# Block 1 - Central Park, Chippendale

# Noise Impact Assessment

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# 1 INTRODUCTION

This report presents an analysis of acoustic impacts associated with the proposed residential development located at Block 1, within the Central Park Precinct.

In this report we will:

- Conduct an external noise impact assessment and recommend acoustic treatments to ensure that internal noise levels comply with the requirements of AS 2107 “Recommended Design Sound Levels and Reverberation Times for Building Interiors”, The State Environmental Planning Policy including SEPP and Sydney City Council DCP.

- Identify potential noise sources generated by the site, and determine noise emission goals for the development to meet acoustic requirements by the NSW EPA Industrial Noise Policy.

This report has been prepared based on architectural drawings forwarded to this office from Fosters and Partners.

The report has been undertaken in accordance with the SEAR’s requirements.

# 2 SITE DESCRIPTION

The proposed development consists of an 18 storey residential development above the podium level of the Frasers Central Park Precinct, Sydney. The site is located with Broadway to the north of the site which major roadway, which carries high traffic volumes. Other major roadways within the vicinity of the site include Abercrombie Street to the west of the site.

The following noise sources are potentially impact on the project site:

- Traffic Noise within the surrounding vicinity of the site.

Noise potentially generated by the site will primarily consist of noise from the mechanical plant and equipment.

The nearest potentially affected noise receivers are:

- Residential properties on Abercrombie Street to the west of the site;
- Existing and future residential receivers within the Central Park Precinct to the south, east and west.

Refer to Figure 1 below which details the site location and noise measurement locations.

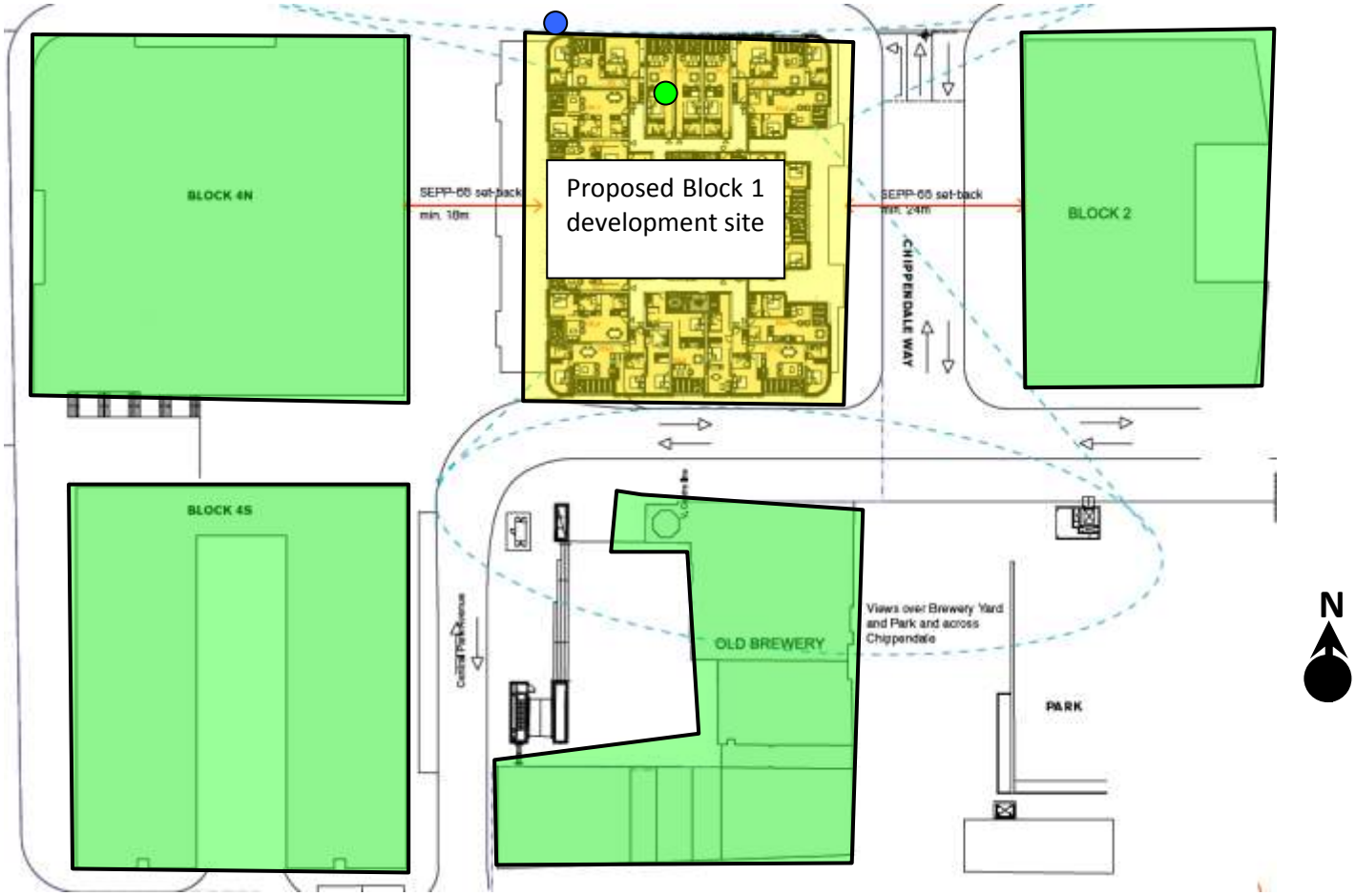



**Figure 1 - Site and Measurement Locations**

Subject Site

Unattended Noise Measurement Location (Conducted on the roof of the display unit)

Attended Noise Measurement Location

Residential Receivers (existing and future receivers)

# 3 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 15-20 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. 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 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 traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the $L_{eq}$ parameter as a means of measuring traffic noise, whereas the $L_{10}$ parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the $L_{90}$ parameter is not used to assess traffic noise intrusion.

# 4 ASSESSMENT OF TRAFFIC NOISE INTRUSION

The Significant traffic noise sources in the vicinity of the site are as follows:

- Broadway, to the north of the site, carries high traffic volumes of greater than 40,000 vehicles as AADT and is required to be assessed on conjunction with NSW State Environmental Planning Policy (Infrastructure) 2007 criteria.

Traffic noise impacts should comply with the requirements of Council DCP, infrastructure and the Australian Standard AS2107:2000.

## 4.1 TRAFFIC NOISE CRITERIA

### 4.1.1 City of Sydney Council DCP - Sydney Development Control Plan 2012

The Sydney DCP 2012 states the following with regards to the control of traffic noise intrusion:

> *"Dwellings are to be constructed so that in a naturally ventilated situation the repeatable maximum LAeq (1 hour) level does not exceed:*
>
> *i) for closed windows and doors::*
> *bedrooms (10pm-7am), 35dB; and*
> *main living area (24 hours) 45dB*
>
> *ii) for open windows and doors:*
> *bedrooms (10pm-7am), 45dB; and 45dB*
> *main living area (24 hours), 55dB. 55dB*
>
> *Where natural ventilation of a room cannot be achieved, the repeatable maximum LAeq (1hour) level when doors are windows are shut and mechanical ventilation/ air conditioning is operating in a dwelling is not to exceed, within:*
>
> *i) bedrooms (10pm-7am), 38dB; and*
>
> *ii) main living area (24 hours) 48dB*
>
> *These levels are to include the combined measured level of noise from both external sources and the ventilation system operating normally."*

### 4.1.2 Australian Standards AS2107:2000

The Australian Standard AS2107-2000 "Recommended Design Sound Levels and Reverberation Times for Building Interiors" recommends maximum design sound levels for different areas of occupancy in the residential development while AS 3671 -1989 "Road Traffic Noise Intrusion - Building Siting and Construction" recommends that an appropriate $L_{eq}$ or $L_{10}$ traffic noise descriptor be used for the occupancy being assessed. Traffic noise criteria for AS2107-2000 is presented in the table below, based on developments near major roadways.

### 4.1.3 State Environmental Planning Policy (Infrastructure) 2007

The NSW Department of Planning's policy, Development Near Rail Corridors And Busy Roads – Interim Guideline, sets out internal noise level criteria adapted from the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP') for developments with the potential to be impacted by traffic or rail noise and vibration.

