ACOUSTIC LOGIC CONSULTANCY
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Report: 2006273/0630A/R1/MC

Prepared for: BOVIS LEND LEASE

BUILDING B & F, TOP RYDE RESIDENTIAL

DA NOISE ASSESSMENT

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1. INTRODUCTION

This report presents our assessment of the potential acoustic impacts to the residential development at Building B & F, Top Ryde Residential.

External noise intrusion from traffic will be assessed within the development in accordance with AS 2107 (AS/NZS2107:200 “Acoustics-Recommended Design Sound Levels and Reverberation Times for Building Interiors”) and AS3671 (AS3671-1989 “Acoustics – Road Traffic Noise Intrusion – Building Siting & Construction”). As the building will be primarily of concrete and masonry construction and insulated lightweight composite façade material, the only significant noise paths requiring assessment will be through the glazing assemblies and roof required to exclude traffic noise are recommended based on traffic noise levels measured at the site.

Mechanical noise assessment is based on EPA industry policy.

The assessment is based on the drawings provided by Bovis Lend Lease with drawing numbers: A1.00,A2.21 to A2.30 and A2.41 to A2.45 dated September 2006.

2. SITE DESCRIPTION

The proposed development is located on the top of the proposed Top Ryde Shopping Centre opposite the Ryde Civic Centre on Devlin Street. The proximity of the residential buildings to the mixed use/retail is set back and accommodates significant distance above active retail areas. Centre Management controls and hours for retail uses have been considered and are set out in DA672/2206 Consent Conditions.

The site is bounded by Devlin Street to the west, Blaxland Road to the southwest, Pope Street to the northeast and Tucker Street to the southeast. Devlin Street is the continuation of Lane Cove Road which is a major road carrying high traffic volumes and Blaxland Road is a busy road carrying medium traffic volumes. Pope Street is a mixture of commercial and residential landuses whilst Tucker Street includes the Ryde Public School, associated preschool and commercial landuses. Existing Top Ryde driveway access points are served off Pope and Tucker Streets.

The location of the development and noise monitoring locations are indicated in Figure 1 below.

Figure 1 Site Map and Unattended Monitors Location

3. NOISE MONITORING

3.1 UNMANNED LONG TERM NOISE MONITORING

Unattended ambient noise level measurements were conducted in the locations shown in Figure 1 and are provided in Appendix 1. Inspection on site indicated that the main environmental noises at the site are that of transportation noise associated with Devlin Street and Blaxland Road.

3.2 MEASUREMENT EQUIPMENT

Unmanned noise monitoring was conducted using an Acoustic Research Laboratories Pty Ltd noise monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noise monitors were calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. Measurements were taken on A-frequency weighting and fast time weighting.

3.3 MEASUREMENT LOCATION

Location 1

Unattended noise monitoring was conducted on the rooftop of the commercial building on the corner of Pope and Devlin Street. The monitor was positioned on the south eastern corner of the roof overlooking the existing Top Ryde Centre.

Location 2

Unattended noise monitoring was conducted on an open balcony of the commercial building located on the eastern side of Blaxland and Tucker Street intersection. The monitor was positioned overlooking Tucker Street to the north west corner of the commercial building with direct line of sight to the existing Top Ryde Centre.

3.4 TIME OF MEASUREMENTS

The monitoring period was conducted between 24 April and 4 May 2006 for the corner of Pope and Devlin Street and up to the 10th May for Tucker Street. Unmanned noise monitoring data is presented in Appendix 1.

3.5 MEASURED NOISE LEVELS

As environmental noise is variable in nature, noise levels are described in terms of statistical descriptors. The L_{90} noise level is the level exceeded 90 per cent of the time and is approximately the average of the minimum noise levels. The L_{90} level is often referred to as the *background* noise level. The L_{eq} level represents the average noise energy during a measurement period. The monitored noise levels are provided in the Table 1. The unattended noise monitoring graphs are provided in Appendix 1 (uncorrected). The levels documented have been corrected by -2.5 dB(A) to account for façade reflection for monitoring location 2.

Table 1 – Measured Unmanned Noise Levels

Location	Time	$L_{Aeq(1hr)}$
Cnr Devlin and Pope Street	Day (7am to 6pm)	65
	Evening (6pm to 10pm)	64
	Night (10pm to 7am)	62
Tucker Street	Day (7am to 6pm)	65
	Evening (6pm to 10pm)	63
	Night (10pm to 7am)	59

4. TRAFFIC NOISE DESCRIPTORS

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

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

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement 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 measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

4.1 TRAFFIC NOISE CRITERIA

Traffic noise criteria for the proposed development are shown below. These requirements have been assessed in accordance with AS 2107 (AS/NZS2107:200 “Acoustics-Recommended Design Sound Levels and Reverberation Times for Building Interiors”) and AS3671 (AS3671-1989 “Acoustics – Road Traffic Noise Intrusion – Building Siting & Construction”). Internal requirements are for residential units and are measured internally with windows closed.

Table 2 details the assessment criteria applicable for the development are provided below.

Table 2 – Internal Noise Level Criteria

LOCATION	CRITERIA
Bedroom	$L_{eq\ 1Hour}$ 35 dB(A) (22:00-7:00)
Living Room	$L_{eq\ 1Hour}$ 40 dB(A) (7:00-22:00)

5. EVALUATION OF NOISE INTRUSION

Noise intrusion into the building was assessed using the measured levels in Section 4.

Calculations were performed 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.

In all cases, the selected glazing type (refer below) reduces internal noise levels to within the nominated criteria for the various space types.

6. RECOMMENDED CONSTRUCTIONS

These constructions are recommended to comply with the noise objectives stated in Section 4 above.

6.1 EXTERNAL WALLS

All external walls will be of concrete, masonry and lightweight composite material construction and are acoustically satisfactory for traffic noise intrusion.

6.2 ROOF

The roof will be concrete structure and is acoustically satisfactory for traffic noise intrusion.

6.3 GLAZED WINDOWS AND SLIDING DOORS

The recommended glazing assemblies are indicated in Table 3. They are all assumed as aluminium awning windows and doors. In all cases, the selected glazing type reduces internal noise levels to within the nominated criterion for the various space types.

The proposed glazing thickness will satisfy all acoustic requirements of Section 4. 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.

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.

Table 3 - Recommended Glazing for Windows and Doors

Building	Space	Facade	GLAZING THICKNESS	ACOUSTIC SEALS
B	Bedroom	North/West/East	6mm	Yes
	Living Room	North/West/East	5mm	Yes
	Remaining	Remaining	4mm	Yes
F	Bedroom	South/West/East	6.38mm Lam	Yes
	Living Room	North/West/East	6mm	Yes
	Remaining	Remaining	4mm	Yes

In addition to complying with the minimum scheduled glazing thickness, the STC rating of the glazing fitted into openable frames and fixed into the building opening should not be lower than the values listed in Table 4 for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of openable frames and the frame will need to be sealed into the building opening using a flexible sealant. Note that all these windows are assumed as aluminium awning windows and mohair seals in windows and doors are not acceptable where acoustic seals are required. Acoustic seals shall be equal to Schlegel Q-lon series.

Table 4 - Minimum STC of Glazing

GLAZING ASSEMBLY	ACOUSTIC SEALS	MINIMUM STC OF INSTALLED GLAZING
4mm	Yes	27
5mm	Yes	28
6mm	Yes	29
6.38mm	Yes	31

7. MECHANICAL NOISE ASSESSMENT

Since detailed mechanical plant selections were not finalised at this stage, this report sets out the noise emission criteria from the plant. Detailed treatments to commercial and retail plant have been addressed in separate report ensuring that all plant and equipment is treated at the source to preserve the amenity of future residential occupants.

7.1 REQUIREMENTS

Noise emissions from plant and equipment comply with the '*provisions of the Protection of the Environment Operations Act 1997,* EPA's Industrial Noise Policy and Noise Control Manual

7.2 NOISE EMISSION LIMITS

The EPA Industrial Noise Policy provides guidelines for assessing noise impacts from industrial developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The EPA Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the EPA in its Environmental Noise Control Manual states that noise controls should be applied with the General intent to protect residences from sleep arousal.

7.3 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). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

7.4 PROTECTION OF THE ENVIRONMENTAL OPERATIONS CRITERIA

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

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

52 Air Conditioners

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

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or

(b) before 7 am or after 10 pm on any other day.

7.5 AMENITY CRITERION

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

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Table 5 provides the recommended ambient noise levels for the urban residential and school receivers for the day, evening and night periods. For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm; and
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

Table 5 - EPA Recommended Acceptable Noise Levels

Type of Receiver	Time of day	Recommended Acceptable Noise Level dB(A) L_{eq}
Residential	Day	60
	Evening	50
	Night	45

If the existing amenity noise levels due to industrial noise are close to or above the recommended acceptable noise levels then operation of the site shall be designed to a lower level than the acceptable noise level.

If the existing amenity levels from industrial noise and other transportation noise sources are more than 2 dB(A) above the acceptable levels, and there is no prospect of these levels reducing in the future, then the amenity criterion is set at 10 dB(A) below the existing level. In practice, this prevents any audible increase in the existing noise level.

7.6 SLEEP AROUSAL

To minimise the potential for sleep arousal the L_1 noise level of any specific noise source does not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. The L_1 noise level is the level exceeded for 1 per cent of the time and approximates the typical maximum noise level from a particular source. Since the minimum

repeatable noise level is 37 dB(A) the sleep disturbance criterion is 52dB(A) L_1 outside the closest bedroom window.

If the L_1 noise level emitted by the proposed development from new plant and equipment exceeds 52 dB(A) an assessment of the proposed development's potential to significantly increase sleep arousal (when compared to the existing noise sources) should be carried out.

7.7 NOISE ASSESSMENT OBJECTIVES

Under the current EPA requirements the Industrial Noise Policy supersedes the requirements of the Noise Control Manual for assessment of mechanical plant noise. In addition we note that compliance with the Industrial Noise Policy will also indicate compliance with the Protection of the Environment Operations Act.

Based on the EPA's Industrial Noise Table 6 provides a summary of the assessment criteria applicable to the subject premises at the neighbouring potentially affected residential properties based on noise monitoring conducted for the subject site. The intrusiveness and amenity criteria for this project have been determined using the EPA guidelines and the noise monitoring results.

Table 6 – Noise Objectives for Residential Receivers, dB(A)

Time of Day	Measured minimum L_{90} Noise Level dB(A)	Measured L_{eq} Noise Level dB(A)	Amenity Criterion dB(A) L_{eq}	Intrusiveness Criterion dB(A) L_{eq}	Noise Objective, dB(A) L_{eq}	Sleep Arousal Objective, dB(A) L_1
Day	56	65	55	61	55	N/A
Evening	53	63	45	58	45	N/A
Night	47	59	40	52	40	62

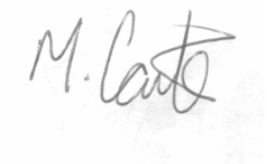
8. CONCLUSION

This report provides an evaluation of traffic noise and mechanical intrusion into the proposed development of Building B and F at Top Ryde Residential, Top Ryde. Noise levels were measured on the site and the results used to determine glazing requirements to comply with Australia Standards requirements for internal noise levels. Provided the glazing constructions requirements set down in Section 7 of this report are implemented, noise levels will comply with the criteria recommended in Section 4 of this report.

The criteria for mechanical noise emission from the proposed site have been set in this report.

