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Prepared for: Henroth Development

KIRRAWEE BRICK PIT PRINCES HIGHWAY, KIRRAWEE

ACOUSTIC ASSESSMENT OF PROPOSED MIXED USE DEVELOPMENT

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1. INTRODUCTION

This acoustic report has been prepared in support of an application for Concept Plan approval under Part 3A of the Environmental Planning and Assessment Act at 566-594 Princes Highway Kirrawee, otherwise known as the former Kirrawee Brick Pit (Reference MP 10_0076). The application seeks approval for a mixed use development comprising residential, retail and commercial uses and building envelopes of between 5 and 15 storeys,. The proposal also involves basement car parking and includes commuter parking, landscaping, services and the provision of a major new public park.

Specifically, this report addresses issues 6 and 8 as detailed in the Director General's Requirements (DGR's) issued by the Department of Planning on 24 August 2010.

In this report we will:

- Identify environmental noise sources (traffic noise, noise from adjacent industrial land use) which may impact future occupants and tenants on the site and recommend acoustic treatments to reduce these impacts to acceptable levels, as required by Director General's Requirement 8.
- Identify noise emissions which will be generated by the site (mechanical plant noise and increased vehicle noise) and recommend acoustic and management controls in order to reduce noise impacts on nearby properties and to new dwellings within the development, in satisfaction of Director General's Requirement 6.

2. SITE DESCRIPTION / PROPOSAL

2.1 SITE DESCRIPTION

The site is bounded by the Princes Highway, Oak Road and Flora Street, Kirrawee.

Development in the vicinity of the site is as follows:

- The site is bounded to the north by the Princes Highway which carries high traffic flows during the day and night. Further to the north, across the Highway, lies primarily industrial development.
- The site is bounded to the east by James Cook Industrial Estate, comprising (amongst other things) a building supply yard, metal fabrications, saw sharpening and upholstery workshops.
- The site bounded to the south by Flora Street, which carries medium traffic flows during the daytime, and light flows at night. Further to the south, across Flora Street, lies a mixture of commercial and industrial development (automotive repair, paving supplies).
- The site is bounded to the west by Oak Road. Further to the west lies residential development.

2.2 PROPOSED MIXED USE DEVELOPMENT

The proposed development will consist of a mixed use commercial, retail and residential development (and car parking)., comprising the following:

- 8 residential towers, of varying height (between 5 and 15 storeys).

- Ground level and lower ground level commercial development (indicatively including commercial showrooms, supermarkets, cafes, retail space).
- Basement car parking.
- Public open space.

2.3 NOISE SENSITIVE AREAS

New tenants of the residential development are potentially affected by the following noise sources:

- Traffic noise (particularly apartments facing the Princes Highway) and to a lesser extent those facing the industrial developments and to the east and the Flora Street driveway entry to the underground car park and loading dock.
- Noise from the adjacent industrial development, to the east of the site.
- Noise generated from within the site (noise from cafes, mechanical services, vehicle noise).

The nearest potentially affected receivers outside of the development are:

- Residential properties on Oak Road.
- Industrial developments to the south and east.

These developments are potentially affected by vehicle noise (as a result of increased traffic flows on surrounding streets) and mechanical plant noise generated on site.

3. 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 15-20 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.

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 traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

The L_1 parameter is used to quantify peak noise events (eg – impacts, bottles breaking etc).

4. EXTERNAL NOISE INTRUSION

Assessment of external noise and vibration is required pursuant to Director Generals Requirement 8.

The following noise sources will be assessed in order to determine their impact on the development:

- Traffic noise from Princes Highway and Flora Street.
- Traffic noise from cars entering/leaving the commercial/retail developments on the site.
- Noise from the adjacent industrial developments.

4.1 ACOUSTIC OBJECTIVES

4.1.1 Traffic noise from the Princes Highway

Traffic noise from the Princes Highway are to comply with SEPP Infrastructure 2007 acoustic objectives, as presented below. We note that the Department of Planning – Interim Guidelines adopt the same acoustic criteria.

Table 1 –Traffic Noise Criteria – Princes Highway

Space type	Time	Criteria*
Sleeping Areas	Night time only - 10pm-7am	35dB(A) $L_{eq}(9 \text{ hour})$
Living Areas	Daytime – 7am-10pm	40dB(A) $L_{eq}(15 \text{ hour})$

*The 9 hour/15hour descriptors referred to in the table above are consistent with the Department of Planning – Development Near Rail Corridors and Busy Roads - Interim

4.1.2 Traffic Noise from Flora Street and Noise from Industrial Development

SEPP Infrastructure does not apply to noise sources such as local roads or industrial developments. Acoustic objectives as set out in AS2107 will therefore be adopted for these other noise sources. Objectives are as follows:

The objectives adopted are as follows.

Table 2 –Traffic Noise Criteria – Other Noise Sources

Space type	Time	Criteria
Sleeping Areas	Night time only - 10pm-7am	35dB(A) $L_{eq}(\text{Worst } 1 \text{ hour})$
Living Areas	Daytime – 7am-10pm	40dB(A) $L_{eq}(\text{Worst } 1 \text{ hour})$

4.1.3 Rail noise and vibration

We note that the southern rail line lies at least 90m from the southern boundary of the site and as such, assessment of rail noise and vibration is not required pursuant to Department of Planning (Development Near Rail Corridors and Busy Roads) guidelines.

4.2 NOISE MEASUREMENTS

4.2.1 Traffic Noise

Princes Highway

Unattended noise monitoring was conducted between 5 and 11 December 2007 using an Acoustic Research Laboratories monitor set on A-weighted fast response mode. The monitor was installed 5.5m from the near curb of the highway, with a clear line of site of the road.

To supplement the unmanned monitoring, additional manned measurements were made on 16 September 2010 to ensure logging data remains accurate.

Flora Street

Attended noise monitoring was conducted on 16 September 2010 using a Norsonic 140 Type 1 Sond Analyser. Measurements were taken at approximately 8am (the morning peak hour) at a distance of 6m from the road.

Both sets of equipment were set to fast response and calibrated before and after the measurements. No significant drift was noted.

Measured traffic noise levels are detailed in the table below.

Table 3 – Measured Traffic Noise Levels

Location	Measured Level	
	Daytime (dB(A) $L_{eq}(15 \text{ hour})$)	Daytime (dB(A) $L_{eq}(9 \text{ hour})$)
Princes Highway at 5.5m from curb	71	68
Flora Street at 6m from curb	63	60

4.2.2 Noise from the adjacent industrial development to the east

Noise from industrial park adjoining the development to the east was measured on 11 December 2007.

During the observation period, the loudest typical noise source in the industrial park was from a saw sharpening workshop. Work was conducted with the entry door to the workshop open. Measurements were taken at a distance of approximately 7m from the workshop entry door.

Measured levels are presented below.

Table 4 – Measured Noise Levels – Industrial Park

Location	Measured Level dB(A) L_{eq}
Industrial Park – Saw Sharpening (at 7m from workshop entry)	65*

*It will be residents on the upper levels of the eastern façade of buildings A, B and C which are most potentially affected by this noise. As a measurement cannot be made at the future façade of these buildings (on level 2-3), it will be necessary to use the measurement made at 7m, and a prediction at the future façade made (after adjusting for distance).

4.3 RECOMMENDED TREATMENTS

Given the distance from the proposed new residential development to the industrial units, it will be traffic noise from the Princes Highway and Flora Street which will be the dominant noise impacts (as opposed to noise from the adjacent industrial sites).

Assessment of measured noise levels indicates that noise levels complying with acoustic criteria will be achievable through suitable single glazed windows with acoustic seals. Indicative window thickness are set out in the following tables.

Analysis of existing noise impacts indicates that compliance with noise impact goals is achievable.

The following section presents indicative acoustic treatments which can be adopted to ensure compliance with noise impact requirements.

4.3.1 Glazing

The following minimum glazing thicknesses are required.