The Infrastructure SEPP defines busy roads that are subject to an acoustic assessment as:

*"Clause 102: development for any of the following purposes that is on land in or adjacent to a road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data available on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*

- *building for residential use*
- *a place of public worship*
- *a hospital*
- *an educational establishment or childcare."*

The Infrastructure SEPP sets out the following criteria for internal noise levels from airborne traffic noise:

> *"For Clauses 87 (Rail) and 102 (Road):*
>
> *"If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following $L_{Aeq}$ levels are not exceeded:*
>
> *in any bedroom in the building : 35dB(A) at any time 10pm–7am*
>
> *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

Internal requirements are for residential spaces and are measured internally with windows closed.

### 4.1.4 Summary of Internal Traffic Noise Criteria

Based on the requirements of Sydney City Council DCP, SEPP and AS2107-2000 the following assessment criteria would apply to the proposed development.

**Table 1 - Traffic Noise Criteria for All Spaces**

| LOCATION | CRITERIA |
|---|---|
| Bedrooms | 35dB(A) $L_{eq(Worst\ 1\ hr\ 10pm\ to\ 7am)}$ (City of Sydney) |
| | 35dB(A)$_{Mean\ Logarithmic}$ $L_{eq(Night\ 9\ hr)}$ (SEPP) |
| Living areas | 45dB(A) $L_{eq(Worst\ 1\ Hour\ 24hr)}$ (City of Sydney) |
| | 40dB(A) $_{Mean\ Logarithmic}$ $L_{eq\ (24\ hr\ )}$ (SEPP) |

## 4.2 MEASUREMENTS PROCEDURE

As part of this investigation, traffic noise from the surrounding perimeter roadways has been measured. The results of this measurement will be used to determine the treatments required to reduce noise levels to within the project acoustic objectives.

Measurements included attended and unattended noise levels measurements conducted at the locations as detailed in Figure 1 above.

### 4.2.1 Unattended Noise Monitoring

Unattended noise monitoring was conducted using an Acoustic Research Laboratories Pty Ltd series 315 noise monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the unmanned monitoring period. Equipment was calibrated at the beginning and the end of the measurement using a Rion NC-74 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. The unattended noise monitor was installed from 12th to 19th February, 2014.

### 4.2.2 Attended Monitoring

Attended monitoring was conducted on Abercrombie Street at the boundary of the site were obtained using a Norsonics type 140 Precision Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted. Measurements were conducted on 12th February 2014 during the morning traffic peak time.

### 4.2.3 Resultant Noise Levels

The following table presents the resultant noise levels at the proposed façade of the development. The noise levels are based on both the attended and unattended noise measurement results conducted by this office. The noise levels are based on the manned background noise measurement results adjusted by the difference with the noise monitor results of similar time periods and distance attenuation.

**Table 2 – Measured Traffic Noise Levels**

| Locations | Traffic Noise Levels | |
|---|---|---|
| | Daytime (7am-10pm) | Night-time (10pm- 7am) |
| Broadway Façade | 73dB(A) $L_{eq(1\ Hour)}$ | 69 dB(A) $L_{eq(1\ Hour)}$ |

## 4.3 RECOMMENDED CONSTRUCTIONS

Traffic noise intrusion into the proposed development was assessed using the measured external noise levels reported above as a basis.

Calculations were performed taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. Acoustic treatment required to ensure compliance with the assessment criteria are detailed in this section.

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.

Details of glazing are indicative of the proposed acoustic treatments required to comply with the relevant internal noise levels presented in this report. Details of external glazing to be provided to the project will be provided at the CC stage of the project.

### 4.3.1 Glazed Windows and Doors

The following constructions are recommended to comply with the traffic noise objectives stated in this report and are the typical selections to ensure the internal noise level criteria presented in this report are achieved.

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.

The recommended constructions are listed in the table below.

**Table 3 – Glazing Construction**

| Façade | Level | Room | Glazing | Acoustic Seals |
|---|---|---|---|---|
| Broadway | All Levels | Living Areas | 10.38mm laminated | Yes |
| | | Bedrooms | 12.38mm laminated | Yes |
| East and West Facades | All Levels | Living Areas | 6.38mm laminated | Yes |
| | | Bedrooms | 10.38mm laminated | Yes |
| South Façade | All Levels | Living Areas | 6.38mm laminated | Yes |
| | | Bedrooms | 6.38mm laminated | Yes |

The proposed glazing thickness will satisfy all acoustic requirements of Section 4.1. 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 open-able 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 open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

**Table 4 - Minimum STC of Glazing (with Acoustic Seals)**

| Glazing Assembly | Minimum STC of Installed Window |
|---|---|
| 6.38mm laminated | 31 |
| 10.38mm laminated | 35 |
| 12.38mm laminated | 36 |

## 4.4 ROOF CONSTRUCTION

Concrete roof will not require any acoustic treatment.

## 4.5 EXTERNAL CONCRETE WALLS

External walls of concrete construction are acoustically acceptable for traffic noise intrusion. There should not be vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed.

## 4.6 VENTILATION REQUIREMENTS

As the recommended internal noise levels cannot be achieved with windows open within the development, an alternative outside air supply system or air conditioning will be required to be installed in accordance with the Sydney City Council DCP.

All proposed tenancies are required to be provided with an alternative ventilation or air conditioning system to maintain adequate ventilation with the windows closed.

Any alternative ventilation system that is installed should be acoustically designed to ensure that the acoustic performance of the recommended constructions is not reduced and does not exceed Council criteria for noise emission to nearby properties.

As part of the project air conditions is to be provided to the units and which will be complaint with the requirements of the DCP.

# 5 EXTERNAL NOISE EMISSION ASSESSMENT

Noise emissions from the site should be assessed to ensure that the amenity of nearby land users is not adversely affected.

Potential noise sources which should be assessed are:

- Noise generated by mechanical plant.

The nearest potentially affected noise receivers are:

- Residential properties on Abercrombie Street to the west of the site;
- Future student housing project (assessed as residential) to within the Frasers Broadway precinct.

Noise emissions noise will be assessed to the following criteria:

- City of Sydney Standard Conditions
- The NSW EPA Industrial Noise Policy

## 5.1 BACKGROUND NOISE MONITORING

Unattended noise monitoring was conducted using an Acoustic Research Laboratories Pty Ltd series 315 noise monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the unmanned monitoring period. Equipment was calibrated at the beginning and the end of the measurement using a Rion NC-74 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. The unattended noise monitor was installed from 12th to 19th February, 2014.

Measured background noise levels are presented below. Refer to Appendix 1 for unmanned noise monitoring data.

**Table 5 - Measured Background Noise Levels**

| Description | Day Noise Level 7am to 6pm (dB(A)) | Evening Noise Level 6pm to 10pm (dB(A)) | Night Noise Level 10pm to 7am (dB(A)) |
|---|---|---|---|
| Minimum Repeatable Background $L_{90,15min}$ | 57 | 55 | 44 |

## 5.2 NOISE EMISSION OBJECTIVES

Noise emissions from the development will have to achieve the following requirements.

### 5.2.1 City of Sydney Standard Conditions

***(62) NOISE - MECHANICAL PLANT AND EQUIPMENT***

*Noise associated with the use of mechanical plant and equipment must not give rise to any one or more of the following:*

a) *Transmission of "offensive noise" as defined in the Protection of the Environment Operations Act 1997 to any affected receiver.*

b) *A sound pressure level at the boundary of any affected receiver that exceeds the background (LA90, 15minutes) noise level by more than 5dB. The background noise level must be measured in the absence of noise emitted from the use in accordance with Australian Standard AS1055.*

*Note: The method of measurement of vibration being carried out in accordance with "assessing Vibration; Technical Guidelines" – DEC (EPA) AS1055 for sound level measurements.*

**Table 6 – Day (7am-6pm) Noise Emission Limit Background + 5dB(A) Leq (15min)**

| Location | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject Site | 67 | 67 | 62 | 59 | 58 | 58 | 54 | 47 | 42 | 62 |

**Table 7 –Evening (6pm-10pm) Noise Emission Limit Background + 5dB(A) Leq (15min)**

| Location | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject Site | 65 | 66 | 61 | 57 | 56 | 56 | 52 | 45 | 40 | 60 |

**Table 8 – Night-time (10pm-7am) Noise Emission Limit Background +5dB(A) Leq (15min)**

| Location | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject Site | 54 | 54 | 50 | 46 | 45 | 45 | 41 | 34 | 29 | 49 |

***(63) AIR CONDITIONERS IN RESIDENTIAL BUILDINGS***

*The air conditioner/s must not:*

*a) emit noise that is audible within a habitable room in any other residential property (regardless of whether any door or window to that room is open):*

*(i) before 8.00am and after 10.00pm on any Saturday, Sunday or public holiday; or*

*(ii) before 7.00am and after 10.00pm on any other day; or*

*b) emit a sound pressure level when measured at the boundary of any other residential property, at a time other than those specified in (i) and (ii) above, which exceeds the background (LA90, 15minutes) by more than 5dB(A). The source noise level must be measured as a LAeq 15 minute.*

**Table 9 – Noise Emission Limits from Air Conditioners**

| Description | Day<br>7am to 6pm | Evening<br>6pm to 10pm | Night<br>10pm to 7am |
|---|---|---|---|
| Noise Emission Limit dB(A) $L_{eq,15min}$ | 62 | 60 | 49 (inaudible internally) |

### 5.2.2 NSW EPA Industrial Noise Policy

The NSW EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This 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.

- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all "industrial" noise sources such as mechanical plant 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.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

#### 5.2.2.1 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 do 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 adopted are presented in Section 5.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

**Table 10 – Intrusiveness Noise Emission Goals**

| Location | Period/Time | Intrusiveness Noise Emission Goal dB(A) $L_{eq(15min)}$ |
|---|---|---|
| Nearby Residences | Day (7am-6pm) | 62 |
| | Evening(6pm-10pm) | 60 |
| | Night(10pm-7am) | 49 |

#### 5.2.2.2 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 OEH 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 areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by suburban receivers.

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.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

**Table 11 – Amenity Noise Emission Goals**

| Location | Period/Time | Amenity Noise Emission Goal dB(A) $L_{eq(Period)}$ |
|---|---|---|
| Nearby Residences | Day (7am-6pm) | 60 |
| | Evening(6pm-10pm) | 50 |
| | Night(10pm-7am) | 45 |
| Commercial premises | When in use | 65 |

### 5.3 NOISE EMISSION ASSESSMENT - MECHANICAL PLANT

Mechanical plant items are not typically selected at DA stage.

Detailed review of all external mechanical plant should 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 can be satisfactorily attenuated to levels complying with noise emission criteria through appropriate location and (if necessary) standard acoustic treatments such as noise screens, enclosures, in-duct treatments (silencers/lined ducting) or similar.

# 6 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

## 6.1 CONSTRUCTION NOSIE

The Council of the City of Sydney details specific construction noise and vibration criteria applicable construction sites within the CBD in the *Construction Hours/Noise within the Central Business District*. The proposed development sits outside of the area applicable to this code of practice, however the objective of this plan is to adhere to the intent of the code as to the reduce the potential for noise impact as practically possible.

Where feasible and practical measures may be applied the construction site should endeavour to comply with the criteria outlined in the Council of the City of Sydney's Code of Practice for Construction Hours/Noise within the Central Business District". A summary of the code is detailed below.

### 6.1.1 Sydney City Council's "Code of Practice for Construction Hours/Noise within the Central Business District"

The noise goals for the construction activities on this project are aimed at minimising adverse impacts within the commercial or residential/hotel buildings. The noise goals adopted by the code of practice are outlined below.

**Table 12 – Construction Noise Criteria**

| Day | Time Zone | Noise Criteria $L_{10(15\ minute)}$ |
|---|---|---|
| Monday to Saturday | 7am to 8am | Background Noise + 5 |
| Monday to Friday | 8am to 7pm | Background Noise + 10 |
| Saturday | 8am to 5pm | Background Noise + 10 |

The Code also mentions that the guidelines for control of construction noise as outlined in AS2436 shall be applied, where appropriate.

### 6.1.2 Australian Standard AS2436:1981 "Guide to noise control on construction, maintenance and demolition sites

The Australian Standard AS2436 states that where all reasonable and available measures have been taken to reduce construction noise, mitigation strategies may be put in place to reduce levels noise levels to within a reasonable and acceptable level.

For the control and regulation of noise from construction sites AS2436:1981 *"Guide to noise control on construction, maintenance and demolition sites"* nominates the following:

a. That reasonable suitable noise criterion is established,

b. That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes to locations of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours, and

c. The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the construction site.

The guideline reflects on feasible and reasonable mitigation strategies, management controls and public liaising in the effort to reach realistic comprises between construction sites and potential noise affected receivers.

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.
- Adopt management conditions as per AS 2436 in the event of a non-compliance.

### 6.1.3 Background Noise Monitoring

Background noise levels during have been determined from monitoring on site and detailed in the sections above.

### 6.1.4 Background Noise Levels

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

**Table 13 – Measured Background Noise Level**

| Time of Day | Unattended Noise Monitoring (2014) Background Noise Level dB(A) $L_{90}$ |
|---|---|
| Day | 57 |
| Evening | 55 |
| Night | N/A as construction works will not be conducted during this time |

### 6.1.5 Construction Noise Objectives

Construction noise objectives applicable to the development have been determined based on the minimum background noise level recorded and the construction noise criteria detailed in Table 12 of this report. Noise level objectives for the construction period of the site are detailed in Table 14.

**Table 14 – Construction Noise Objectives**

| Category | Time of Day | Background Noise Level dB(A) $L_{90}$ | Construction Noise Objective dB(A) $L_{Av\ max}$ |
|---|---|---|---|
| Monday to Saturday | 0700 - 0800 | 53 | 62 |
| Monday to Friday | 0800 - 1900 | 53 | 62 |
| Saturday | 0800 - 1700 | 53 | 62 |

### 6.1.6 Proposed Construction Works

The proposed construction works will include the following:

- Base building construction;
- Fitout works and finishes.

The typically loudest piece of equipment used will typically be concrete sawing which will only be used sporadically. It should be noted that excavation and demolition activities are not proposed as part of the construction works. Some detailed excavation and removal of footings will be required as part of the construction stage of the project.

**Table 15 – Construction Activities**

| Construction Activity | Equipment / Process | Sound Power Level dB(A) |
|---|---|---|
| General Construction works | Trucks | 108 |
| | Concrete Pumps | 110 |
| | Concrete Sawing | 115 |
| | Drilling | 94 |
| | Angle grinders | 114 |
| | Electric Saw | 111 |
| | Impact drill | 105 |
| Internal Fitout & Finishes | Hammering | 110 |
| | Drilling | 94 |
| | Impact drill | 112 |
| | Electric Saw | 111 |
| | Angle Grinders | 114 |

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

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

## 6.2 VIBRATION CRITERIA

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*

- For human exposure to vibration, British Standard BS 6472 – 'Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz.

The criteria and the application of this standard are discussed in separate sections below.

### 6.2.1 Structure Borne Vibrations

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 16.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

**Table 16 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration**

| Type of Structure | | Peak Particle Velocity ($mms^{-1}$) | | | |
|---|---|---|---|---|---|
| | | At Foundation at a Frequency of | | | Plane of Floor of Uppermost Storey |
| | | < 10Hz | 10Hz to 50Hz | 50Hz to 100Hz | All Frequencies |
| 1 | Buildings used in commercial purposes, industrial buildings and buildings of similar design | 20 | 20 to 40 | 40 to 50 | 40 |
| 2 | Dwellings and buildings of similar design and/or use | 5 | 5 to 15 | 15 to 20 | 15 |
| 3 | Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order) | 3 | 3 to 8 | 8 to 10 | 8 |

### 6.2.2 Human Comfort

The British Standard BS 6472 – 'Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz' will be used to assess construction vibration for human comfort.

This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings. The recommendations of this guideline should be adopted to assess and manage vibration from the site. Where vibration exceeds, or is likely to exceed, the recommended levels then an assessment of reasonable and feasible methods for the management of vibration should be undertaken.

