DATE OF REPORT: 29TH MAY, 2015

Attention: Katrin Schmidt-Dangler

Merhis Pty Ltd C/-Marchese Partners

L14, 46 Edward Street

Brisbane QLD 4000

E-mail: ksdengler@marchesepartners.com.au

REPORT NO. APR15052-B.1

RESIDENTIAL DEVELOPMENT AT 74-80 RESTWELL & 1-9 LEONARD STREET BANKSTOWN – ACOUSTIC ASSESSMENT

AUTHORISATION:

JAVED MOAZZAM (MENV ENG)

SENIOR CONSULTANT (AIR QUALITY, NOISE AND ESD)

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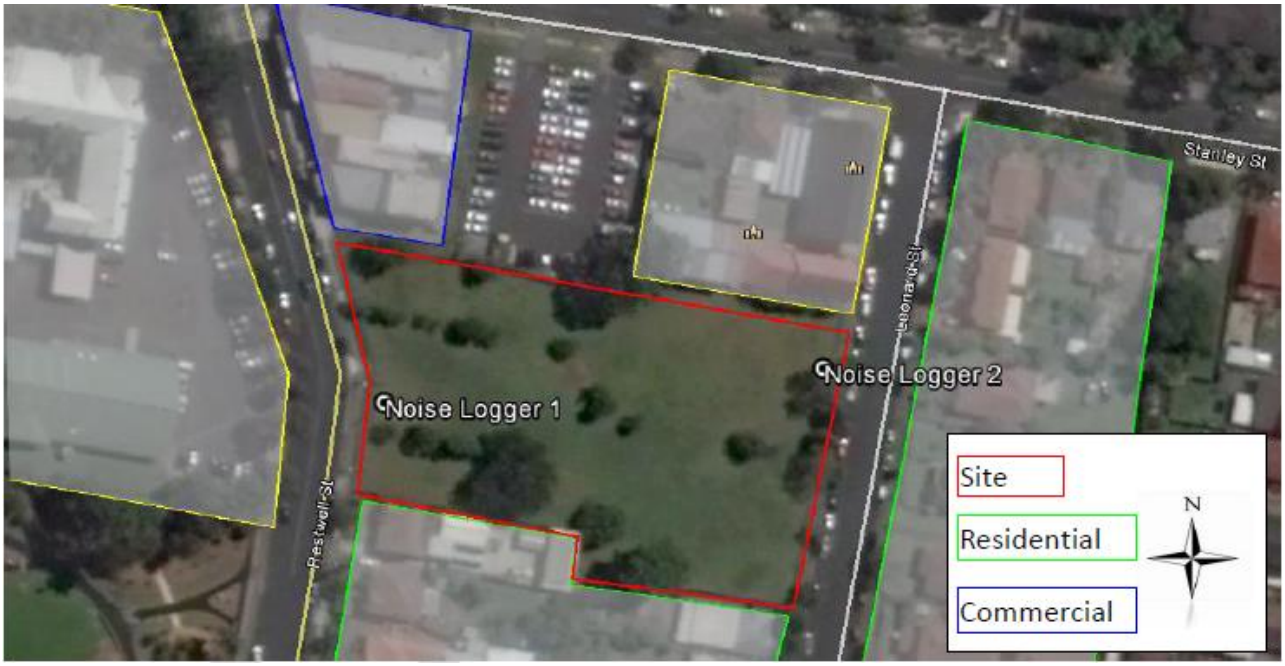
1. INTRODUCTION

The following report has been prepared by Airlabs on behalf of Marchese Partners to assess the potential for noise impact associated with the residential development at 74-80 Restwell and 1-9 Leonard Street, Bankstown. The residential development will include:

- Two (2) levels of basement carpark
- Residential apartment on ground to level 6

The proposed residential development is surrounded by existing residential buildings to the south and east. To the north are commercial buildings and a place of worship. To the west is Bankstown Public School. General traffic noise along the Restwell and Leonard Street contributes to the surrounding ambient noise levels. The site location is showing in **Figure 1**.

Figure 1: Site Location, Nearest Residents and Noise Logger Position



2. NOISE CRITERIA

The following standards and guidelines are applicable to this project:

- Bankstown City Council Development Control Plan (DCP) – Part D2 Residential Development;
- NCC/BCA Part F5;
- NSW EPA "Noise Guide for Local Government" (NGLG);
- Australian Standard AS/NZS 2107-2000: Acoustics – Recommended design sound levels and reverberation times for building interiors;
- Australian Standard AS 1055.1-1997: Acoustics – Description and measurement of environmental noise – General procedures.

2.1 Internal Noise Levels

For the residential development, the Bankstown City Council DCP Part D2 has no specific acoustic requirements and therefore the AS/NZS 2107-2000 outlines the acceptable internal noise levels such that a satisfactory acoustic environment within occupied spaces in new and existing buildings can be achieved. **Table 1** presents the recommended internal design noise levels for apartments in minor roads.

Table 1: Recommended Internal Design Noise Levels (AS/NZS 2107)

Type of occupancy/activity	**Recommended design sound level, Leq in dB(A)**	
	Satisfactory	**Maximum**
Living	30	40
Sleeping	30	35
Work	35	40
Apartment common areas	45	55

2.2 Sound Insulation Requirement (Part F5 NCC/BCA)

For sound transmission and insulation between sole occupancy units (SOU) within the same development, walls and floors to be constructed in accordance with requirements of Part F5 of the Building Code of Australia (BCA). Sound insulation requirements are summarised in **Table 2.**

Table 2: NCC Part F5 Requirements (Class 2 or 3)