Table 5 – Required Glazing – Blocks A, B and C

Facade	Level	Room Type	Recommended Acoustic Treatment
North-east, North-west	Ground to Level 4	Living Room	6mm
		Bedroom – Full Face Glazing	6.38mm laminated glass
		Bedroom – Window no more than 2.5m	6mm
	Level 5 and above	Living Room	6.38mm laminated glass
		Bedroom – Full Face Glazing	6.38mm laminated glass
		Bedroom – Window no more than 2.5m	6mm
Other Facades	All	Living Room	4mm
		Bedroom	6mm

Table 6 – Required Glazing – Block D

Facade	Level	Room Type	Recommended Acoustic Treatment
South and East	All	Living Room	6mm
		Bedroom	6.38mm laminated glass
Other facades		Bedroom	6mm
		Living Room	4mm

Table 7 – Required Glazing – Block E

Facade	Level	Room Type	Recommended Acoustic Treatment
South	All	Living Room	6mm
		Bedroom – Full Face Glazing	6.38mm laminated glass
		Bedroom – Window no more than 2.5m	6mm
Other facades		Bedroom	6mm
		Living Room	4mm

Table 8 – Required Glazing – Blocks F, G and H

Facade	Level	Room Type	Recommended Acoustic Treatment
North	All	Living Room – Full Face Glazing	6.38mm laminated glass/100mm airgap/6mm glass OR Wintergarden (see section 4.3.1)
		Living Room – Glazing no more than 60% of façade area	12.38mm laminated glass OR Wintergarden (see section 4.3.1)
		Bedroom – Full Face Glazing	6.38mm laminated glass/100mm airgap/6.38mm laminated OR Wintergarden (see section 4.3.1)
		Bedroom – Window no more than 2.5m	10.38mm laminated glass
East/West	All	Living Room – Full Face Glazing	12.38mm laminated glass OR Wintergarden (see section 4.3.1)
		Living Room – Glazing no more than 75% of façade area	10.38mm laminated glass OR Wintergarden (see section 4.3.1)
		Bedroom – Full Face Glazing	6.38mm laminated glass/100mm airgap/6.38mm laminated OR Wintergarden (see section 4.3.1)
		Bedroom – Window no more than 2.5m	10.38mm laminated glass
South	All	Living Rooms	6.38mm laminated glass
		Bedrooms	6.38mm laminated glass

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 the table below 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 mohair seals in windows and doors are not acceptable where acoustic seals are required. The proposed suppliers should provide evidence that the window systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum STC requirements listed in the table below, and that they will be constructed and installed in a manner equal to the test samples.

Table 9 – Minimum STC of Glazing

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
6.38mm/100mm airgap/6.38mm glass	Yes	44
6.38mm/100mm airgap/6mm glass	Yes	42
10.38mm laminated	Yes	35
6.38mm laminated	Yes	31
6mm	Yes	29
4mm	Yes	27

4.3.2 Winter gardens

External noise levels on the northern, eastern and western facades of buildings F, G and H and the north-western façade of building A will exceed 55dB(A) at the façade. Although a glazing system can be designed to ensure internal noise levels within the space comply with Department of Planning acoustic guidelines, there will still be a potential loss in the amenity of the balconies as a private outdoor space.

The DECC Environmental Criteria for Road Traffic Noise states, for example, that a noise level of no more than 55dB(A) is an appropriate level for passive outdoor space.

Use of a winter garden (a completely enclosed balcony, although windows can be openable) provides two advantages:

- It will reduce the noise level on the balcony to a level more consistent with DECC Road Traffic Noise guidelines (improving the amenity of the space).
- Assuming that the balcony windows are closed – it will remove the need for a double glazed system to the bedrooms/living rooms facing the Princes Highway.

Recommended winter garden construction:

- Enclosed balcony glass – 6mm thick. This will result in a noise level on the balcony of less than 55dB(A).
- Bedroom or living room windows/sliding doors – 6.38mm laminated glass.

Provided that both set of windows are closed, noise levels within the apartments will comply with the required criteria.

Other combinations of glass thickness can be reviewed if requested.

4.3.3 External Walls

External walls are to be constructed using concrete/masonry elements and will not require upgrading for acoustic purposes.

4.3.4 Ventilation

Any units where internal noise levels cannot be achieved with windows open require an alternative outside air source in accordance with AS 1668.2 requirements. If a mechanical ventilation system is required, it should be acoustically designed such that the acoustic performance of the noise attenuation treatments presented above (glazing etc) is not reduced by any duct or pipe penetrating the wall/ceiling/roof. Noise emitted to the property boundaries by any ventilation system shall comply with Council/EPA requirements.

4.3.5 Roof Constructions

If metal deck roof sheet is used, roof ceiling construction in Stage 1 may consist of sheet metal, 13mm plasterboard ceiling and 75mm thick glasswool insulation to the ceiling cavity.

5. NOISE EMISSIONS

Noise emissions from the site will be assessed to ensure that the amenity of nearby land users (both new occupants in the development and residents in nearby properties) is not adversely affected.

The following noise sources will be assessed:

- Mechanical plant noise.
- Noise from increased traffic / vehicle noise generated on surrounding streets.

5.1 BACKGROUND NOISE MONITORING

Unattended noise monitoring was conducted between 5 and 11 December 2007 using an Acoustic Research Laboratories monitor set on A-weighted fast response mode. The monitor was calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded.

The monitor was installed at the in the south-eastern corner of the site, approximately 40m from Flora Street and approximately 15m from the eastern boundary. Background noise levels measured at this location will be indicative of the background levels that would be measured at the nearby residential properties (both within the development, and in the general vicinity).

Measured background noise levels are presented below.

Table 10 – Measured Background Noise Levels

Location	Background noise level dB(A) _{L₉₀}		
	Daytime (7am-6pm)	Evening (6pm-10pm)	Night time (10pm-7am)
Kirrawee Brick Pit	47	42	37 (42 for 6am-7am shoulder period) (40 for 10pm-11pm shoulder period)

5.2 ACOUSTIC OBJECTIVES

Noise emissions generated by the site will be assessed using the following criteria:

- Mechanical Plant Noise, Loading Dock noise, Café patron noise - The DECCW Industrial Noise Policy Objectives, (both Amenity and Intrusiveness Criteria).
- Noise as a result of increased traffic on the surrounding road network (and its impact on nearby residential properties on Oak Road and Flora Street) will be assessed pursuant to DECCW Environmental Criteria for Road Traffic Noise criteria.

- The impact of noise from vehicles driving within the development (in particular, using the retail car park) will be assessed on residents within the development. Criteria to be used will be the same as those adopted in the traffic impact assessment conducted in section 4.1.

5.2.1 Mechanical Plant, Loading Dock, Café Noise Emission Objectives (DECCW Industrial Noise Policy Acoustic Criteria)

- Noise Emissions to Residential Properties.

Noise emission will be assessed with reference to the EPA Intrusiveness and Amenity Criteria.

Intrusiveness criteria are calculated with reference to the background noise levels presented above. The Intrusiveness and Amenity Criteria are as follows:

Table 11 – Noise Emission Requirements – Residential Receivers

Receiver Type	Time of Day	Intrusiveness Noise Objective $L_{eq(15min)}$ (Background + 5dB)	Amenity Noise Objective (Suburban Areas) $dB(A)L_{eq(Lt)}$
All Potentially Affected Residential Properties	Day Time (7am – 6pm)	52	55
	Evening (6pm – 10pm)	47 (45 for 10pm-11pm shoulder period)	45
	Night (10pm-7am)	42 (47 for 6am-7am shoulder period)	40

In addition, peak noise events (such as impact noise generated by use of the loading dock) should comply with DECC sleep disturbance guidelines, which recommend that $L_{1(1min)}$ noise emissions not exceed background noise levels by more than 15dB(A). Corresponding noise emissions goal is therefore as follows:

Table 12 – Peak Noise Emission Requirements – Residential Receivers

Receiver Type	Time of Day	Background Noise Level – $dB(A)L_{90}$	Noise Emission Objective (Background+15d(A))
All Potentially Affected Residential Properties	Night (10pm-7am)	37 (40 for 10pm-11pm shoulder period)	52dB(A) $L_{1(1min)}$ (55dB(A) $L_{1(1min)}$ for 10pm-11pm shoulder period)

- Noise Emissions to Industrial and Commercial Properties.

For commercial and industrial properties, noise emissions are assessed using only the Industrial Noise Policy “Amenity” criteria, as set out below.

Table 13 – Noise Emission Requirements – Commercial/Industrial Receivers

Receiver Type	Time of Day	Amenity Noise Objective (Suburban Areas) dB(A) $L_{eq}(Lt)$
Commercial	When in use	65
Industrial	When in use	70

5.2.2 Noise From Increased Traffic Generation

Council has no specific noise criteria with respect to traffic generation associated with developments. In the absence of this, EPA guidelines can be used for assistance.

For land use developments with the potential to create additional traffic the development should comply with the requirements for new developments detailed in the EPA Environmental Criteria for Road Traffic Noise guidelines. Increased noise levels on Oak Road and Flora Street will be assessed against the “local” roads acoustic criteria. This is the strictest acoustic criteria adopted in the guidelines, and are presented below. Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property. However, if existing noise levels exceed those in the table below, the new development must not cause an increase noise of more than 2 dB.

Table 14 - Criteria for Traffic Noise for New Developments

Time of day	Criteria for Acceptable Traffic Noise Level Collector Roads - dB(A)
Day (7am to 10pm)	55 $L_{Aeq}(1hr)$
Night (10pm to 7am)	50 $L_{Aeq}(1hr)$

However, if existing noise levels exceed those in the table below, the new development must not cause an increase noise of more than 2 dB.

5.2.3 Vehicle/Loading Dock Affecting Other Residences in this development.

Vehicle noise generated on site will potentially affect the proposed residential development within the site. Glazing as recommended in section 4.3.1 has been selected with a view to achieving noise levels within the residential units comply with the SEPP Infrastructure and AS2107 recommended internal noise levels.

5.3 NOISE EMISSION ASSESSMENT

Noise emissions from the development are predicted below. In all cases, predictions are made on the assumption that the recommendations set out in section 5.4 of this report are adopted.

