

MANAGING DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO

GENERAL MANAGER
MATTHEW SHIELDS



2008402/1410A/R1/GW

14/10/2010

Bovis Lend Lease Pty Ltd
Level 4, 30 The Bond
30 Hickson Road
MILLERS POINT NSW 2000

ATTN: MS. QI CHAN

Liverpool Hospital - Stage 2 Phase 1 - Milestone 3 & 4 Major Application Noise Assessment

1 INTRODUCTION

This report presents the DA noise assessment for the proposed Milestone 3 & 4 development within Liverpool Hospital.

The following noise sources have been considered in the noise assessment:

- Helicopter Noise.
- Traffic Noise along Gouburn St.
- External Noise emissions from the proposed plant serving Milestone 3 & 4.

2 HELICOPTER NOISE ASSESSMENT

2.1 HELICOPTER AIRBORNE NOISE CRITERIA

To determine suitable noise levels for the various space types with regards to the helicopter landing pad the following information was examined and evaluated;

1. The proposed location of the helicopter landing pad.
2. Typical frequency of use of the landing facility.
3. Recommended design sound levels for different areas of occupancy as specified in AS 2021.

SYDNEY
A: 9 Sarah St Mascot NSW 2020
T: (02) 8338 9888
F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au
11 068 954 343

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It has been assumed that helicopter movements will be limited to emergency situations. Based on this assumption an acceptable noise level for rare and short term occurrences such as helicopter arrival and departures would be the recommended AS 2021 level plus 20 dB(A).

The nominated noise levels for the various spaces types selected following the methodology described above are shown in the table which follows.

Table 1 - Nominated Helicopter Noise Levels

SPACE TYPE	NOISE LEVEL OBJECTIVE dB(A)
Wards	70
Theatres	65
Treatment rooms	70
Consulting rooms	70
Laboratories	75
Service Areas	85
Private offices, conference areas	70
Offices - general	75
Sleeping Studies	55

2.2 HELICOPTER NOISE LEVELS

The helicopter noise testing was conducted in Westmead Hospital with Bell 412 type landing and take off twice during the testing.

The measured noise levels by an unattended noise logger have been presented as below.

Table 2 –Noise data of Helicopter

Measurement Location	Measured Noise Level dB(A) L _{max}
External – 15m from the helicopter	105

2.3 NOISE ASSESSMENT

Noise intrusion into the habitable spaces within the existing neighbouring buildings in the vicinity of the Helipad and flight path was assessed. The calculations were based on the discussed flight paths and assumed the worst case that helicopters pass directly over Milestone 3/4.

3 TRAFFIC NOISE ASSESSMENT

The investigation of external noise (primarily traffic noise) intrusion into this proposed development is carried out for the following reasons, namely:

High levels of traffic noise heard within sensitive spaces may be disruptive to general day to day activities such as speech communication. Therefore, such noise needs to be reduced to a level where it is not intrusive upon normal activities.

As part of this investigation, traffic noise was measured at the subject site. The results of these measurements will be used to determine the treatments required to reduce noise levels to within the project acoustic objective.

3.1 INTERNAL TRAFFIC NOISE CRITERIA

Internal noise level criteria for the future development have been developed in conjunction with The Australian Standard AS2107:2000 *Recommended Noise Levels and Reverberation Times for Building Interiors*. The recommended internal noise level criteria for the future areas of the development are detailed in the table below.

Table 3 - Traffic Noise Criteria for All Spaces inside Development

SPACE/ACTIVITY TYPE	NOISE LEVEL L_{eq} dB(A)
Meeting rooms	40
Open plan office areas	45
Private Offices	40
General office areas	40
Laboratories	45
Seminar Room	40

3.2 TRAFFIC NOISE MEASUREMENTS

3.2.1 Time of Measurements

Attended traffic noise measurements were conducted along Gouburn St on 7th October 2010.

3.2.2 Measurement Position

The noise measurements were conducted along Gouburn St with microphone full view the traffic.

3.2.3 Measurement Equipment

Noise measurements were obtained using a CEL-593 Type 1 Sound Level Analyser, set to A-weighted fast response. The sound level meter was calibrated before and after the measurements using a RION NC-73 Sound Level Calibrator. No significant drift was recorded.

3.2.4 Measured traffic Noise Levels

The measured traffic noise levels have been summarised in Table 1 which was determined from the noise measurements on site.

Table 4 -Measured Traffic Noise Levels dB(A)

Location	Time Period	Measured Noise Level L_{eq} dB(A)
Gouburn St	7am to 10pm	60*

*Note: Calculated CORTON noise level impacting on the proposed future building façade.

4 RECOMMENDED CONSTRUCTIONS

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

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

4.1 GLAZED WINDOWS AND DOORS

The following constructions are recommended to comply with the traffic noise objectives stated in Section 2 and 3. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria listed in Table 3 below.

Table 5 - Glazing Requirements

Façade	Levels	Glazing Requirements	Acoustic Seals
All Façade	All Levels	10.38mm laminated	Yes

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.

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.

Table 6 - Minimum STC of Glazing

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
10.38mm laminated	Yes	35

4.2 EXTERNAL WALLS

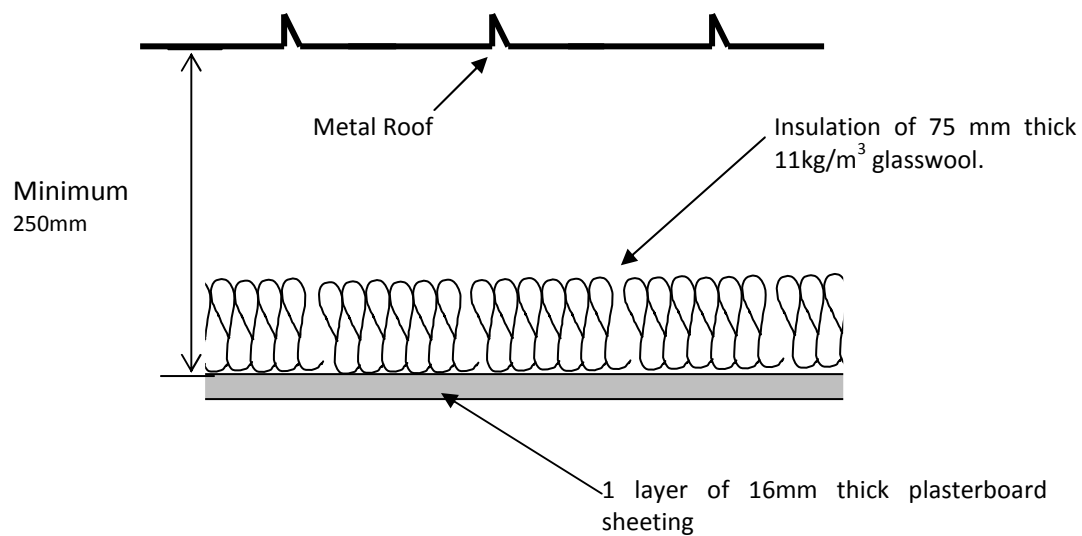
Part of external walls composed of concrete or masonry elements would not require upgrading. Walls other than concrete and masonry have been reviewed and details shall be as below:

Table 7 - External Wall

Space	Wall Details
Wards, Private Offices, Consulting Room, Corridor, Meeting	Metal cladding/ minimum 300mm gap with 20kg/m ³ glasswool / 2 layers of 13mm plasterboard, refer to detail AC011
General Offices, Store Room, Toilet	Metal cladding/ minimum 300mm gap with 20kg/m ³ glasswool / 1 layer of 13mm plasterboard, refer to detail AC012

4.3 ROOF CONSTRUCTION

The recommended roof/ceiling construction is shown below in Figure 2.