Building Element	**Minimum NCC Part F5 Requirements**
Sound Insulation Rating of Walls (Class 2 or 3)	
Walls between separate sole occupancy units.	Rw + Ctr 50 (airborne)
Walls between wet areas (bathrooms, sanitary compartment, laundry or kitchen) and a habitable room (other than kitchen) in adjoining apartments.	Rw + Ctr 50 (airborne) & of discontinuous construction
Walls between sole occupancy unit and stairway, public corridors, public lobby or the like or parts of a different classification.	Rw 50 (airborne)
Walls between a plant room or lifts shaft and a sole occupancy unit.	Rw 50 (airborne) & of discontinuous construction
Sound Insulation Rating of Floors (Class 2 or 3)	
Floors between Walls between separate sole occupancy units and plant room, lift shaft, stairway, public corridor, public lobby or the like.	Rw + Ctr 50 (airborne) & Ln,w + Cl < 62 (impact)
Apartment Entry Doors (Class 2 or 3)	
A door incorporated in a wall that separates a sole occupancy unit from a stairway, public Floors between Walls between separate sole occupancy units and plant room, lift shaft, stairway, public corridor, public lobby or the like.	Rw 30 (airborne)
Services (Class 2, 3 or 9c)	
If a storm water pipe, a duct, soil, waste or water supply pipe including a duct or pipe that is located in a wall or floor cavity serves or passes through more than one sole occupancy unit must be separated:	Rw +Ctr 40

Building Element	**Minimum NCC Part F5 Requirements**
If the adjacent room is a habitable room (other than a kitchen); or If the room is a kitchen or non-habitable room	 Rw + Ctr 25

Construction Deemed to Satisfy

The forms of construction must be installed as follows:

a) Masonry – Units must be laid with all joints filled solid, including those between the masonry and any adjoining construction.
b) Concrete slabs – Joints between concrete slabs or panels and any adjoining construction must be filled solid.
c) Sheeting materials –
    i. If one layer is required on both side of a wall, it must be fastened to the studs with joints staggered on opposite sides; and
    ii. If two layers are required, the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer; and
    iii. Joints between sheets or between sheets and any adjoining construction must be taped and filled solid.
d) Timber or steel-framed construction – perimeter framing members must be securely fixed to the adjoining structure and –
    i. Bedded in resilient compound; or
    ii. The joints must be caulked so that there are no voids between the framing members and the adjoining structure.
e) Services –
    i. Services must not be chased into concrete or masonry elements.
    ii. A door or panel required to have a certain Rw + Ctr that provides access to a duct, pipe or other service must –
        A. Not open into any habitable room (other than a kitchen); and
        B. 10mm, be fitted with sealing gasket along all edges and be constructed of –
            1. Wood, particleboard or blackboard not less than 33mm thick; or
            2. Compressed fibre reinforced cement sheeting not less than 9A mm thick; Or
            3. Other suitable material with a mass per unit area not less than 24.4 kg/m^2
    iii. A water supply pipe must –
        A. Only be installed in the cavity of discontinuous construction; and
        B. In the case of a pipe that serves only one sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10mm to the other wall leaf.
    iv. Electrical outlets must be offset from each other –
        A. In masonry walling, not less than 100mm; and
        B. In timber or steel framed walling, not less than 300mm.

2.3 Noise Survey and Project Specific Limits

An unattended noise survey was carried out at the site to measure the background and ambient noise levels. Noise monitoring was conducted between Monday 19th to Monday 25th May 2015. The monitor was positioned (as shown in Figure 1) at the following locations:

- Location 1 – Restwell Street
- Location 2 – Leonard Street

Measurements were conducted using the following equipment:

- SVAN 977 Type 1 Real time Analyser/Noise Logger. Serial No. 34892
- SVAN 958A Type 1 Real time Analyser/Noise Logger. Serial No. 36624
- SVAN SV30A Type 1 Sound Level Calibrator. Serial NO. 31830

Noise monitoring was conducted in general accordance with Australian standard AS 1055.1-1997: Acoustics-Description and measurement of environmental noise-General procedures.

The noise analyser was calibrated immediately before and after measurements were taken with no discernible differences between these two recorded levels. The sound analyser is Type 1 and complies with Australian standard AS1259.2:1990.

Table 3: Measured Ambient and Traffic Noise Levels, dBA

Location	Period	Average Leq (period)	Highest Leq 1hr
Restwell Street	Day (07:00 – 22:00)	61	66
	Night (22:00 – 07:00)	55	62
Leonard Street	Day (07:00 – 22:00)	59	66
	Night (22:00 -07:00)	53	64

The Bankstown City Council DCP Part D2 does not have any specific guide for controlling noise emission from the operation of mechanical equipment associated with the development. However, the EPA Noise Guide for Location Government (NGLG) does provides a guide into considering intrusive impact to nearby receivers from the residential development.

The assessment of intrusive noise levels has been conducted in general accordance with the procedures as set out in the NSW Industrial Noise Policy, which defines intrusive noise as 5 decibels above the background noise level. For the purpose of the assessment, the background noise level has been determined using the RBL. In addition to the intrusive noise criteria, noise from the equipment must not be audible in a habitable room in a neighbouring residence during the restricted hours.

Table 4: Noise Survey Summary and Project Limits, dBA

	Time Period	Existing Noise Levels		Noise Limits, Leq
		Leq (period)	RBL	NGLG Criteria
Restwell Street	Day	61	48	53
	Evening	61	46	51
	Night	55	39	44
Leonard Street	Day	60	46	51
	Evening	55	45	50
	Night	53	40	45

During detailed design stage, the design and selection of the mechanical equipment required to service the proposed development will be required to achieve the NGLG noise limits as presented in the table above. During the monitoring period any adverse weather condition have been excluded. The noise logger results are presented in Appendix C.

3. ASSESSMENT AND RECOMMENDATIONS

3.1 Façade Glazing Requirements

Acoustic glazing for the apartments are given in Table 5 are required to reduce noise impact on the internal occupants and should result in noise levels within such units in accordance with the Department of Planning Noise Guidelines and AS/NZS 2107:2000.

All other non-habitable spaces, such as bathrooms and laundries required minimum 6mm monolithic glass (Rw 28). When closed, all windows/doors should be well sealed (air tight) with good acoustic seals around the top and bottom sliders. Mohair seals are not considered to be acoustic seals.