5.3.1 Mechanical Plant

Detailed review of all external mechanical plant will be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the levels set out in section 5.2 of this report.

All plant items can be satisfactorily attenuated to levels complying with Industrial Noise Policy criteria through appropriate location and (if necessary) acoustic treatments such as screens or enclosures.

5.3.2 Loading Dock and Vehicles on Site

Loading docks are proposed to be enclosed and will not generate noise likely to disturb nearby residences.

Use of the loading dock serving retail spaces spaces/supermarket would be the subject of a subsequent development application. Operating times of the loading dock (and associated noise generated from truck movements to and from the dock) would be assessed as part of that application, and management controls adopted so as to ensure no adverse impacts on nearby development will occur.

Glazing to residences in block F, B, C and D which are potentially impacted by vehicle movements on the site (where the driveways are not enclosed) has been determined in order to ensure internal noise levels compliant with SEPP Infrastructure and AS2107 guidelines will be achieved. Recommended treatments are incorporated in the glazing tables in section 4.3.1.

5.3.3 Noise from Increased Traffic Generation

The operation of the shopping centre will be the primary source of traffic generation. Cars using the shopping centre have the potential to create increased traffic on surrounding roads, and in turn, generate increased vehicle noise.

Any noise generated by vehicles using the Princes Highway driveway will be negligible compared to the traffic noise already on the highway.

Traffic noise on Flora Street and Oak Road, however, should be assessed. In this regard we note:

- Existing traffic on Flora Street and Oak Road generate noise levels of more than 55dB(A)_{Leq1hr} during the daytime (measured levels on both Flora Street and Oak Road exceeded 60dB(A)_{Leq1hr} during a daytime attended measurement). Noise levels therefore already exceed DECCW recommended noise levels (refer to section 5.2.2).
- Noise generated by the site, therefore, should not result in an increase in existing noise levels by more than 2dB(A) (refer to section 5.2.2).
- On review of current and predicted future traffic flows on the road network surrounding the site (refer to Traffic Management and Accessibility Plan by Halcrow dated October 2010, page 30), increases in traffic volumes on the local roads in the vicinity of the site will be approximately 40% compared to existing levels.

- An increase in traffic flow of 40% will result in an increase noise level of approximately 1.5dB(A), and is therefore compliant with DECC Road Traffic Noise Guidelines (which allows an increase of up to 2dB(A)).

5.3.4 Café Noise

Mechanical plant (kitchen exhaust fans) and the outdoor dining area have the potential to disturb residents of nearby residential units.

We assume that use of music or external areas for outdoor dining would be the subject of a development application from the proposed tenant, and noise emission impacts on residents within the development will be suitably addressed through control of patron numbers and trading times to ensure reasonable amenity of future tenants.

6. CONCLUSION

Potential noise impacts of the proposed residential / commercial development at the Kirrawee Brick Pit site have been assessed.

As required by DGR 8, noise impacts from nearby noise sources (traffic, nearby industrial development) on future occupants or tenants have been assessed in accordance with Interim Guidelines for Development Near Rail Corridors and Busy Roads". SEPP Infrastructure 2007 and AS2107 guidelines where relevant. The acoustic treatments necessary to achieve these objectives have been set out in section 4.3.

As required by DGR 6, noise emissions from the operational noise from the site (in particular mechanical plant noise, loading dock noise and café noise) have been assessed against the DECCW Industrial Noise Policy (for mechanical plant/loading dock and café noise). Compliance with noise emissions goals is achievable provided that the recommendations set out in section 5.3 of this report are adopted.

Report prepared by



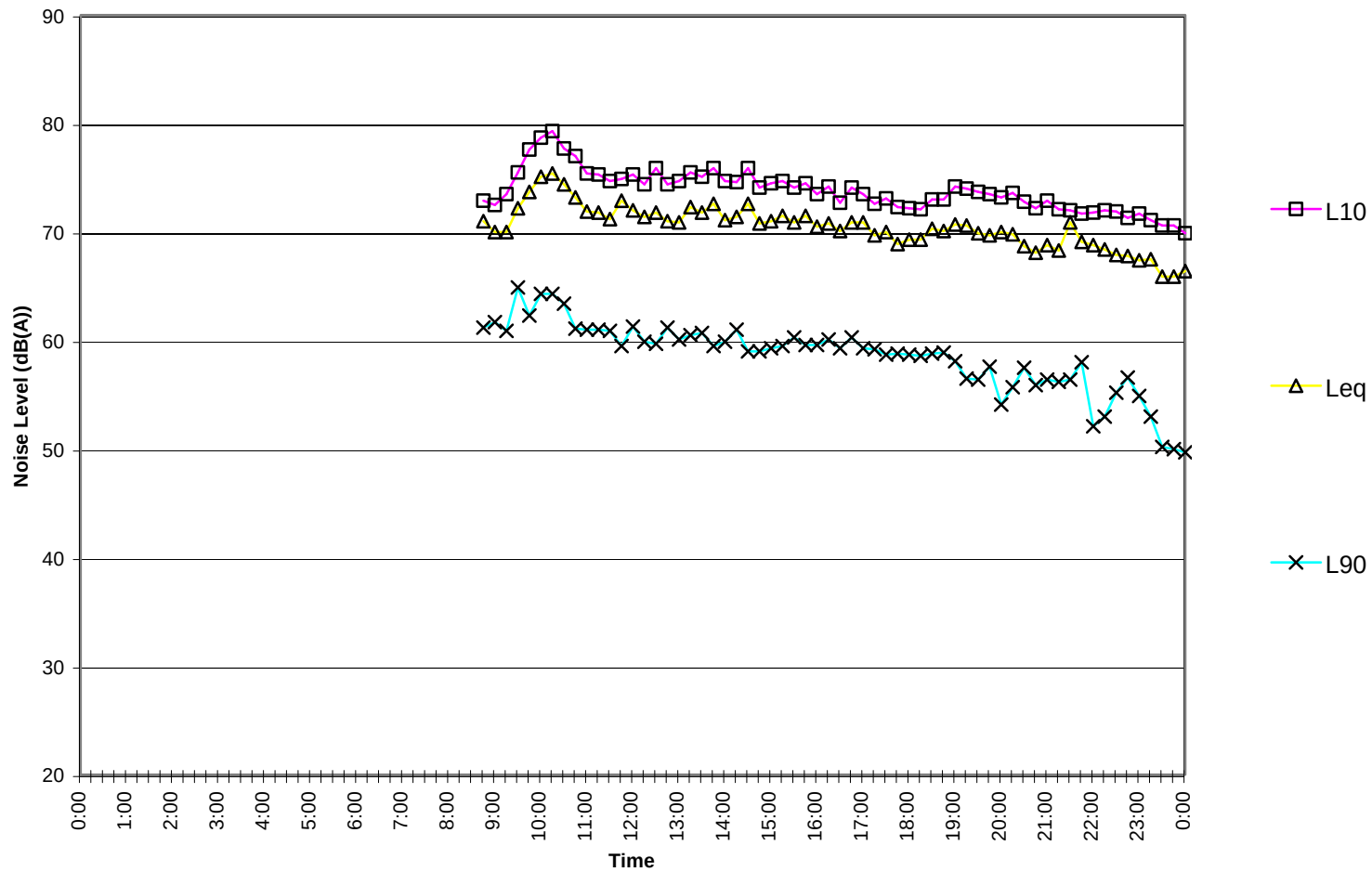
ACOUSTIC LOGIC CONSULTANCY PTY LTD
Thomas Taylor

