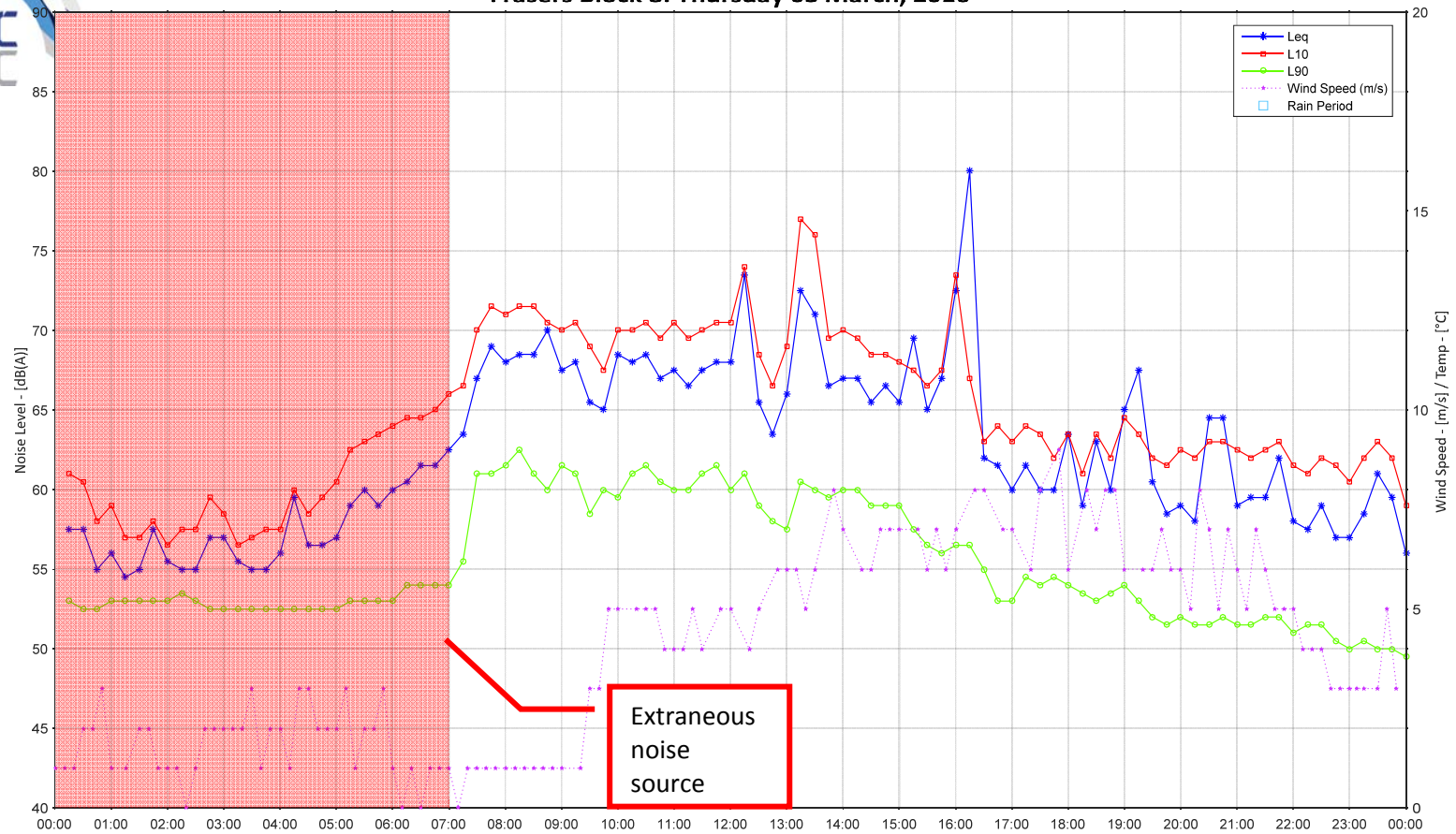
Frasers Block 8: Tuesday 01 March, 2016



Fraser's Block 8: Wednesday 02 March, 2016



Frasers Block 8: Thursday 03 March, 2016



Frasers Block 8: Friday 04 March, 2016