**Table 17 – BS 6472 Vibration Criteria**

| | | RMS acceleration ($m/s^2$) | | RMS velocity (mm/s) | | Peak velocity (mm/s) | |
|---|---|---|---|---|---|---|---|
| Place | Time | Preferred | Maximum | Preferred | Maximum | Preferred | Maximum |
| Continuous Vibration | | | | | | | |
| Residences | Daytime | 0.01 | 0.02 | 0.2 | 0.4 | 0.28 | 0.56 |
| Offices | | 0.02 | 0.04 | 0.4 | 0.8 | 0.56 | 1.1 |
| Workshops | | 0.04 | 0.08 | 0.8 | 1.6 | 1.1 | 2.2 |
| Impulsive Vibration | | | | | | | |
| Residences | Daytime | 0.3 | 0.6 | 6.0 | 12.0 | 8.6 | 17.0 |
| Offices | | 0.64 | 1.28 | 13.0 | 26.0 | 18.0 | 36.0 |
| Workshops | | 0.64 | 1.28 | 13.0 | 26.0 | 18.0 | 36.0 |

Note 1: Continuous vibration relates to vibration that continues uninterrupted for a defined period (usually throughout the daytime or night-time), e.g. continuous construction or maintenance activity. (DECC, 2006)

Note 2: Impulsive vibration relate to vibration that builds up rapidly to a peak followed by a damped decay and that may or may not involve several cycles of vibration (depending on frequency and damping), with up to three occurrences in an assessment period, e.g. occasional loading and unloading, or dropping of heavy equipment. (DECC, 2006)

### 6.3 AMELIORATIVE MEASURES

#### 6.3.1 Site specific recommendations

Site specific recommendations as follows:

- Concrete sawing
    - Noise from concrete sawing is likely to result in an exceedances of allowable noise levels at all surrounding receivers. It should be noted however that this activity will be only be used sporadically. It should also be noted that noise impacts for receivers to the West of the site will be masked by high traffic noise levels associated with Abercrombie Street.
    - Any significant acoustic treatment of concrete sawing is not feasible – surrounding developments are multi-storey, negating any benefit that could be provided by noise screens. Accordingly, these activities should be managed so as to reduce noise impacts, as is consistent with AS2436 when strict compliance with noise emission goals is not achievable.
    - We therefore recommend that concrete sawing works are scheduled to times which will minimise impacts on surrounding sensitive receivers.
- Vehicle Noise:

  Access to the site will primarily occur from within the One Central Park precinct and will not typically result in a significant noise impact to residents to the South of the site. Noise associated with traffic along Abercrombie Street will mask noise associated with trucks on site.

  To minimise the impacts from vehicles on all receivers, it is recommended that;

    - Truck movements should not commence prior to 7:00am.
    - Trucks, trailers and concrete trucks must turn off their engines when on site to reduce impacts on adjacent land uses and receivers to the South (unless truck ignition needs to remain on during concrete pumping).
- Other activities:
    - Typically, noise from most construction activities will comply with the construction noise objectives at surrounding receiver locations. The receivers to the West will typically have more acoustic impact from Abercrombie Street in any event.
    - In the event of complaint, noise management techniques identified in this report should be employed to minimise the level of noise impact. This may include community consultation and scheduling of loud construction processes.

## 7 CONTROL OF CONSTRUCTION NOISE AND VIBRATION

The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow chart presented in Figure 2 illustrates the process that will be followed in assessing construction activities.

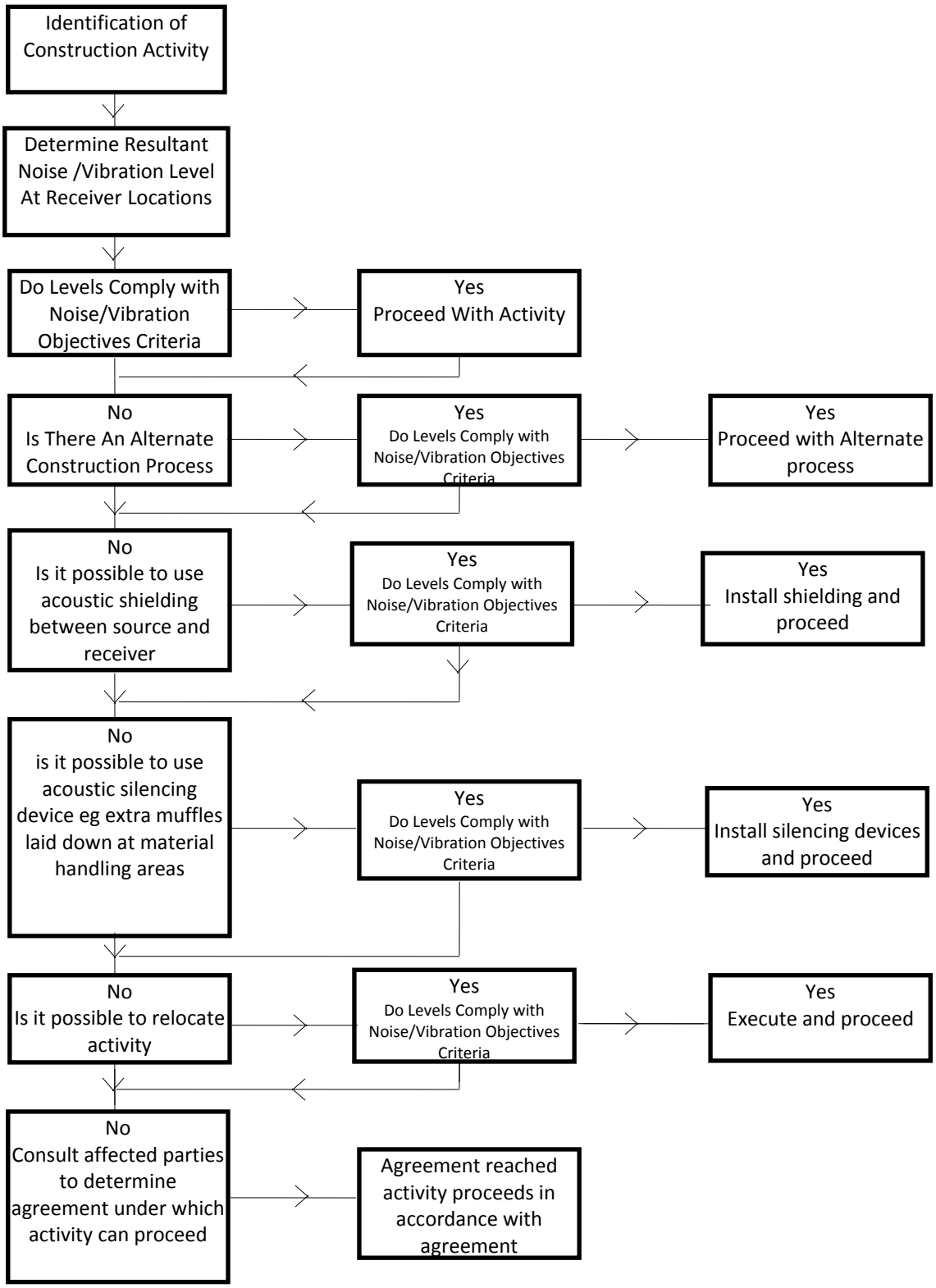



**Figure 2 – Process Flowchart**

## 7.1 NOISE AND VIBRATION CONTROL METHODS

The determination of appropriate noise control measures will be dependant on the particular activities and construction appliances. This section provides an outline of available methods.

### 7.1.1 Selection of Alternate Appliance or Process

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

### 7.1.2 Acoustic Barrier

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

- The placement of barriers at the source is generally only effective for static plant (tower cranes). Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.
- Barriers can also be placed between the source and the receiver however this will not beneficial in this instance due to receivers overlooking the site.

The degree of noise reduction provided by barriers is dependant on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

### 7.1.3 Silencing Devices

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

### 7.1.4 Material Handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

### 7.1.5 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

### 7.1.6 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. It is recommended that all available and reasonable treatments and mitigation strategies presented in this report be adopted to minimise noise emissions from construction activities on site.

### 7.1.7 Noise Monitoring

Noise monitoring can be undertaken to determine the effectiveness of measures which are been implemented. The results of monitoring can be used to devise further control measures.

### 7.1.8 Combination of Methods

In some cases it may be necessary that two or more control measures be implemented to minimise noise.

## 7.2 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

### 7.2.1 Establishment of Direct Communication with Affected Parties

In order for any construction noise management programme to work effectively, continuous communication is required between all parties, which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation processes is to:

- Inform and educate the groups about the project and the noise controls being implemented;
- Increase understanding of all acoustic issues related to the project and options available;
- Identify group concerns generated by the project, so that they can be addressed; and
- Ensure that concerned individuals or groups are aware of and have access to a Constructions Complaints Register which will be used to address any construction noise related problems should they arise.