APPENDIX 1

TRAFFIC NOISE MONITORING PRINCES HIGHWAY

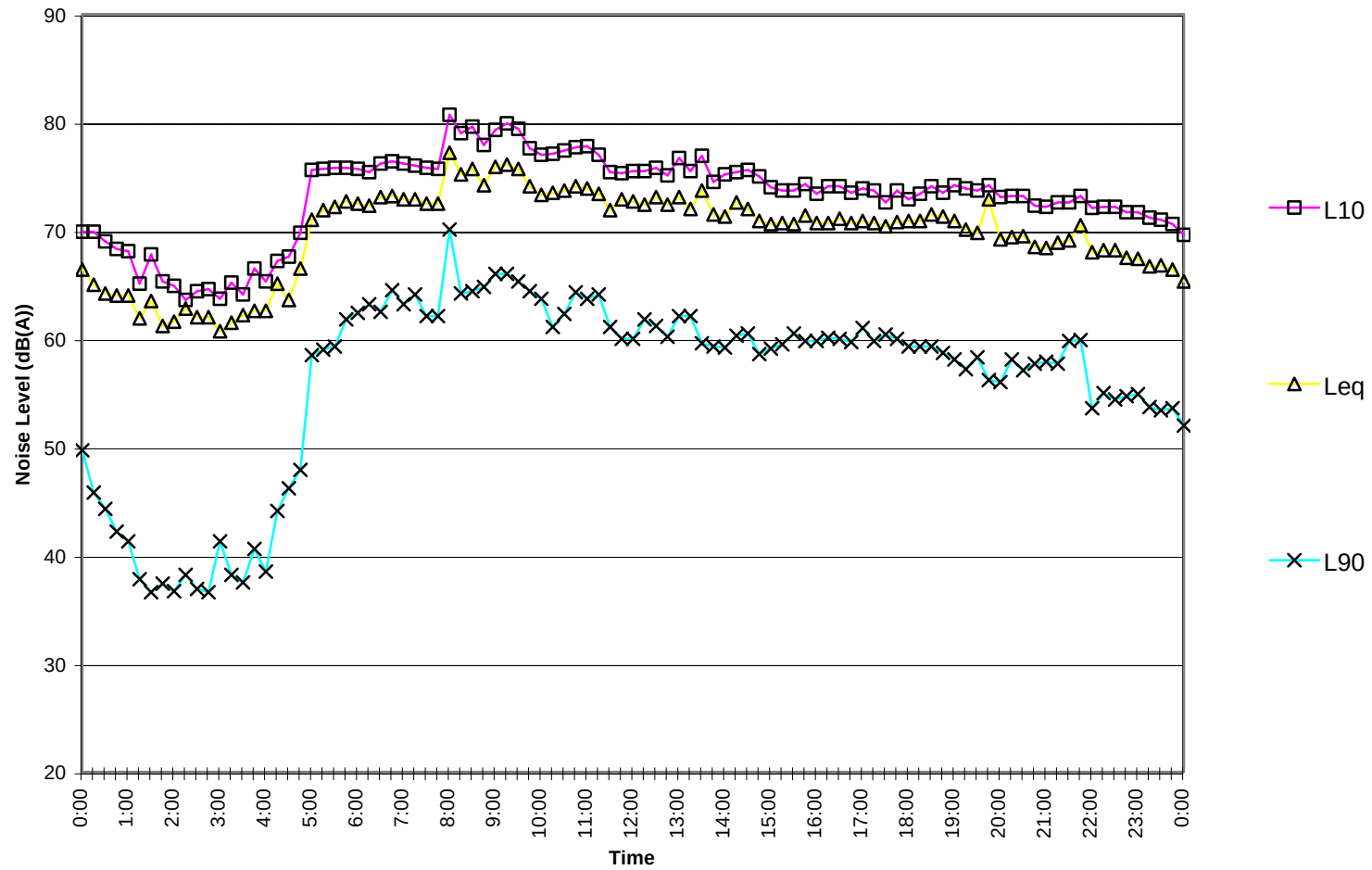
Princes Highway

Wednesday December 5, 2007



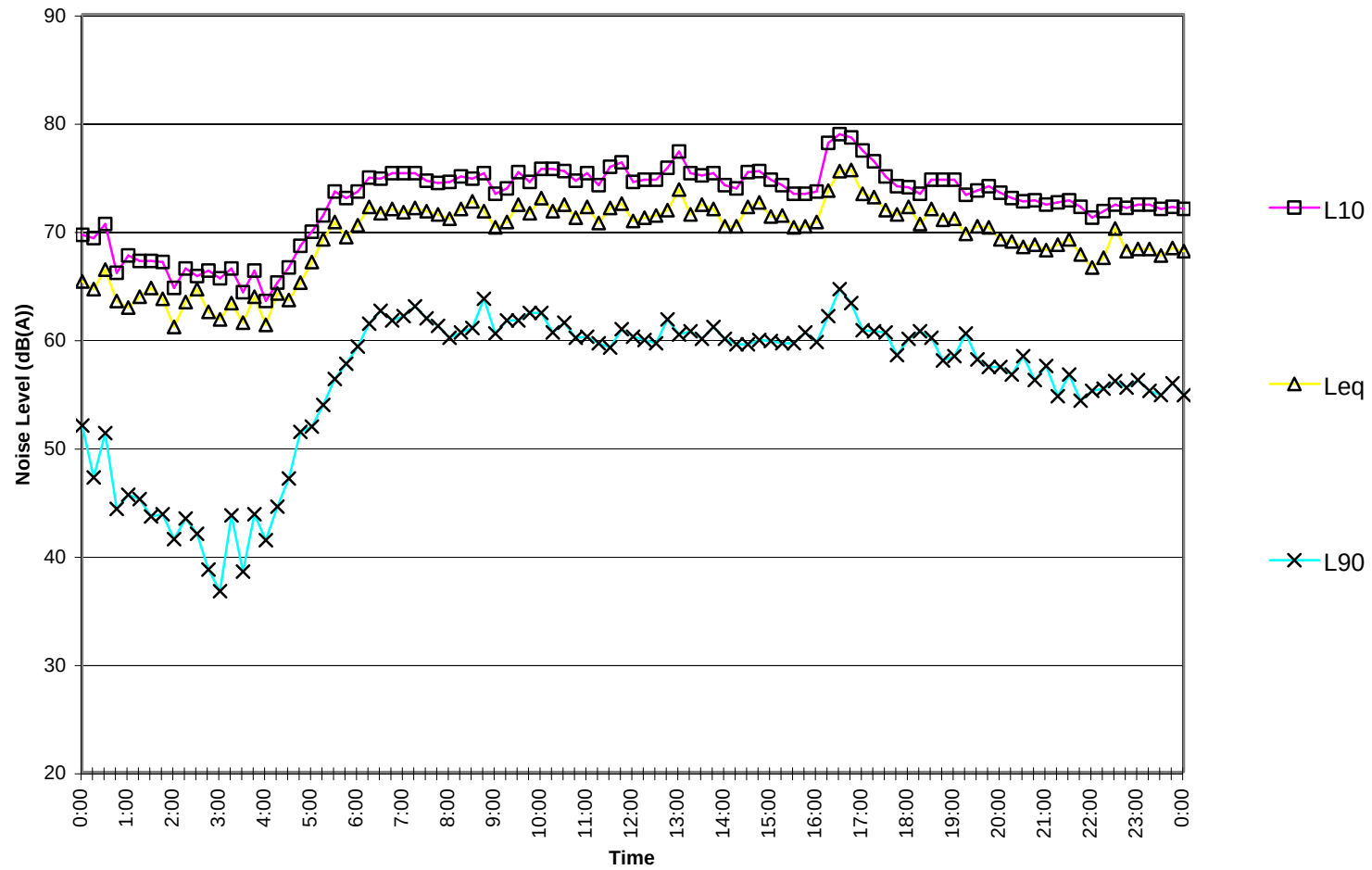
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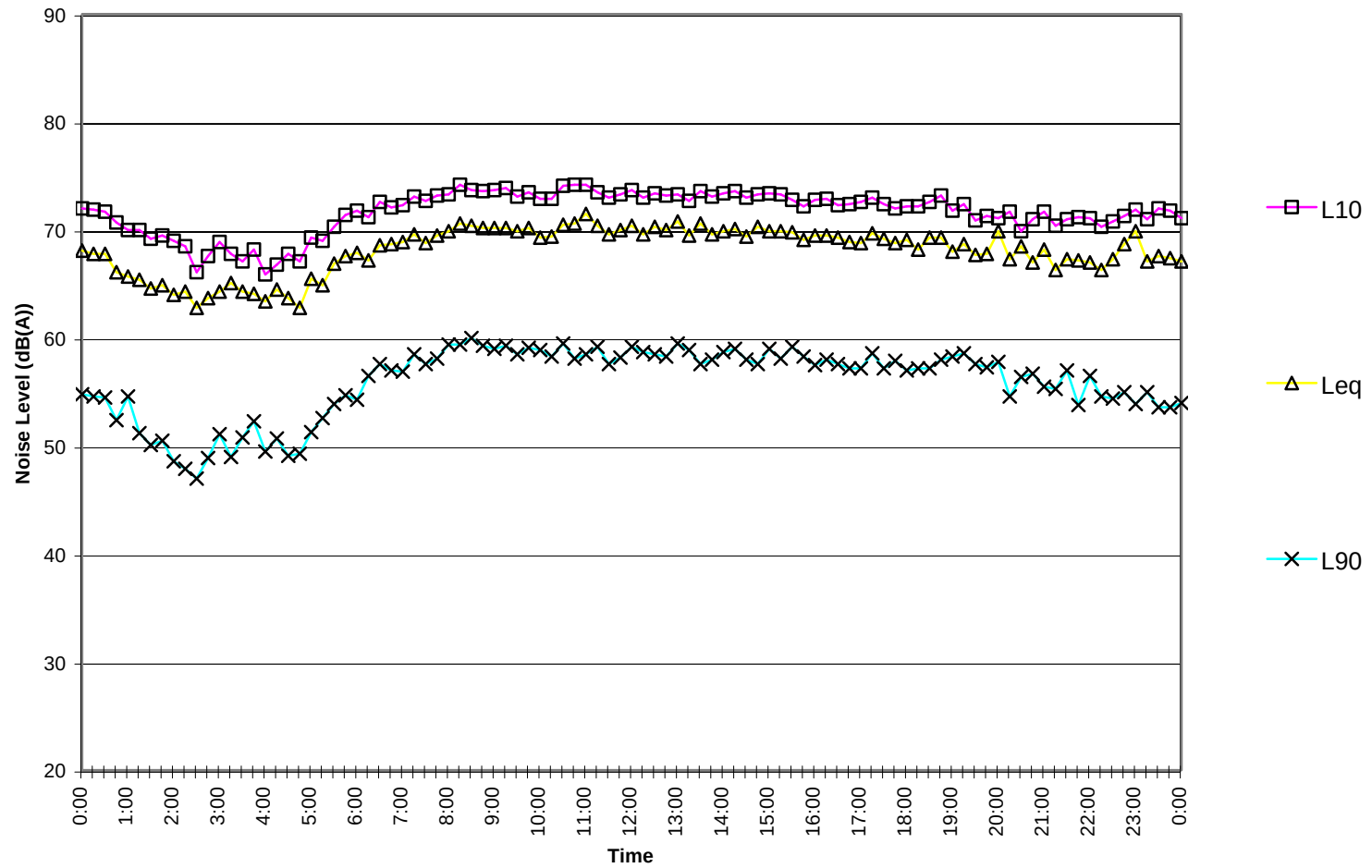