Note: Insulation i

Figure 2 - Roof / Ceiling Construction

5 EXTERNAL NOISE EMISSION ASSESSMENT

Detailed mechanical equipment selection and layouts are not available at this stage. The external noise emission criteria are set up in this section of the report to ensure that the amenity of nearby land users is not adversely affected.

5.1 EXTERNAL NOISE EMISSION OBJECTIVES

The external noise emission from the project site shall comply with the requirements of the DECC Industrial Noise Policy guidelines. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The DECC Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion.

5.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential and commercial receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels were determined by long term, continuous noise monitoring conducted at the amenity of the project site. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 8 -- Intrusiveness Criteria

Time of day	Background Noise Level - dB(A) L_{90}	Intrusiveness Criteria dB(A) L_{eq}
Day	49	54
Evening	44	49
Night	41	46

5.1.2 Amenity Objectives

Noise emission objectives for “suburban” receivers based on the Industrial Noise Policy “Amenity Criteria” are presented below. Amenity criteria are assessed using the $L_{eq(Period)}$ descriptor – ie noise from the a particular noise source is average over the **entire daytime/evening/night time period**. Acoustic criteria are as follows:

Table 9 - DECC Amenity Objectives

Location	Time of Day	Amenity Noise Objective $dB(A)_{Leq(Period)}$	
		Residential	Commercial
All Potential Affected Neighbouring Boundaries	Day Time (7am – 6pm)	55	65
	Evening (6pm – 10pm)	45	65
	Night (10pm-7am)	40	65

5.2 PROPOSED NOISE OBJECTIVES

Tables below provide a summary of our recommended assessment criteria applicable to the subjected site. The intrusiveness and amenity criteria for this project have been determined using the DECC guidelines and measured background noise levels.

Table 10 - Noise Objectives for Nearest Residential Receiver

Time of day	Measured Background Noise Level $dB(A)_{L_{90}}$	Intrusiveness Criteria $dB(A)_{Leq}$	Amenity Criteria $dB(A)_{Leq}$	Noise Emission Objective $dB(A)_{Leq}$
Day	49	54	55	54
Evening	44	49	45	45
Night	41	46	40	40

Table 11 -Noise Objectives for Nearest Commercial Receiver

Time of day	Noise Emission Objective $dB(A)_{Leq}$
Day	65
Evening	65
Night	65

6 CONCLUSION

DA noise assessment for the proposed Milestone 3 & 4 development within Liverpool Hospital has been conducted. Provided recommended acoustic treatments in Section 4 of this report the internal noise levels will comply with the requirements of AS2107 and AS2021. External noise emission criteria have been setup in Section 5 of this report.

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

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
George Wei

Appendix 1: Unattended Background Noise Measurements

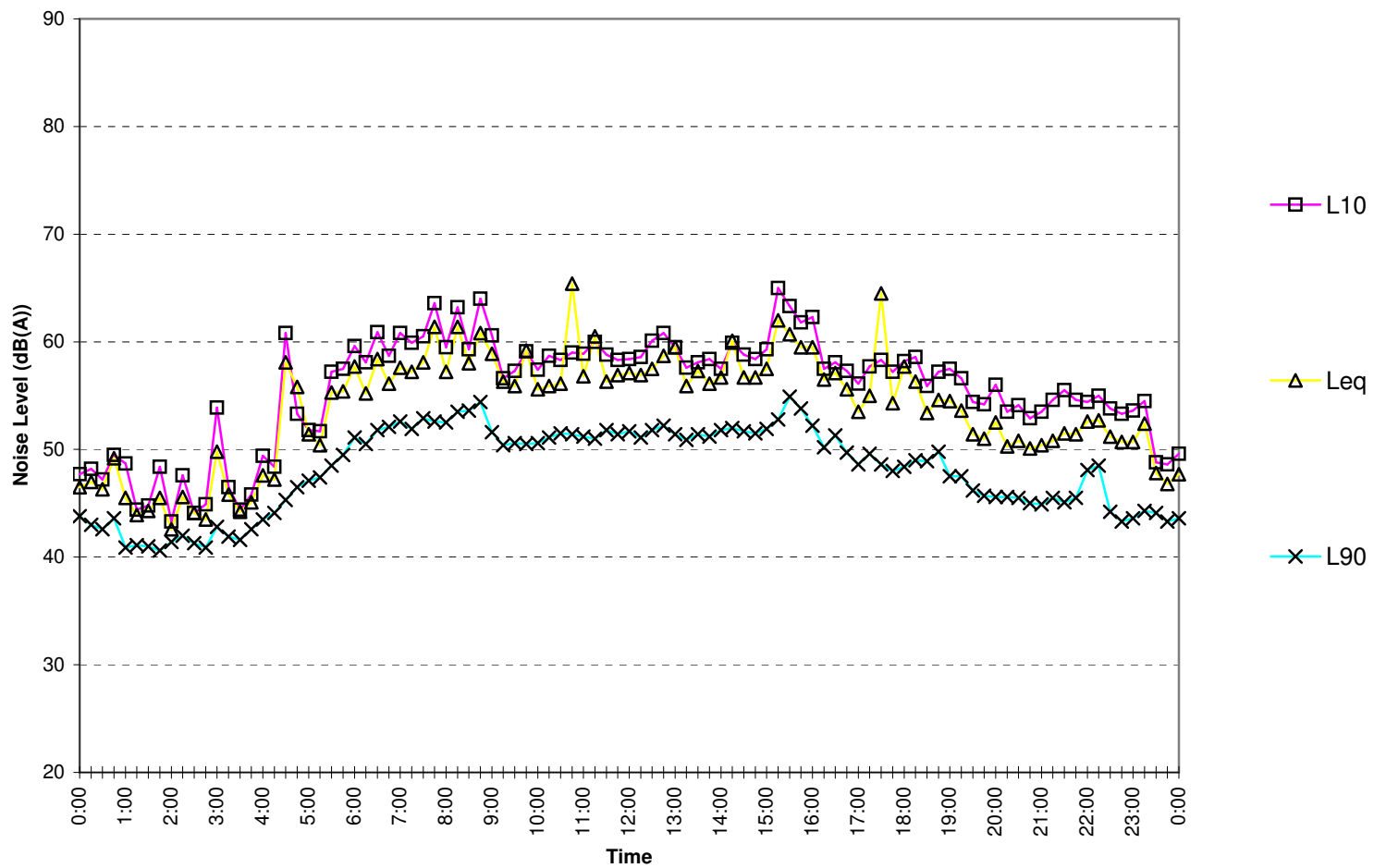
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Wednesday April 28,2010