It is intended that direct lines of communication are developed between Richard Crookes Constructions and potentially impacted receivers in the vicinity of the site.

### 7.2.2 Dealing with Complaints

Should ongoing complaints of excessive noise or vibration criteria occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices. In the case of exceedances of the vibration limits all work potentially producing vibration shall cease until the exceedance is investigated.

The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;
- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held. All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

The investigation of a complaint shall involve where applicable;

- Noise measurements at the affected receiver;
- An investigation of the activities occurring at the time of the incident;
- Inspection of the activity to determine whether any undue noise is being emitted by equipment; and
- Whether work practices were being carried out either within established guidelines or outside these guidelines.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified as soon as possible. Where work practices within established guidelines are found to result in excessive noise being generated then the guidelines should be modified so as to reduce noise emissions to acceptable levels. Where guidelines are not being followed, the additional training and counselling of employees should be carried out.

Measurement or other methods shall validate the results of any corrective actions arising from a complaint where applicable.

### 7.2.3 Reporting Requirements

The following shall be kept on site:

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed in section 9.2.

2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.

3. Any noise exceedences occurring including, the actions taken and results of follow up monitoring.

4. A report detailing complaints received and actions taken shall be presented to the construction liaison committee.

### 7.2.4 Contingency Plans

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determine the offending plant/equipment/process
2. Locate the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implement additional acoustic treatment in the form of localised barriers, silencers etc where practical.
4. Selecting alternative equipment/processes where practical

# 8 CONCLUSION

This report presents the results from the acoustic assessment of noise impacts associated with the proposed residential project at Block 1, within the Central Park Precinct.

Noise intrusion from traffic associated with surrounding roadways will comply with the Sydney City Council, Australian Standards and The State Environmental Planning Policy including SEPP noise criteria on the proviso that the acoustic treatments detailed in this report are adopted.

External noise emission criteria have been setup in Section 5 of this report based on the requirements of the NSW EPA Industrial Noise Policy and the Sydney City Council DCP. Detailed plant noise emission shall be designed to comply with this criterion during CC stage.

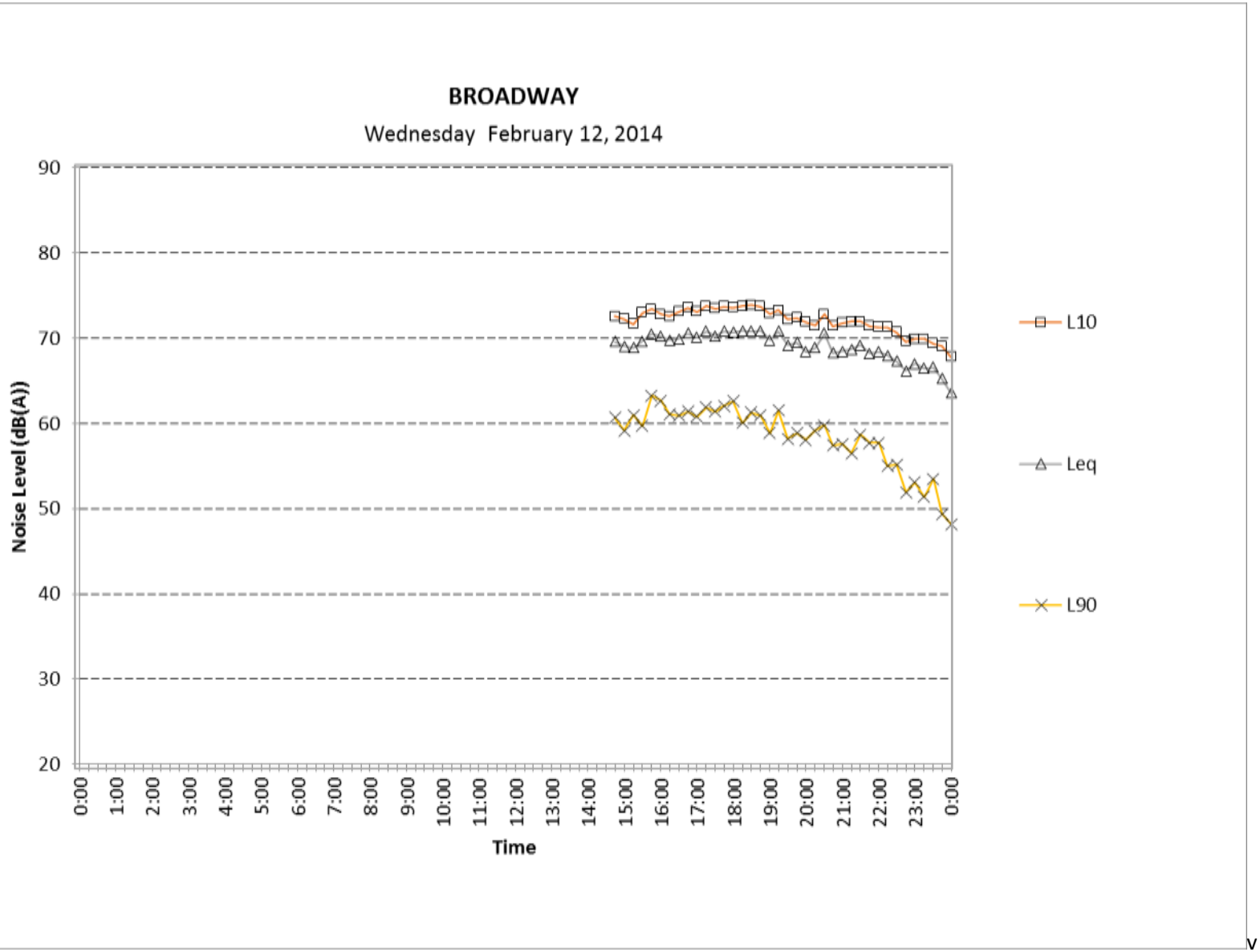
Section 7 of the report details the assessment of construction noise and vibration and details the methodology which will be used to mitigate noise impact to surrounding receivers during the construction stage of the project.