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

Report prepared by



ACOUSTIC LOGIC CONSULTANCY PTY LTD

Matthew Carter

Appendix 1 Unattended Ambient Noise Measurement

Corner Devlin and Pope Street Top Ryde

Monday April 24,2006

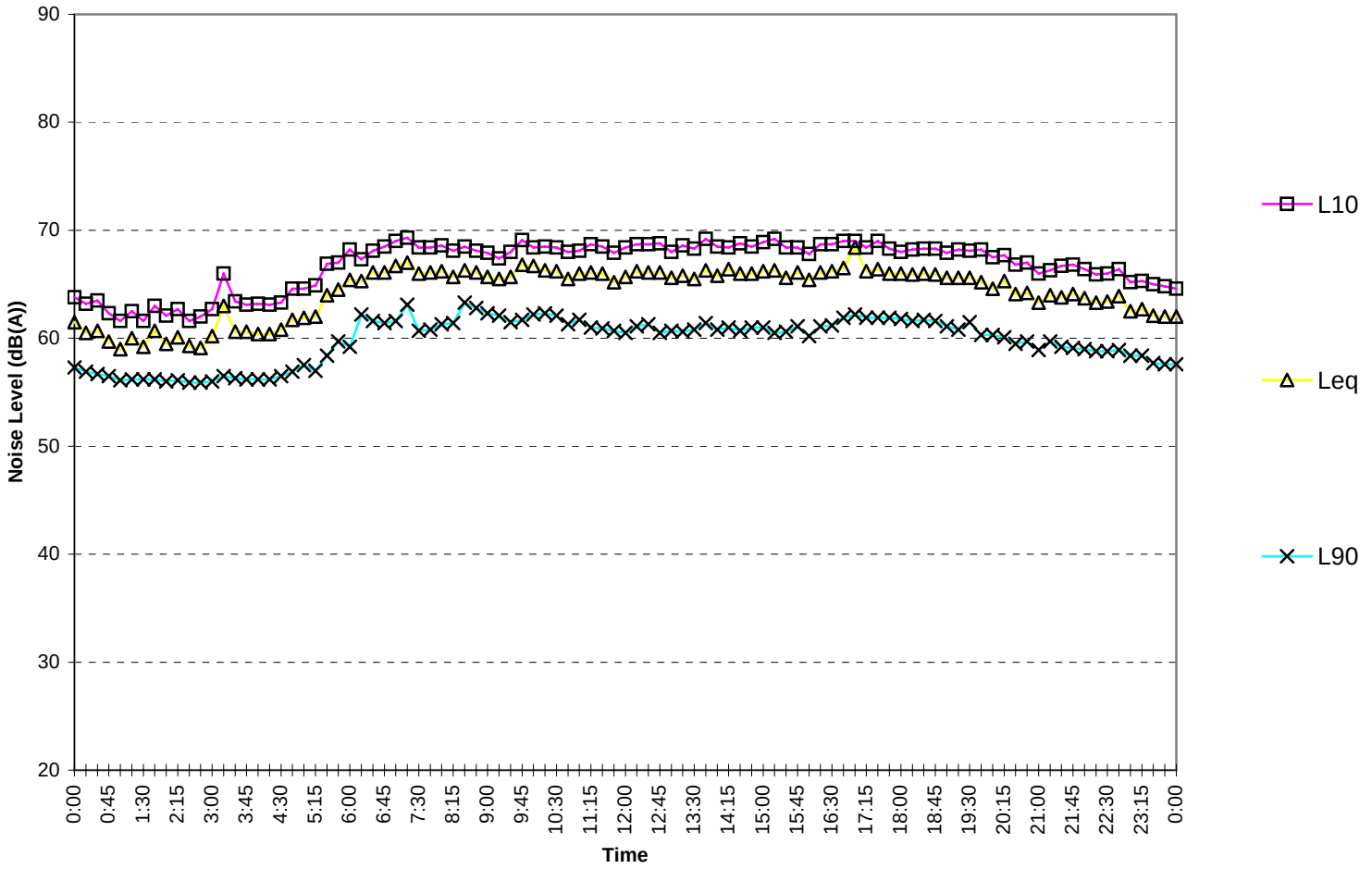
For MC_Sta

Corner Devlin and Pope Street Top Ryde

Tuesday April 25,2006

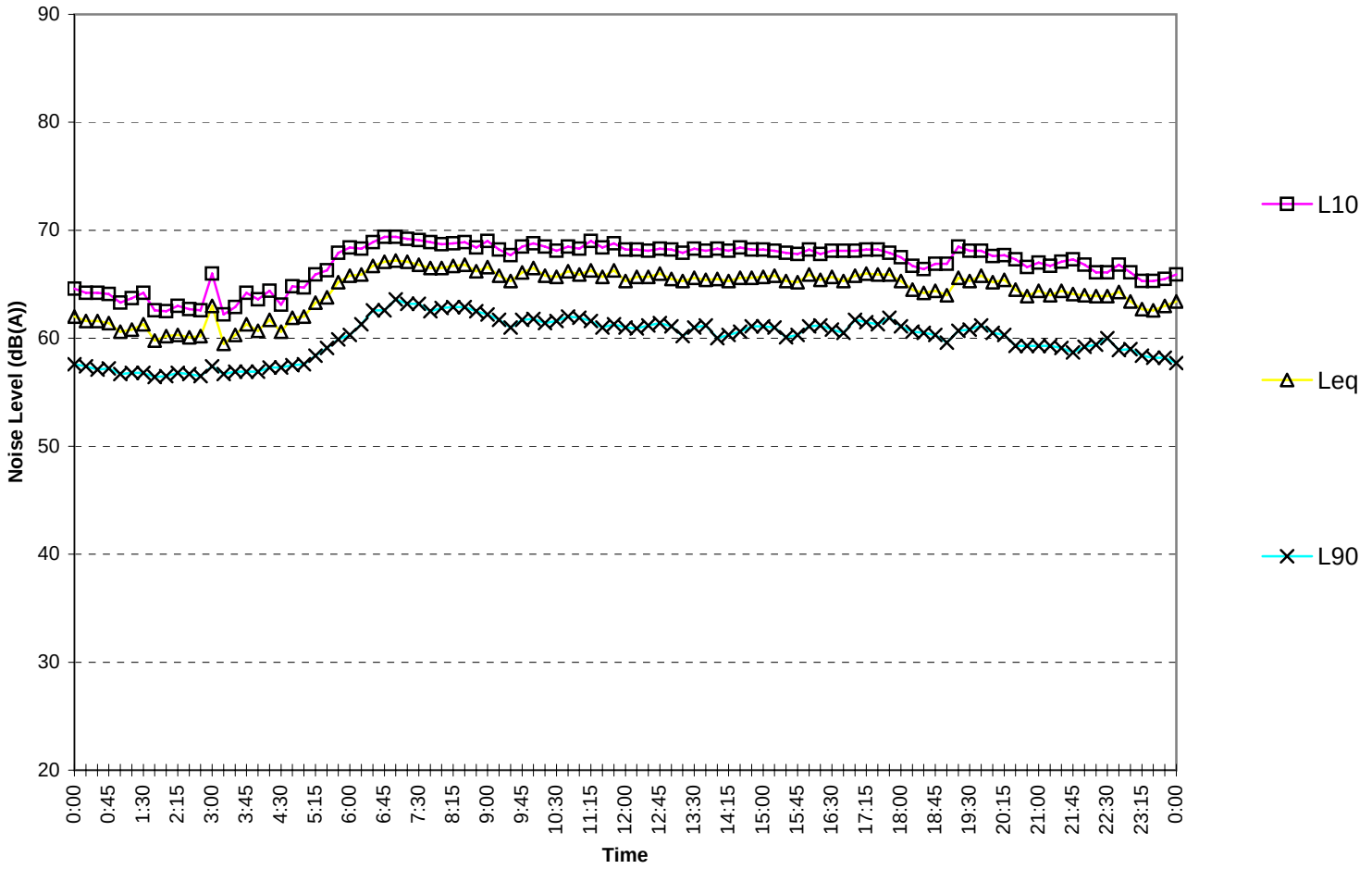
Corner Devlin and Pope Street Top Ryde

Wednesday April 26,2006



Corner Devlin and Pope Street Top Ryde

Thursday April 27,2006