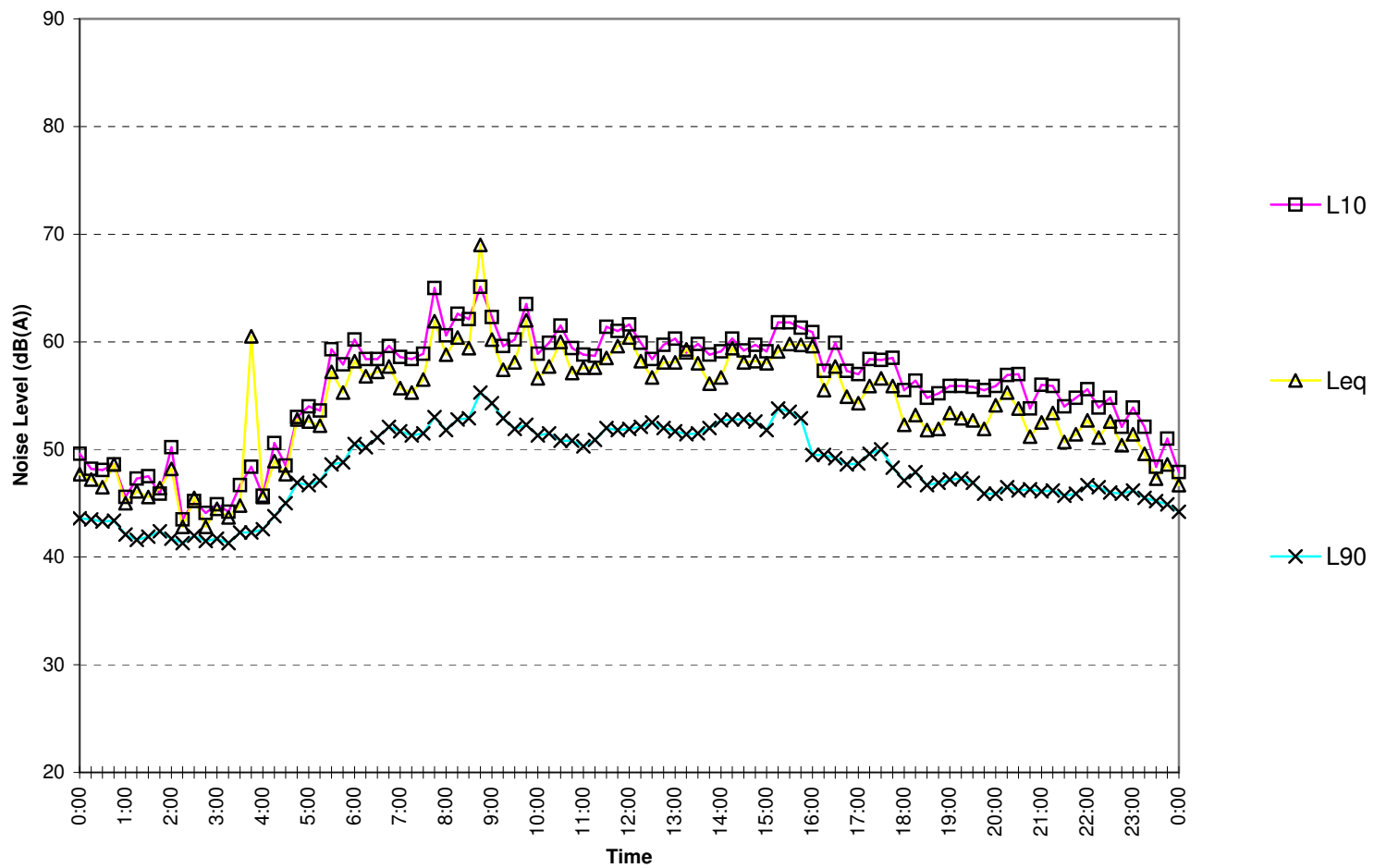
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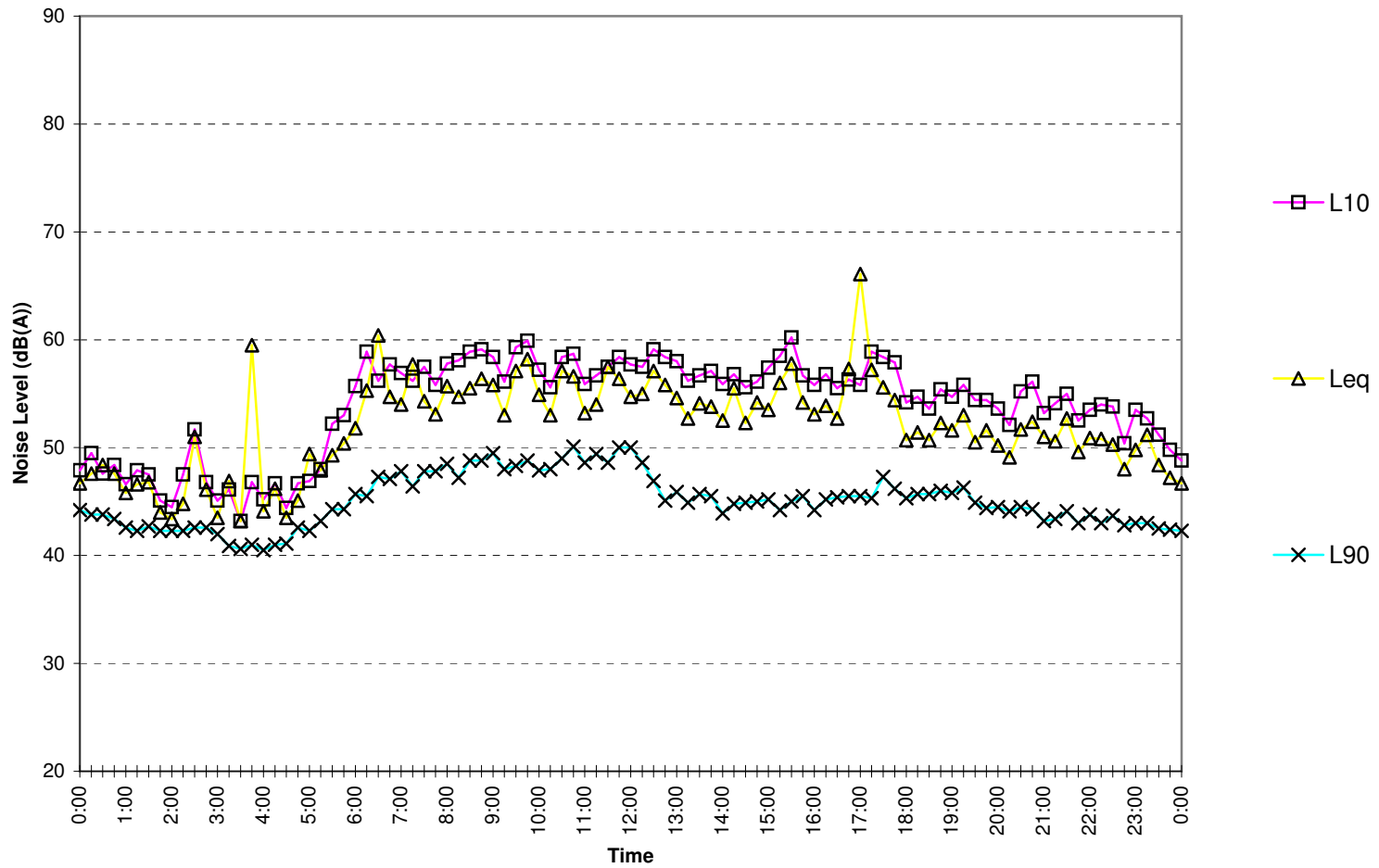
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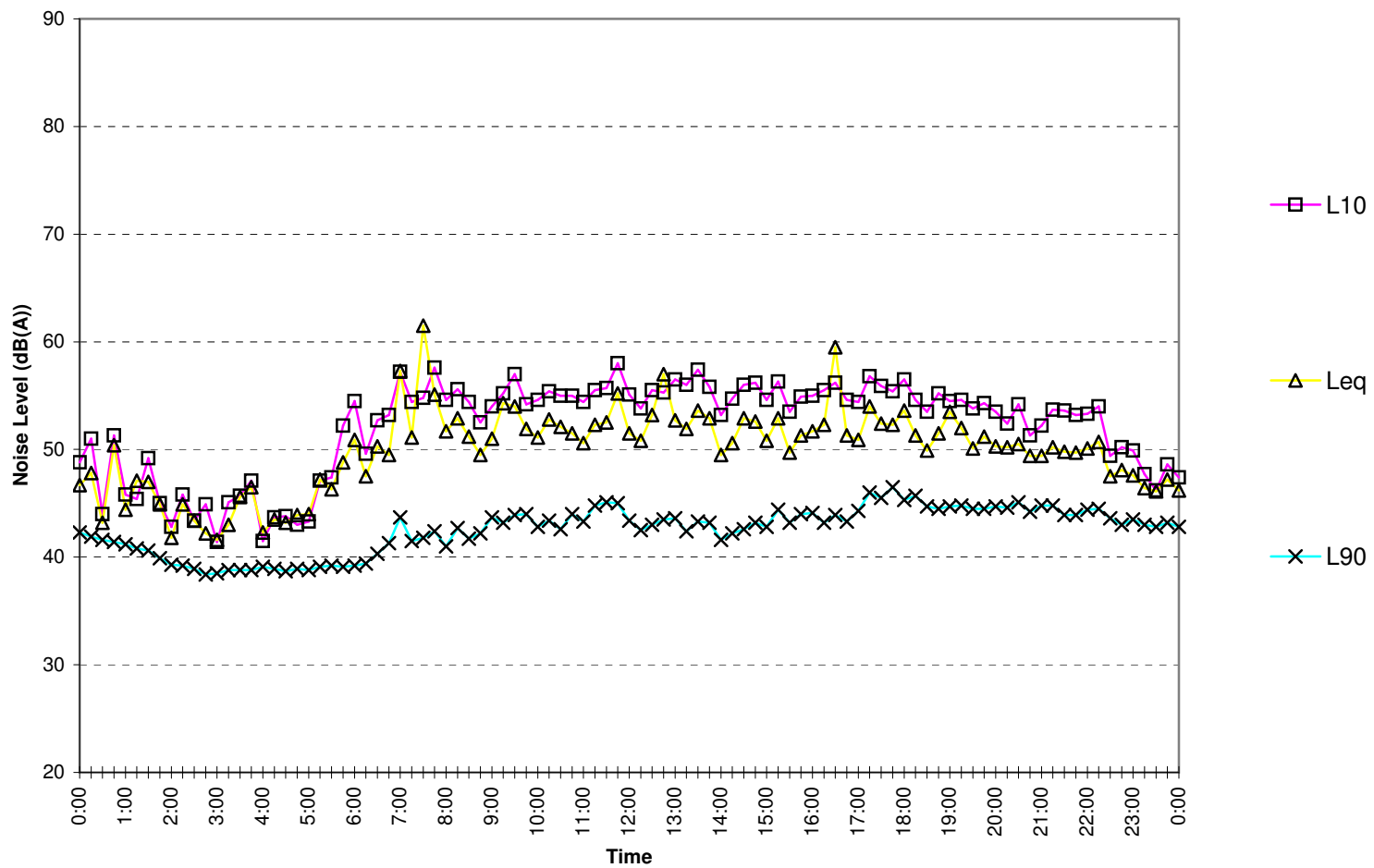
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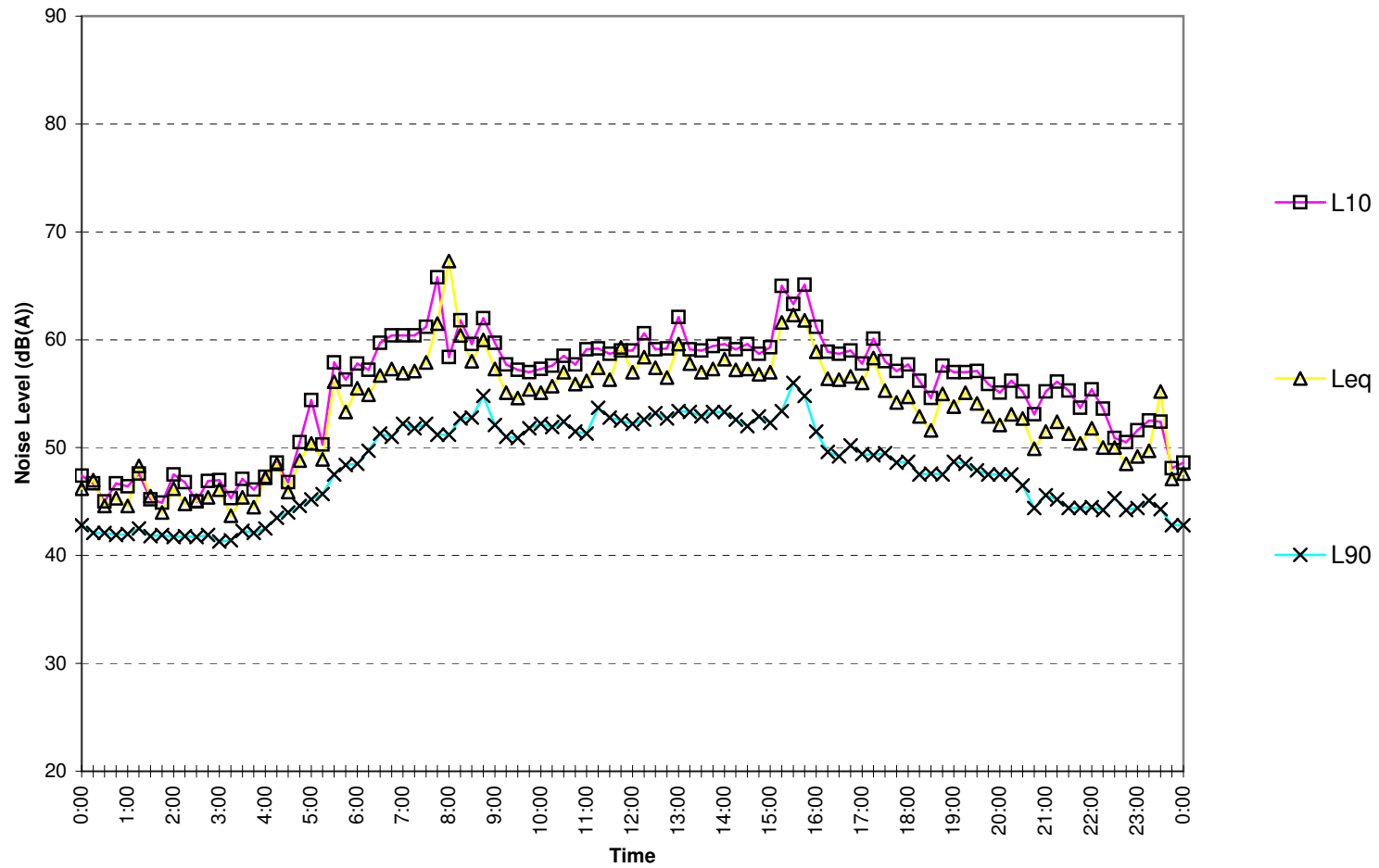
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Sunday May 2,2010