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

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Ben White

# APPENDIX 1
# UNATTENDED NOISE MONITORING DATA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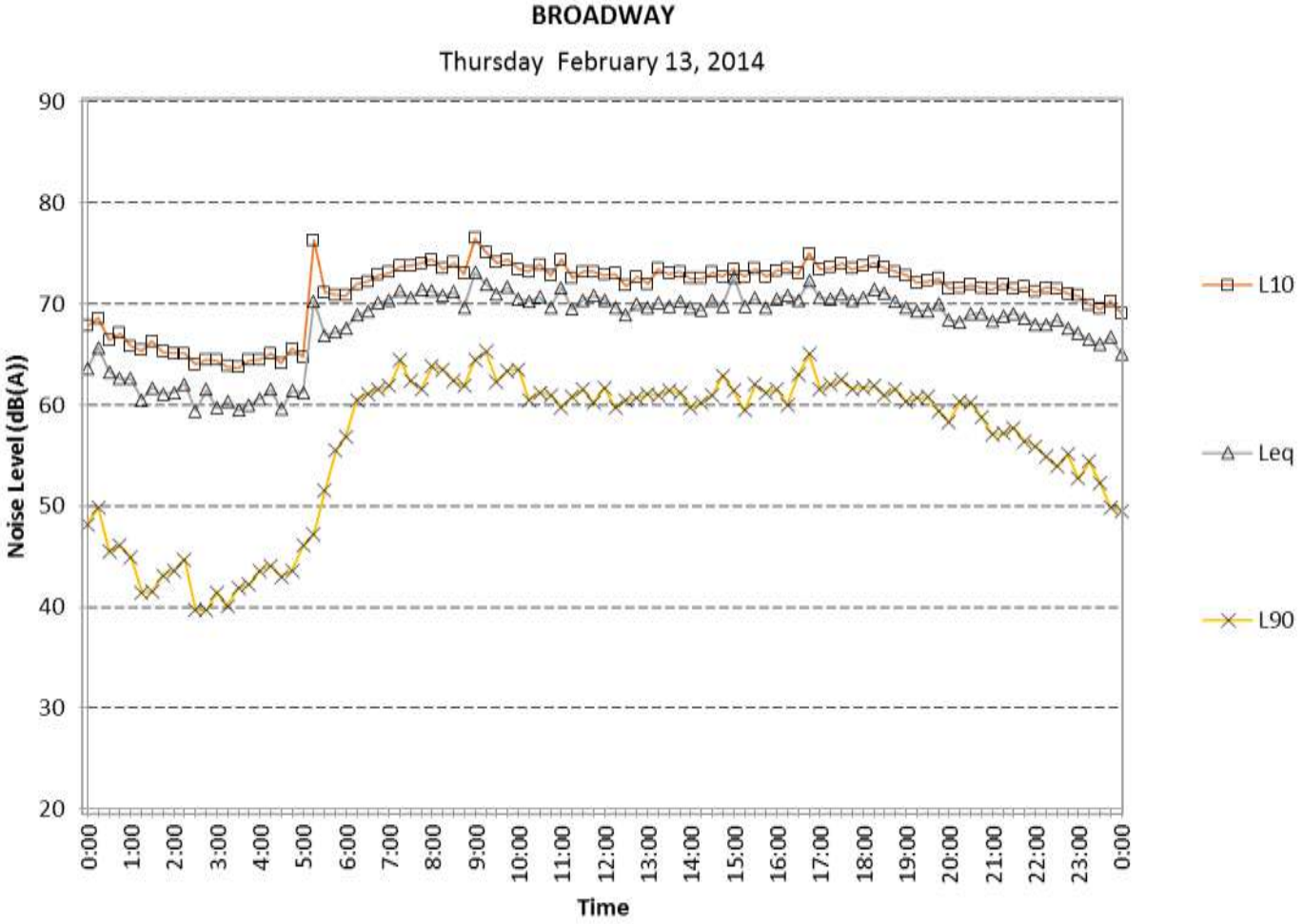