Corner Devlin and Pope Street Top Ryde

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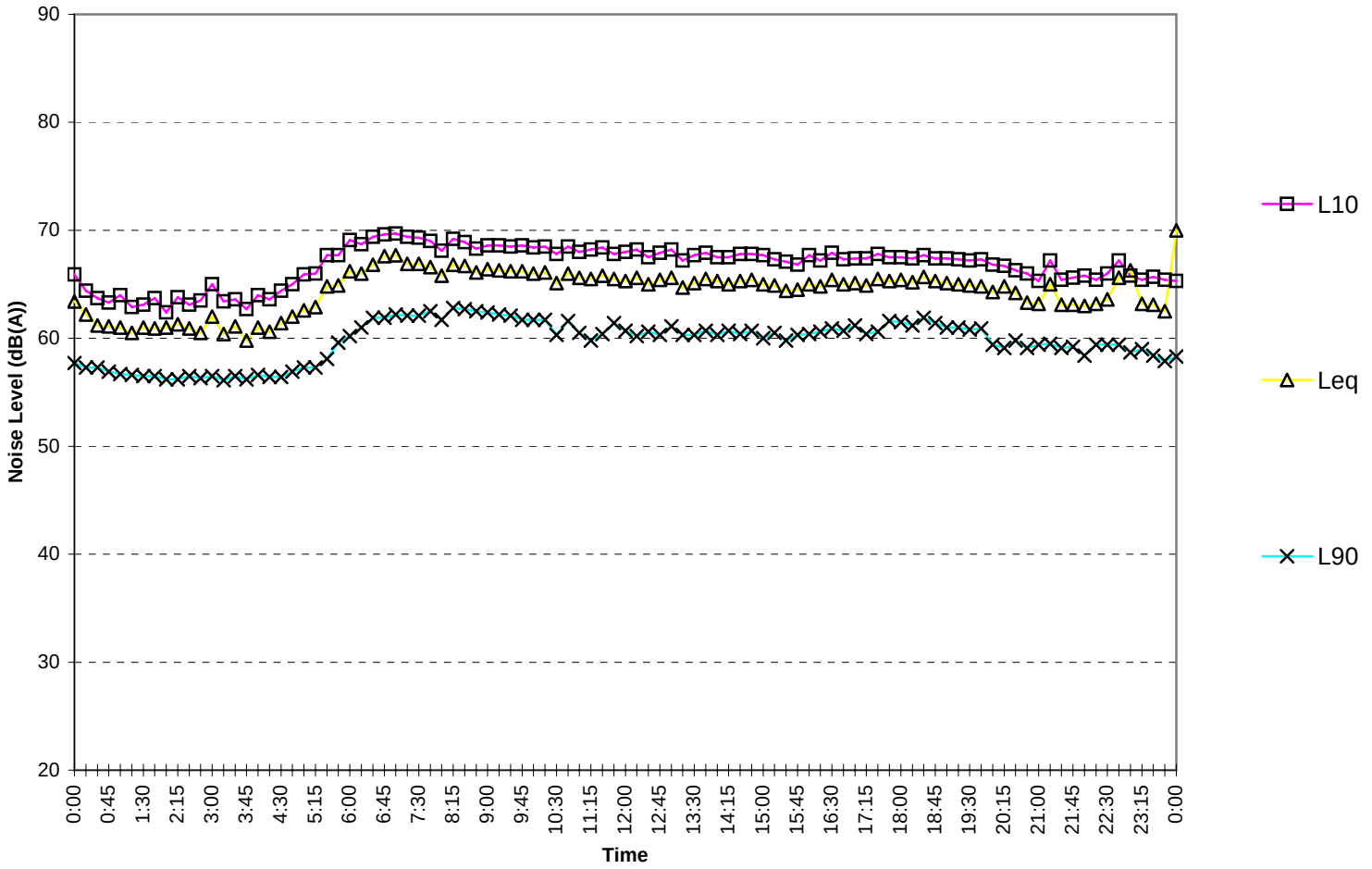
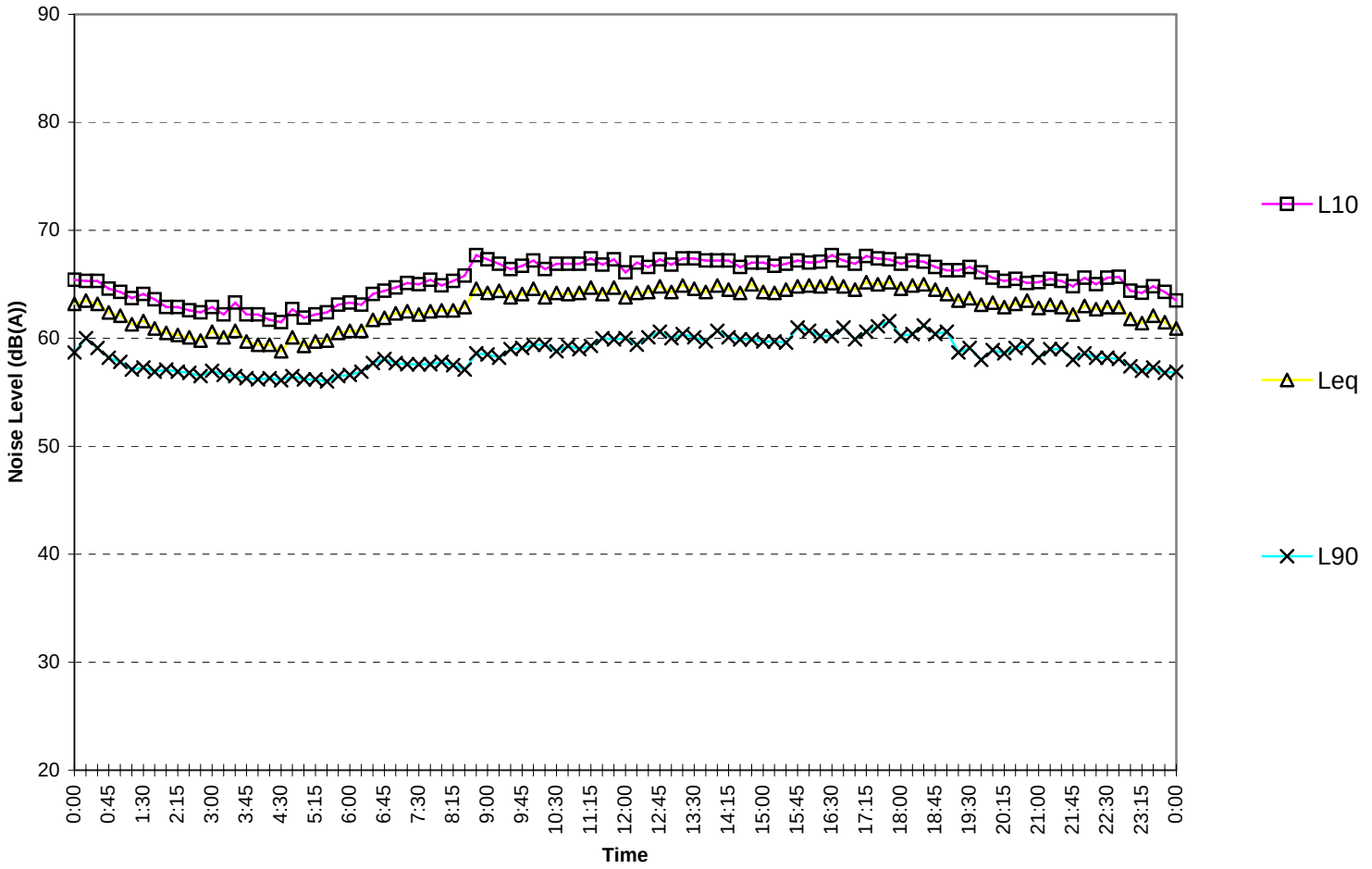


Corner Devlin and Pope Street Top Ryde

Saturday April 29,2006

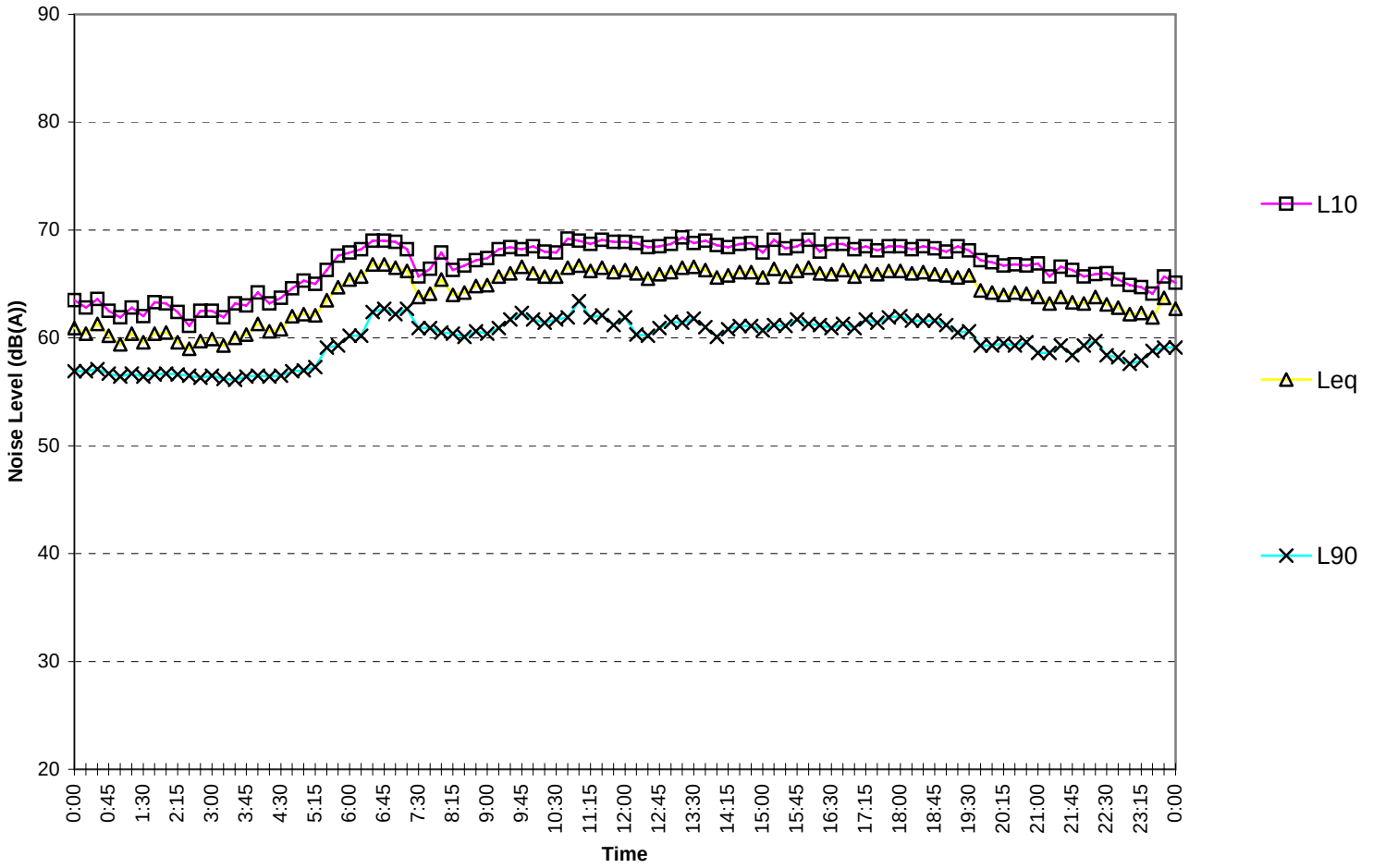
Corner Devlin and Pope Street Top Ryde

Sunday April 30,2006



Corner Devlin and Pope Street Top Ryde

Monday May 1,2006



Corner Devlin and Pope Street Top Ryde

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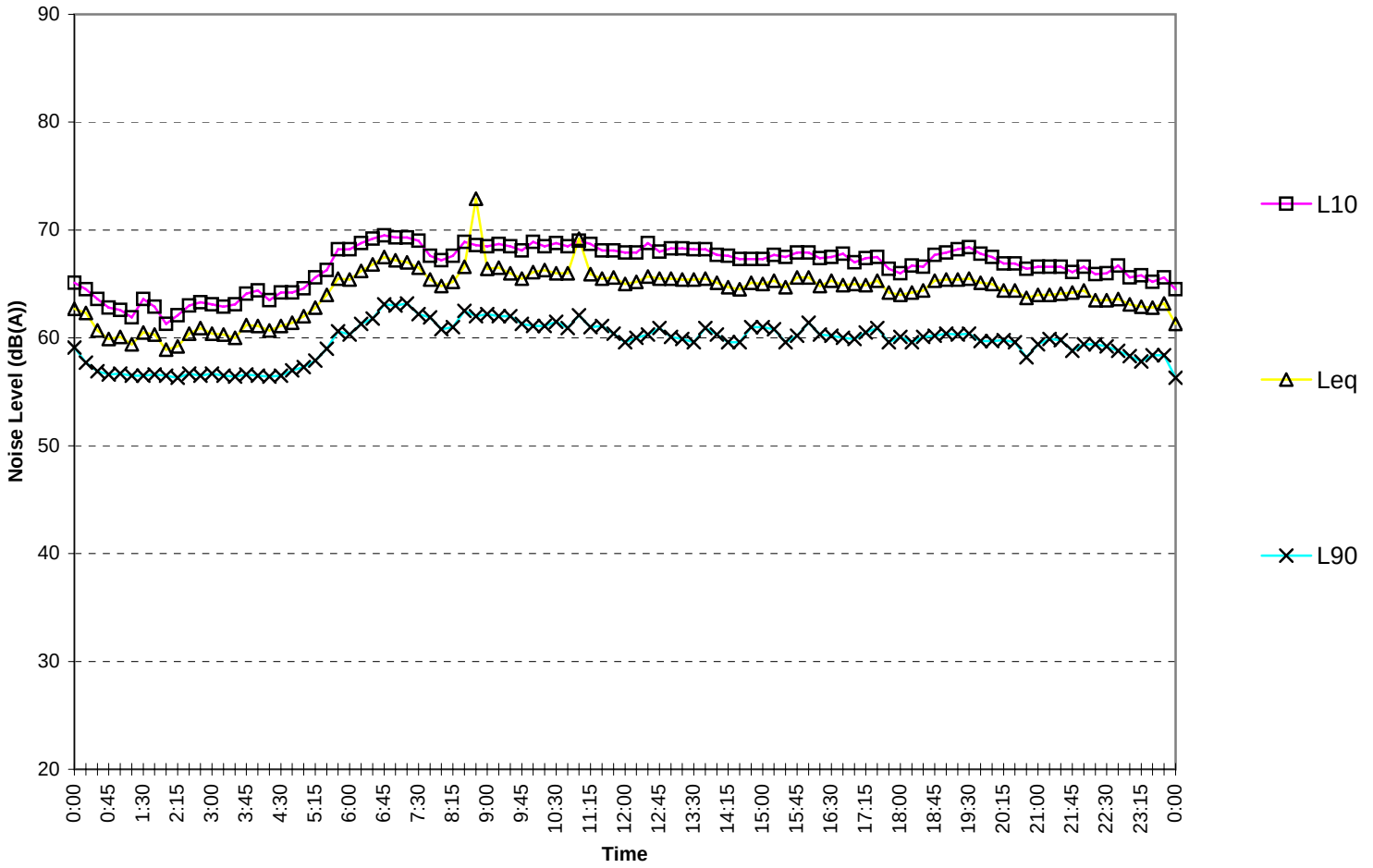


