Harbour Rocks Hotel, The Rocks, Sydney

Acoustic Assessment

Report Number 610.17605-R01

15 November 2017

TMG Argyle P/L + AMCO Argyle P/L

c/- TMG Developments

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Bondi Junction

NSW 2022

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Harbour Rocks Hotel, The Rocks, Sydney

Acoustic Assessment

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1 INTRODUCTION

SLR Consulting Australia Pty Limited (SLR) has been engaged to conduct an acoustic assessment of the proposed refurbishment at the Harbour Rocks Hotel at 34-52 Harrington Street, The Rocks, Sydney.

The report discusses the criteria for noise emissions from the development with respect to construction and operational noise sources, addresses the noise impact from the development onto the nearest noise sensitive receivers, and provides conceptual recommendations where required to support a State Significant Development Application (SSDA).

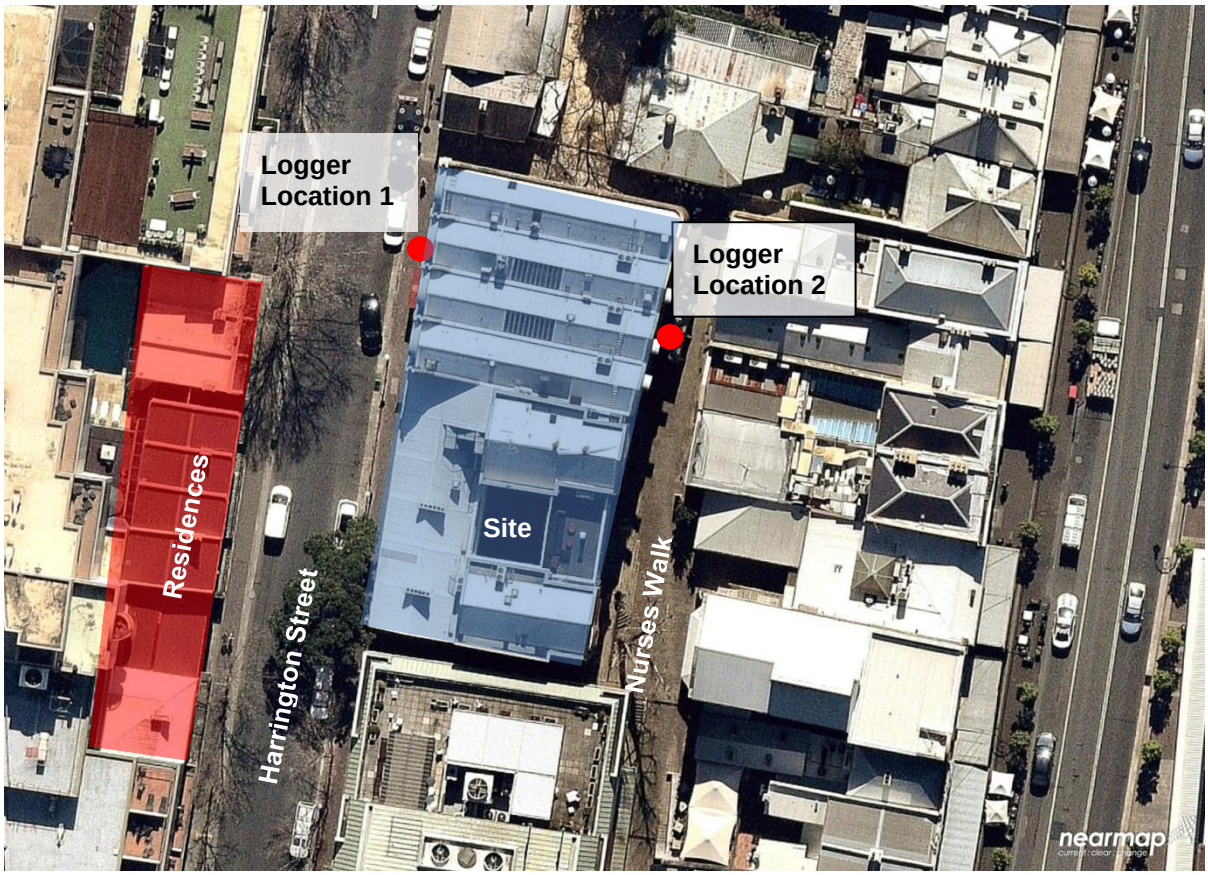
Acoustic terminology used in this report is summarised in **Appendix A**.

2 SITE DESCRIPTION

The proposed refurbishment works comprise the conversion of an existing restaurant, a separate cafe and an office space on the ground floor of the Harbour Rocks Hotel into a single bar / restaurant premises. At the same time it is also proposed to reconstruct the veranda on Nurses Walk. The proposed operational times for the new bar / restaurant are 6:30 am to 12:00 am, Monday to Sunday. Background music is proposed inside the restaurant and on the veranda. This is intended playback music at a low level to enable comfortable conversation between patrons over the music and to avoid generating disturbance to the hotel guest rooms above.

Figure 1 below identifies the site, surroundings, noise monitoring logger locations and the location of the nearest identified residences.

Figure 1 Site Aerial Layout and Noise Monitoring Locations



The site is currently observed to be surrounded by the following receivers:

- Commercial use buildings to the north;
- Commercial use buildings (mostly shops and cafes) to the east across Nurses Walk;
- Commercial use buildings to the south; and
- Residential buildings (including the Rendezvous Hotel) across Harrington Street.

3 EXISTING ACOUSTIC ENVIRONMENT

In order to characterise the existing acoustic environment of the area, noise monitoring was conducted between Monday 11 September 2017 and Wednesday 20 September 2017 at the locations shown in **Figure 1**. Instrumentation for the survey comprised two SVAN 957 noise loggers (Serial Numbers 20668 and 27522) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current manufacturer calibration certificates.

Logger locations 1 and 2 were selected to measure the ambient noise levels at the site in order to establish external noise emission criteria for the development.

Charts presenting summaries of the measured daily noise data are attached in **Appendix B**. The charts present each 24 hour period and show the L_{A10}, L_{Aeq} and L_{A90} noise levels in 15 minute intervals.

4 ASSESSMENT CRITERIA

4.1 Secretary's Environmental Assessment Requirements (SEARs)

Due to the heritage status of the site and surroundings the development is classified as State Significant. As a result, the relevant noise assessment criteria are those identified in the SEARs for the refurbishment of the Harbour Rocks Hotel at The Rocks[1].

Item 7 (Noise) of the SEARs states:

> *Provide a Noise and Vibration Assessment in accordance with the relevant EPA guidelines. This assessment must detail construction noise impacts and consider any potential operational noise impacts on nearby noise sensitive receivers and outline proposed noise mitigation and monitoring issues.*

4.2 Construction

4.2.1 Construction Noise

The NSW Environmental Protection Authority (EPA) *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) contains procedures for the management of noise in relation to construction activities for residential and other sensitive receivers by defining Noise Management Levels (NMLs) and how they are applied.

A summary of the derivation of the relevant NMLs from the ICNG is contained in **Table 1**, **Table 2** and **Table 3**.

[1] Letter SSD 8687 from the Department of Planning & Environment, Planning Services dated 14/09/17

Table 1 Interim Construction Noise Guideline (Residents)

Time of day	Management level $L_{Aeq(15minute)}$	How to apply
Recommended standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

Table 2 Interim Construction Noise Guideline (Other than Residents)

Land Use	Management Level, $L_{Aeq(15minute)}$ (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of worship	Internal noise level 45 dBA
Active recreation areas[1]	External noise level 65 dBA
Passive recreation areas[2]	External noise level 60 dBA
Community Centres	Depends on the intended use of the centre Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

Note1: Characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.

Note 2: Characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation.

Table 3 Interim Construction Noise Guideline (Commercial and Industrial Premises)

Land Use	Management Level, $L_{Aeq(15minute)}$
Office, retail outlets	External noise level 70 dBA

4.2.2 Construction Vibration

The works are not expected to require the use of vibration intensive plant items, such as rock-breakers, therefore the potential vibration impacts from the works are anticipated to be negligible and are not considered any further in this report.