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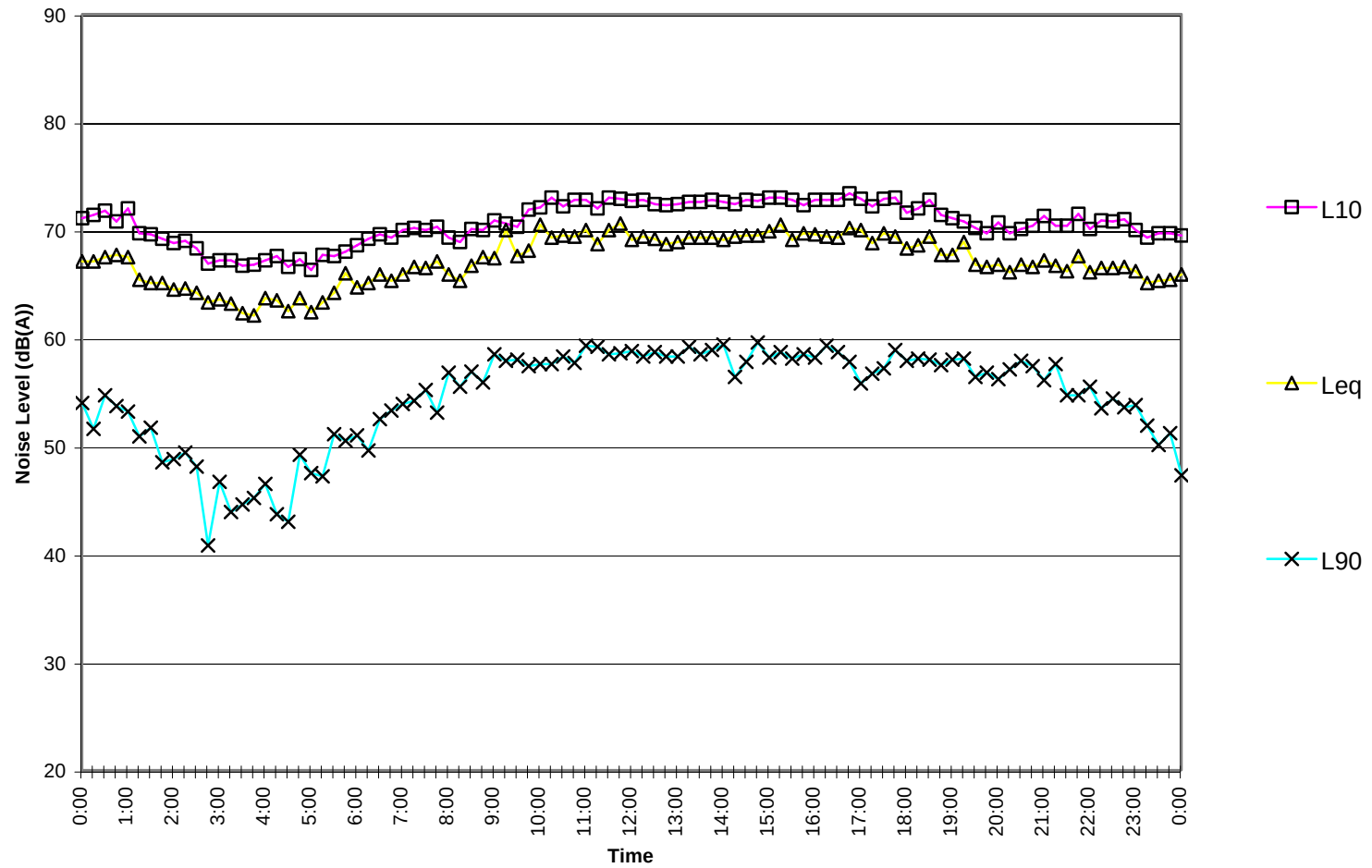
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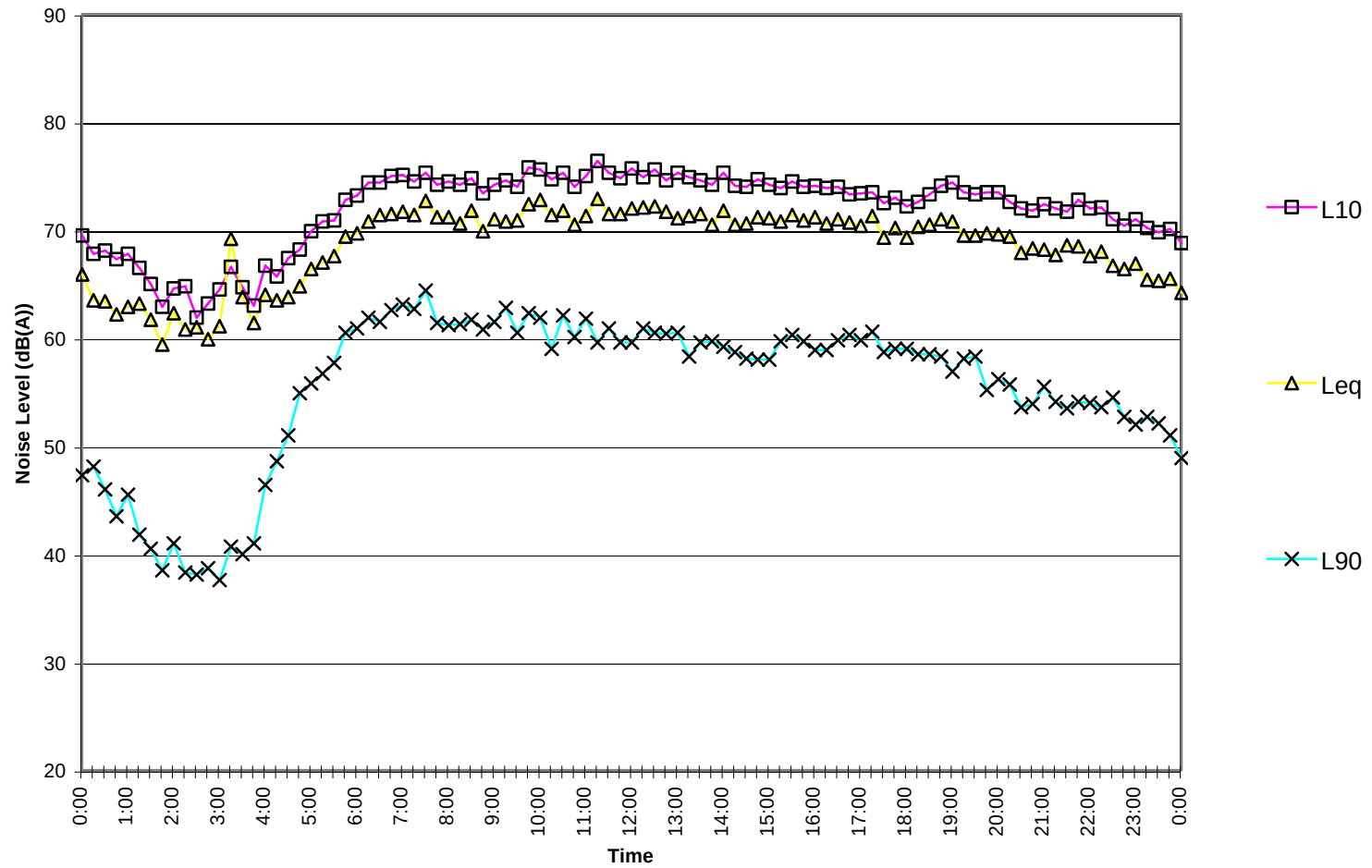
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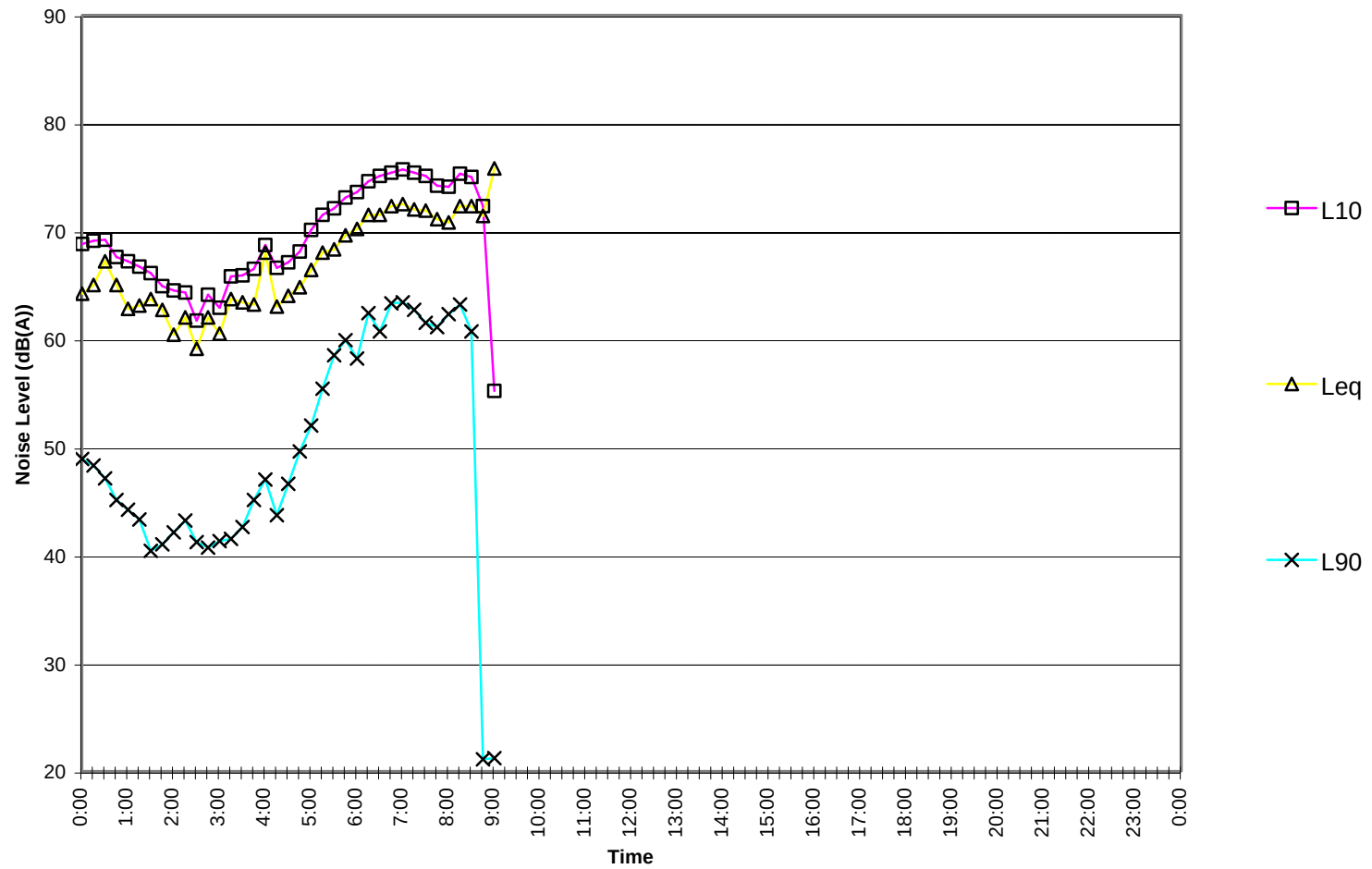
Princes Highway