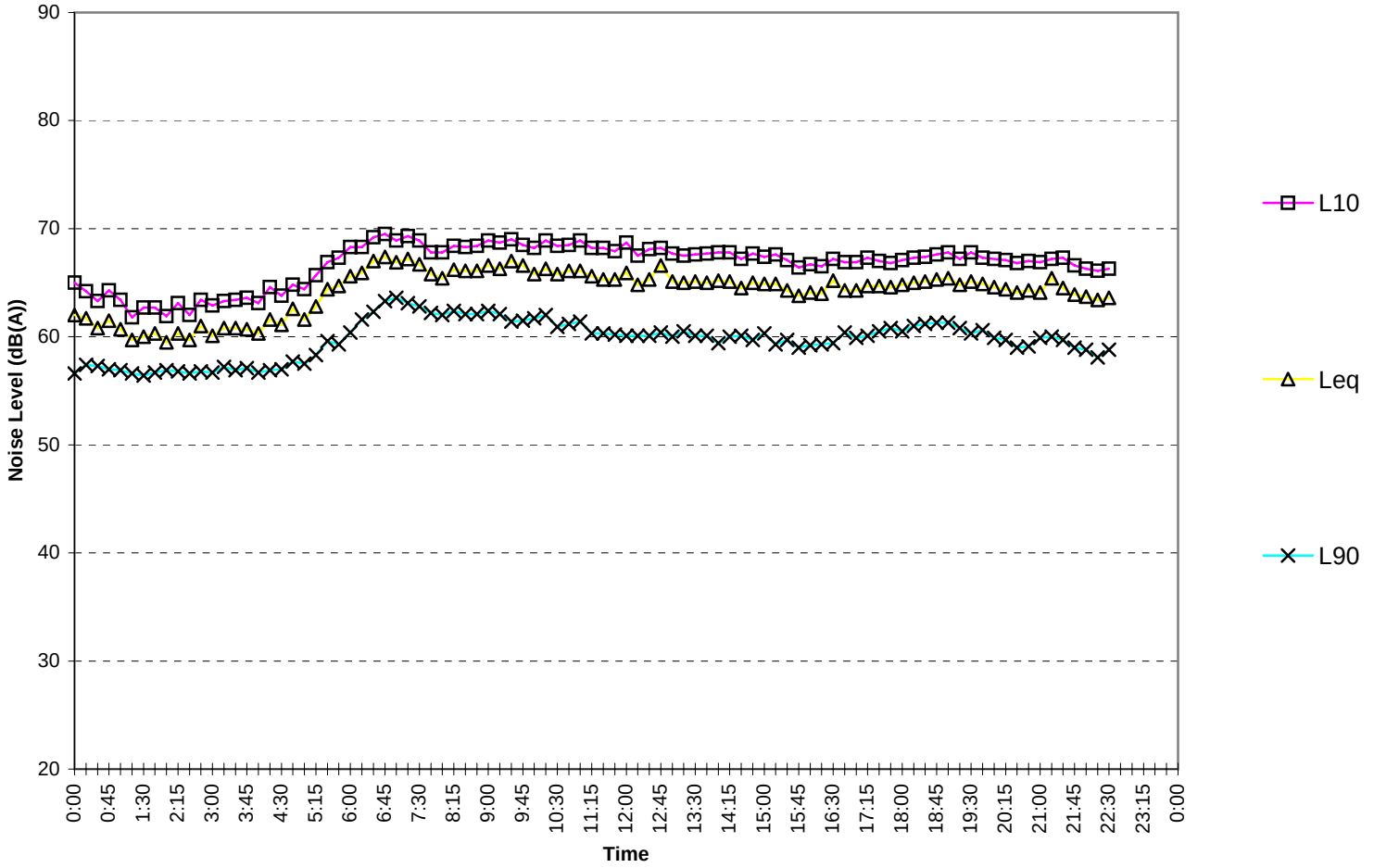
Corner Devlin and Pope Street Top Ryde

Wednesday May 3,2006

For MC_Sta

Corner Devlin and Pope Street Top Ryde

Thursday May 4,2006



Tucker Street Top Ryde

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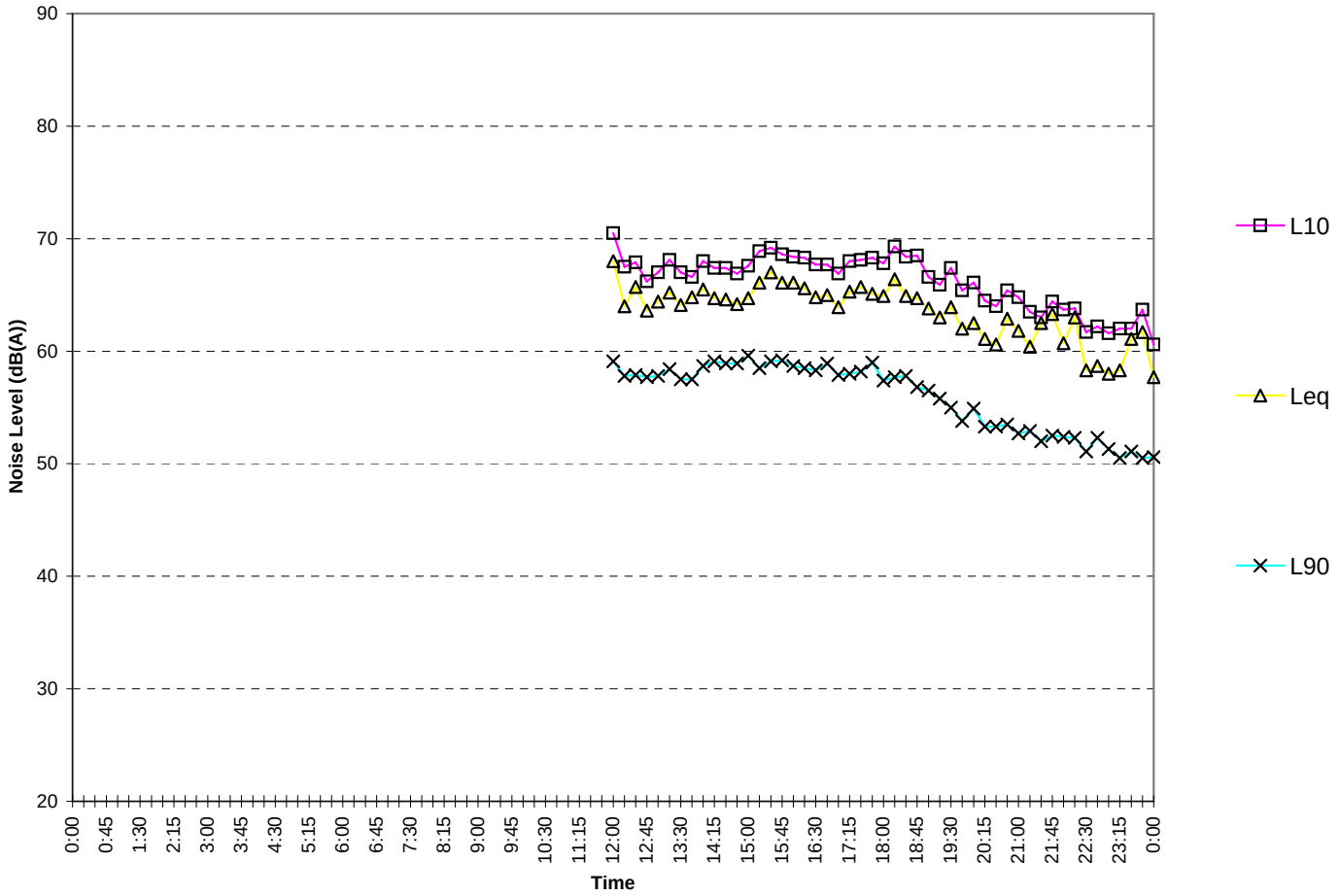

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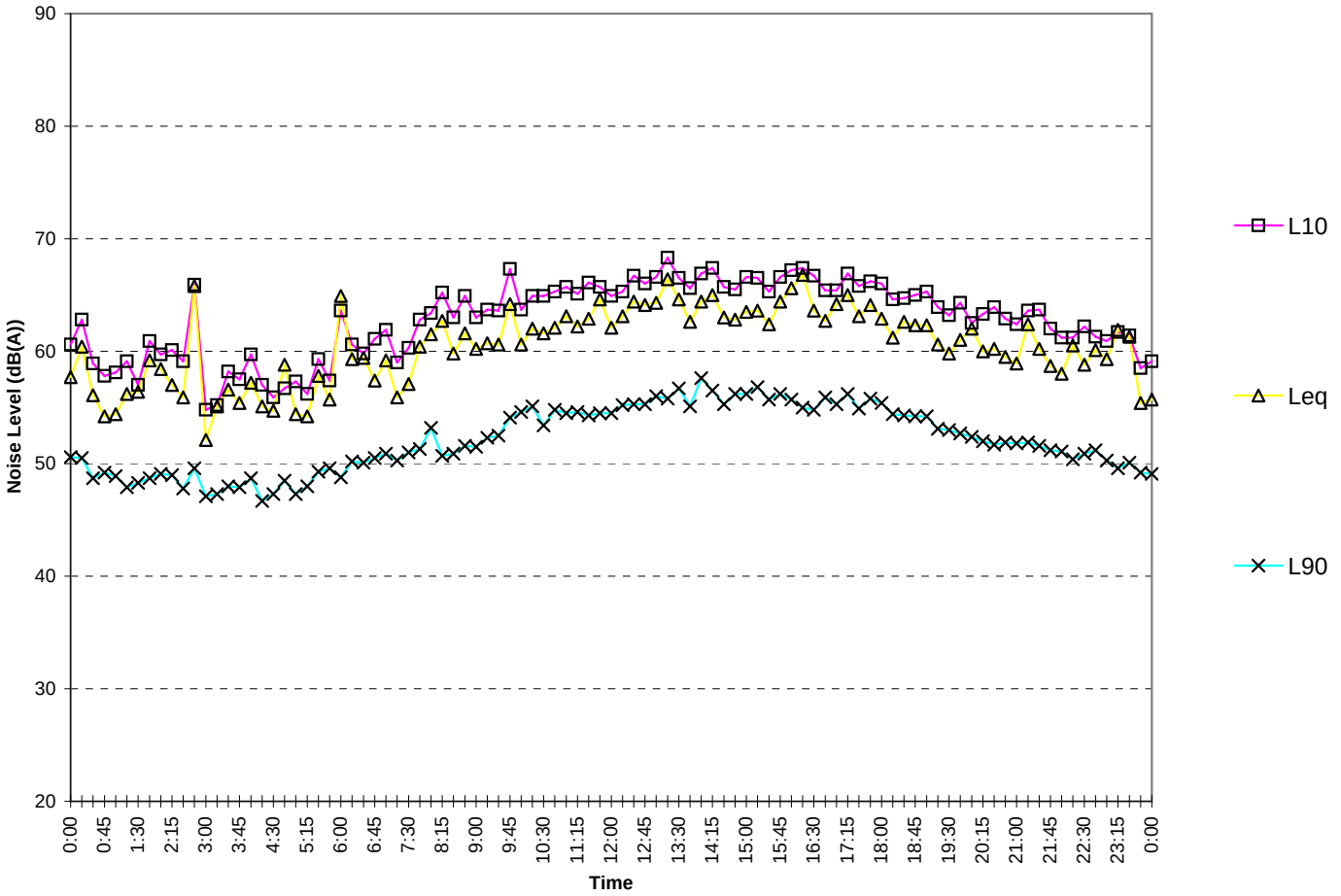