4.3 Mechanical Plant Noise

The NSW EPA *Industrial Noise Policy* (INP) provides a framework and process for deriving noise criteria. The INP criteria for industrial noise sources (including air-conditioning and mechanical plant but excluding patron noise) have two objectives:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

The intrusiveness criterion requires the equivalent continuous noise level (L_{Aeq}) of the source to not be more than 5 dB above the measured Rated Background Level (RBL), over any 15 minute period.

The amenity criterion is based on land use and associated activities and their sensitivity to noise emission (the area surrounding the Harbour Rocks Hotel falls under the 'Urban' area classification). If the existing ambient noise level approaches the INP amenity criteria, then noise levels from new industrial-type noise sources, (including mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would exceed the amenity criteria as defined in the INP.

The noise monitoring results have been processed in accordance with the INP to determine project specific noise emissions criteria. The INP intrusive and amenity criteria for nearby residential premises are presented in **Table 4**. These criteria are nominated for the purpose of assessing potential noise impacts from the proposed development.

For each assessment period, the more stringent of the amenity or intrusive criteria have been adopted, as highlighted and marked in bold in **Table 4**. In this case, as is common for developed areas and constant noise sources such as mechanical plant, the applicable criteria are the amenity criteria.

Table 4 INP Noise Emissions Criteria for Receivers Surrounding the Development, dB

Receiver	Time of Day	Intrusiveness		Amenity		
		RBL $L_{A90(15min)}$[1]	**Criteria $L_{Aeq(15min)}$**	**ANL[2] $L_{Aeq(period)}$**	**Measured $L_{Aeq(period)}$**	**Criteria $L_{Aeq(period)}$[3]**
Residences on Harrington Street	Day	58	63	60	67	**57**
	Evening	57	62	50	66	**56**
	Night	54	59	45	63	**53**
Commercial	When in use	-	-	-	-	**65**

Note 1: RBL = Measured "Rating Background Level".

Note 2: ANL = "Acceptable Noise Level" for residences in Urban areas as per INP.

Note 3: Assuming existing noise levels are unlikely to decrease in the future.

4.4 Patron Noise

The Director of Liquor and Gaming is responsible for dealing with disturbance complaints made in relation to hotels and other licensed venues. The EPA Noise Guide for Local Government identifies that noise conditions can be imposed on licensees by the Director and identifies the following typical currently imposed condition:

The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8,000 Hz inclusive) by more than 5 dB between 07:00 am and 12:00 midnight at the boundary of any affected residence.

The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8,000 Hz inclusive) between 12:00 midnight and 07:00 am at the boundary of any affected residence.

This is a minimum standard. In some instances the Director may specify a time earlier than midnight in respect of the above condition.

Interior noise levels which exceed safe hearing levels are in no way supported or condoned by the Director.

These criteria are applicable to noise emissions from activities related to the restaurant, such as combined patron and music noise. Octave band spectral criteria for each assessment period have been summarised in **Table 5** based on the results of the noise survey measurements.

Table 5 L_{10} patron noise limits for licensed premise at the boundary of any affected residence

Time Period	Octave Band Centre Frequency (Hz), dB[1]								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
7:00 am to 12:00 am	60	60	64	62	58	52	46	39	30
6:00 am to 7:00 am	56	55	59	57	54	47	41	35	26

Note 1: The above limits are linear (i.e., non-weighted).

5 ASSESSMENT AND RECOMMENDATIONS

5.1 Construction Noise

The proposed construction works to demolish and re-construct the veranda area on Nurse's Walk are understood as proposed to take place during standard working hours. Due to the location and limited extent of the works it is understood that the majority of the work will be undertaken using manual labour/hand tools.

The immediately surrounding properties, those most exposed to construction work noise, are all observed to be commercial in nature, i.e., retail shops and cafés; as such they are less sensitive to noise.

The proposed works are low in intensity, limited in duration and can be expected to generate low levels of noise. Through considered management of the works it is expected that construction noise and vibration levels can be readily controlled to meet the relevant limits.

5.2 Mechanical Plant

It is understood that an existing (currently capped off and unused) roof duct with a new fan is to be used to supply fresh air ventilation. This duct is located on the roof of the building on the Nurses Walk side.

The mechanical services design has not yet been finalised. In lieu of this data, as a conservative approach, SLR has assumed a mushroom type rooftop fan with noise levels of 50 dB L_{Aeq} at 3 m. On this basis the mechanical services noise levels at the commercial receivers approximately 8 m away on the opposite side of Nurses Walk are predicted to be approximately 40 dB L_{Aeq} and, therefore, compliant with the INP criteria presented in **Table 4**.

The residences on the opposite side of Harrington Street are some 30 m from the fan location and afforded significant screening due to the intervening hotel building. Noise from the new fan is predicted to be less than 20 dB L_{Aeq} at these properties, comfortably beneath the INP criteria.

5.3 Patron/Entertainment Noise

The Nurses Walk façade of the restaurant comprises four sets of openable double doors which open onto a small veranda. The following assumptions form the basis of the predicted patron/entertainment noise levels.

- Internal reverberant noise levels (including background amplified music) of 75 dB L_{A10}.
- Restaurant operating hours of 6:30 am to 12:00 am.
- Doors facing Nurses Walk may remain open through the entire operating period.
- Speakers on the veranda, if any, shall be limited to provide background ambient levels only - sufficient to enable patrons to enjoy comfortable speech (i.e., without the need to raise their voices).

The residences on the opposite side of Harrington Street are some 35 m from the Nurse's Walk façade and afforded significant screening due to the intervening hotel building.

Due to the distance and significant acoustic screening, patron/entertainment noise from the restaurant and veranda is predicted to be less than 20 dB L_{Aeq} at these properties, comfortably beneath the project criteria.

6 CONCLUSION

SLR has assessed noise emissions associated with the proposed refurbishment at the Harbour Rocks Hotel in Sydney.

This assessment has identified that the construction and operational noise emissions associated with the development are predicted to comply with the identified project criteria at the surrounding receivers.

Acoustic Terminology

1 Sound Level or Noise Level

The terms "sound" and "noise" are almost interchangeable, except that in common usage "noise" is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide

range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2E-5 Pa.

2 "A" Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120 110	Heavy rock concert Grinding on steel	Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerbside of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to quiet
40 30	Inside private office Inside bedroom	Quiet to very quiet
20	Unoccupied recording studio	Almost silent

Other weightings (e.g. B, C and D) are less commonly used than A weighting. Sound Levels measured without any weighting are referred to as "linear", and the units are expressed as dB(lin) or dB.

3 Sound Power Level

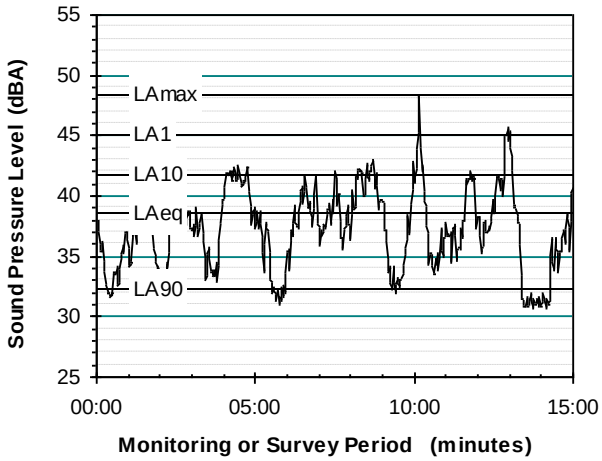
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 1E-12 W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating the statistical indices.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq Is the A-weighted equivalent continuous noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the "repeatable minimum" LA90 noise level over the daytime and night-time measurement periods, as required by the DECCW. In addition the method produces mean or "average" levels representative of the other descriptors (LAeq, LA10 etc.).

