

MANAGING DIRECTORS

MATTHEW PALAVIDIS
VICTOR FATTORETTO

DIRECTORS

MATTHEW SHIELDS
BEN WHITE



St George Hospital - Emergency Department

Acoustic Assessment

SYDNEY

A: 9 Sarah St Mascot NSW 2020

T: (02) 8339 8000

F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA

LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au

ABN: 11 068 954 343

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1 INTRODUCTION

Acoustic Logic have been engaged to conduct an acoustic assessment so as to comply with the requirements of Director Generals Requirement 7.

The report addresses the following:

- Identifies noise generating activities with the potential to create adverse impact (primarily ventilation plant and emergency generator).
- Identifies potentially effected residential properties.
- Identifies appropriate noise emission controls applicable to the site
- Provides an outline of acoustic treatments as required to ensure compliance with noise emission controls is achieved.

This report is based on architectural drawings by HPI.

2 SITE DESCRIPTION

The proposed development is on Gray Street, Kogarah, north of the inter-section with Short Street.

Proposed development consists of a two storey building with:

- Eight ambulance bays.
- Ground floor treatment areas (Resuscitation, Acute Hall, EMU, Imaging areas) with associated reception and consult room areas.
- First floor office/meeting room and plant rooms.

Development in the vicinity of the site is as follows:

- The site is bounded to the north Kogarah Fire station and other buildings within the St George Hospital Precinct.
- To the east and south by other buildings in the Hospital precinct.
- To the west by Gray Street.

The nearest residential development to the site are to the west of the site, on the opposite side of Gray Street.

A aerial photo showing the site and noise measurement locations is shown in Figure 1 below.



Figure 1 Site Map and Measurements Location

3 NOISE DESCRIPTORS

Noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. Therefore a number of different noise descriptors are typically used in the assessment of noise.

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

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of plant and traffic noise impact as it closely corresponds with human perception of a changing noise environment.

In addition, sleep disturbance is typically concerned with peak noise events, using the $L_{1(1min)}$ noise descriptor (the loudest 1% of noise over a 1minute period).

4 OPERATIONAL NOISE EMISSION ASSESSMENT

Noise emission goals for the site will be developed to ensure that the amenity of nearby land users (both within the hospital grounds and the residential properties on Gray Street) is not adversely affected.

We note that pursuant to EPA guidelines (the Industrial Noise Policy) noise from emergency vehicles is not typically assessed.

The primary noise generation by the site is likely to be from building services, which will consist of:

- Ventilation plant and
- An emergency generator proposed to be located on Gray Street.

These will be discussed in more detail below.

4.1 BACKGROUND NOISE MONITORING

Unattended monitoring was conducted at the site using a noise monitor installed in a landscaped area on Gray Street (see aerial photo in section 2).

The monitoring period was from Tuesday 16 and 20 February 2012 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 equipment was calibrated at the beginning and the end of the measurements using a Rion NC-73 calibrator, no significant drift was detected. Measurements were taken on an A-weighted fast response mode.

The measured background levels are shown below.

Table 1 – Background Noise Levels

TIME OF DAY	MEASURED AMBIENT LEVELS – dB(A)L _{eq}	MEASURED BACKGROUND LEVELS – dB(A)L ₉₀
Day (7am-6pm)	63	51
Evening (6pm-10pm)	61	48
Night (10pm-7am)	56	45

4.2 ACOUSTIC OBJECTIVES

As there are no specific noise emission guidelines for Hospitals or similar developments in the any Kogarah Council planning control. In the absence of this, the following noise emission controls will be adopted:

- For ventilation plant generally – the EPA Industrial Noise Policy and commonly adopted EPA sleep disturbance guidelines.
- For the emergency generator – the EPA Noise Control Manual will be used.

4.2.1 Industrial Noise Policy and Sleep Disturbance Guidelines (Ventilation Plant).

The INP and sleep disturbance guidelines will be applied for typical noise generating activities (typical use of plant, not emergency).

4.2.1.1 INP Intrusiveness Criteria

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.