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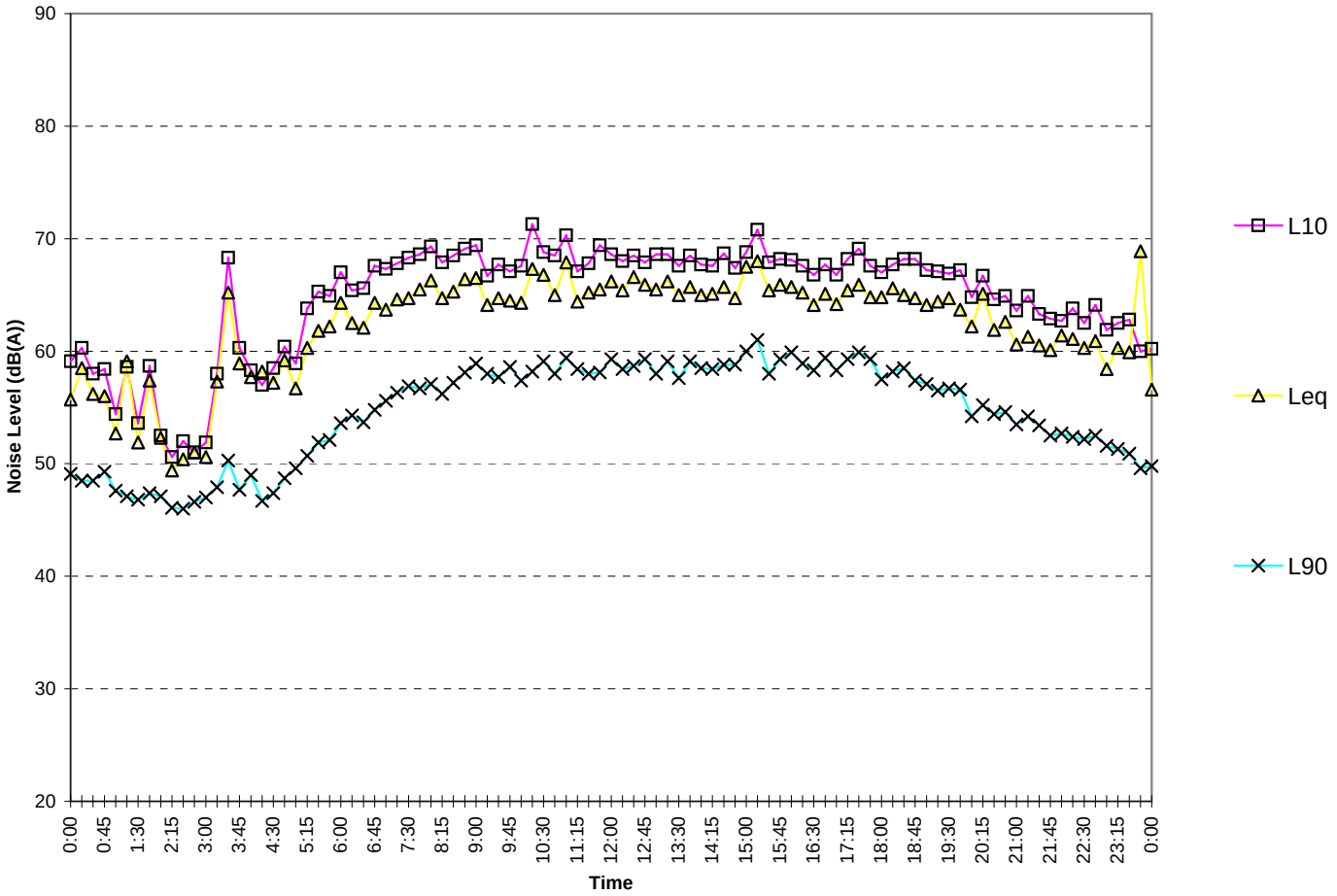

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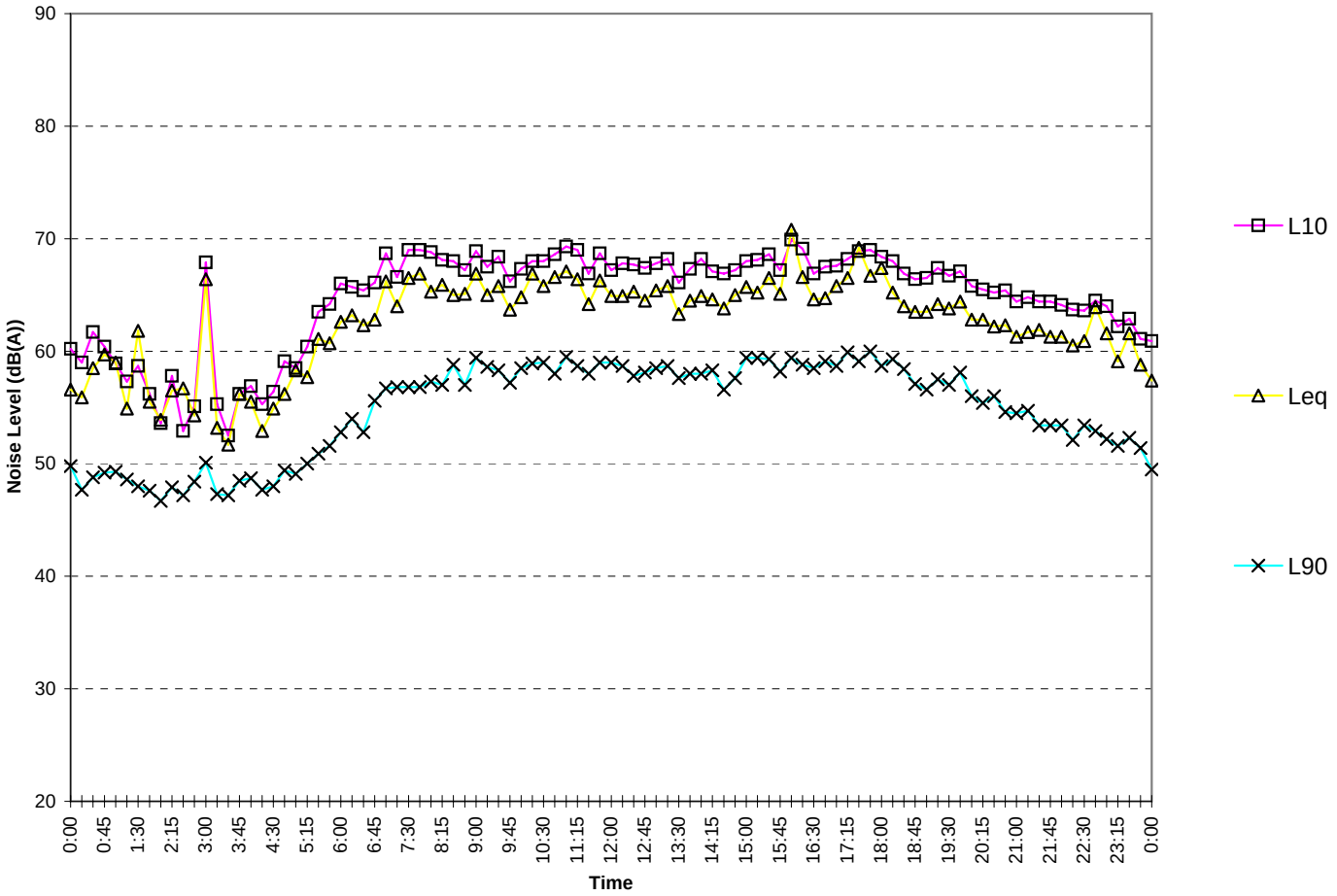

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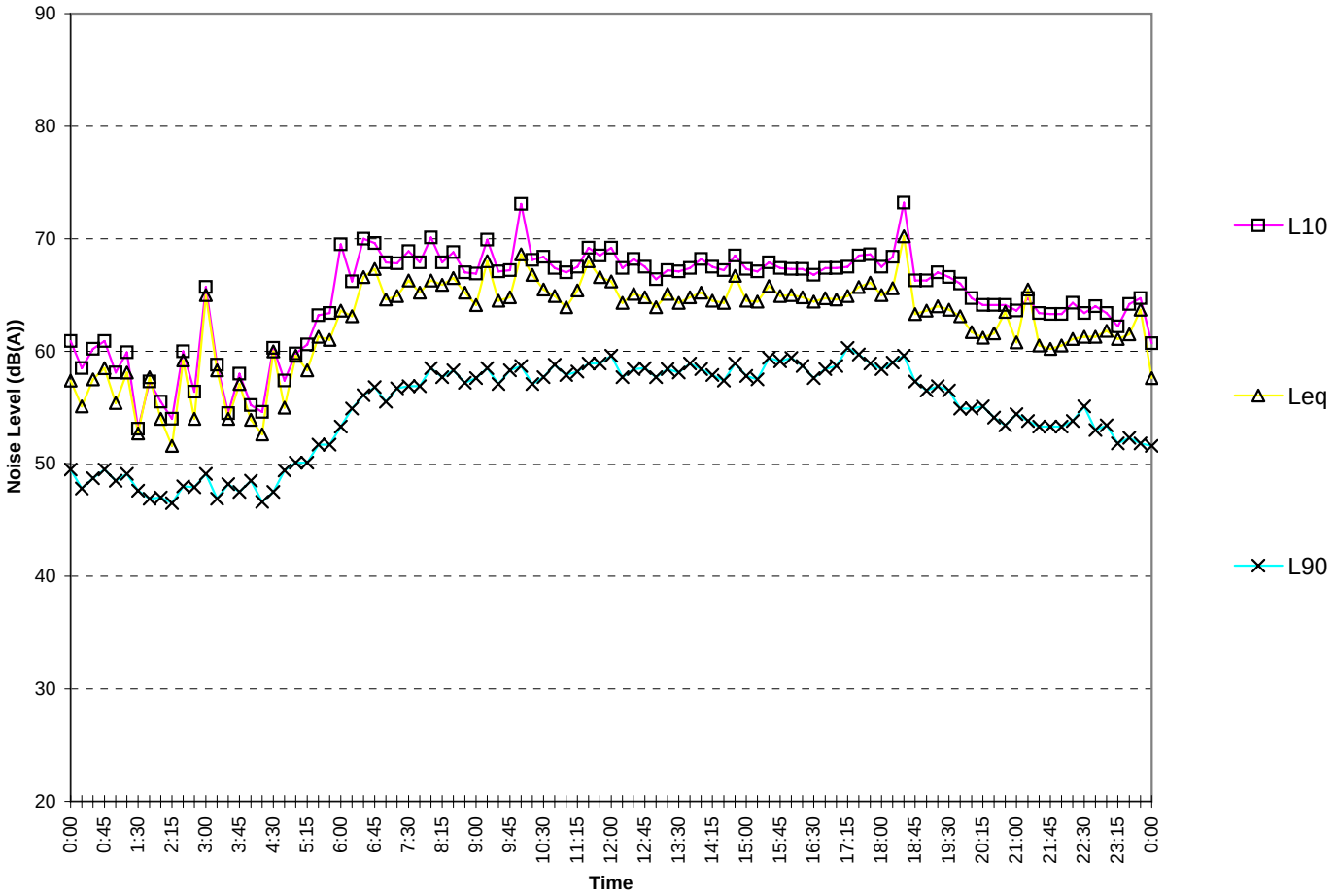