5 Tonality

Tonal noise contains one or more prominent tones (i.e. distinct frequency components), and is normally regarded as more offensive than “broad band" noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

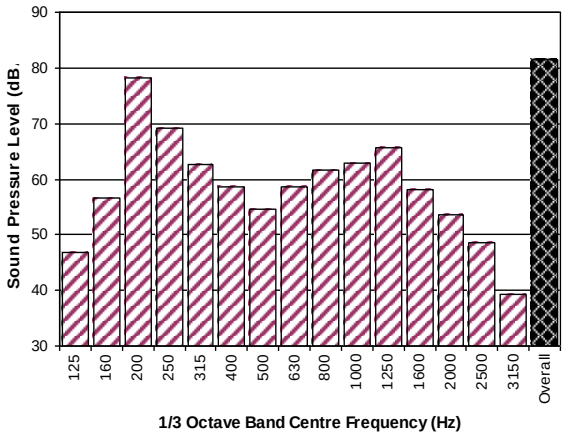
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of “peak” velocity or “rms” velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as “peak particle velocity”, or PPV. The latter incorporate “root mean squared” averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (1E-6 mm/s). Care is required in this regard, as other reference levels are used by some organisations.

9 Human Perception of Vibration

People are able to “feel” vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as “normal” in a car, bus or train is considerably higher than what is perceived as “normal” in a shop, office or dwelling.

10 Overpressure

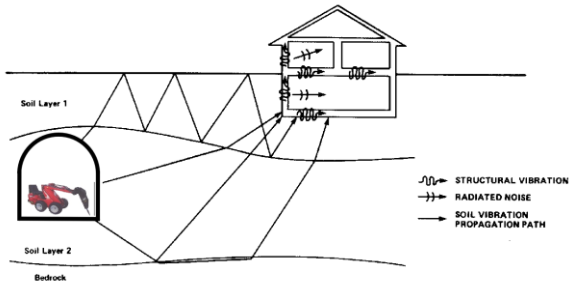
The term “over-pressure” is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (i.e. unweighted), at frequencies both in and below the audible range.

11 Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed “regenerated noise”, “structure borne noise”, or sometimes “ground-borne noise”. Regenerated noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of regenerated noise include tunnelling works, underground railways, excavation plant (e.g. rock breakers), and building services plant (e.g. fans, compressors and generators).

The following figure presents the various paths by which vibration and regenerated noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.

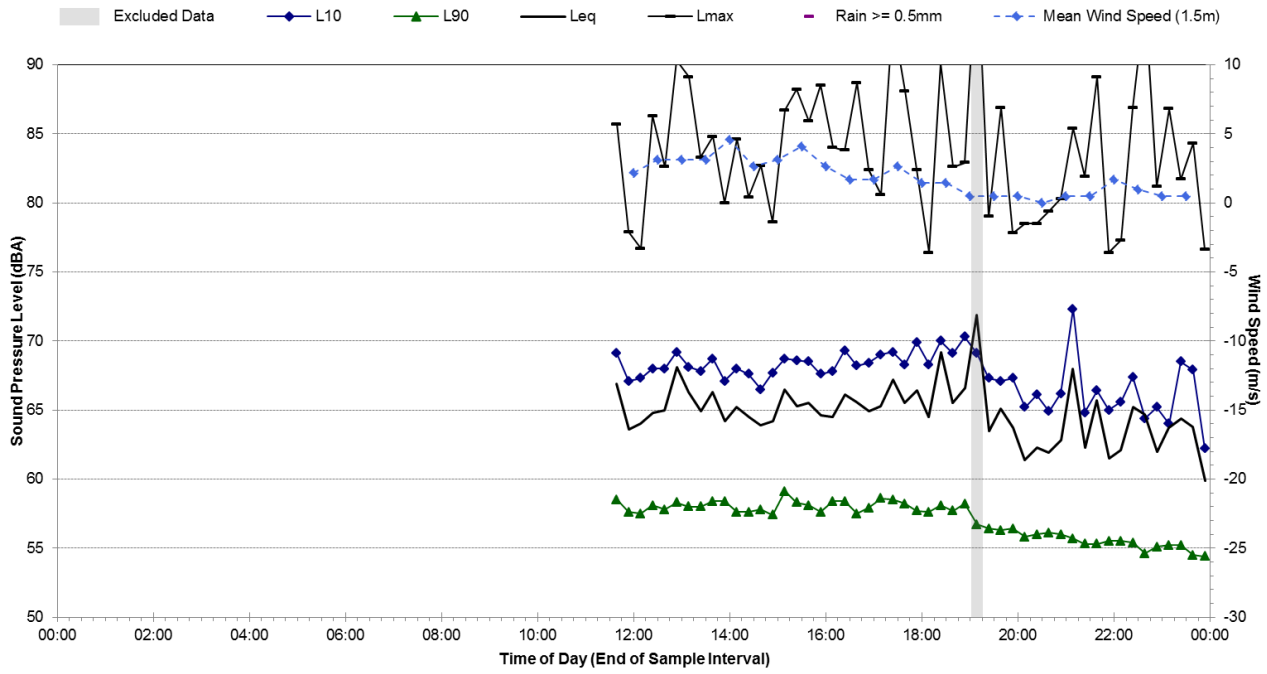


The term “regenerated noise” is also used to describe other types of noise that are emitted from the primary source as a different form of energy. One example would be a fan with a silencer, where the fan is the energy source and primary noise source. The silencer may effectively reduce the fan noise, but some additional noise may be created by the aerodynamic effect of the silencer in the airstream. This “secondary” noise may be referred to as regenerated noise