Table 7 below provides the measured background noise levels and the resulting intrusiveness criteria. 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 2 – Industrial Noise Policy – Intrusiveness Criteria

TIME OF DAY	MEASURED BACKGROUND LEVELS – dB(A) L_{90}	RECOMMENDED ACCEPTABLE NOISE LEVEL - dB(A) $L_{eq(15min)}$ (BACKGROUND + 5dB(A))
Day (7am-6pm)	51	56
Evening (6pm-10pm)	48	53
Night (10pm-7am)	45	50

4.2.1.2 INP Amenity Criterion

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

The Industrial Noise Policy sets out acceptable noise levels for various 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 8 provides the recommended ambient noise levels for the suburban residential 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 3 – Industrial Noise Policy – Amenity Criteria

TYPE OF RECEIVER	TIME OF DAY	AMENITY NOISE LEVEL dB(A) $L_{eq}(\text{Period})^*$
Residential (Suburban)	Day	55*
	Evening	45*
	Night	40*
Commercial	When in use	65
Hospital		
- Internal	Noisiest 1-hour period	35
- External	Noisiest 1-hour period	50

*However, if L_{eq} noise levels in the vicinity of the site already exceed EPA Amenity Criteria, noise from the site should be designed to levels 10dB(A) below the ambient L_{eq} level presented in table 1 (as per Industrial Noise Policy section 2.2, table 2.2). Design “amenity” noise level therefore become 53dB(A) (day), 51dB(A) (evening) and 46dB(A) (night), being 10dB(A) below the L_{eq} levels presented in table 1

4.2.1.3 Sleep Arousal Assessment

Potential sleep arousal impacts should be considered for noise generated after 10pm. Sleep arousal is a function of both the noise level and the duration of the noise.

To assess potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An “emergence” test is first carried out. That is, the L_1 noise level of any specific noise source should 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. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out below.

Table 4 – Sleep Arousal Emergence Criteria (10pm-7am)

Location	Background Noise Level dB(A) L_{90}	Emergence Level dB(A) $L_{1(1min)}$
All Potentially Affected Residential Properties	45	60

- Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the DECCW Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in appendix B of the DECC Environmental Criteria for Road Traffic Noise.

4.2.2 Emergency Generator (EPA Noise Control Manual).

Emergency plant is typically excluded from the Industrial Noise Policy. In the absence of this, chapter 151 of the EPA Noise Control Manual (Generators, Emergency) is of assistance.

For the residential receivers on Gray Street, the following criteria are proposed:

Table 5 – Industrial Noise Policy Recommended Acceptable Noise Levels

Receiver Type	Time of Day	Recommended Criteria	RECOMMENDED NOISE LEVEL dB(A) _{Leq}
Residential	Day/Evening (7am-10pm)	Background+10dB(A)	61 (day), 58 (Evening)
	Night (10pm-7am)	Background+5dB(A)	50

4.3 RECOMMENDATIONS

Pursuant to EPA guidelines, acoustic assessment of emergency vehicles is not required.

Typically it is plant/equipment that has the potential to impact nearby noise sensitive development, in particular the residences to the west of the site, across Gray Street.

Key plant items are:

- *Plant Noise Generally.*

Provided that the acoustic goals set out in table 2 and 3 are achieved, noise emissions will be satisfactory. We note that the EPA Amenity criteria (set out in section 4.2.1.2) require that new noise sources be designed to 10dB(A) less than existing ambient conditions. The purpose of this is to prevent excessive *cumulative* noise impact, and therefore takes into account the potential for cumulative noise impacts from the existing hospital.

Primary source of plant noise will be the level 1 plant room of the emergency department. Acoustic treatments will involve:

- Air-handling units. Outside air and exhaust air ductwork (which is typically ducted to an external louvre, and therefore can create noise impacts on nearby properties) will require internal lining or acoustic attenuators.
- Return/relief air fans. Any ductwork between the fan and an external louvre will require internal lining or acoustic attenuator.
- Any plant room louvre not required for air intake/discharge should be closed off with sheet metal or 6mm fc sheet.
- Detailed review of all plant items is undertaken. The *combined* noise level from all plant items is to be designed to meet the acoustic goals set out in tables 2 and 3.

Provided that the acoustic goals set out in table 2 and 3 are achieved, cumulative noise impacts from the emergency department will comply with EPA requirements.

Compliance with the noise emission goals in section 4.2 will be achieved through the treatments discussed above.

- *Diesel Generator.* Although proposed to be used in emergency only, potential noise impacts should still be mitigated. Recommended treatments are:
 - Generator to be installed within a proprietary acoustic enclosure. Generator with enclosure should create a noise level of no more than 77dB(A) at a distance of 1m.
 - Construct a noise screen around the generator with enclosure. Top of screen to be at least 500mm above the top of the generator (and should provide line of sight screening between the generator and the top floor of the Gray Street apartments, to the west).
 - Gas exhaust – muffler required such that noise level at 1m from gas discharge point no more than 70dB(A).
 - Generator to sit on 40mm static deflection spring vibration isolators.