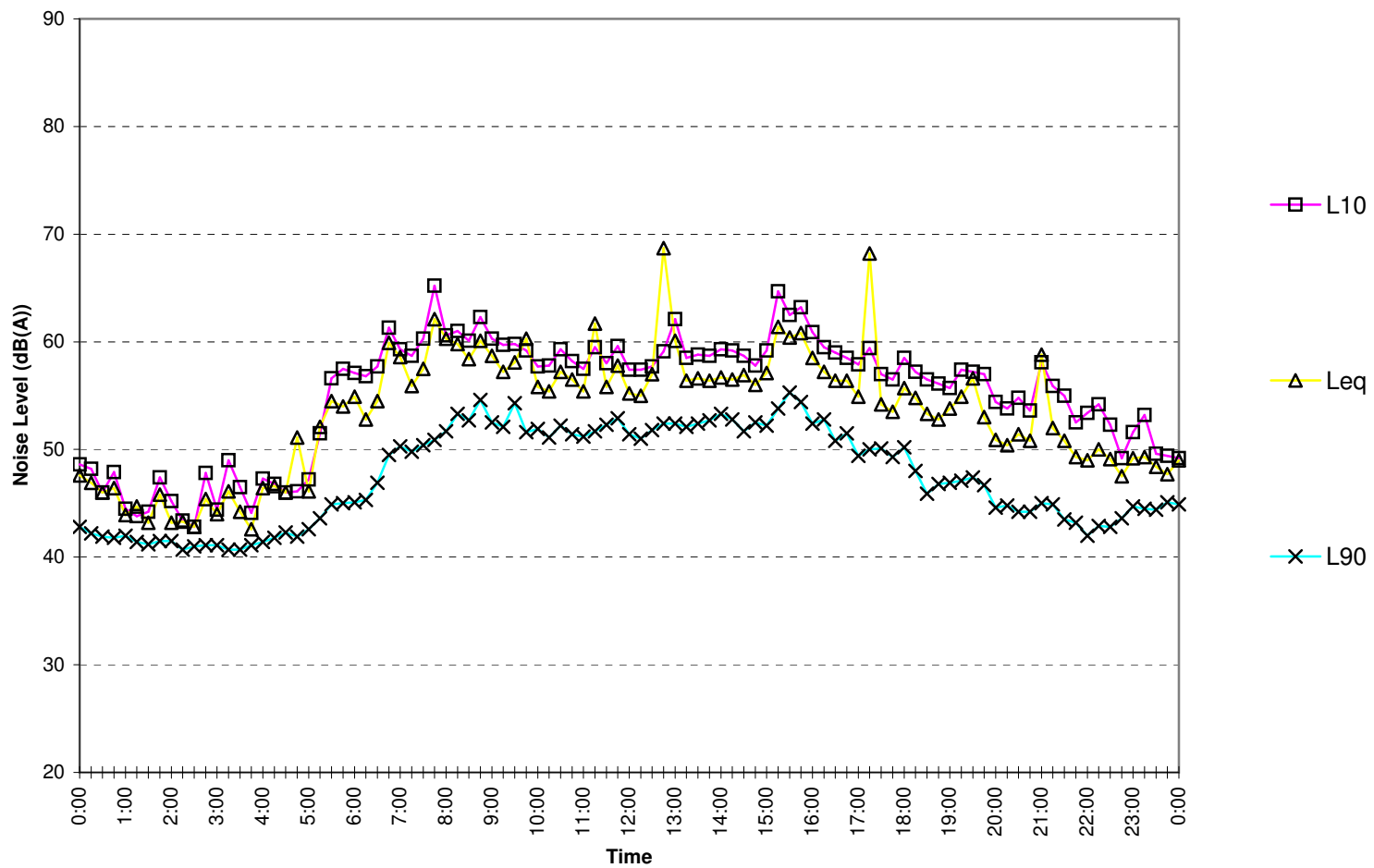
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Monday May 3, 2010