Architectural Drawings

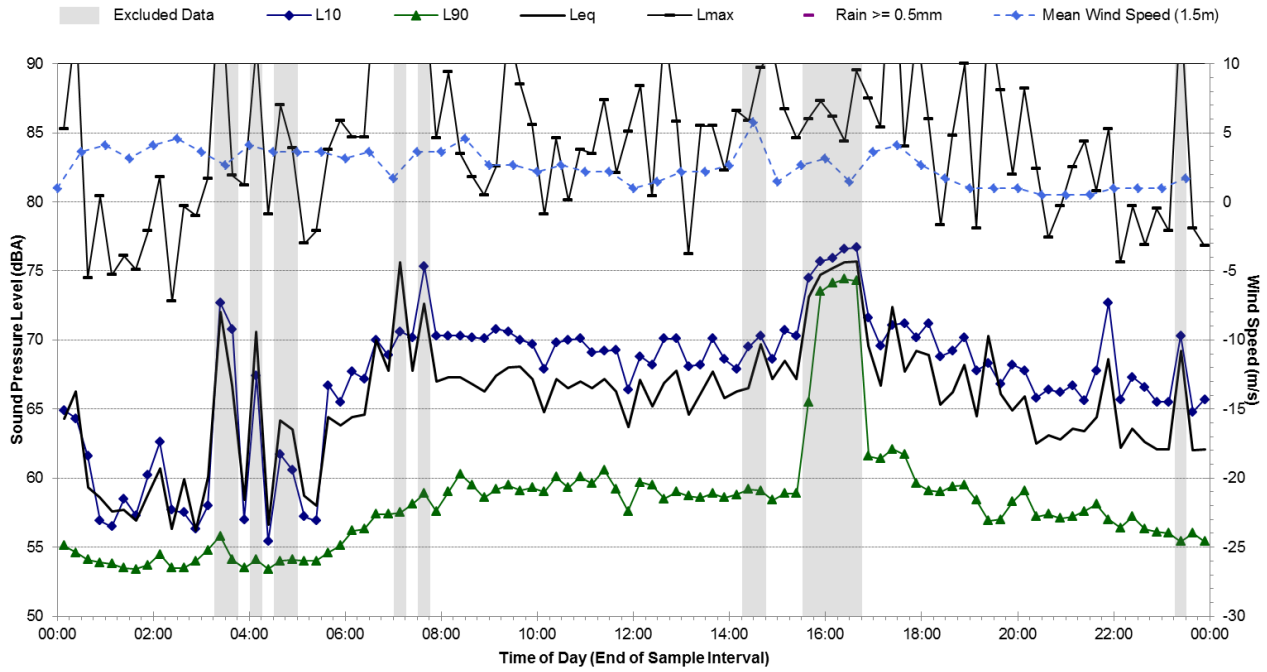
Statistical Ambient Noise Levels

Harrington Street (27522) - Monday, 11 September 2017



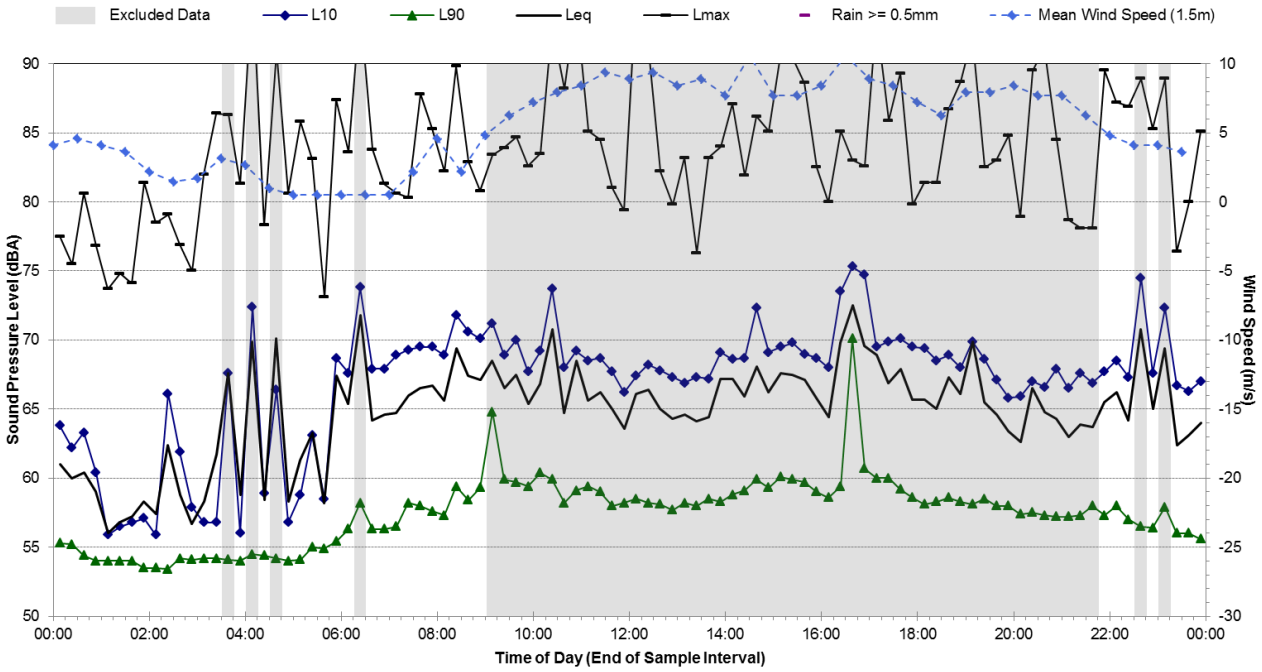
Statistical Ambient Noise Levels

Harrington Street (27522) - Tuesday, 12 September 2017



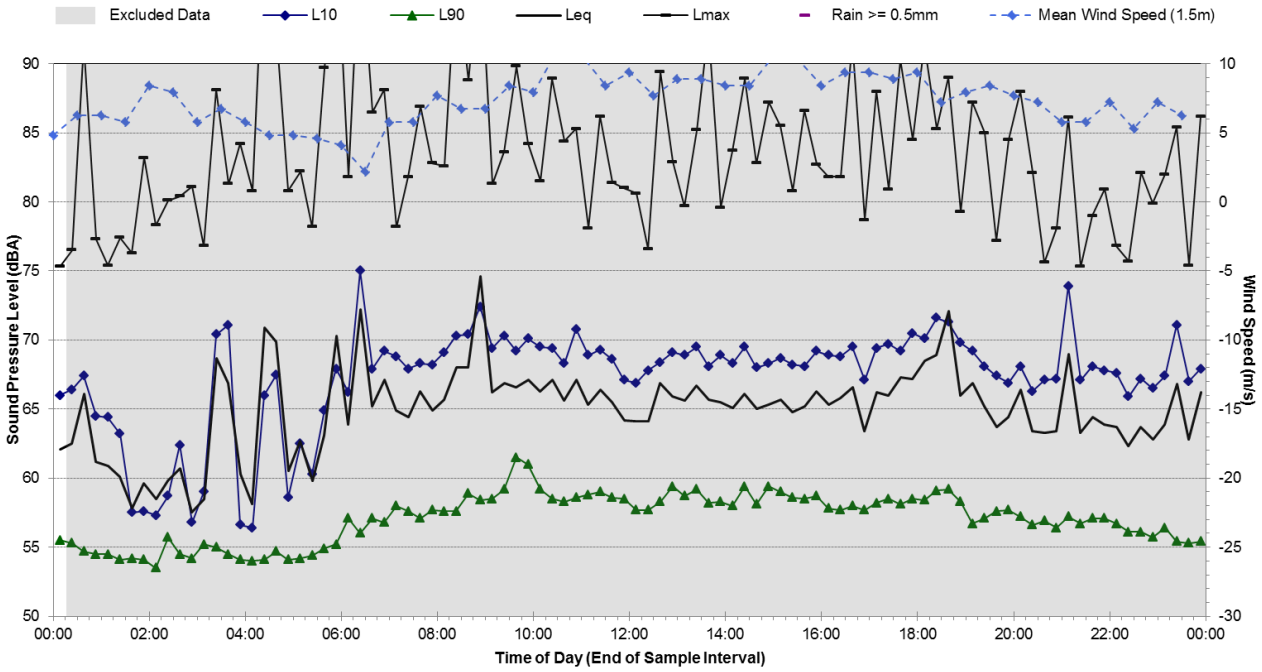
Statistical Ambient Noise Levels

Harrington Street (27522) - Wednesday, 13 September 2017