5 DEMOLITION AND CONSTRUCTION NOISE

With any major construction site there will be noise associated with demolition and construction. The management of impacts arising from these activities is now routine practice, both to address impacts to surrounding properties, and for commercial reasons, to limit impacts on nearby tenancies.

The requirement for a noise management plan to be developed prior to works commencing is not uncommon. This should be done once a construction programme and methodology has been determined.

5.1 ACOUSTIC GOALS

5.1.1 Noise emission goals

The applicable DECCW guidelines and standards are:

- “Interim Construction Noise Guideline” which nominates the following objectives for the proposed hours of construction:
 - Within Standard Working Hours (7am-6pm) – background + 10 dB(A).
 - Outside Standard Working Hours – background + 5 dB(A).
- In the event that strict compliance with the DECCW guidelines cant be achieved - 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.

5.1.2 Vibration goals

Typically, any construction vibration should comply with the objective in the DECC document “Assessing Vibration – A technical guideline”, with the criteria for intermittent vibration applied.

In addition, we recommend that there be consultation with the hospital in the event there is existing vibration sensitive equipment to the work site (medical imaging equipment or similar). If so – operational and equipment damage guidelines from the equipment manufacturer should be provided.

5.2 RECOMMENDATIONS

A detailed construction noise and vibration management plan should be developed once a construction program has been prepared by the builder.

In the event that there are extensive amounts of demolition or excavation proposed in the vicinity of vibration sensitive equipment, we recommend that a vibration monitor be installed on site during the demolition/excavation process. Monitoring system should incorporate a SMS warning capability to enable the contractor to be notified in the event predetermined “trigger” levels are exceeded.

6 CONCLUSION

This report provides the results of our acoustic assessment for the proposed new Emergency Department at St George Hospital, Kogarah.

Noise at the site has been measured and noise goals have been set in accordance with the Director Generals Requirements.

Assessment of noise emissions (both operational and during construction) has been conducted with reference to relevant Council and EPA planning controls. Compliance with these controls is achievable, with detailed acoustic treatments of all primary plant items to be determined in consultation with the design team.

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

Yours faithfully,



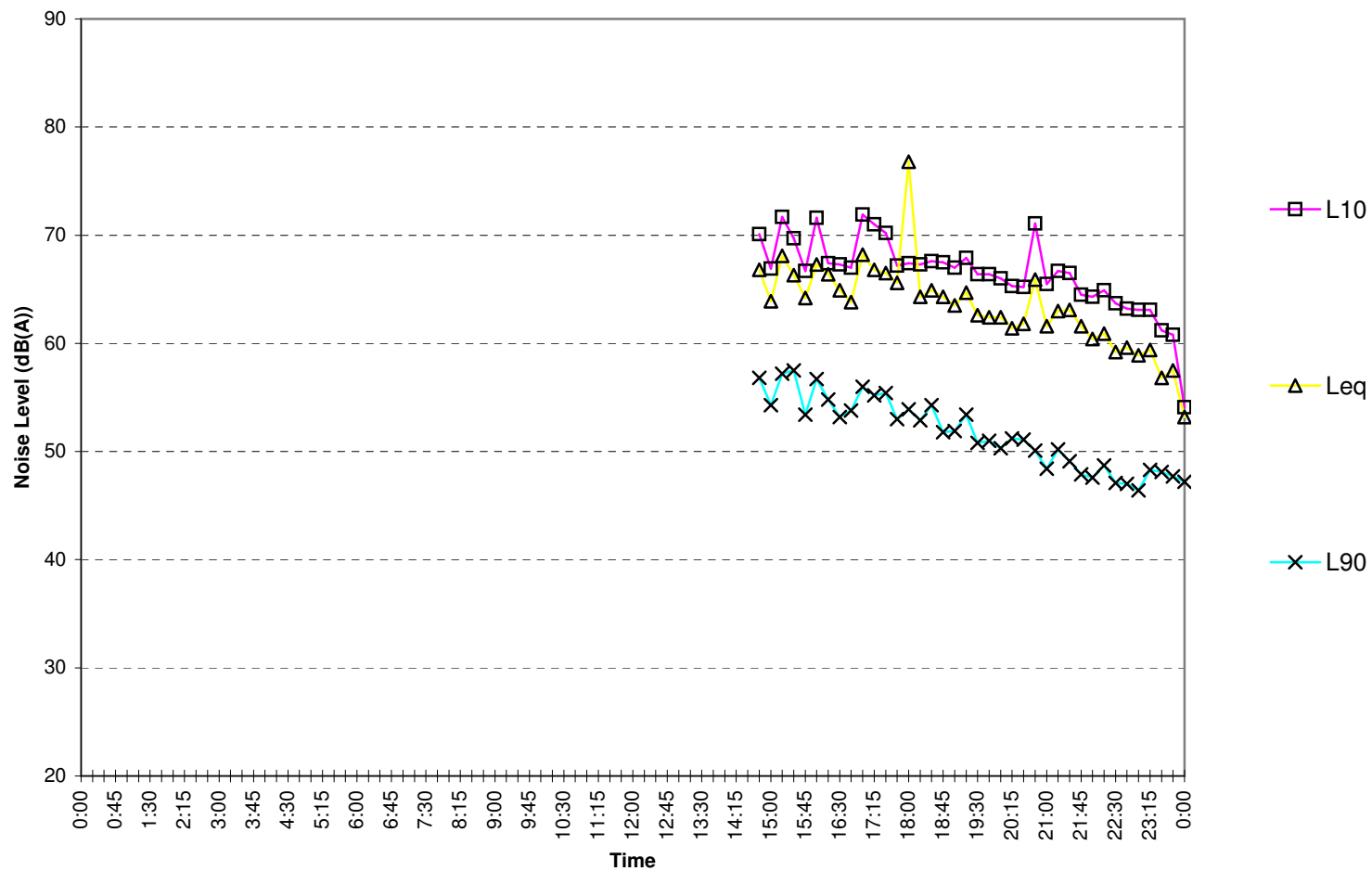
Acoustic Logic Consultancy Pty Ltd
Thomas Taylor