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Princes Highway

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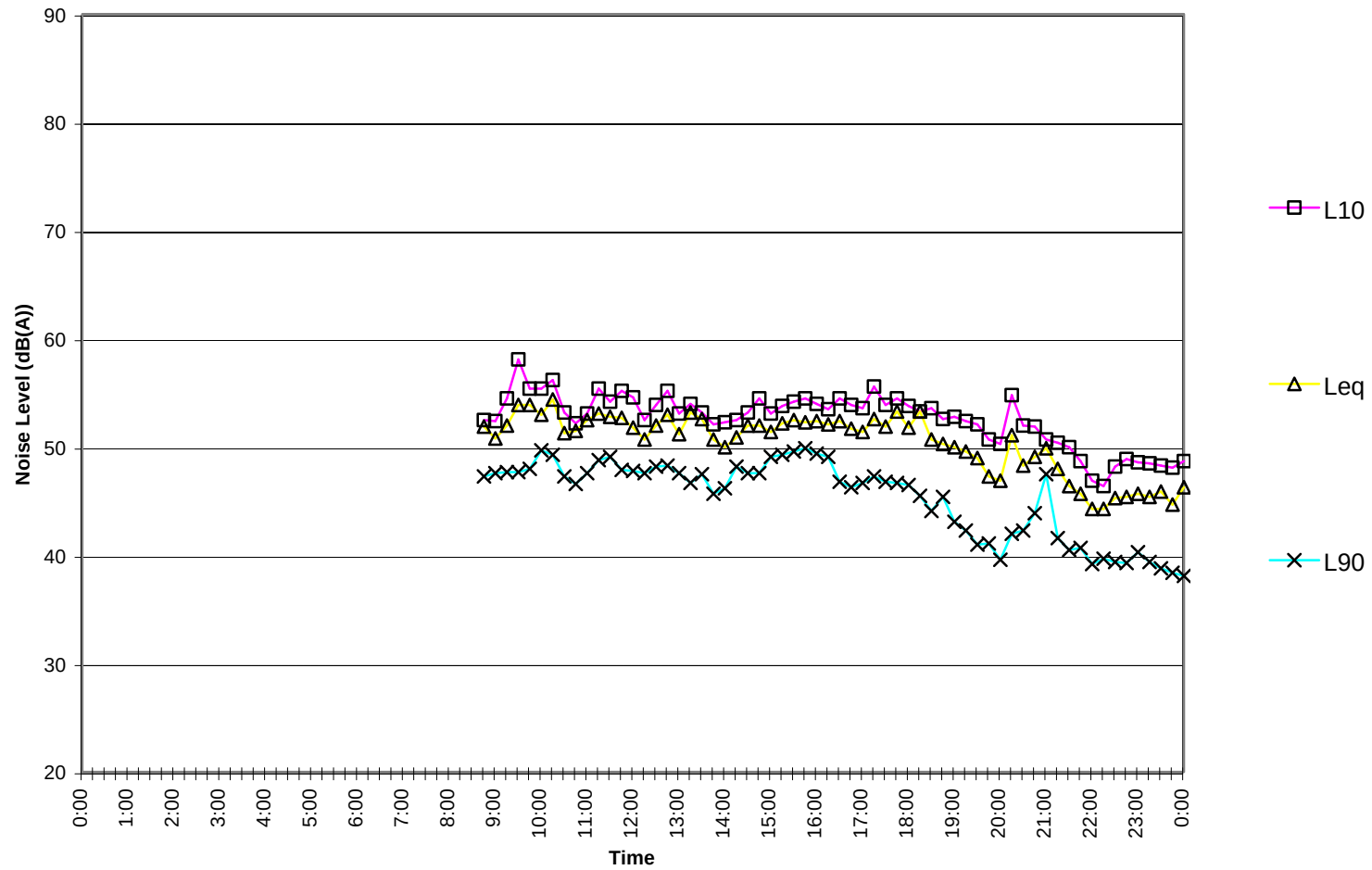