Table 5: Schedule of Window and Glazing (Rw)

Level	Apartment	Space	Glazing Thickness	Minimum Rw (Glazing + Frame)
G	0.04 to 0.07 & 0.14	Living & Bedroom	10.38mm laminated	32
	All other	Living	6mm monolithic	28
		Bedroom	6.38mm laminated	30
1-5	1.04 to 1.07, 2.04 to 2.07, 3.04 to 3.07, 4.04 to 4.07, 5.04 to 5.07,1.16-1.19, 2.16-2.19, 3.16-3.19, 4.16-4.19, 5.16-5.19	Living & Bedroom	10.38mm laminated	32
	All other	Living	6mm monolithic	28
		Bedroom	6.38mm laminated	30
6	6.04 to 6.07	Living & Bedroom	10.38mm laminated	32

3.2 Building Façade Construction

To provide sufficient acoustic attenuation of noise, the general external construction of the proposed building would need to be constructed as detailed in Table 6.

Table 6: External Façade Construction (Rw)

Building Element	Proposed Construction	Minimum Rw
External Wall	Masonry or cavity brick	45
Roof and ceiling	Concrete with a plasterboard cavity ceiling	45

3.3 Mechanical Services

At the DA stage, the design and selection of mechanical equipment has not been finalised. Following the DA approval of the proposed development, during the Construction Certification Stage a detail assessment of all mechanical plant and equipment will be conducted to ensure compliance with the EPA and DCP noise criteria. Typical acoustic measures may include the construction of acoustic barriers, enclosures, attenuators and/or acoustic louvres.

4. CONCLUSION

An acoustic assessment of the proposed development has been carried out in accordance with the requirements of Bankstown City Council DCP.

An environmental noise survey of the site has been conducted and the noise limiting criteria for mechanical plant/equipment noise emission has been determined based on the EPA NGLG. The limits are presented in Table 4.

Construction for glazing, external walls and the roof/ceiling systems have been provided to achieve the internal noise criteria and are detailed in Section 3.1 and Section 3.2.

Providing the recommendations in this report are implemented, the noise from the proposed development is predicted to comply with acoustic requirements of the Bankstown City Council DCP, EPA noise limits, BCA Part F5 and relevant Australian Standards.

5. APPENDIX A – ACOUSTIC TERMINOLOGY

Appendix A – Acoustic Terminology

Decibel, dB: A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 micro Pascals.

A-WEIGHTING: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA). The A-weighted sound level is also called the noise level.

Sound Pressure Level, L p (dB), of a sound: 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Ambient Noise/Sound: All noise level present in a given environment, usually being a composite of sounds from many sources far and near. Traffic, HVAC, masking sound or even low-level background music can contribute to ambient level of noise or sound.

Percentile Level - L 90 , L 10 , etc: A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L 90 is the level which is exceeded for 90% of a measurement period. L 90 is commonly referred to as the "background" sound level.

Background Noise (L 90): The sum total of all unwanted residual noise generated from all direct and reflected sound sources in a space that can represent an interface to, or interfere with good listening and speech intelligibility.

Rating Background Level – RBL: Method for determining the existing background noise level which involves calculating the tenth percentile from the L A90 measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

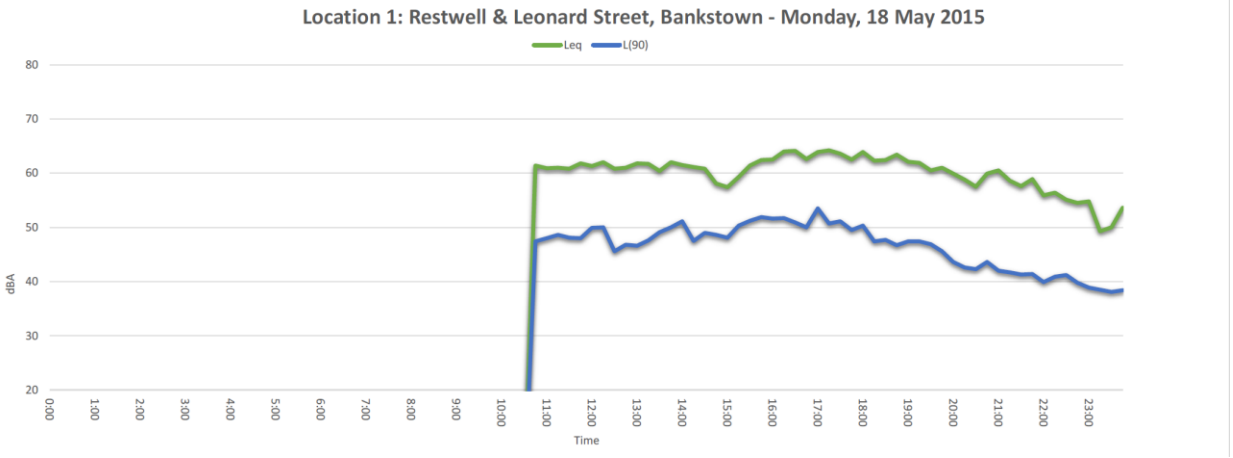
L AEQ,T : Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