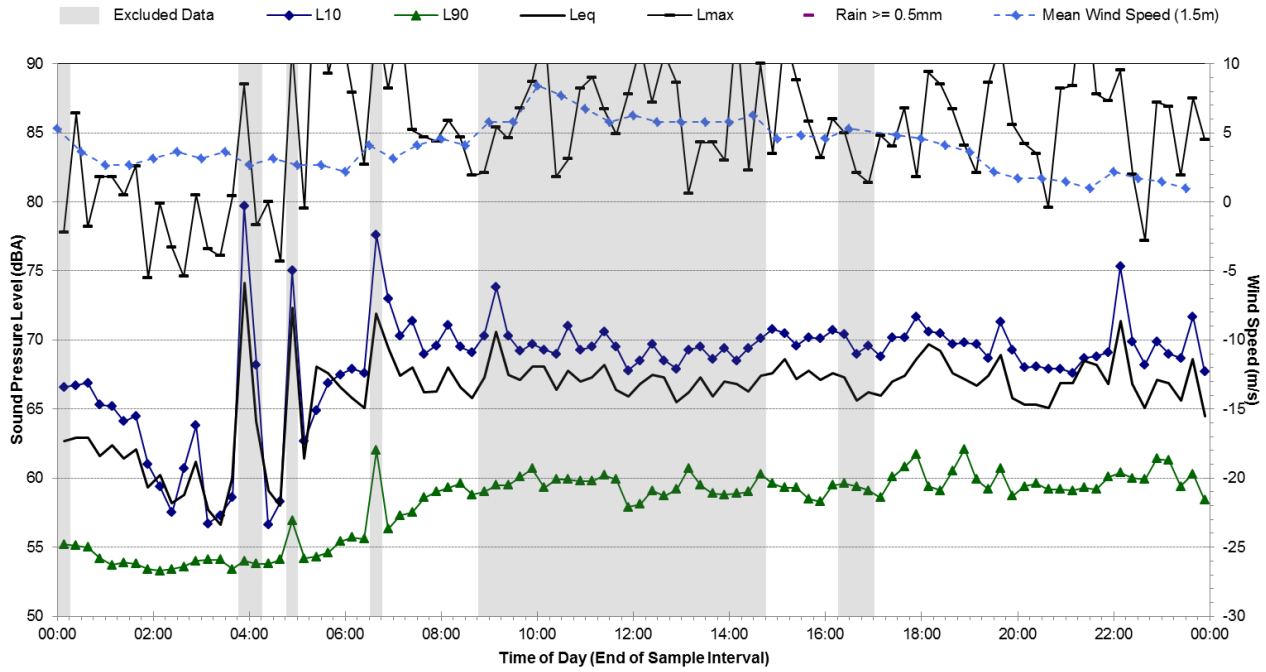
Statistical Ambient Noise Levels

Harrington Street (27522) - Thursday, 14 September 2017



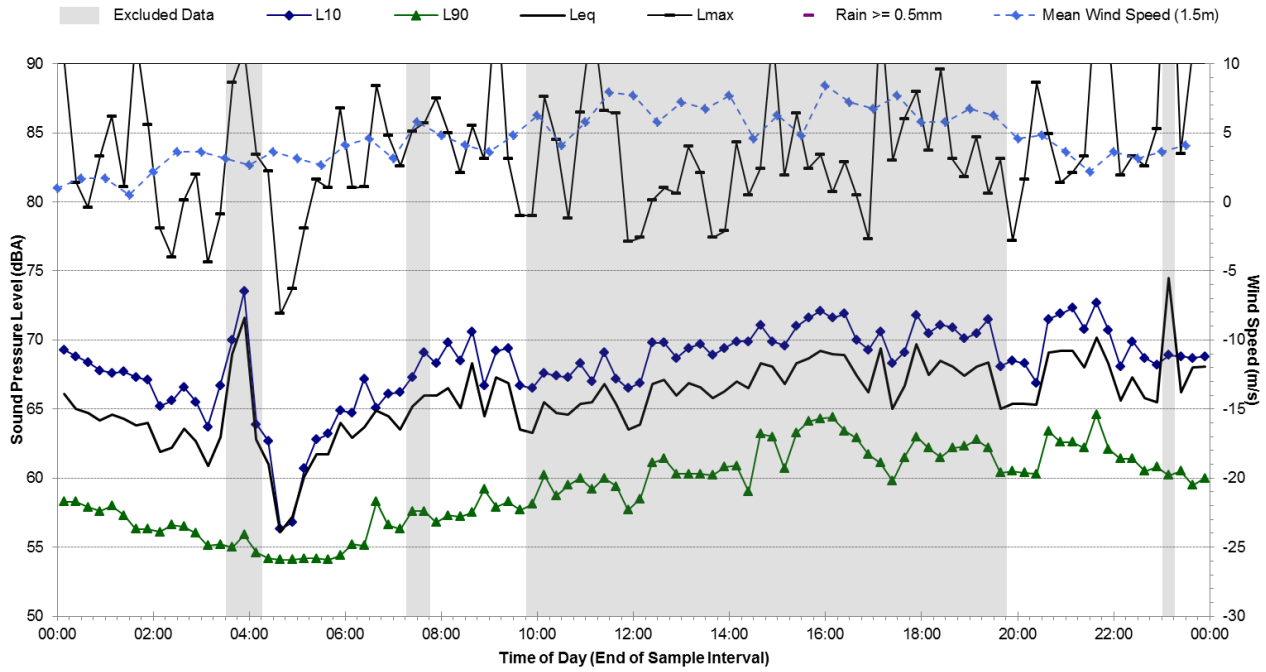
Statistical Ambient Noise Levels

Harrington Street (27522) - Friday, 15 September 2017



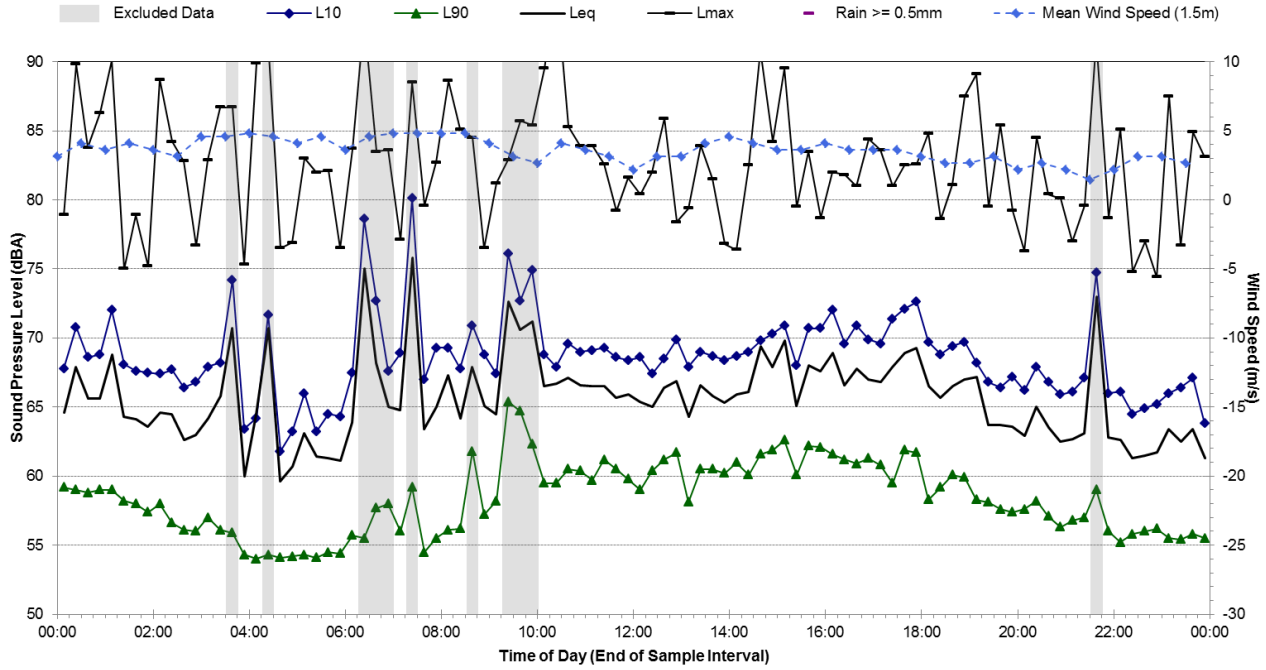
Statistical Ambient Noise Levels

Harrington Street (27522) - Saturday, 16 September 2017