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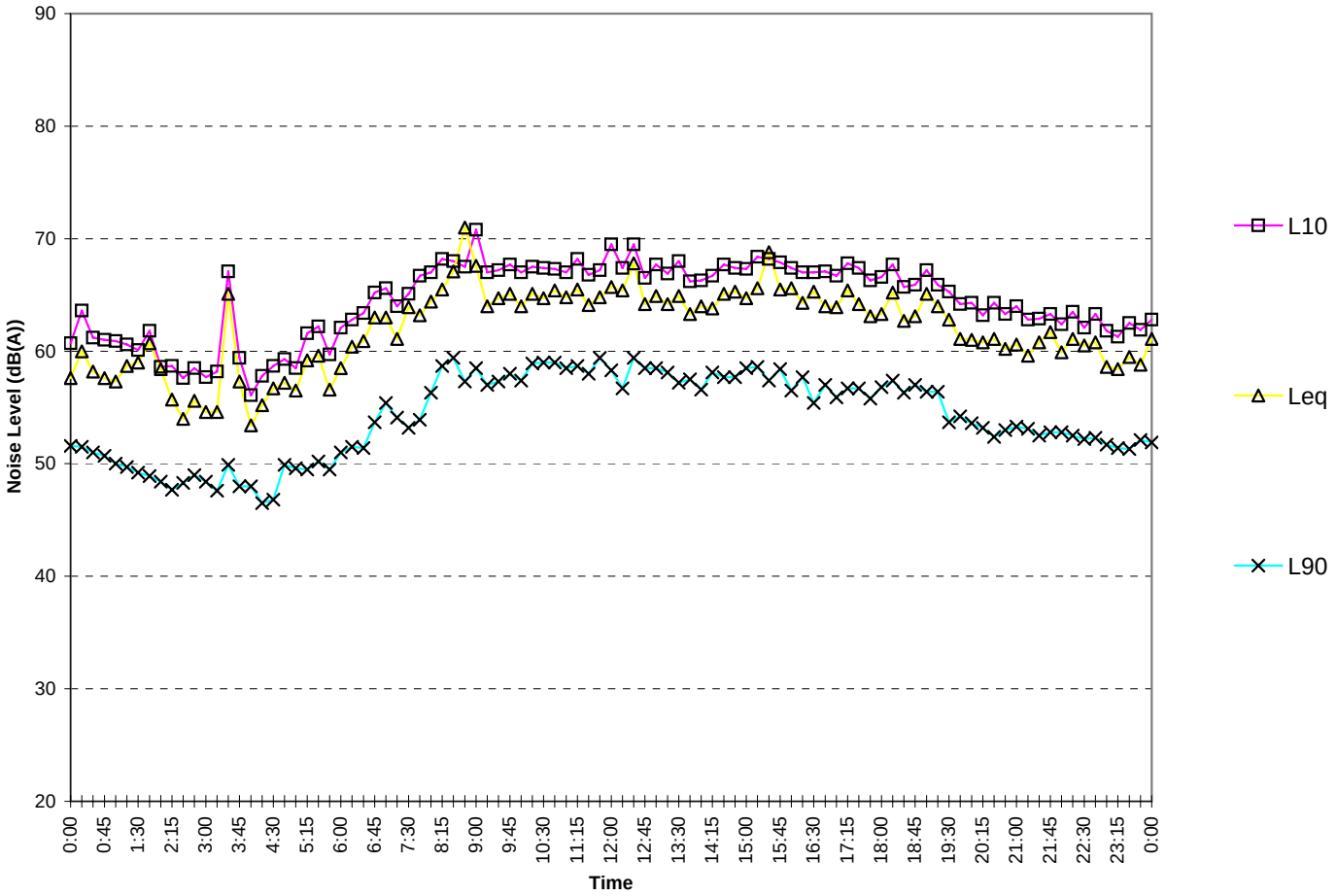

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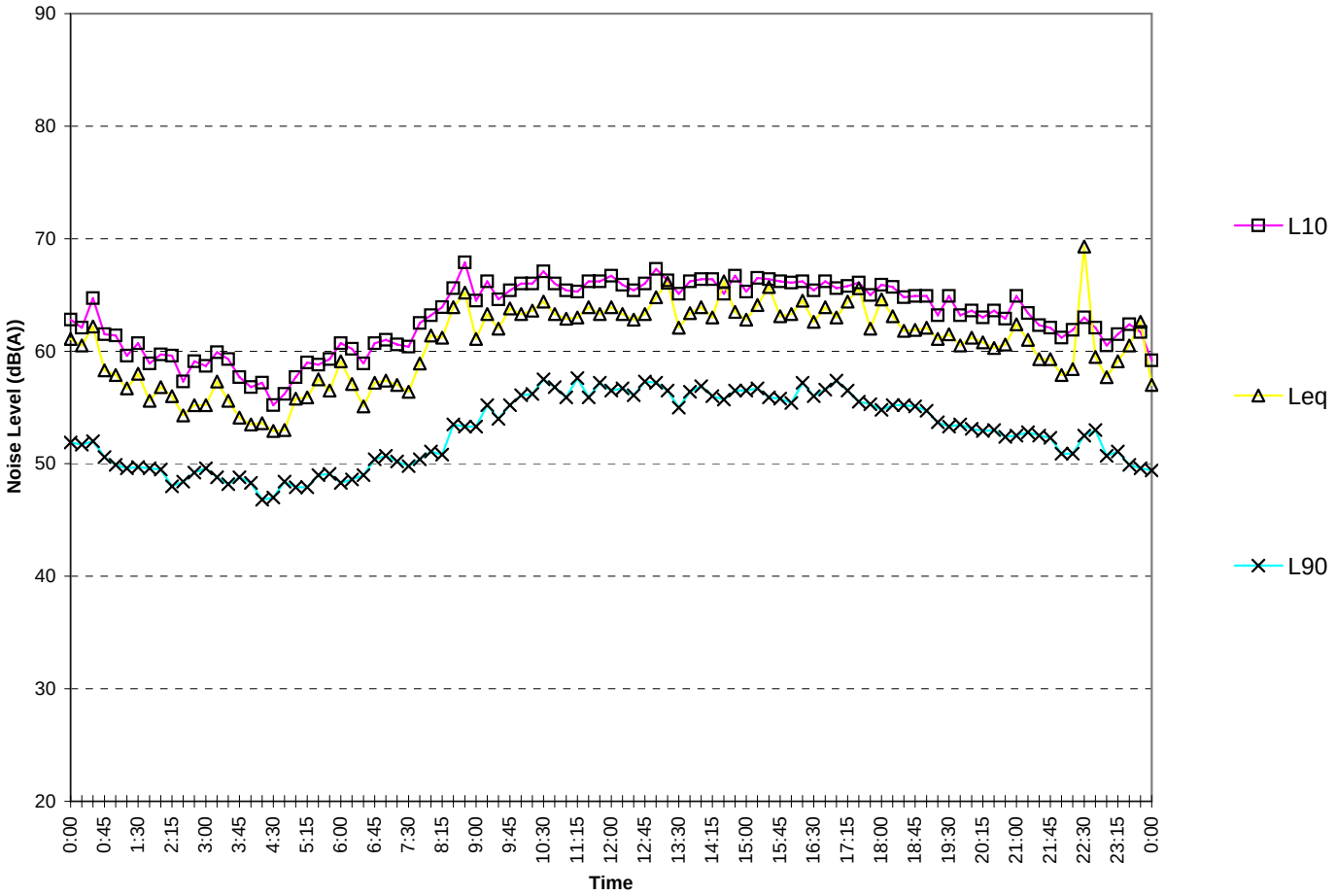

Tucker Street Top Ryde

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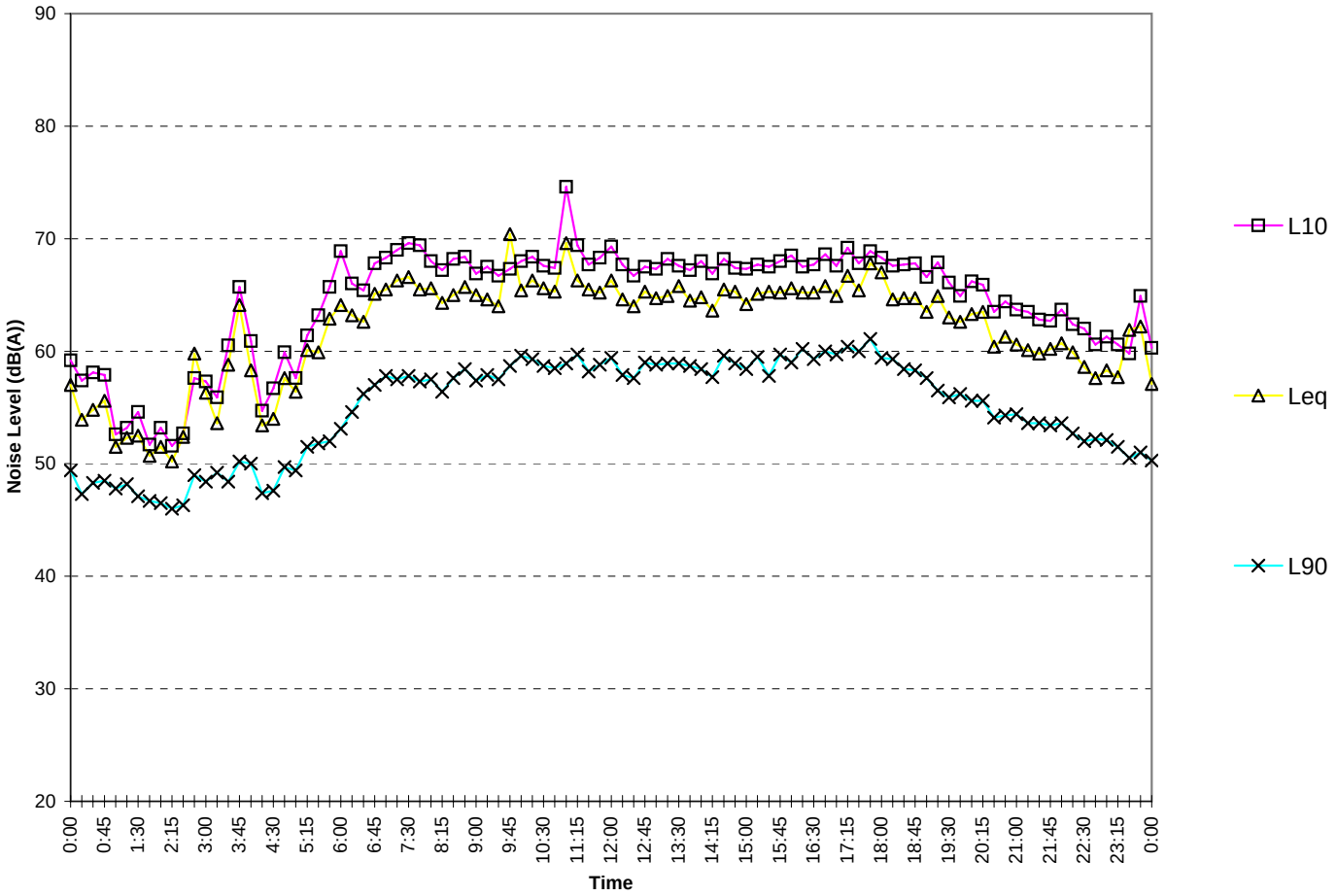