APPENDIX 2

NOISE MONITORING BACKGROUND NOISE

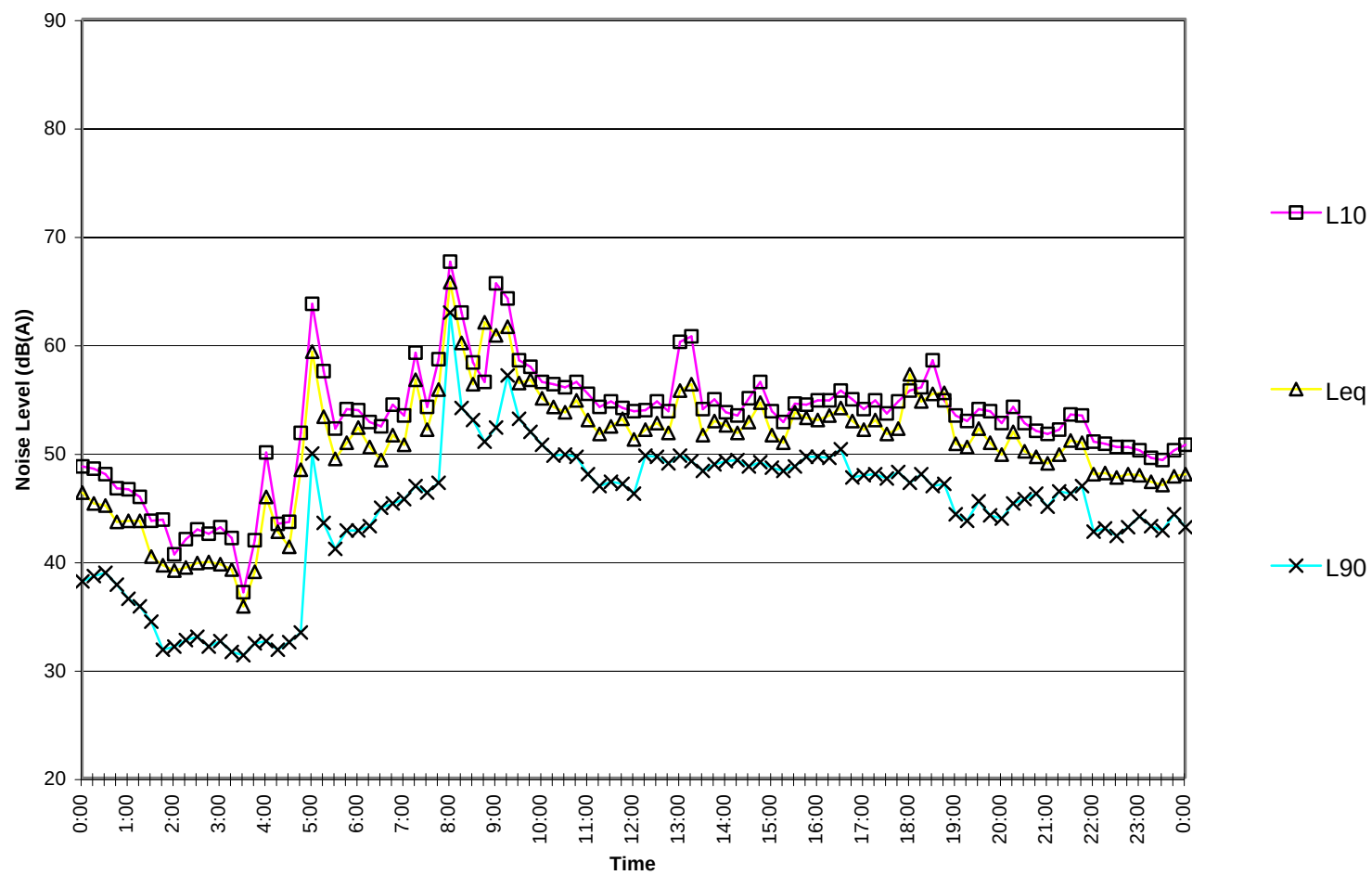
Brickpit - Background Noise Monitoring

Wednesday December 5, 2007



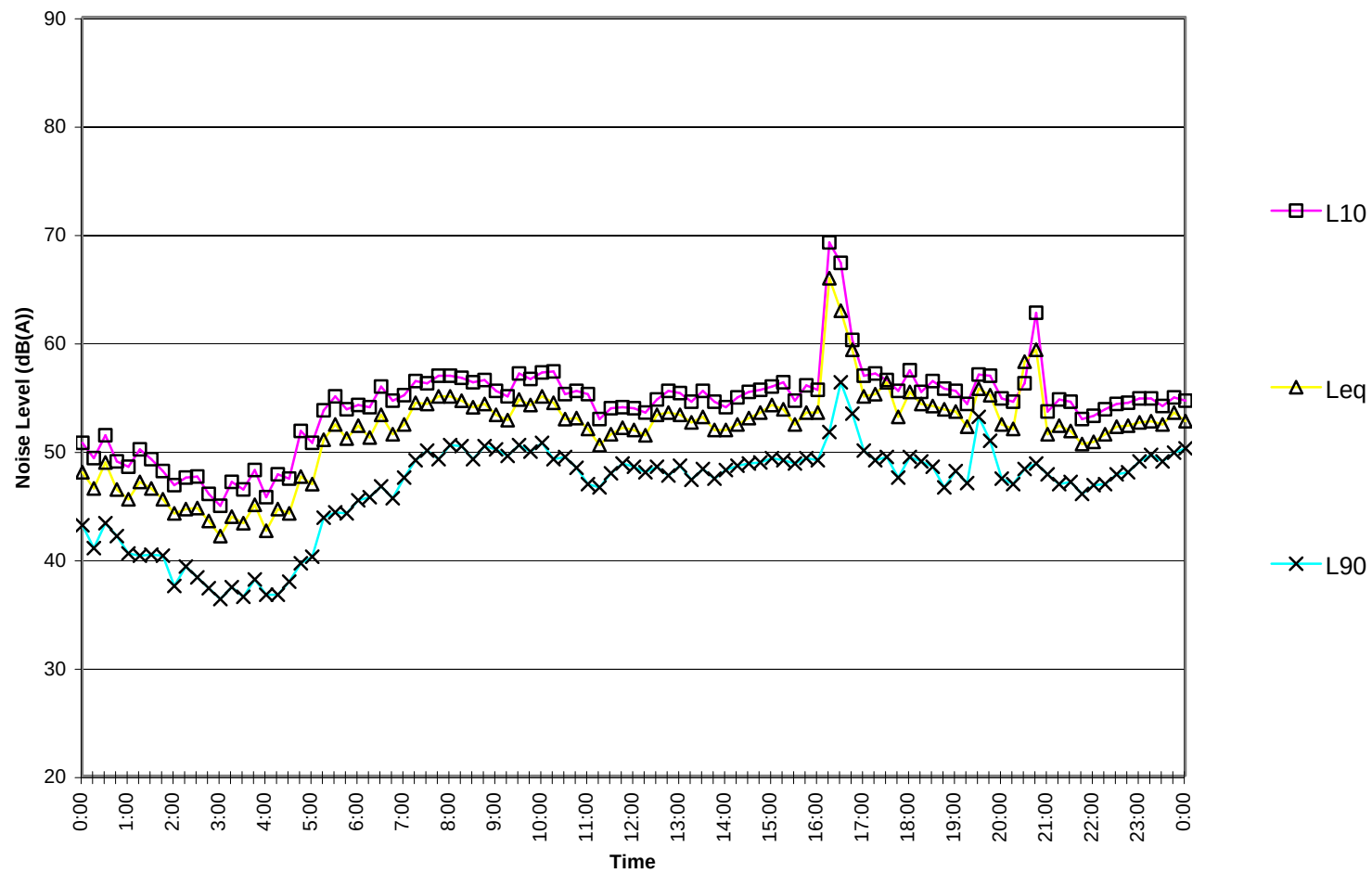
Brickpit - Background Noise Monitoring

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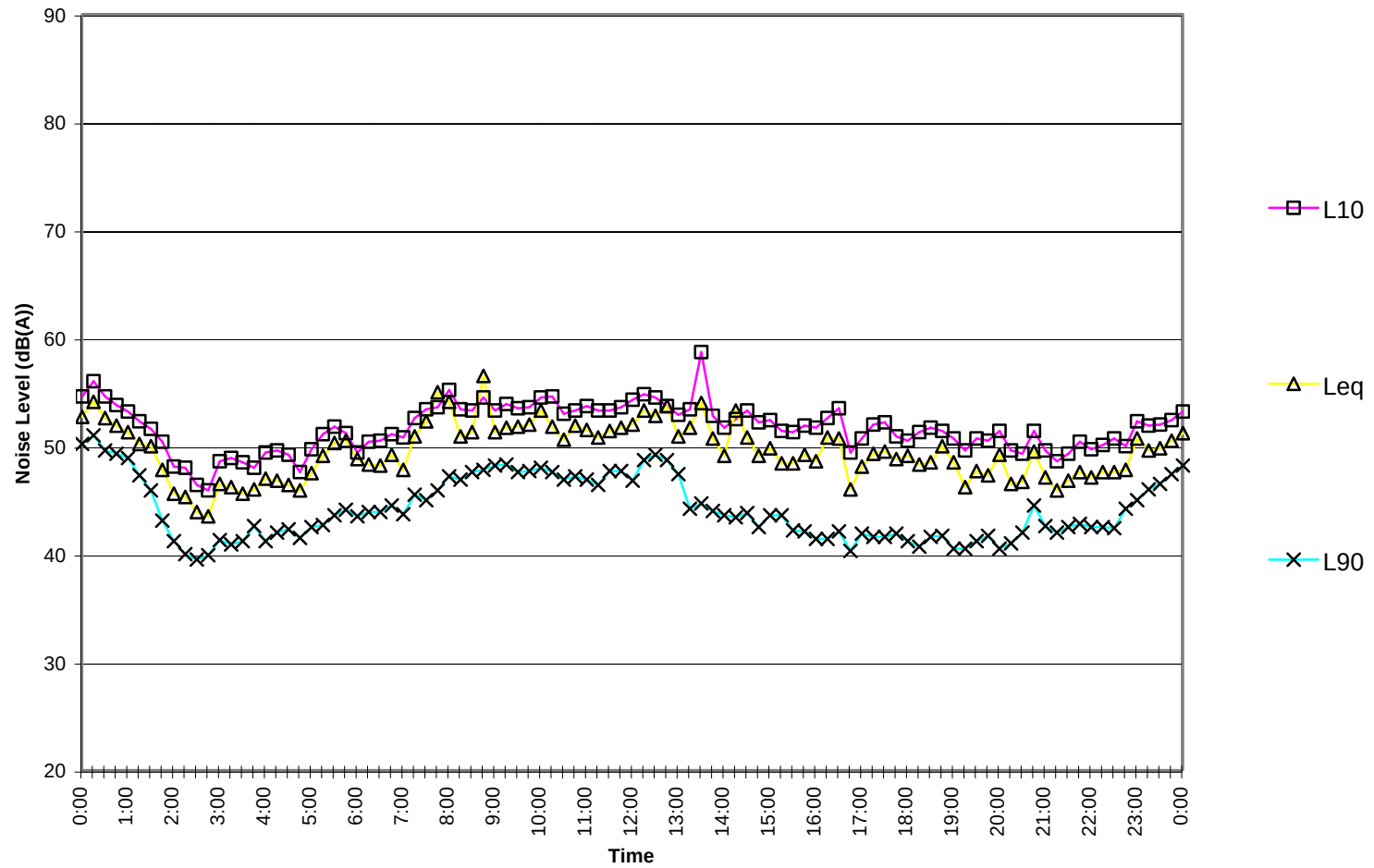
Brickpit - Background Noise Monitoring