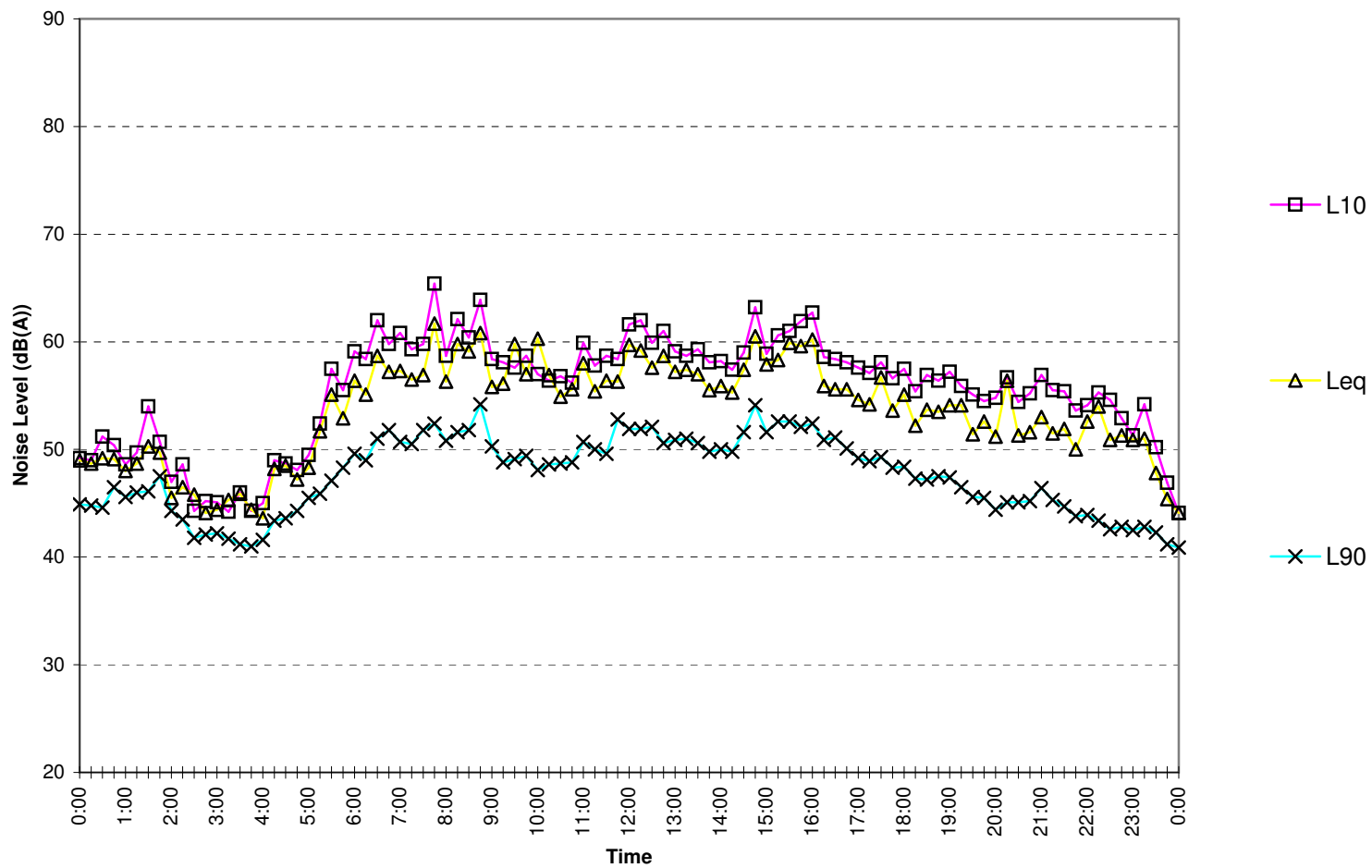
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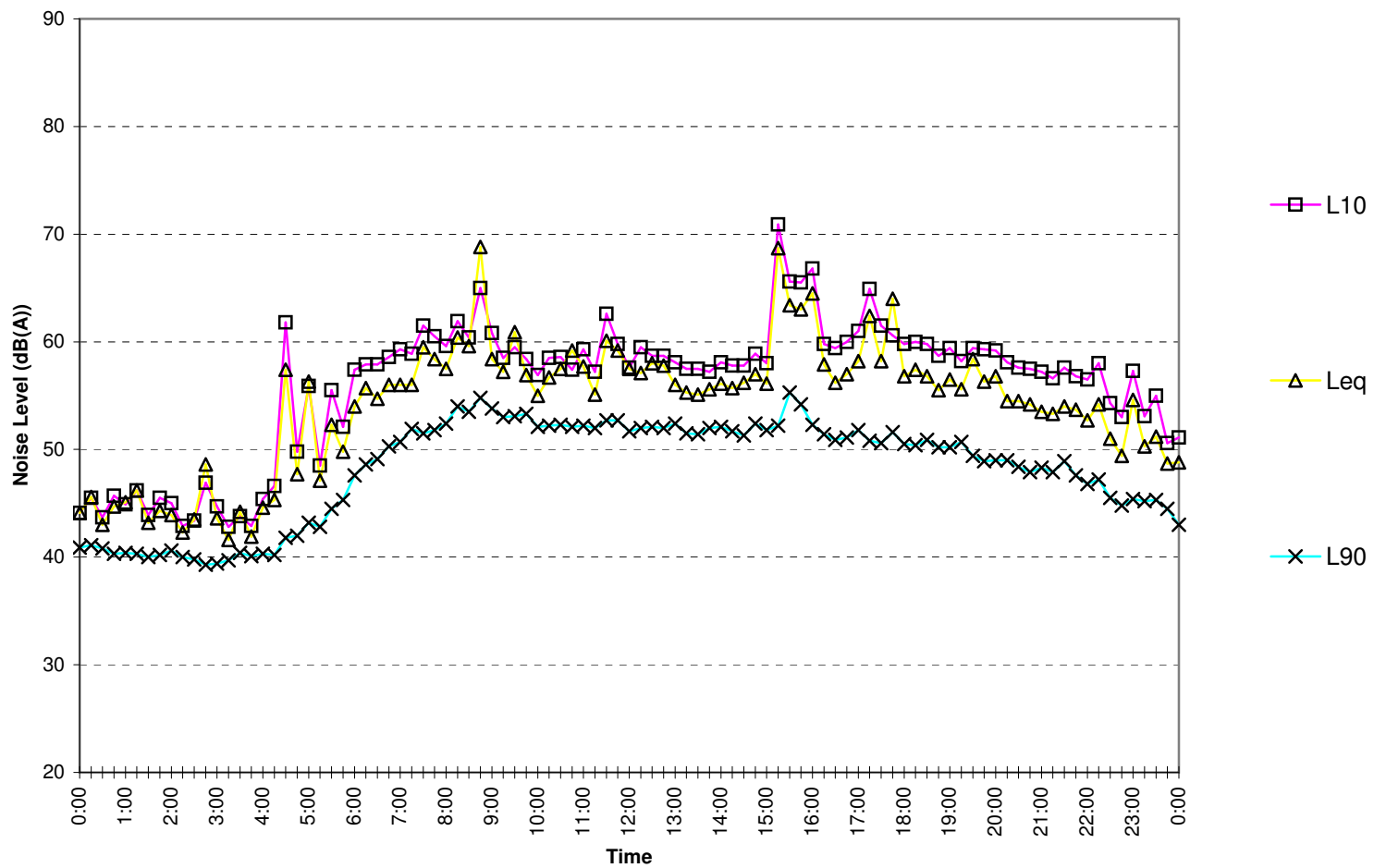
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Wednesday May 5, 2010