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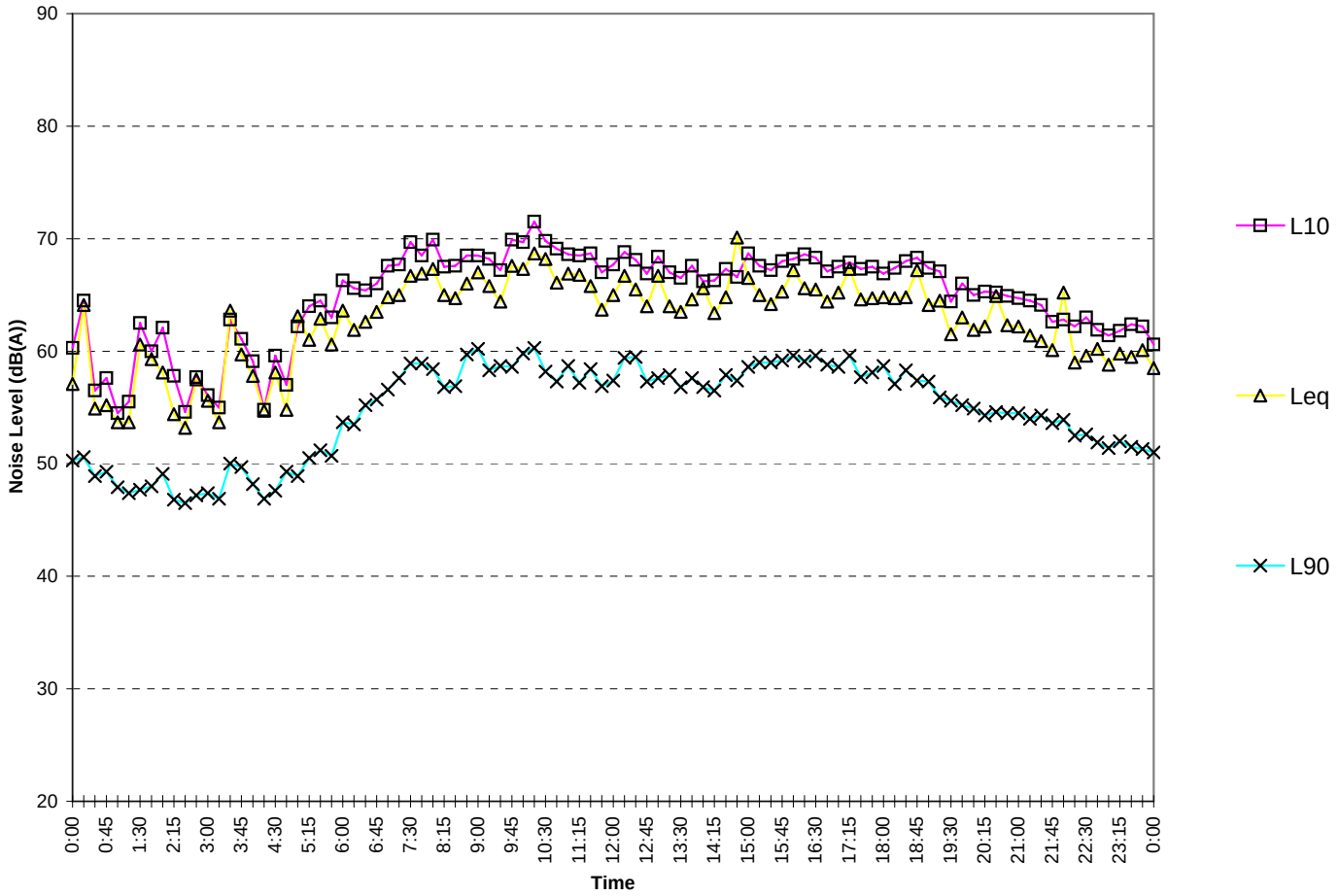

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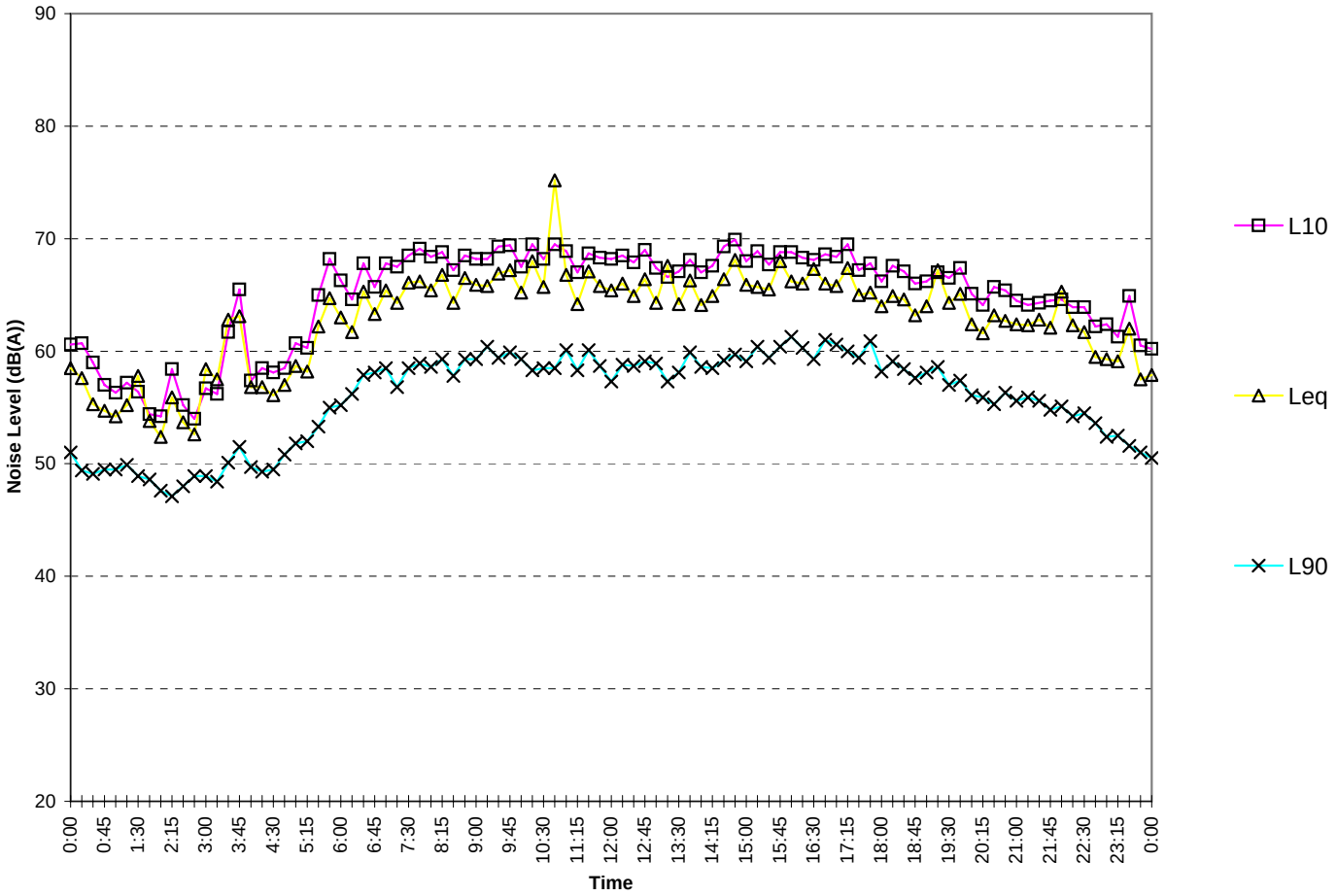

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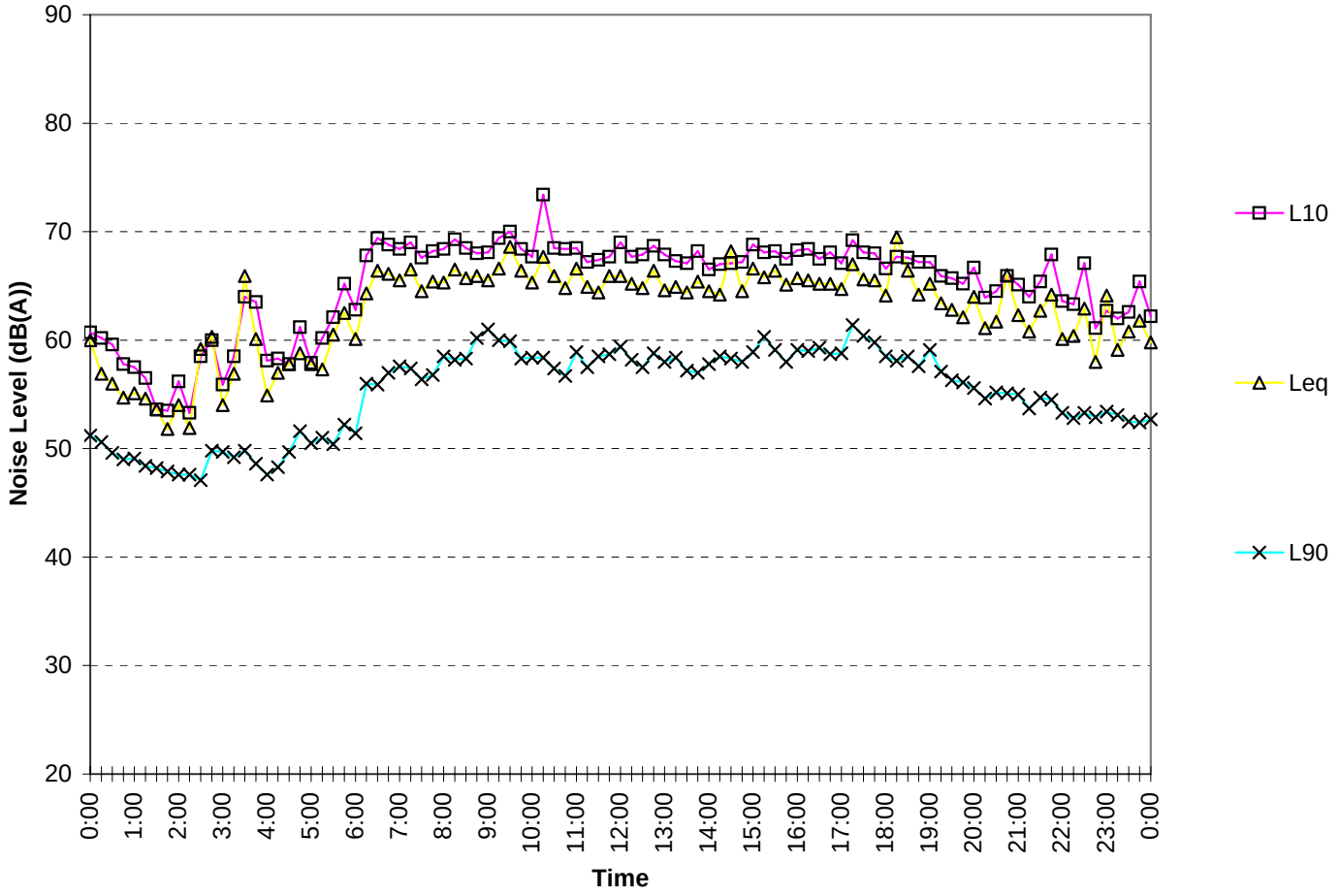