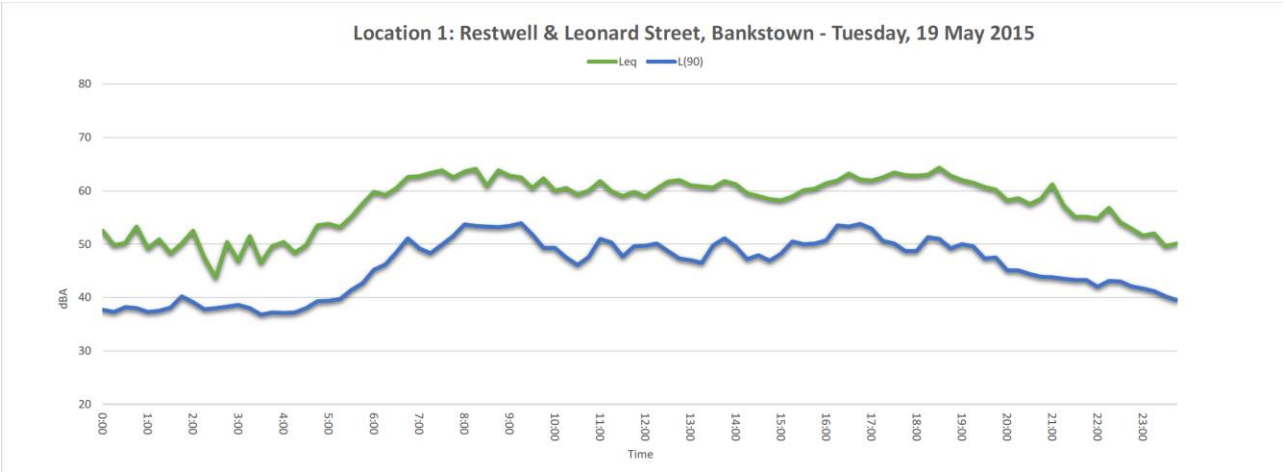
6. APPENDIX B – ARCHITECTURAL DRAWINGS

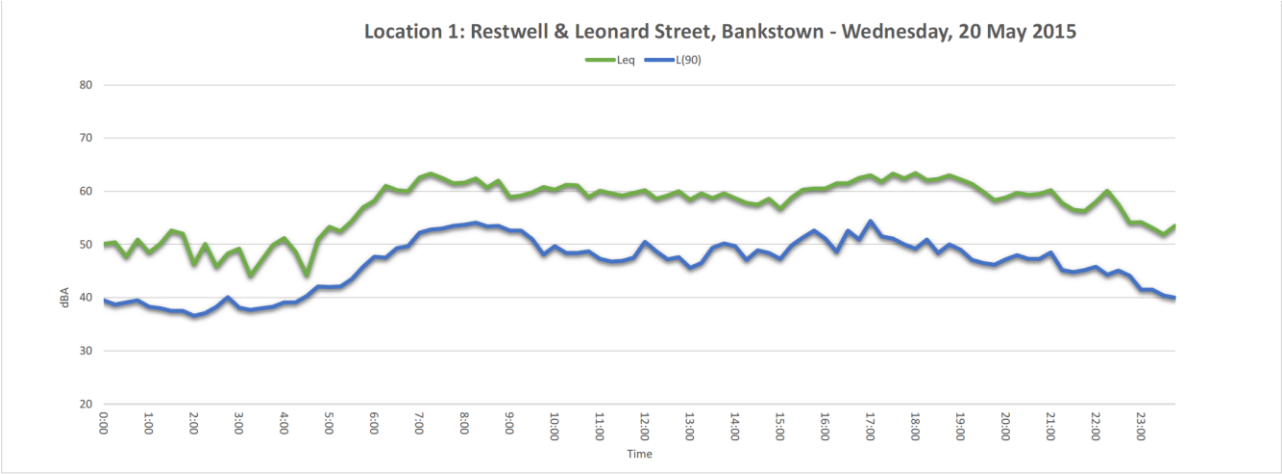
This assessment was based on the following architectural drawings provided by Marchese Partners.

Drawing	Issue	Date	Description
DA 01.01	A	22.05.15	Cover Sheet
DA 01.02	A	22.05.15	Locality Plan
DA 01.03	A	22.05.15	Site Survey
DA 01.04	A	22.05.15	Site Analysis
DA 02.01	A	22.05.15	Site Plan
DA 02.02	A	22.05.15	Basement L2
DA 02.03	A	22.05.15	Basement L1
DA 02.04	A	22.05.15	Ground Floor
DA 02.05	A	22.05.15	Typical Floor Plan Level 1-5
DA 02.06	A	22.05.15	Floor Plan Level 6
DA 02.07	A	22.05.15	Roof Plan
DA 03.01	A	22.05.15	North & Leonard Street Elevations
DA 03.02	A	22.05.15	South & Restwell Street Elevations
DA 04.01	A	22.05.15	Sections