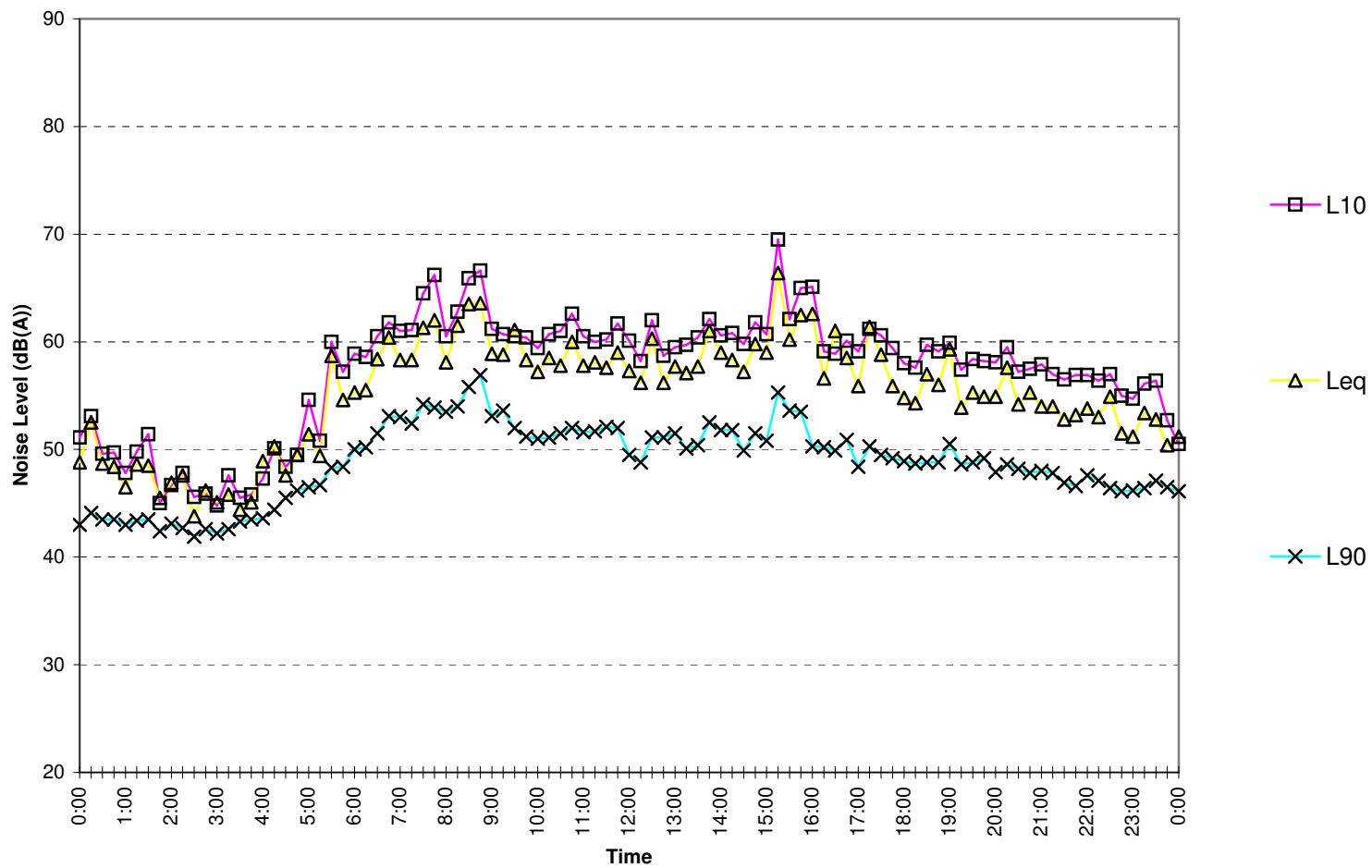
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Thursday May 6,2010