Appendix

Background Noise Logging Data

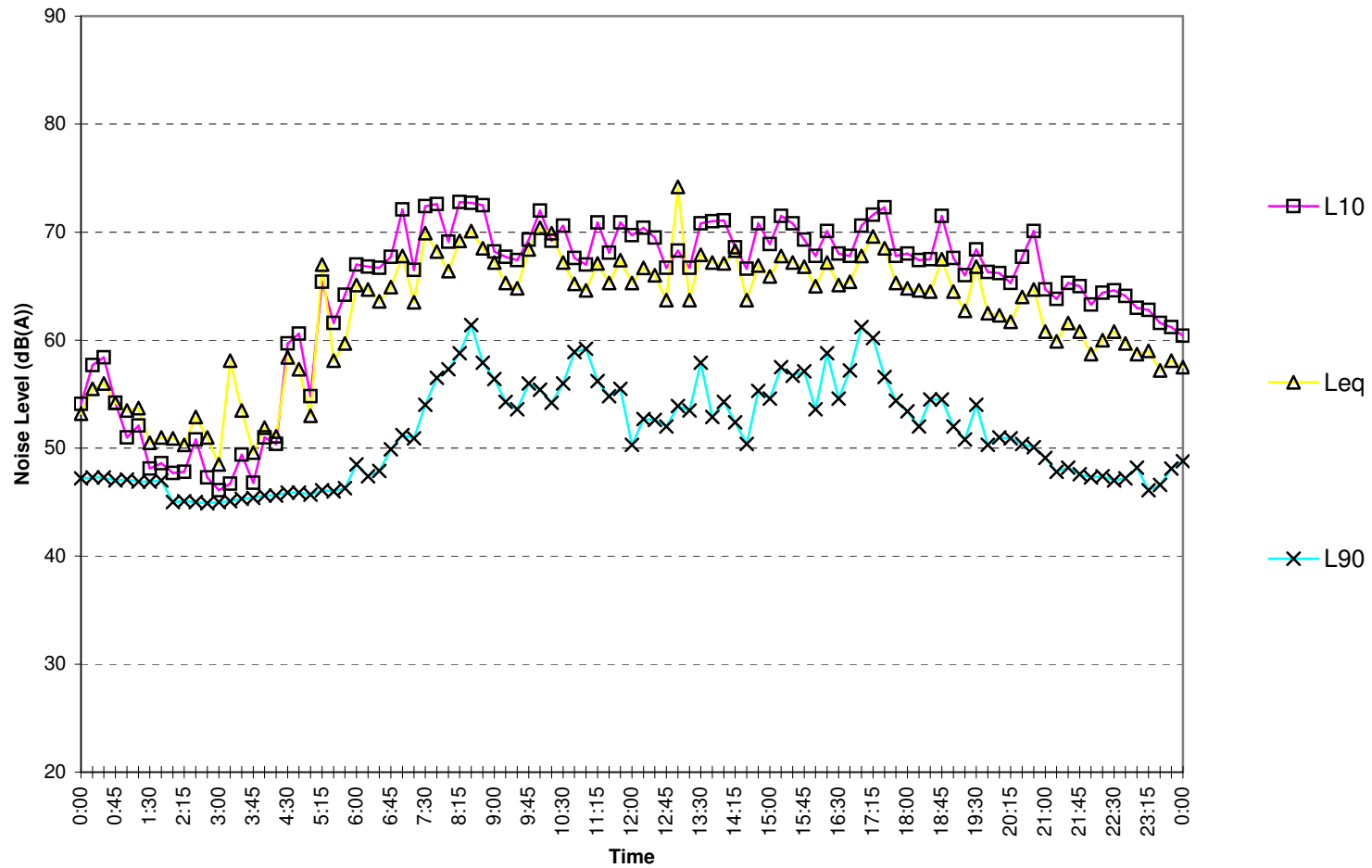
St George Hospital

Thursday February 16,2012