7. APPENDIX C – NOISE LOGGER RESULTS



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Leq
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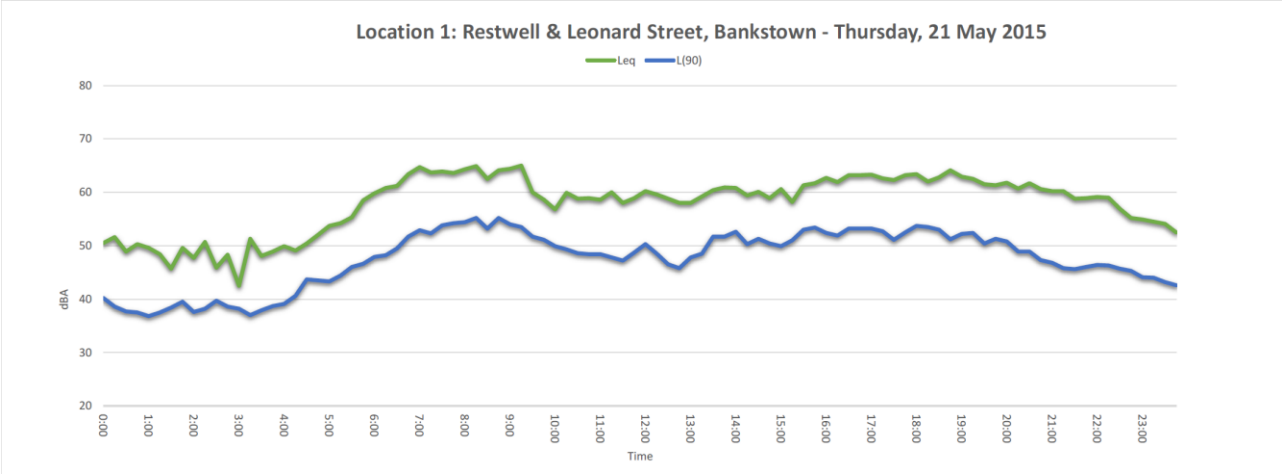
dBA
Time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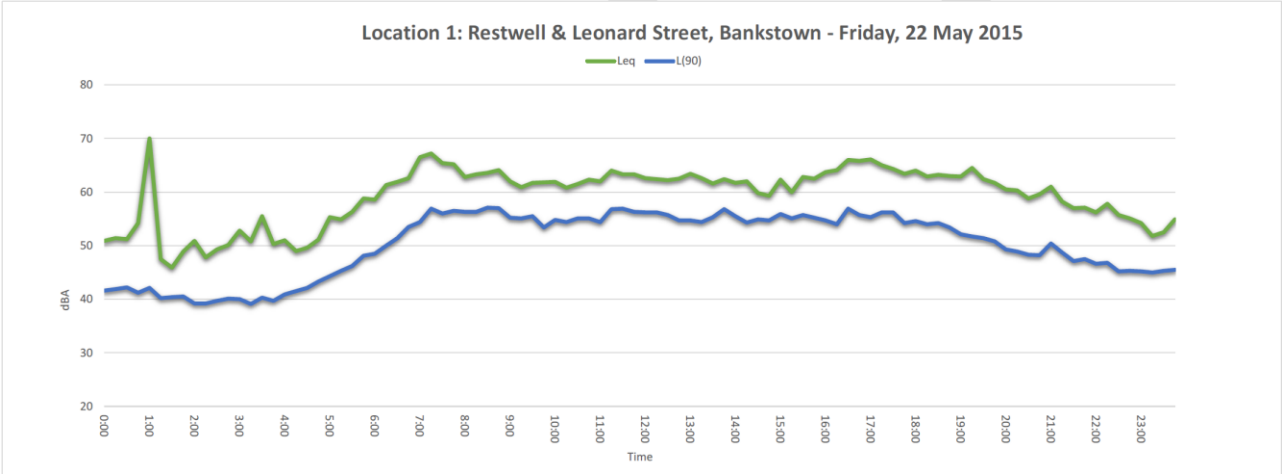
dBA
Time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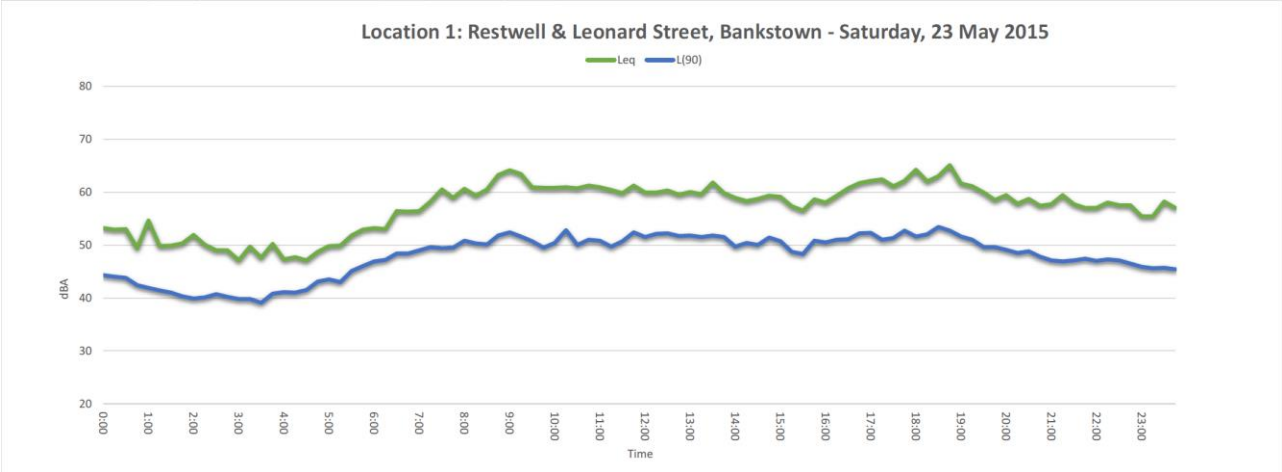