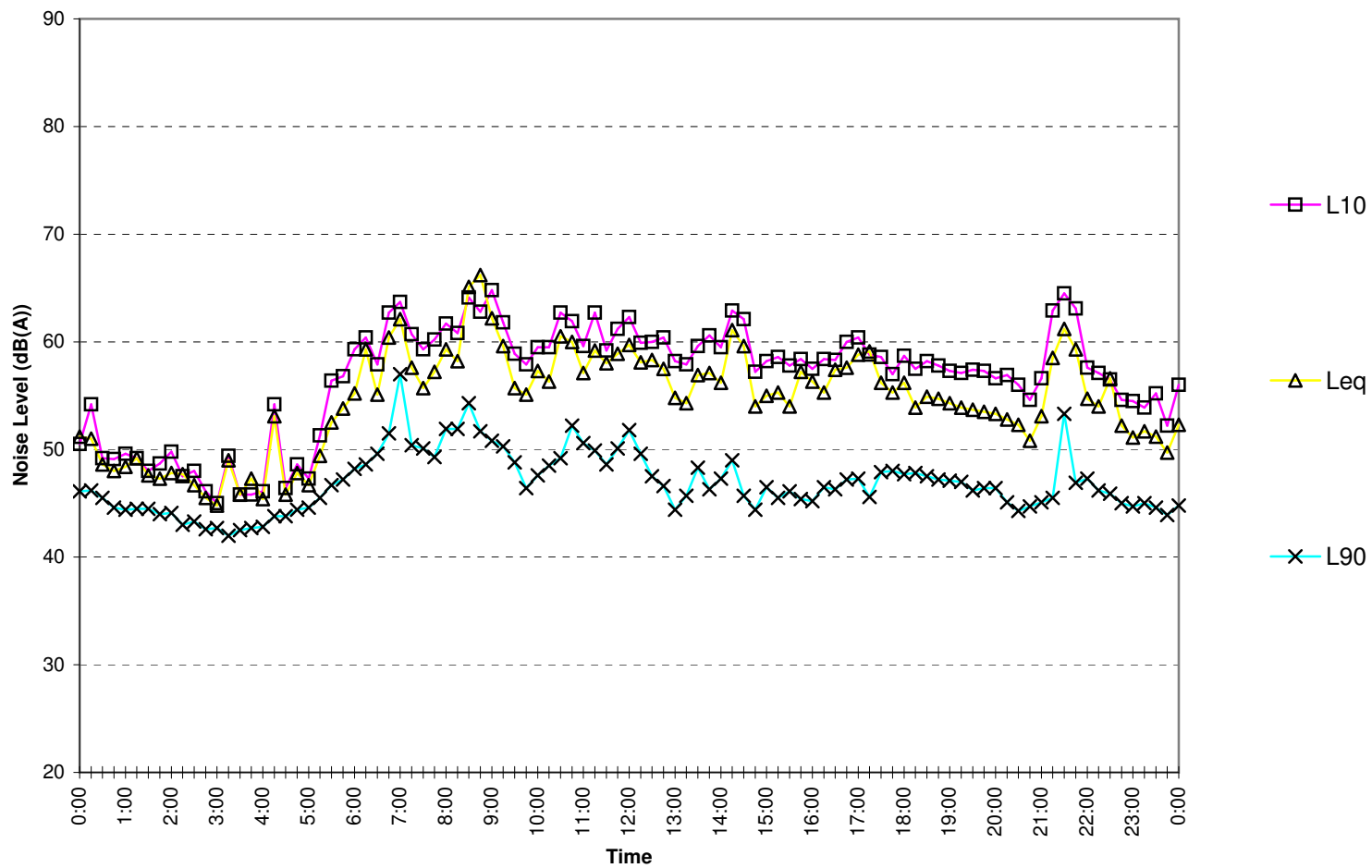
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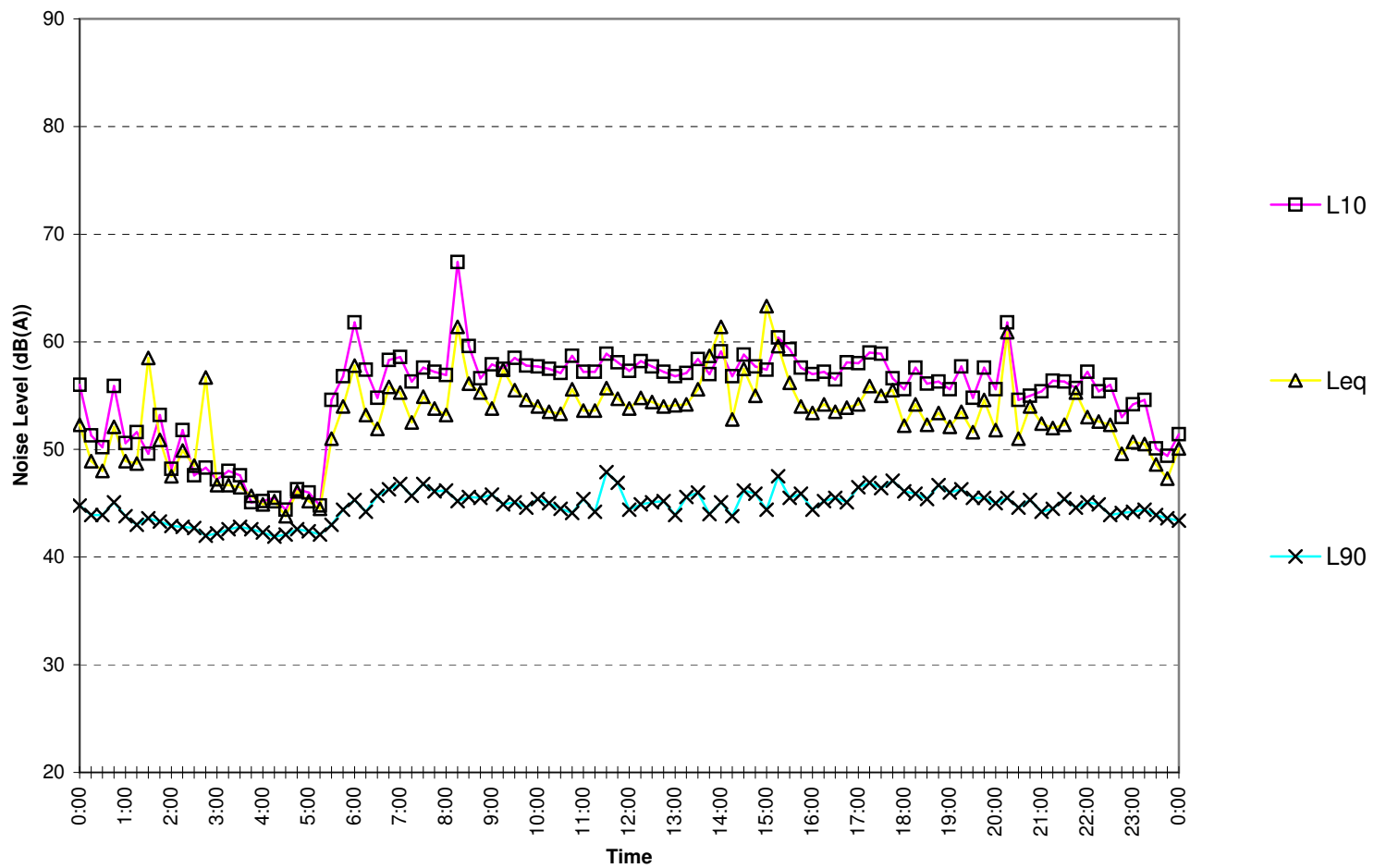
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Saturday May 8, 2010