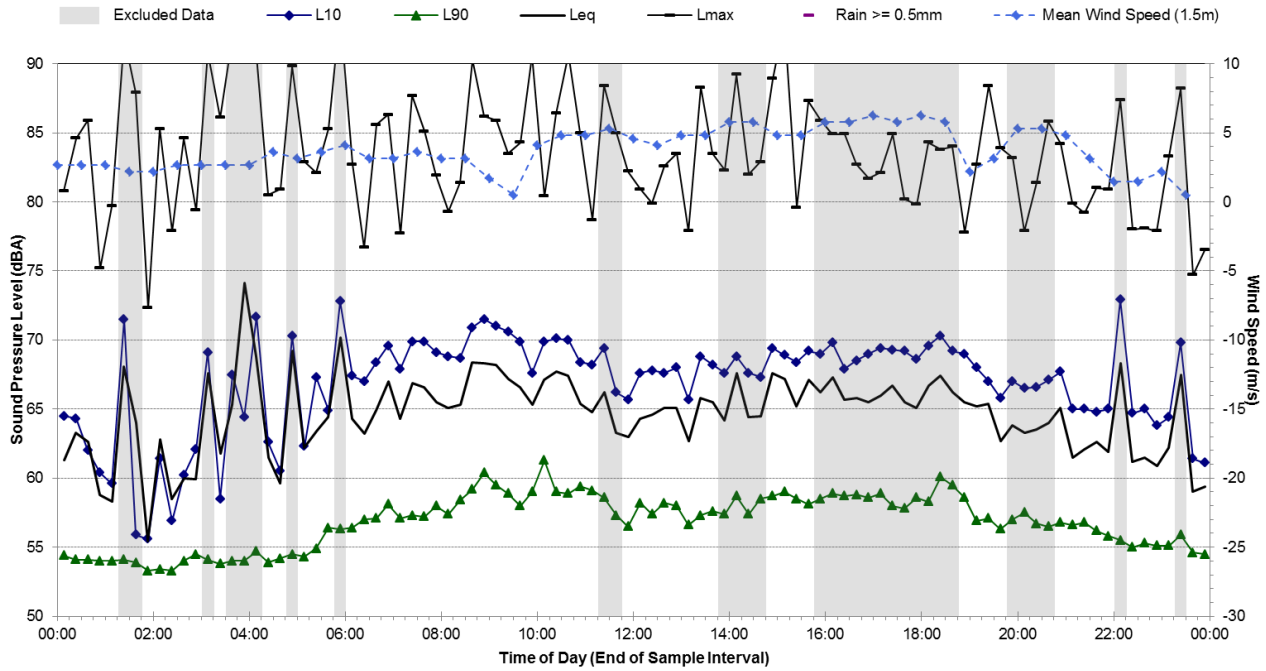
Statistical Ambient Noise Levels

Harrington Street (27522) - Sunday, 17 September 2017



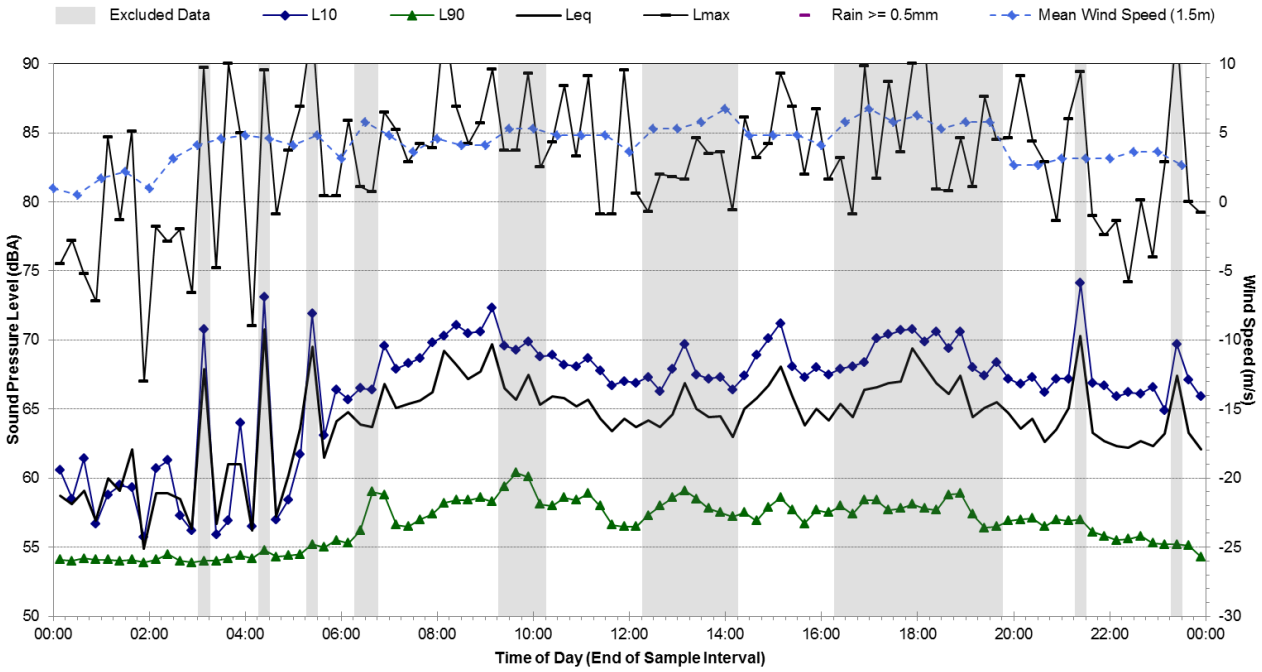
Statistical Ambient Noise Levels

Harrington Street (27522) - Monday, 18 September 2017



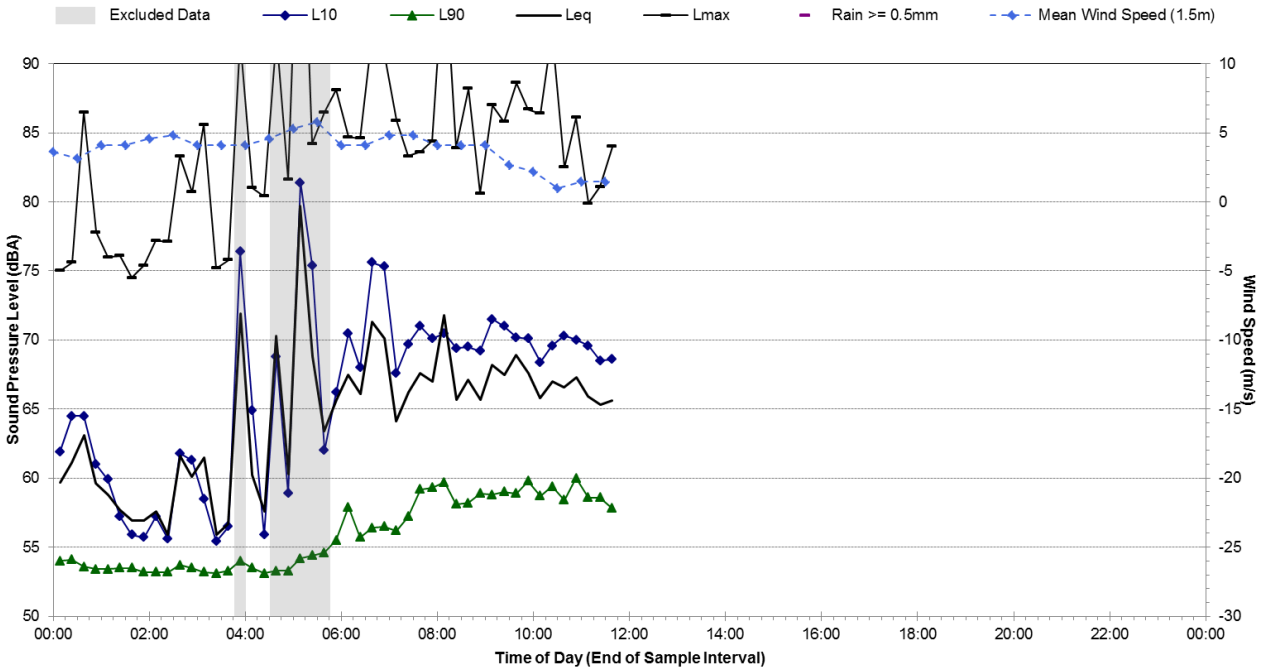
Statistical Ambient Noise Levels

Harrington Street (27522) - Tuesday, 19 September 2017