dBA
Time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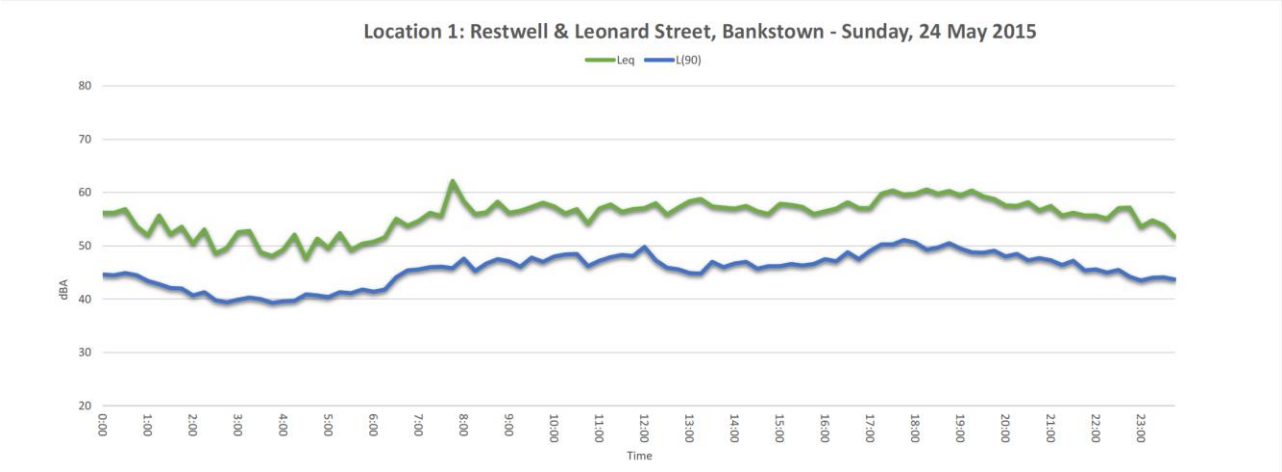
Time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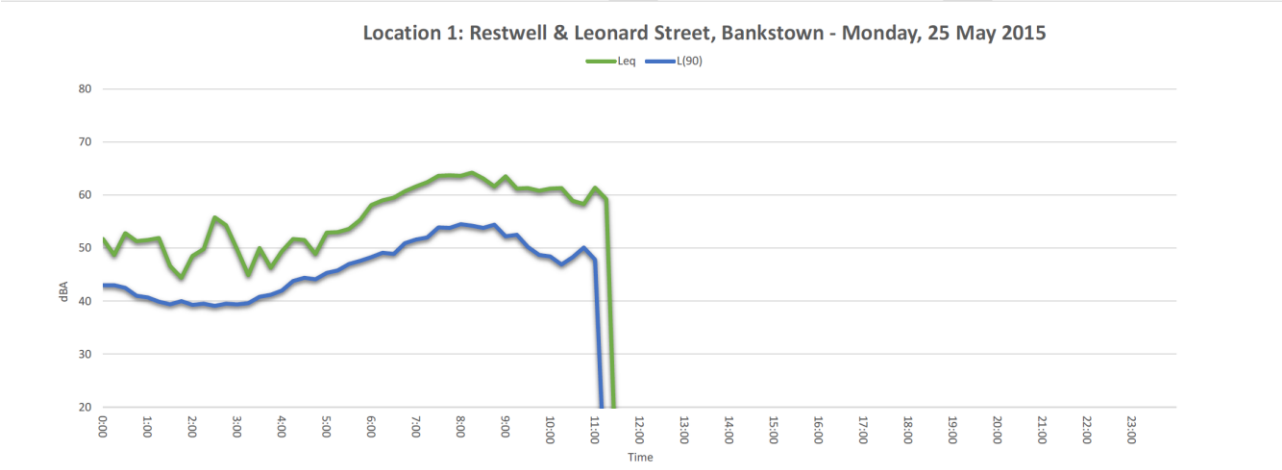
dBA
Time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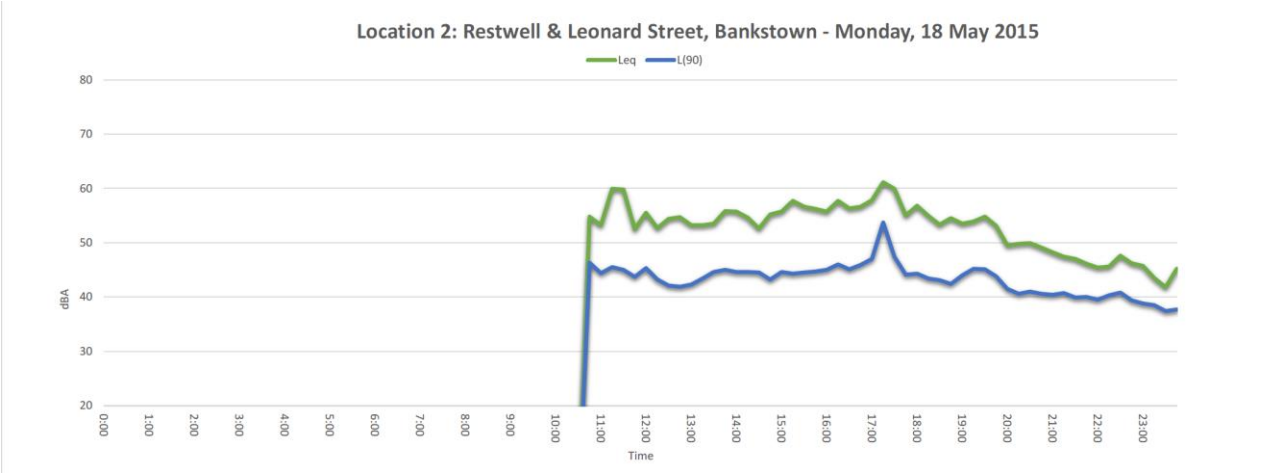