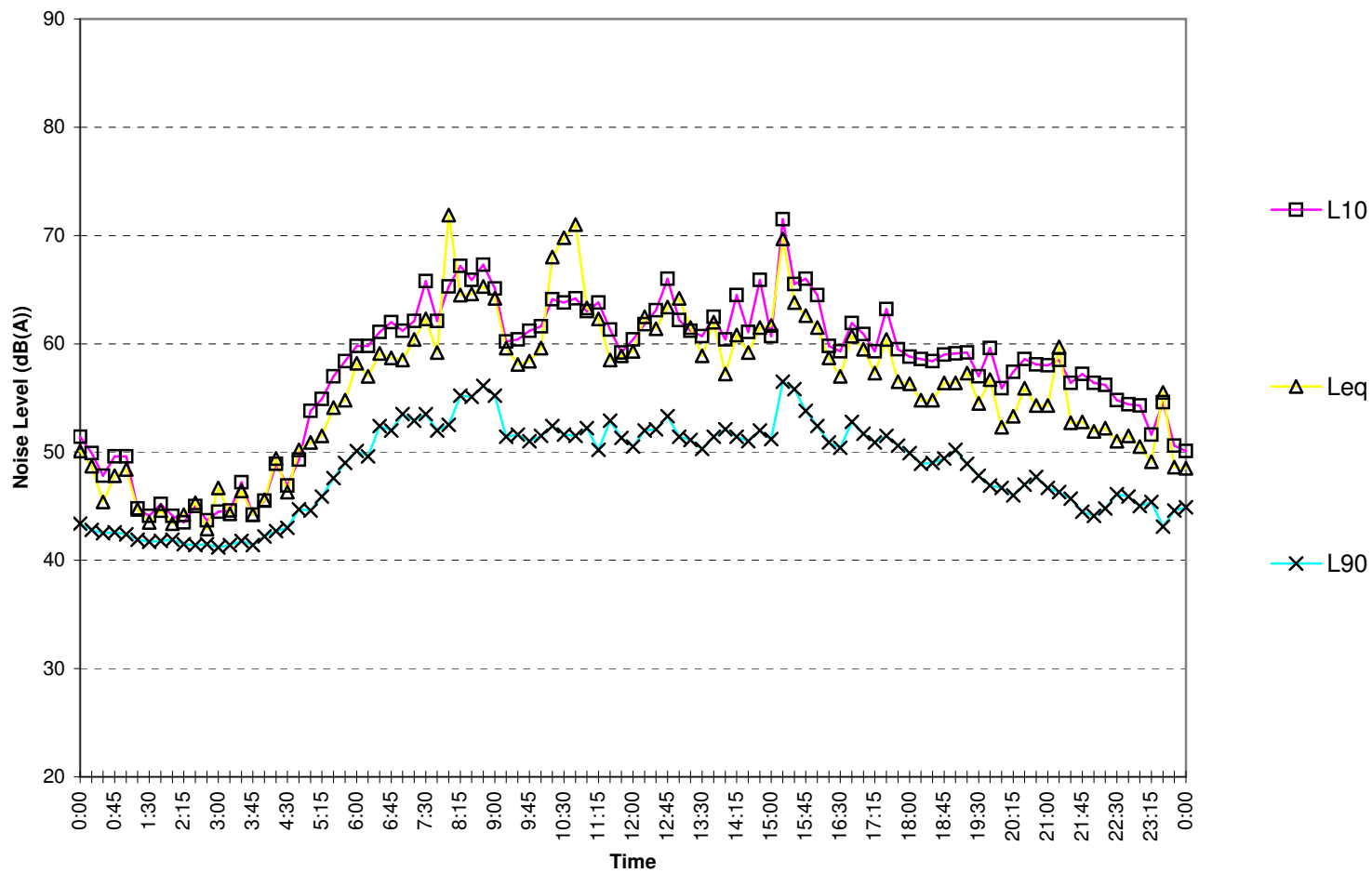
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Sunday May 9, 2010



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Monday May 10, 2010



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Tuesday May 11,2010