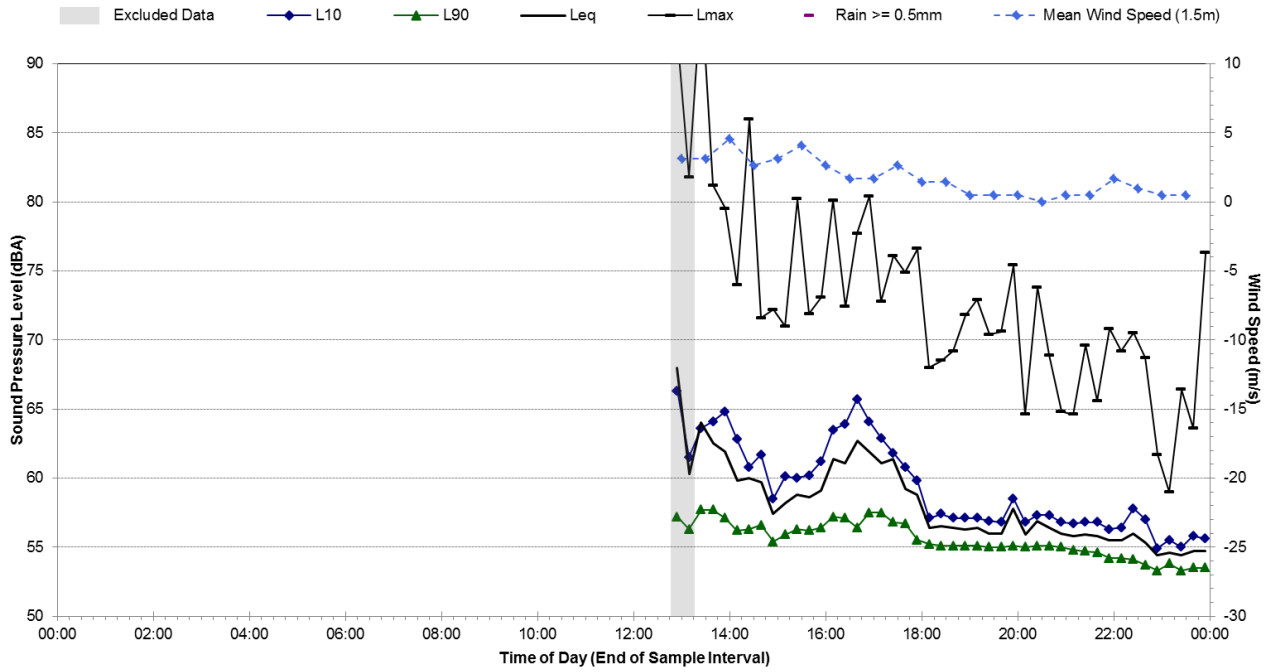
Statistical Ambient Noise Levels

Harrington Street (27522) - Wednesday, 20 September 2017



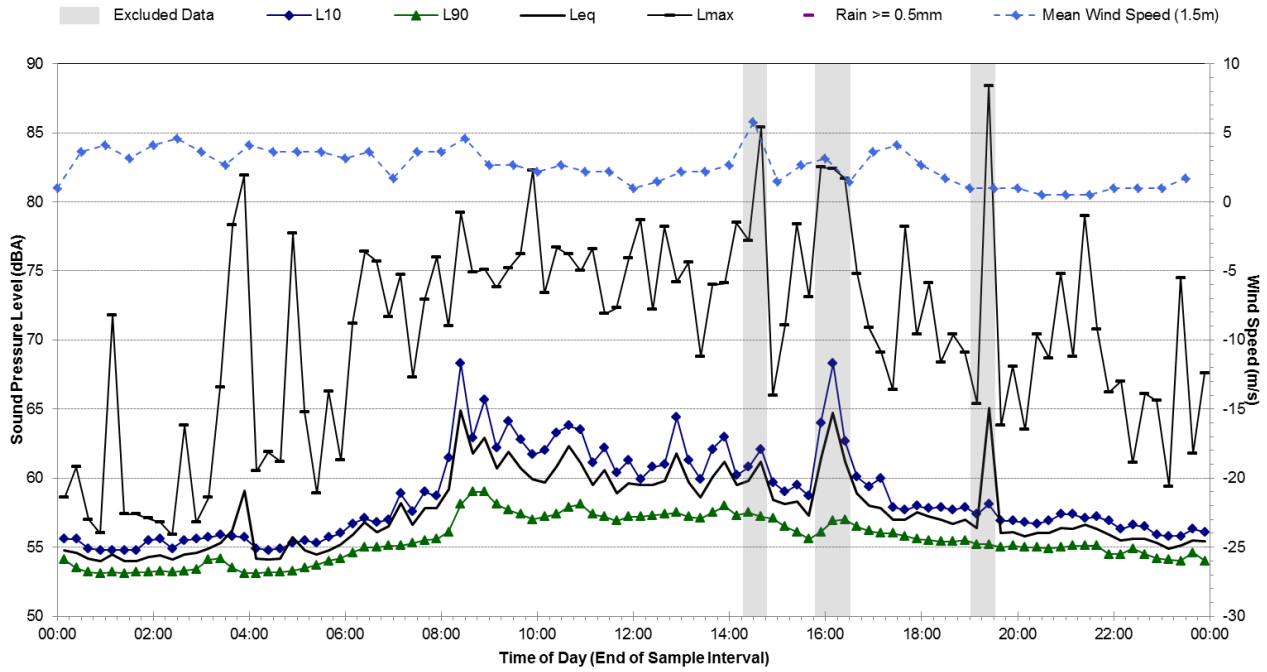
Statistical Ambient Noise Levels

Nurses Walk (20668) - Monday, 11 September 2017



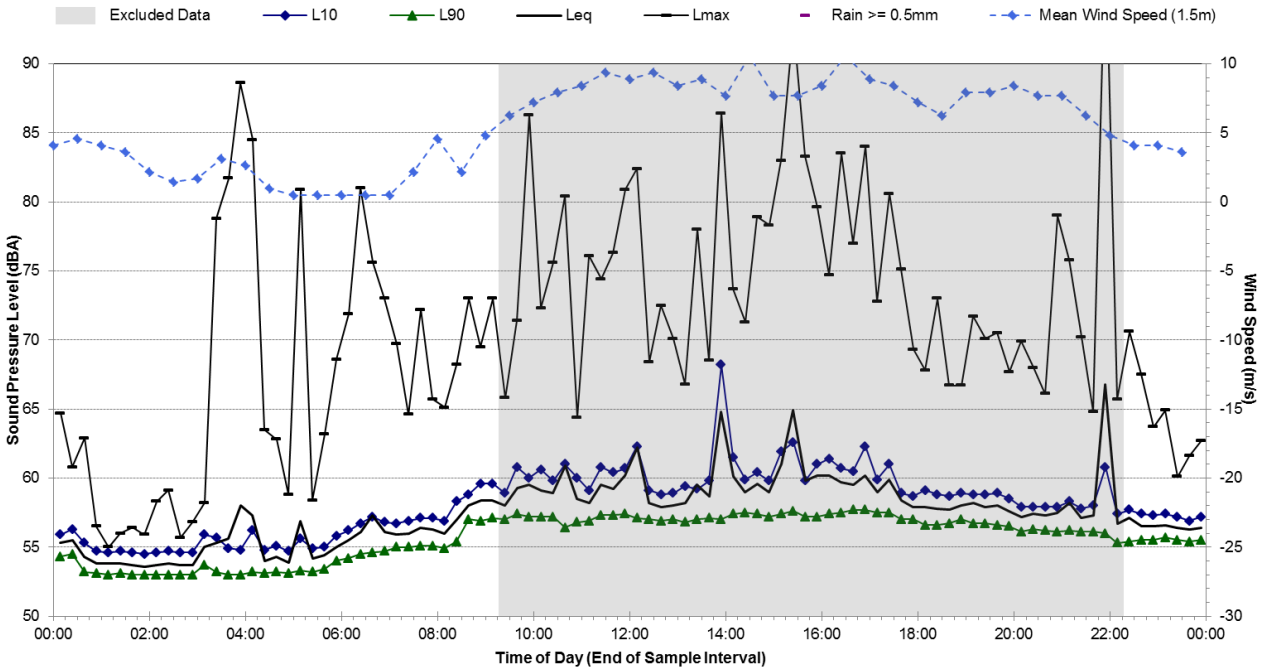
Statistical Ambient Noise Levels

Nurses Walk (20668) - Tuesday, 12 September 2017