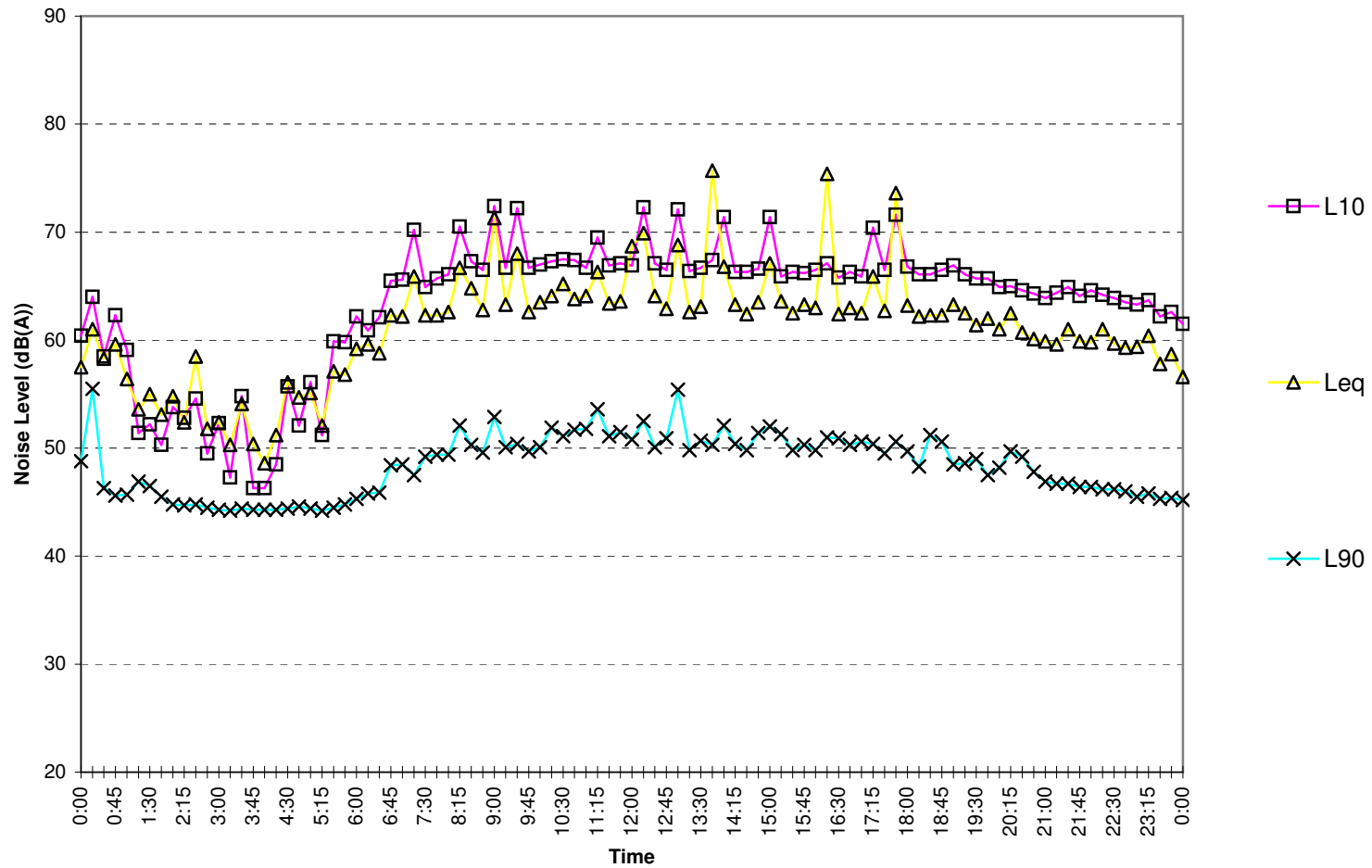
St George Hospital

Friday February 17, 2012



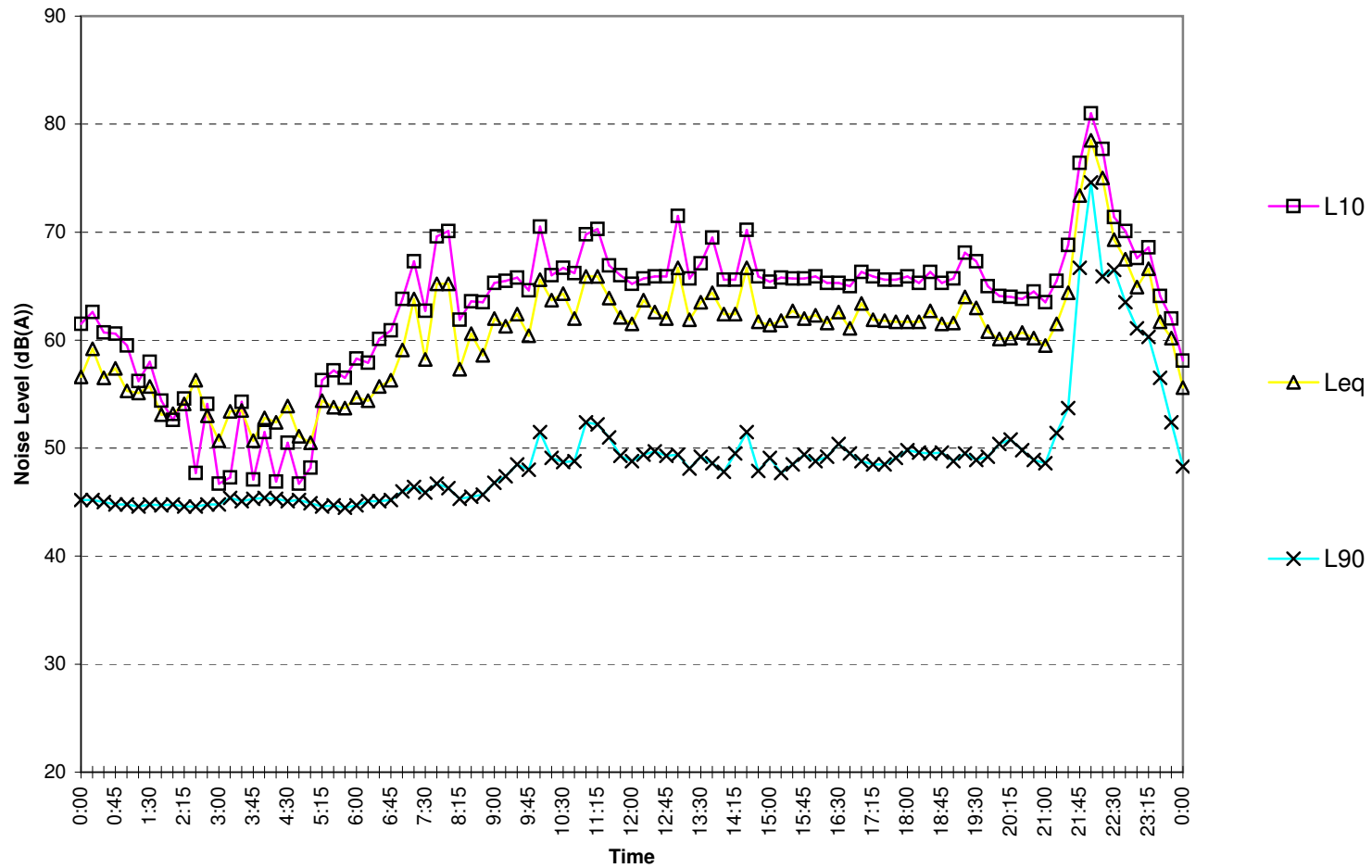
St George Hospital

Saturday February 18, 2012



St George Hospital

Sunday February 19,2012



St George Hospital

Monday February 20, 2012