Friday December 7, 2007



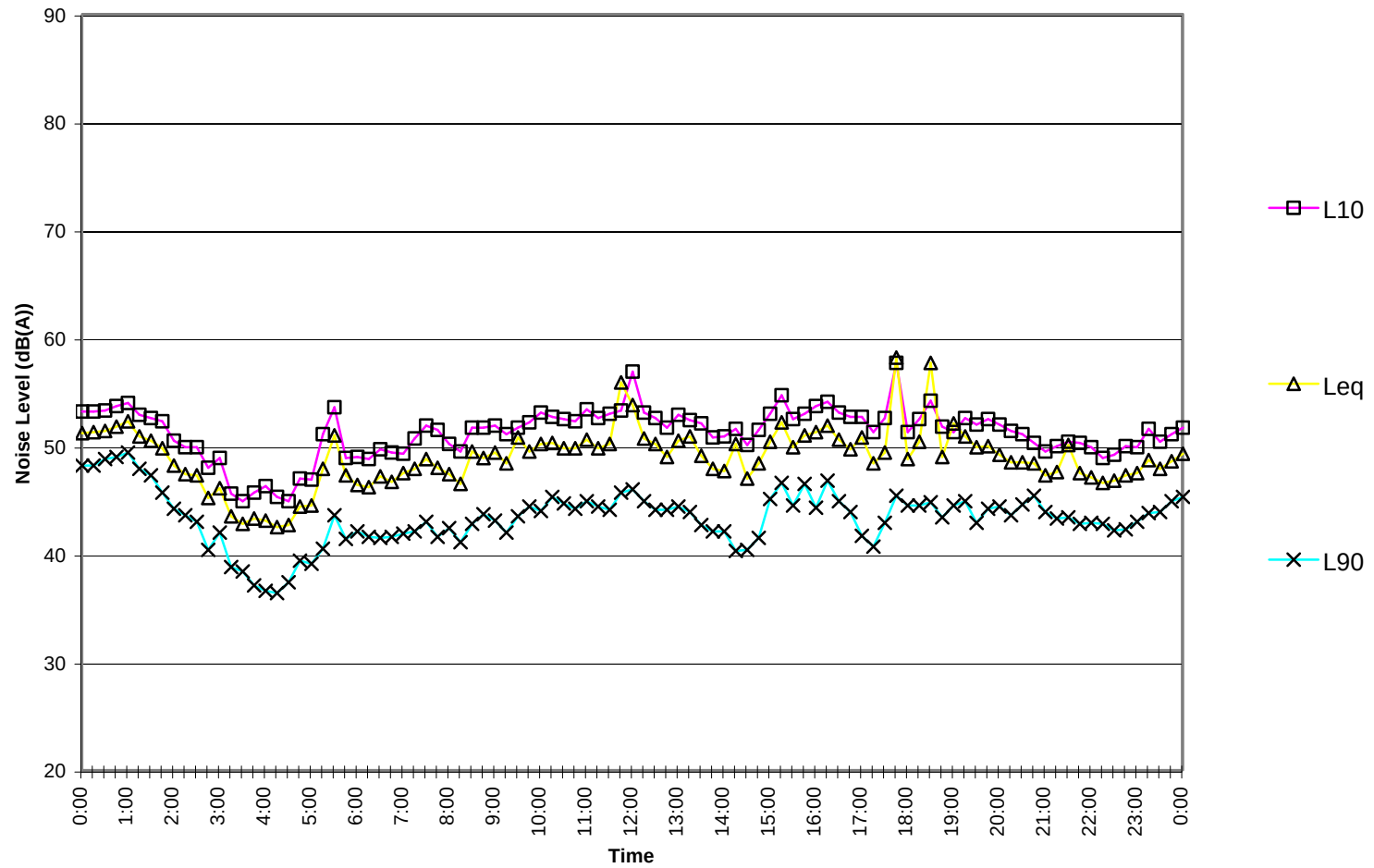
Brickpit - Background Noise Monitoring

Saturday December 8, 2007



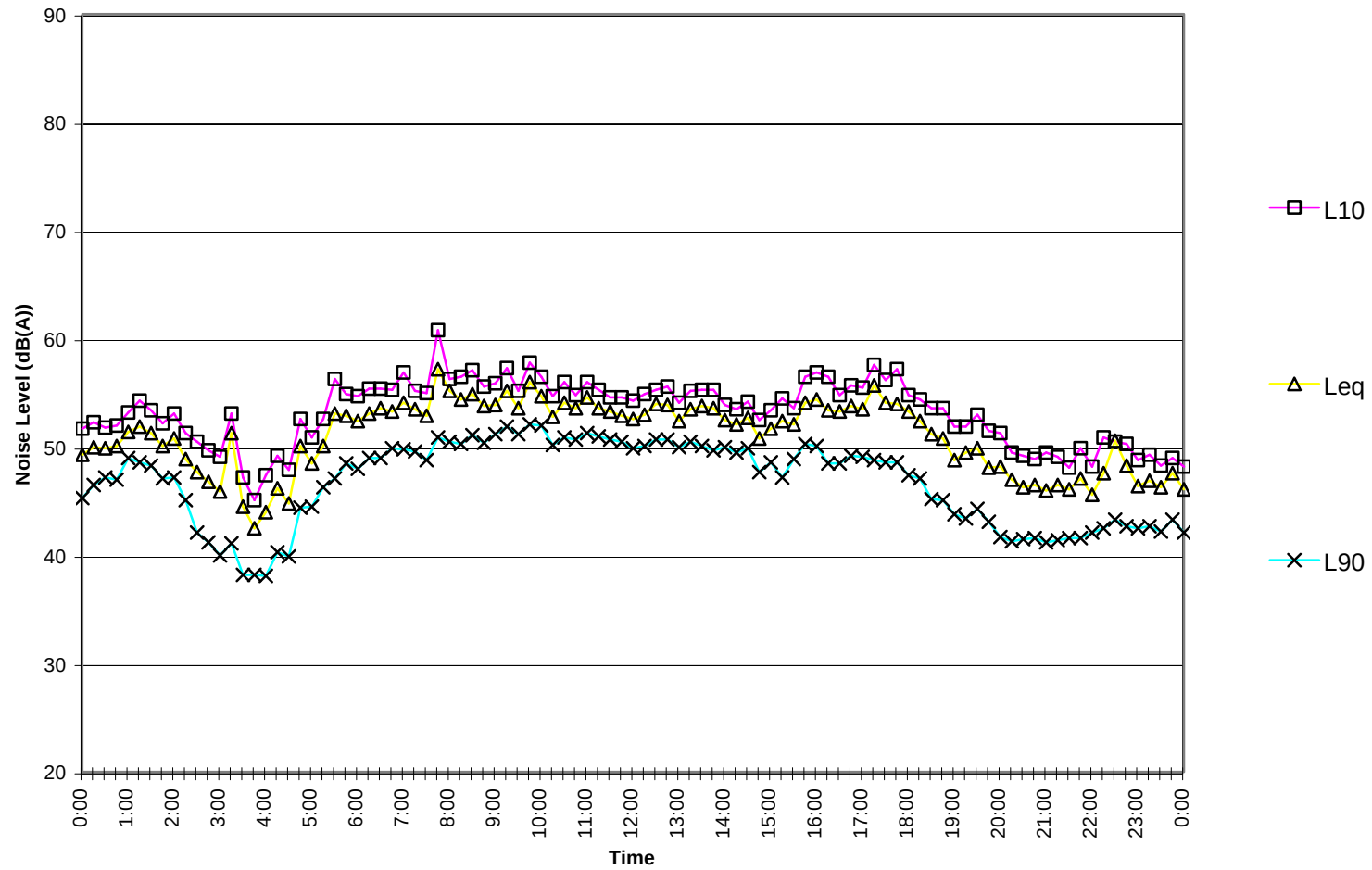
Brickpit - Background Noise Monitoring

Sunday December 9, 2007



Brickpit - Background Noise Monitoring

Monday December 10, 2007



Brickpit - Background Noise Monitoring

Tuesday December 11, 2007