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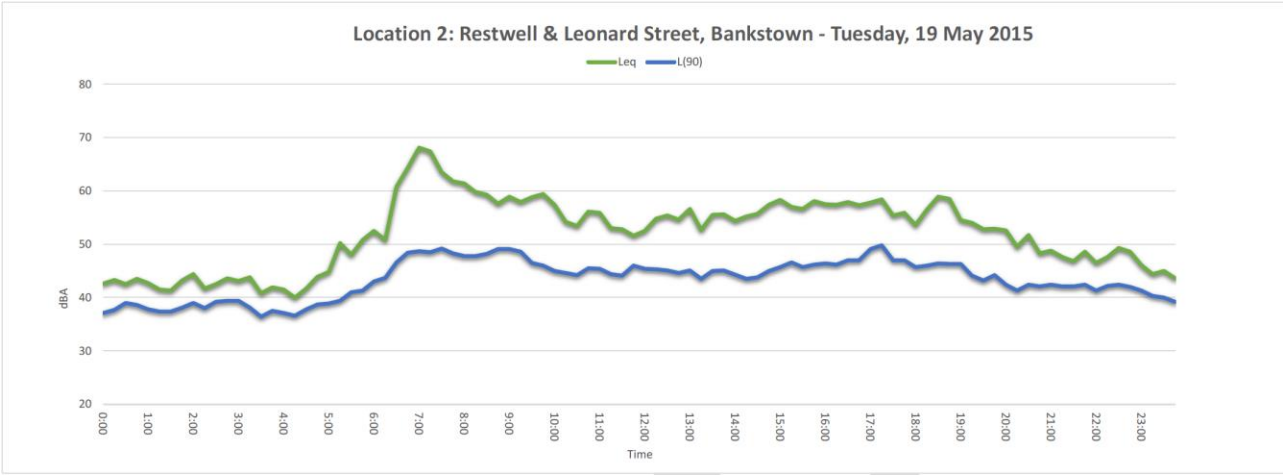
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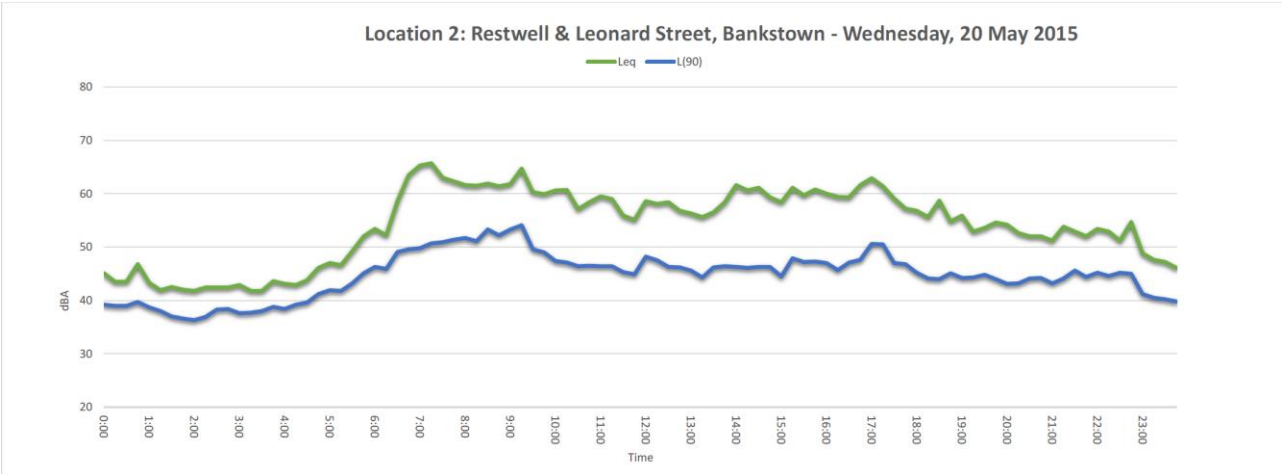
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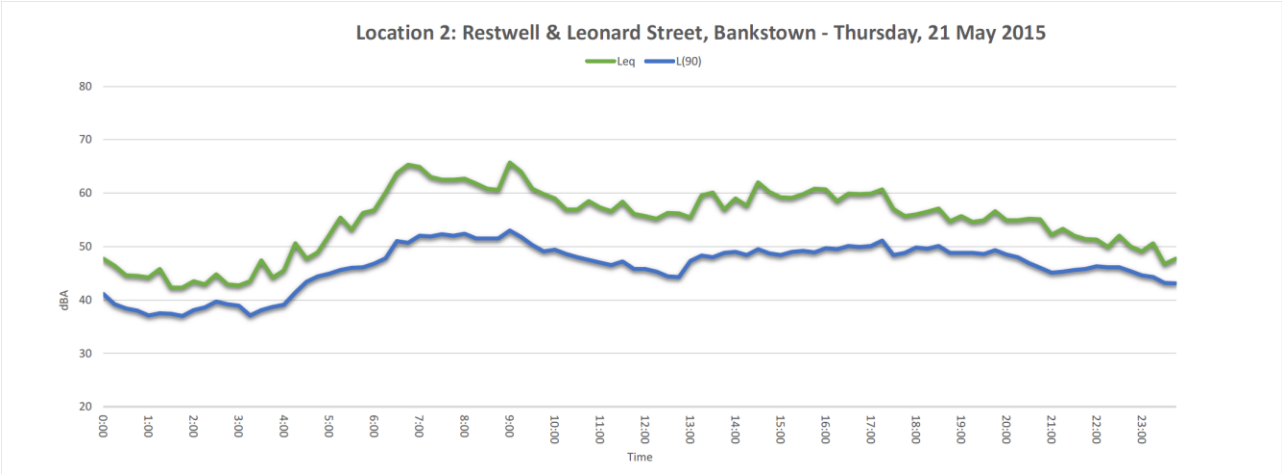
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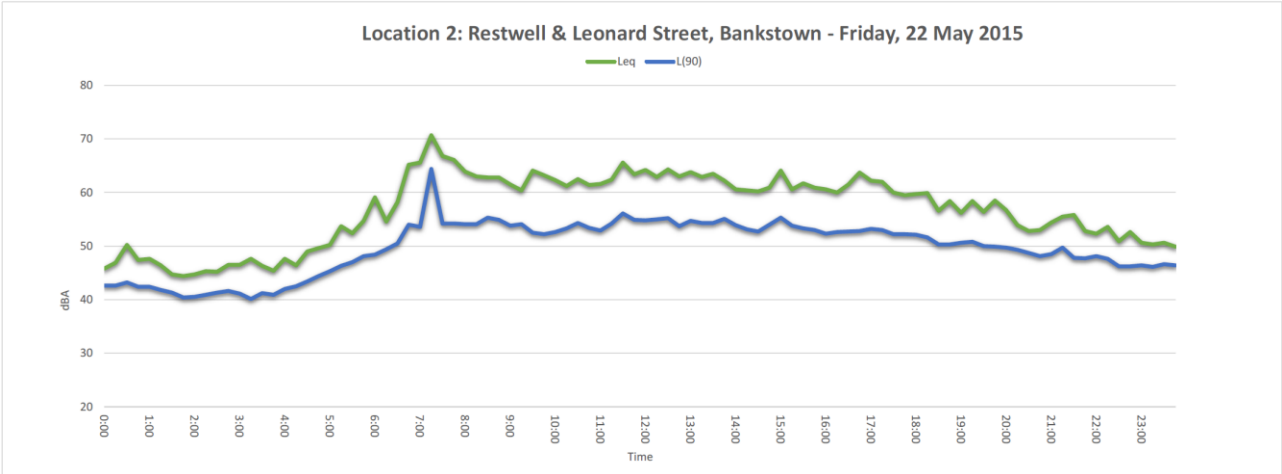