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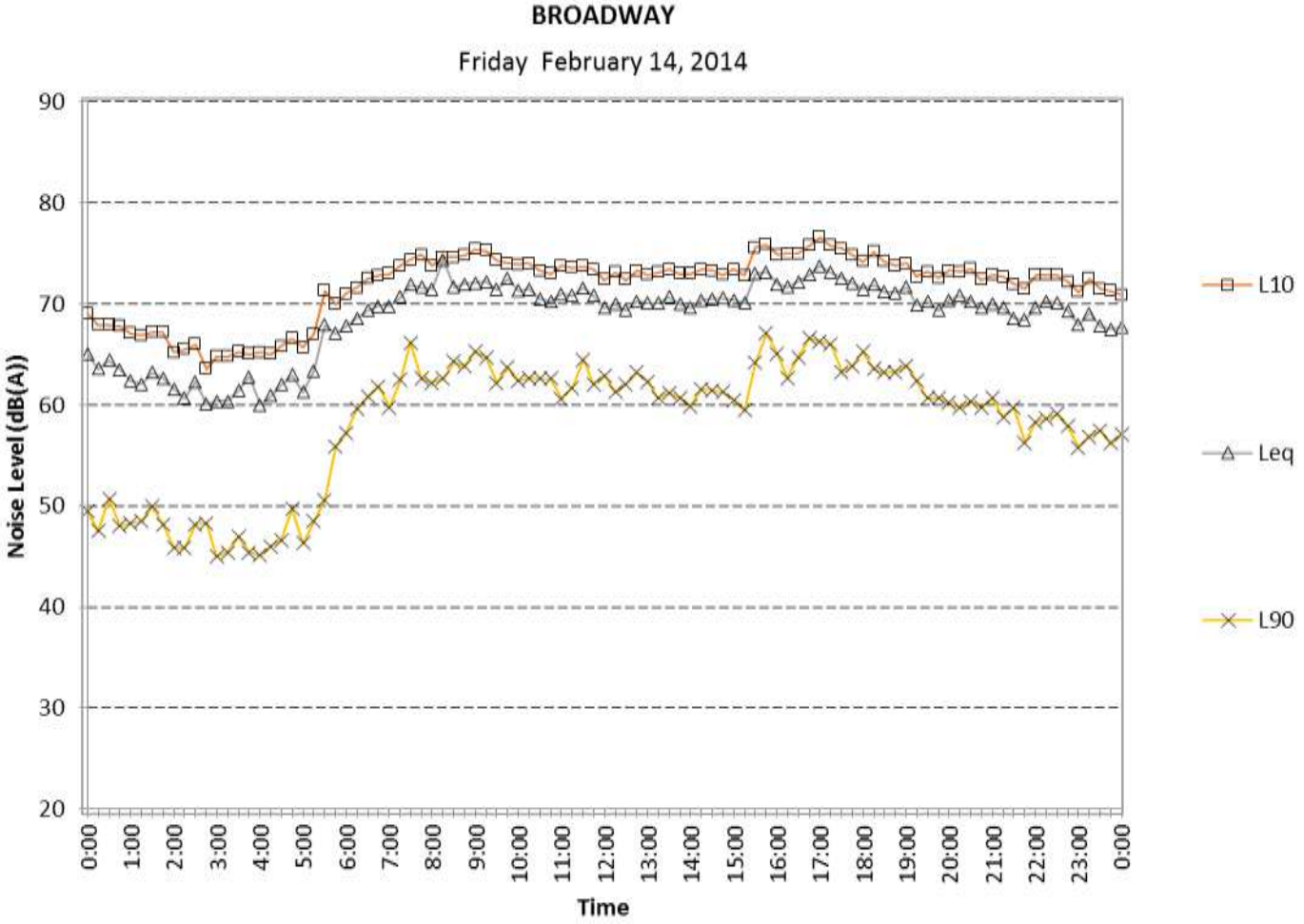
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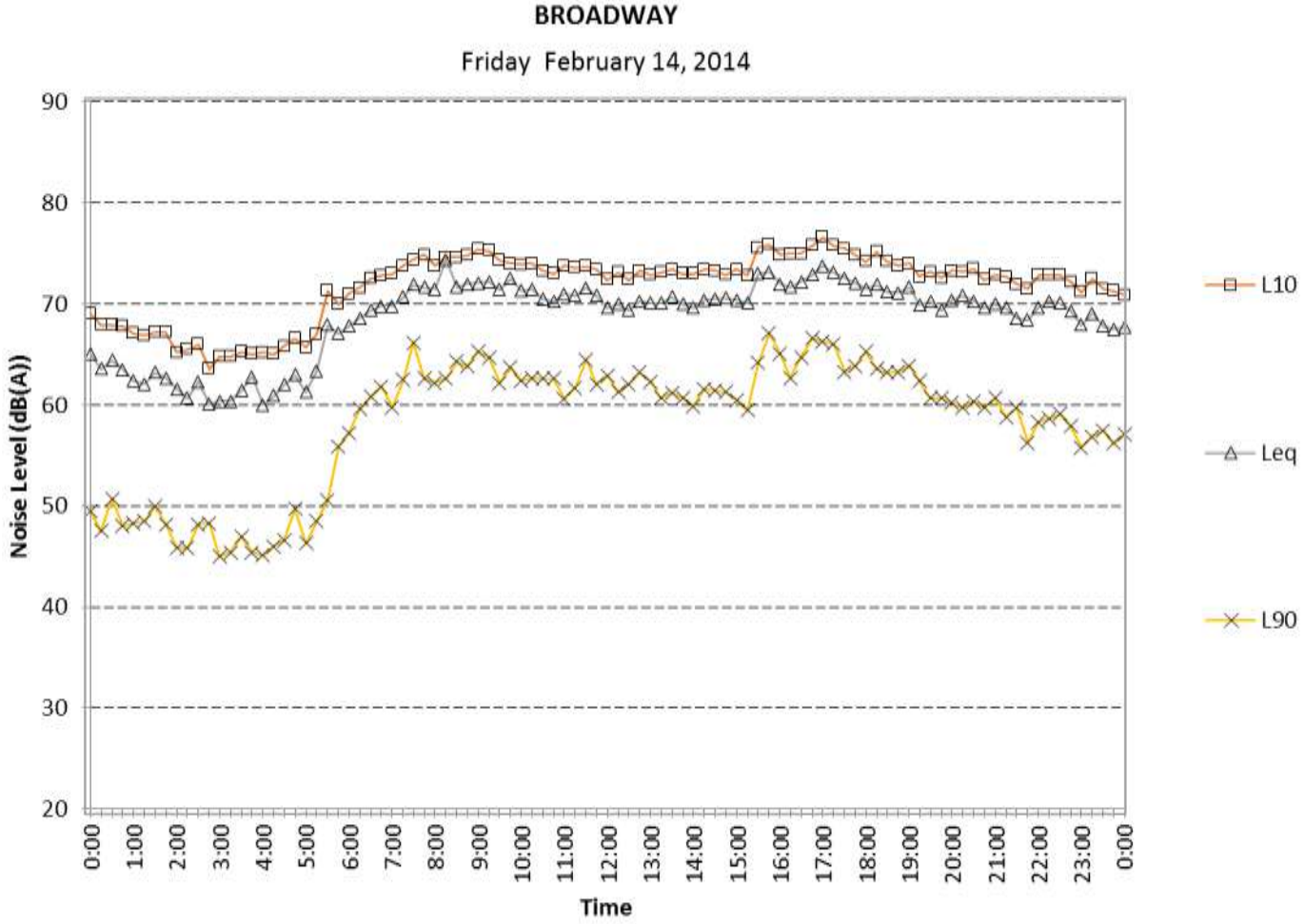
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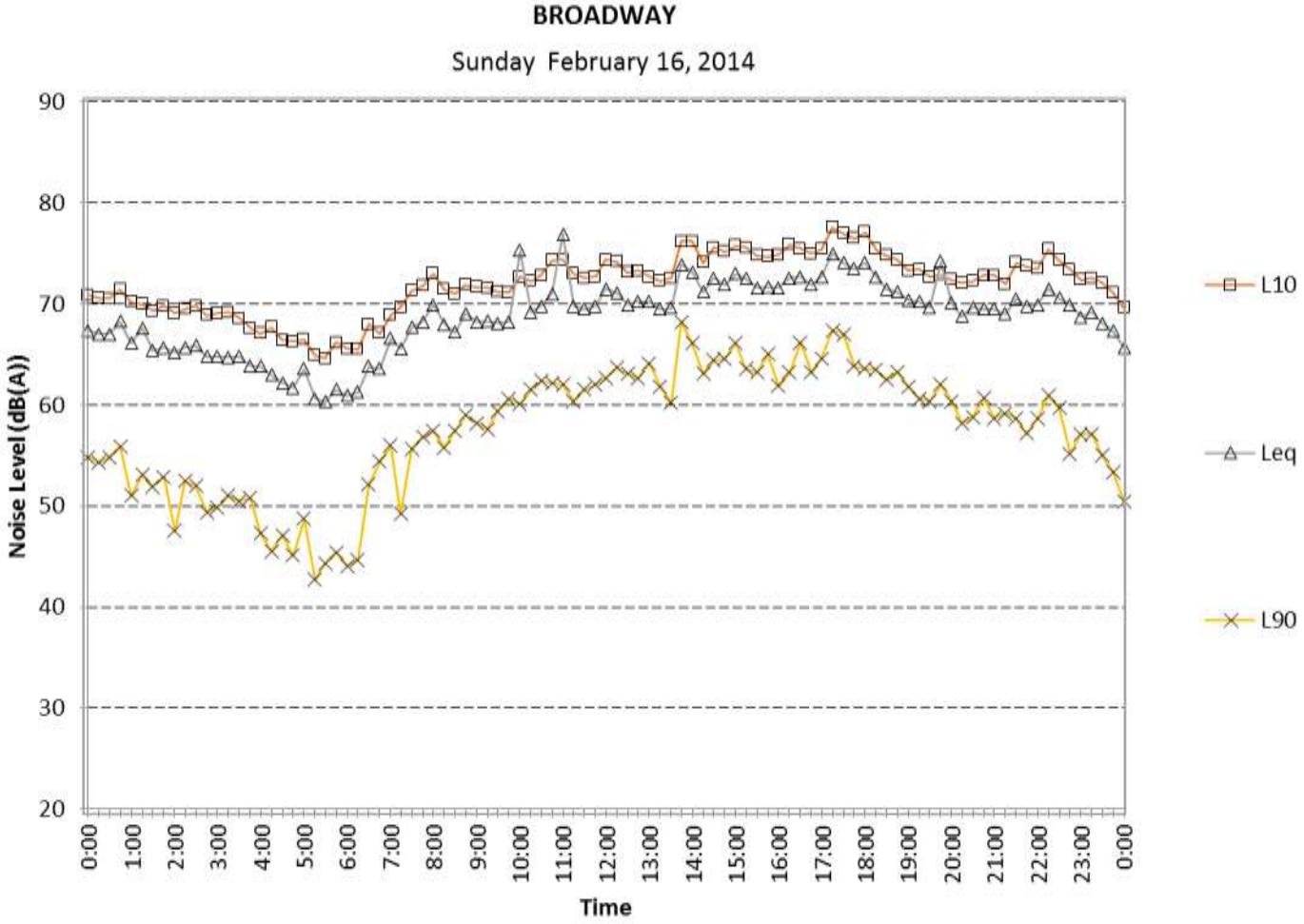