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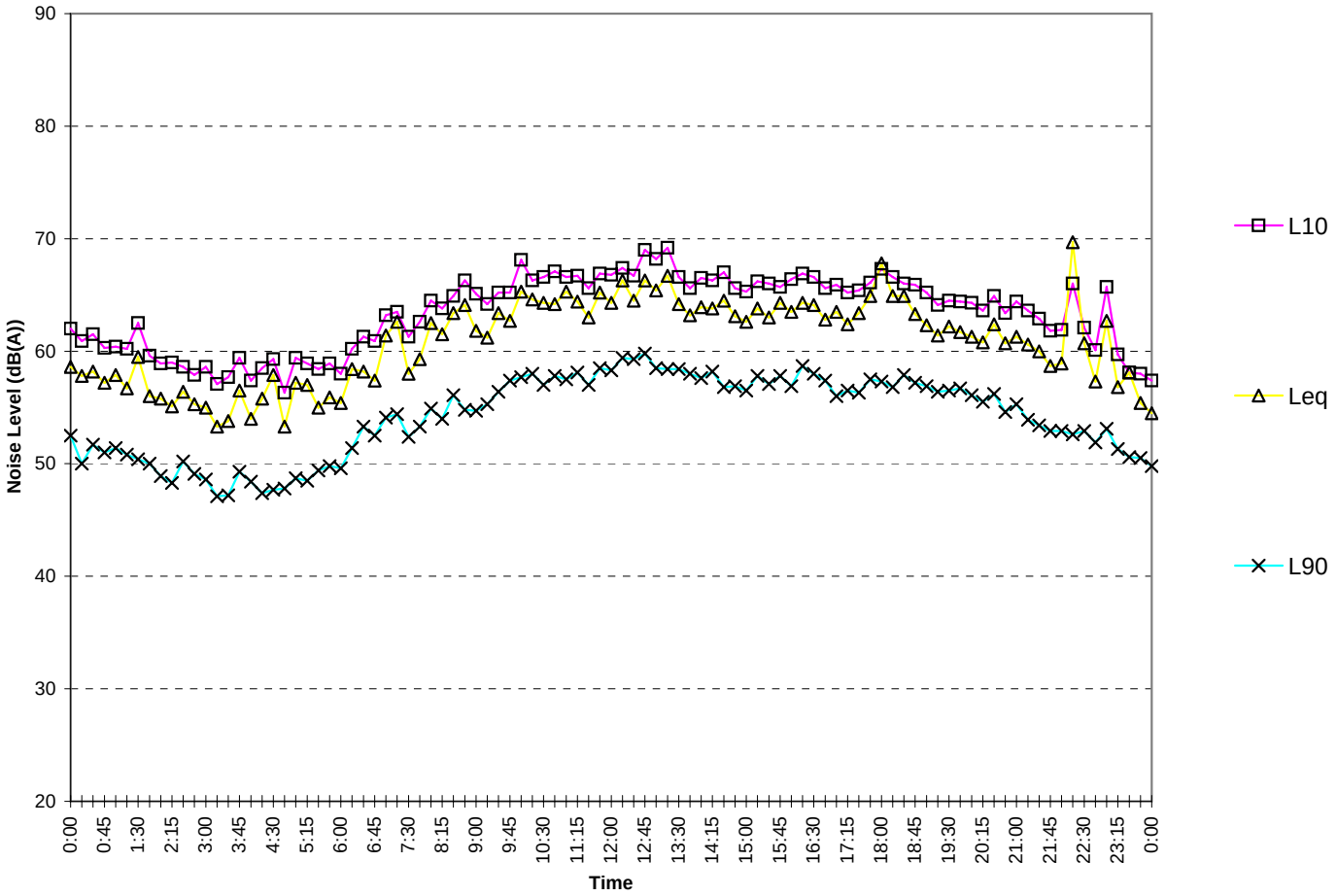

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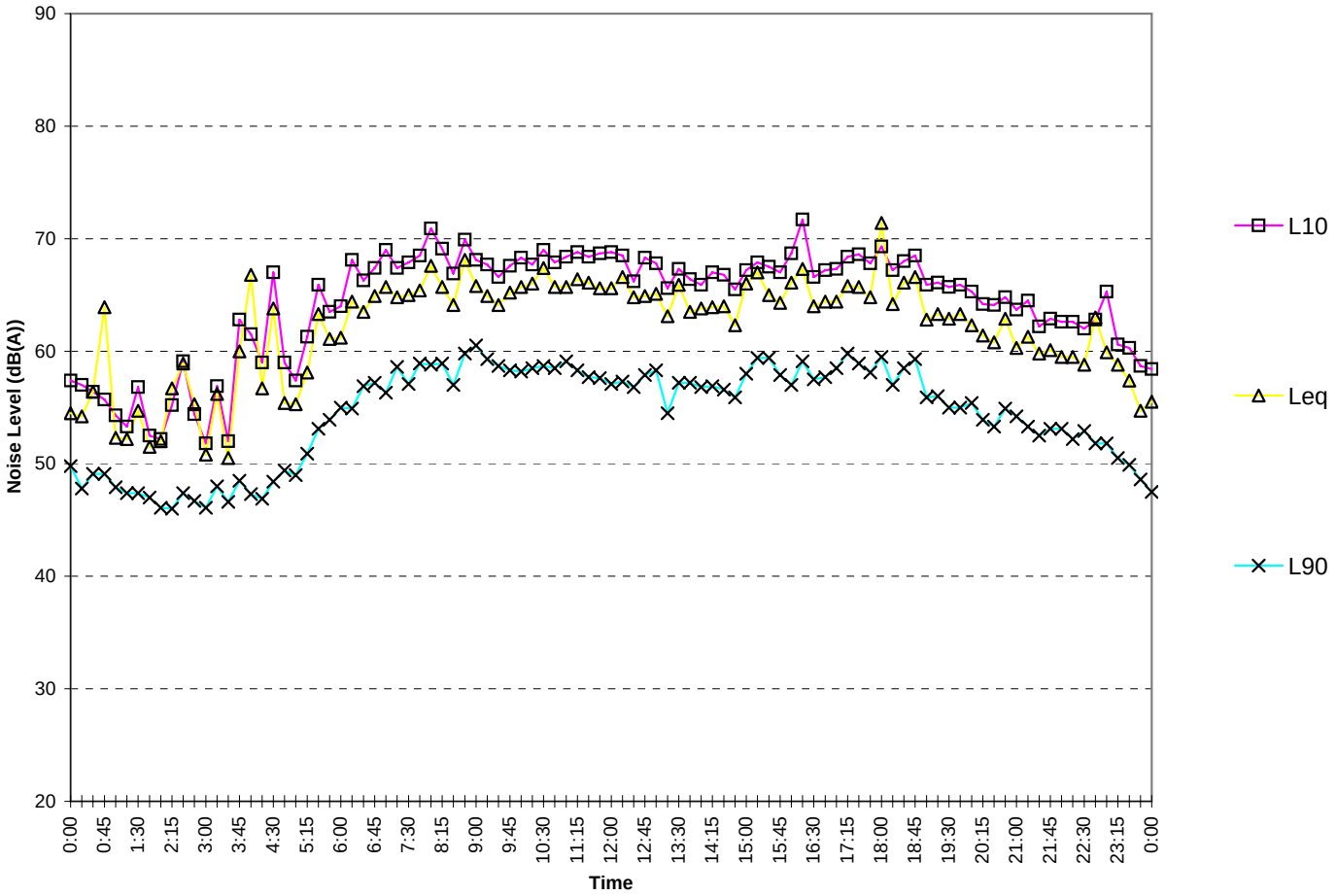

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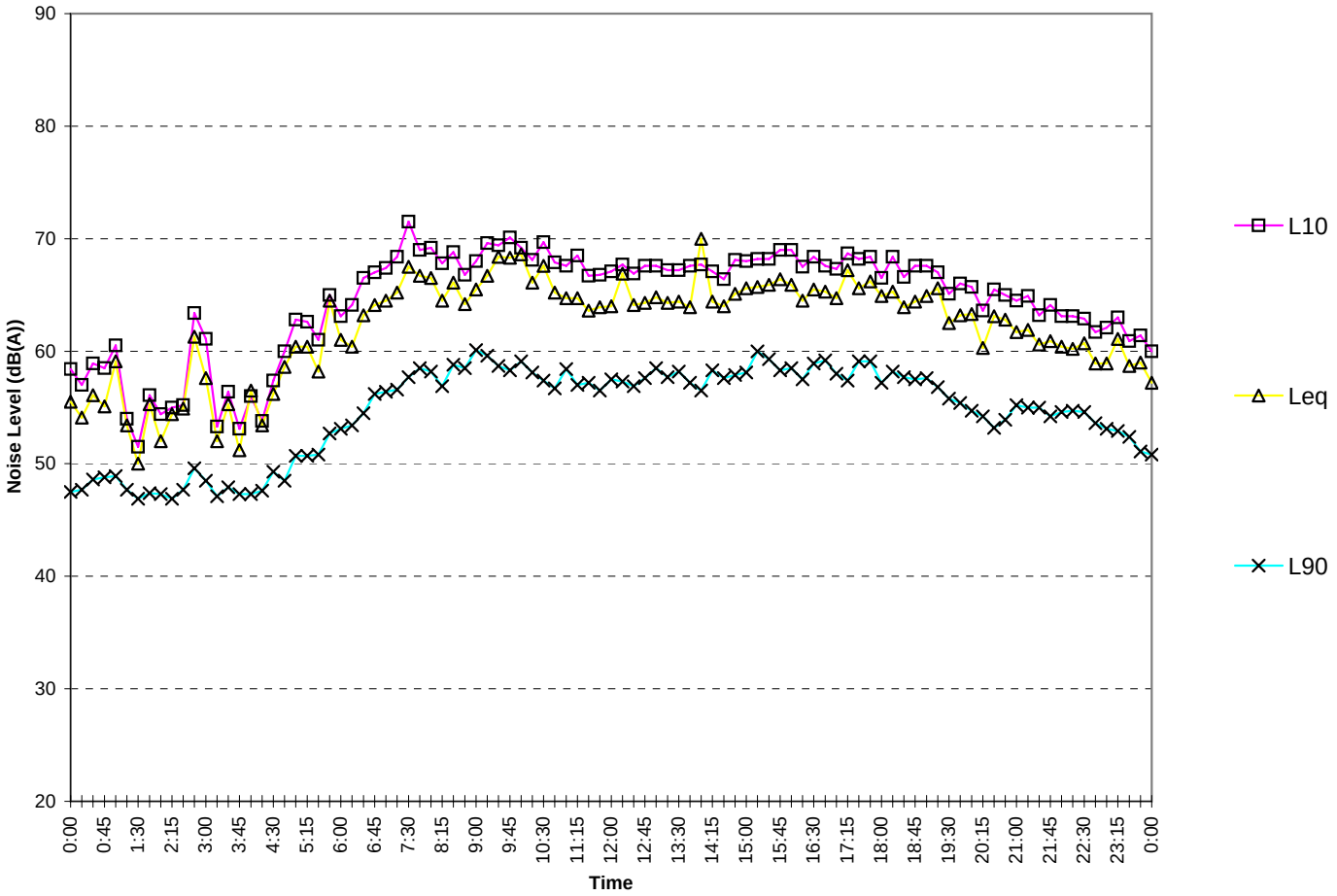

Tucker Street Top Ryde

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