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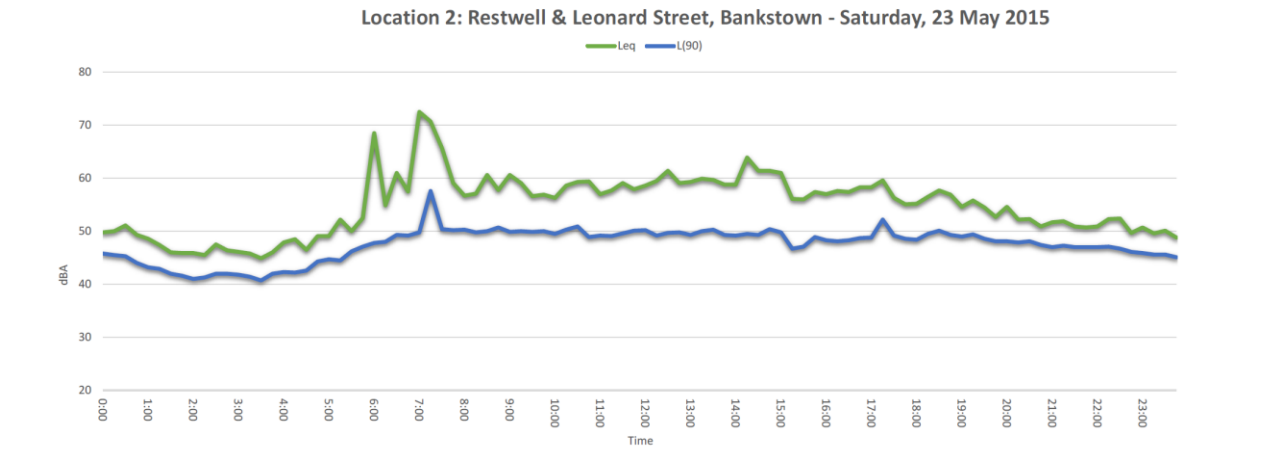
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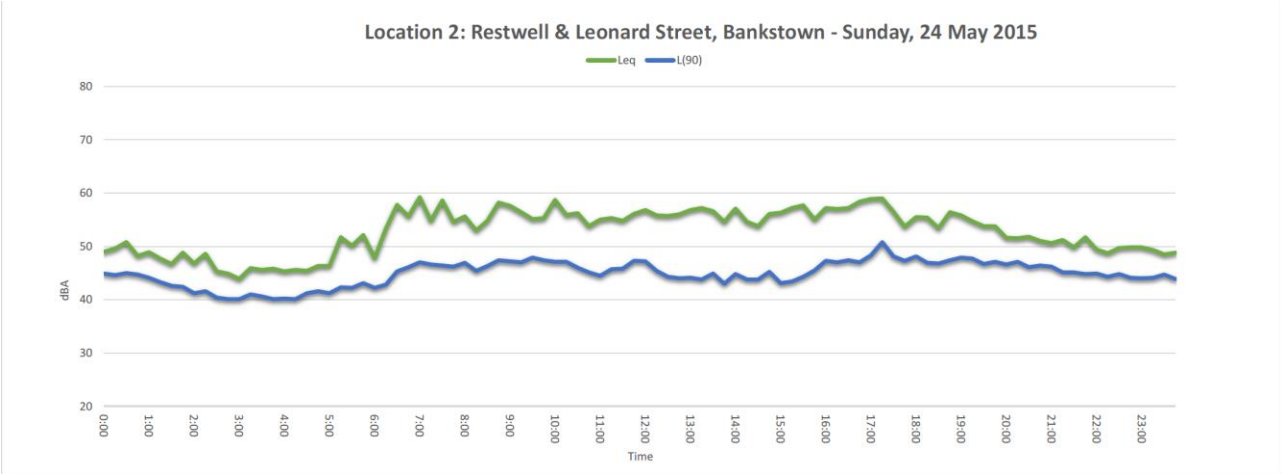
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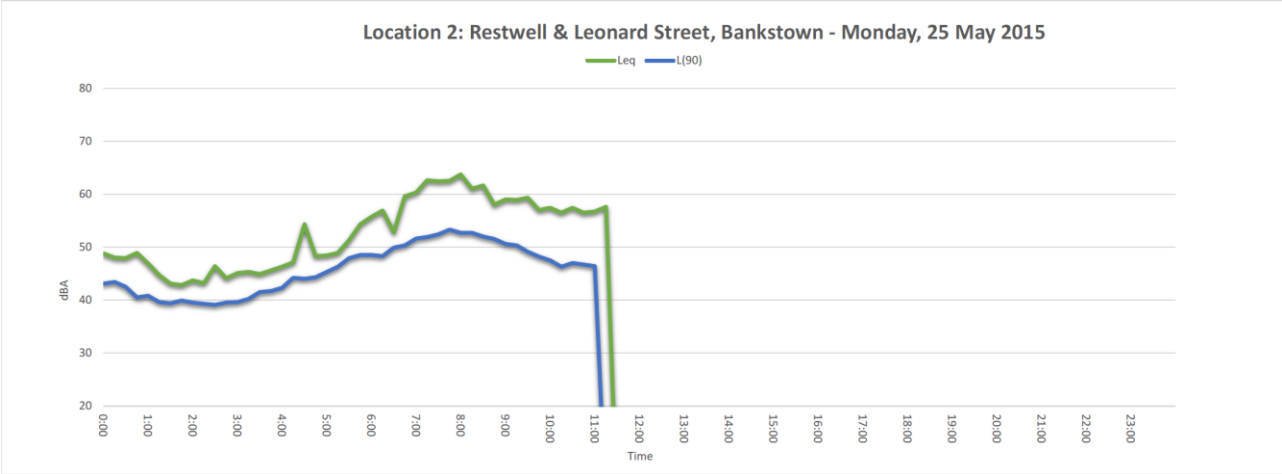
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