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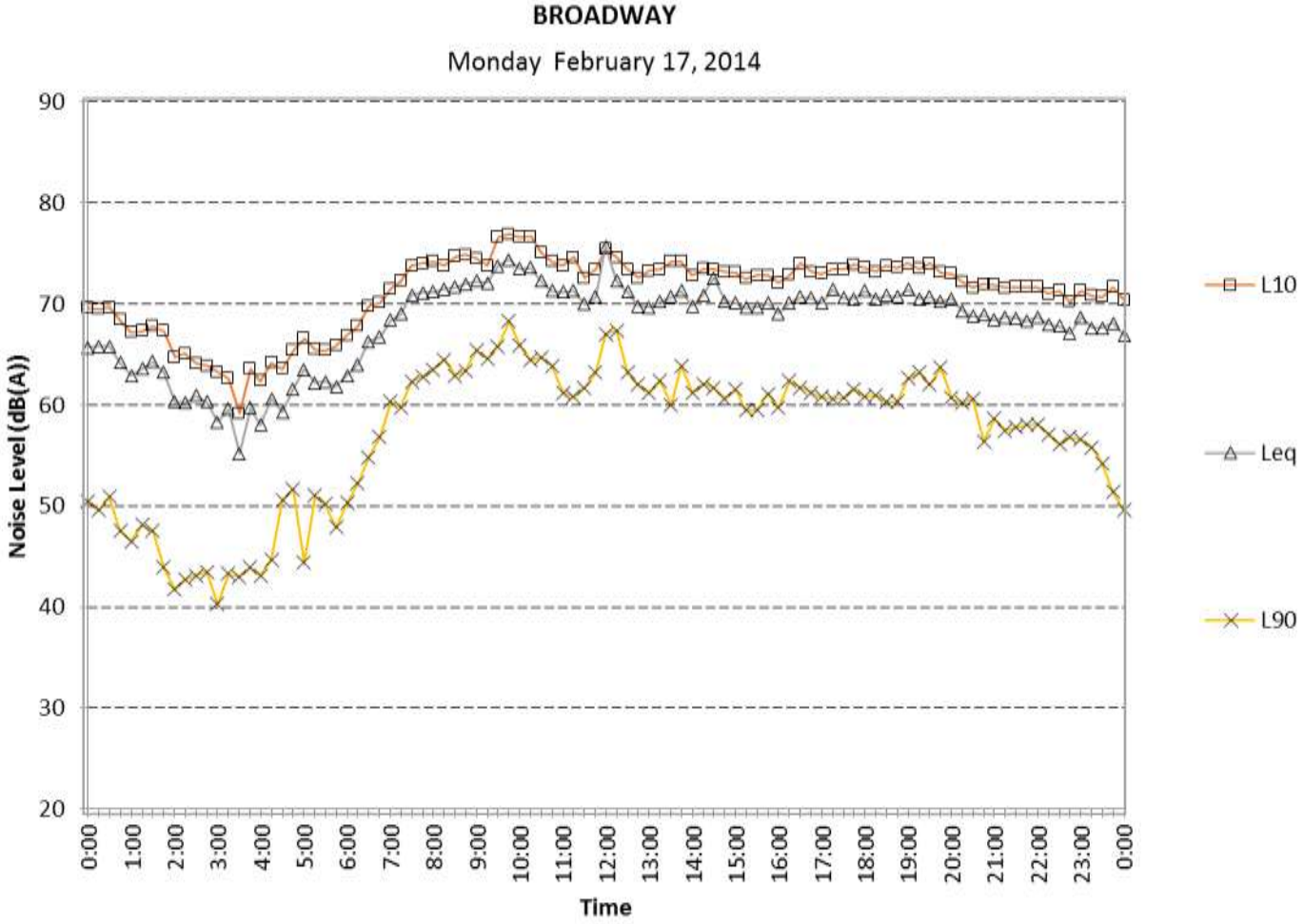
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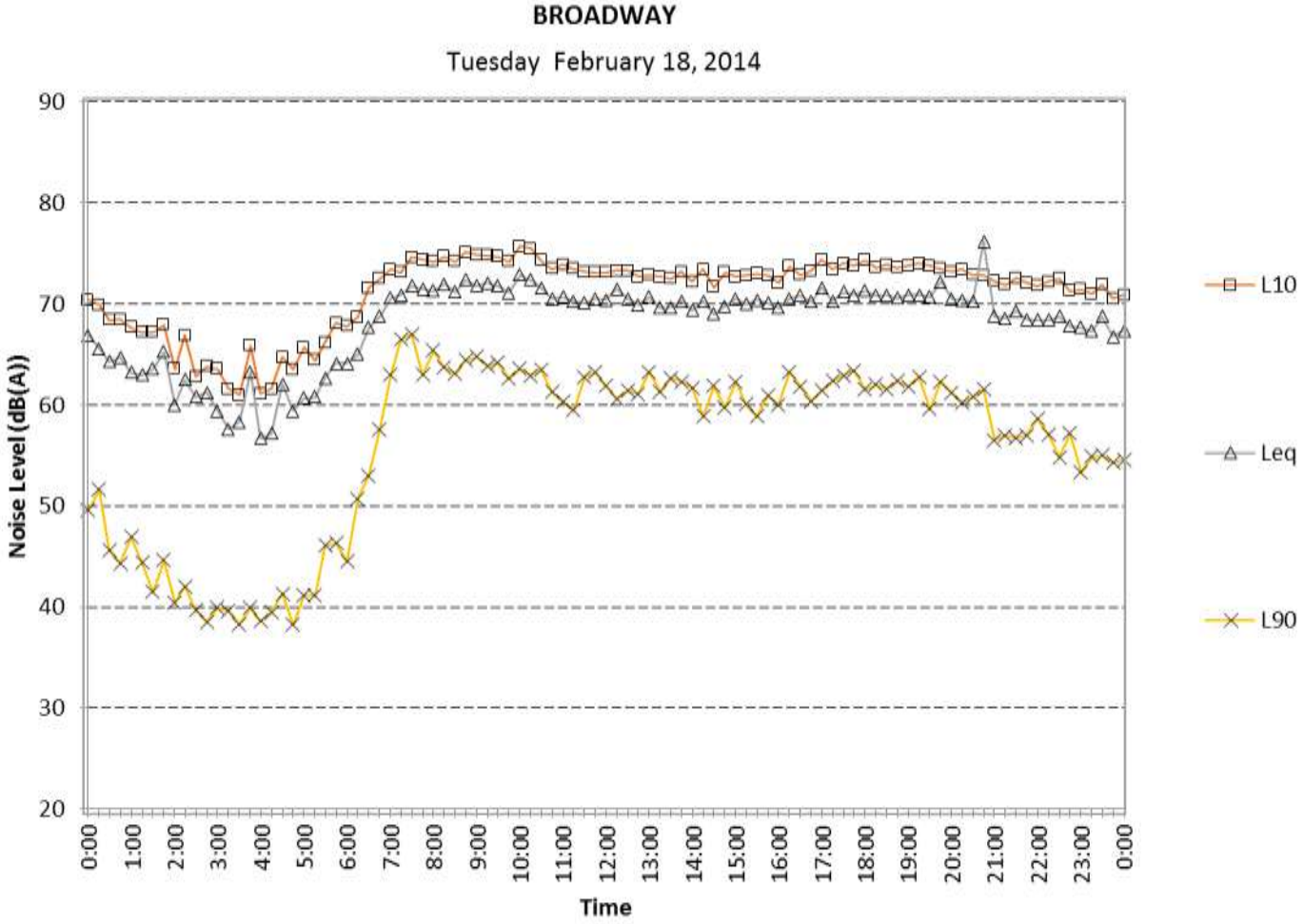
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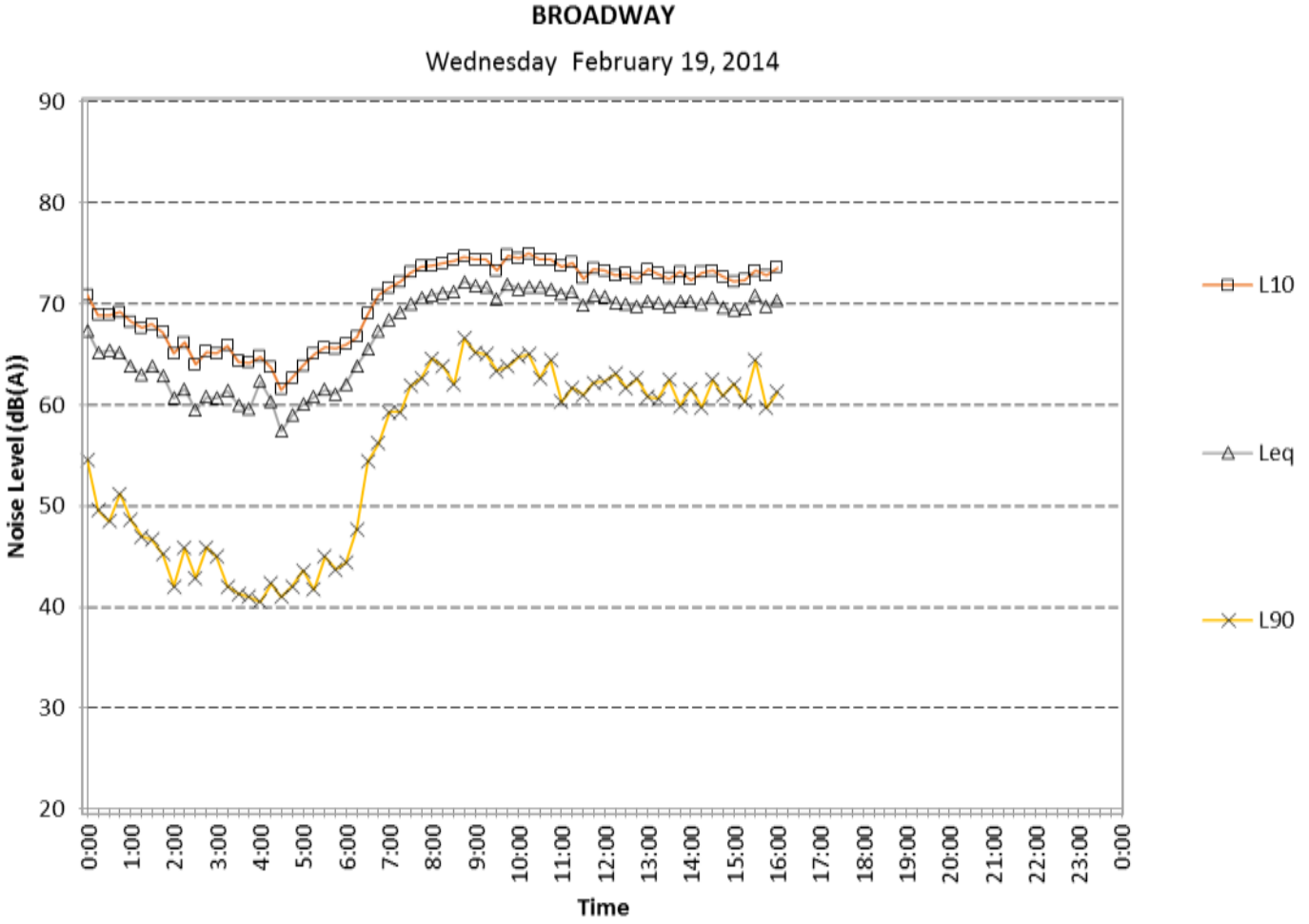
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