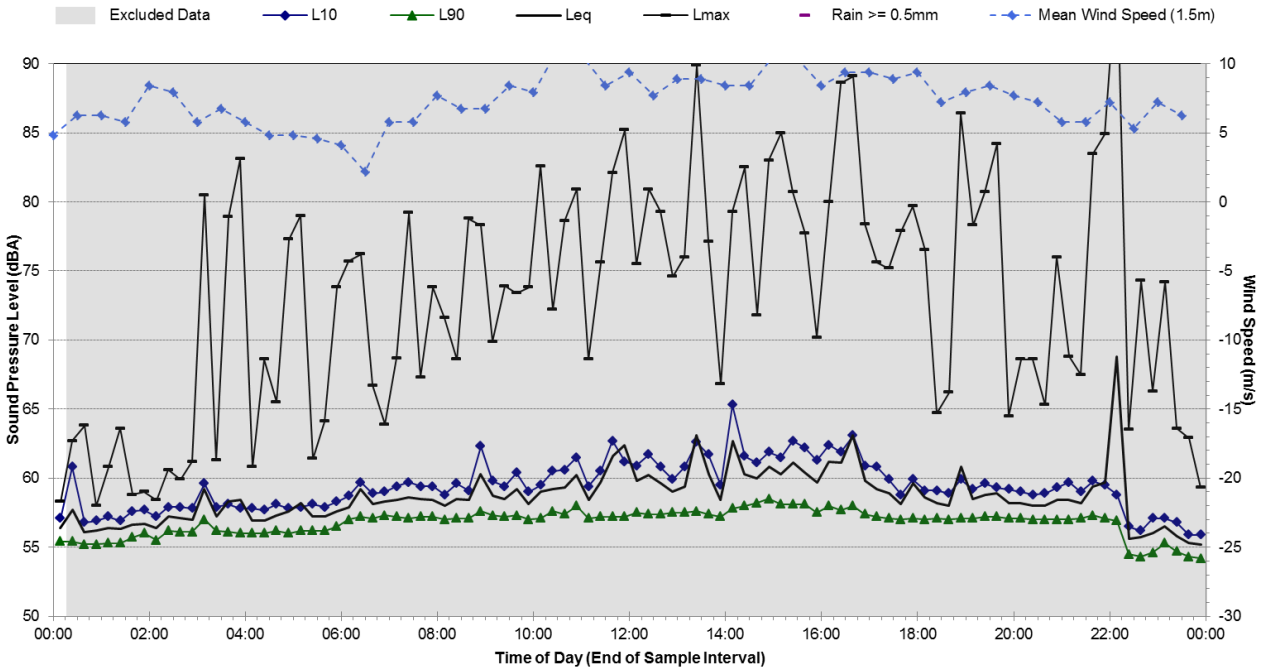
Statistical Ambient Noise Levels

Nurses Walk (20668) - Wednesday, 13 September 2017

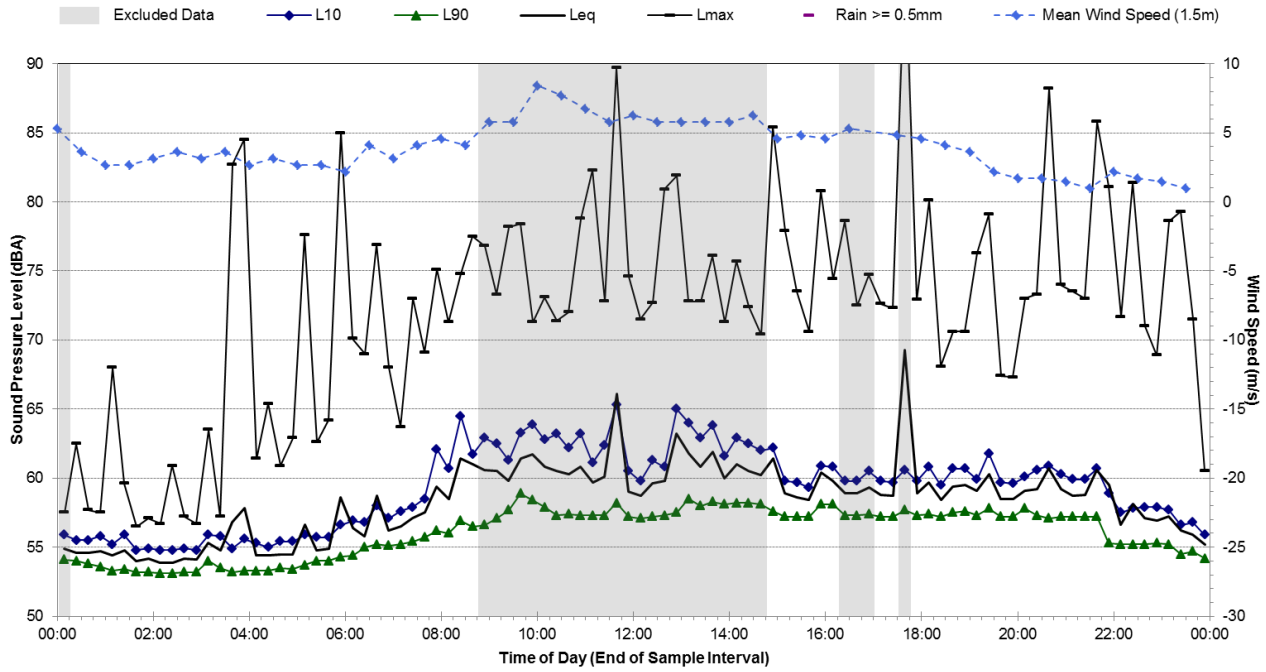


Statistical Ambient Noise Levels

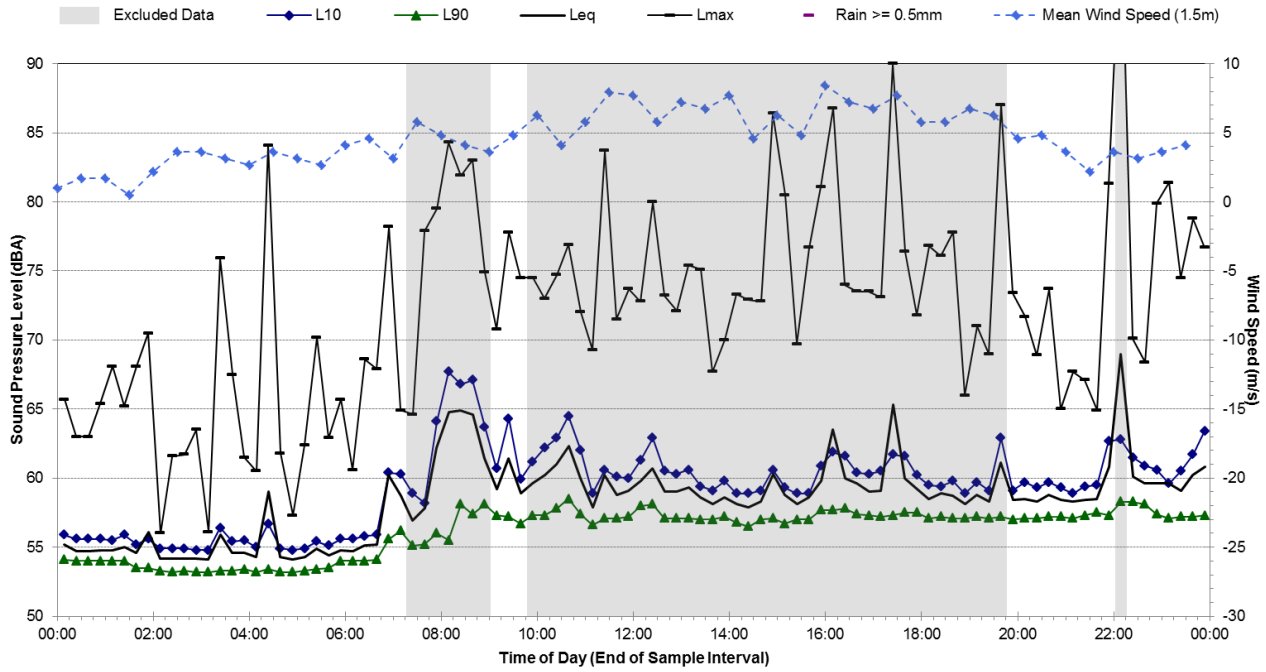
Nurses Walk (20668) - Thursday, 14 September 2017



Statistical Ambient Noise Levels
Nurses Walk (20668) - Friday, 15 September 2017

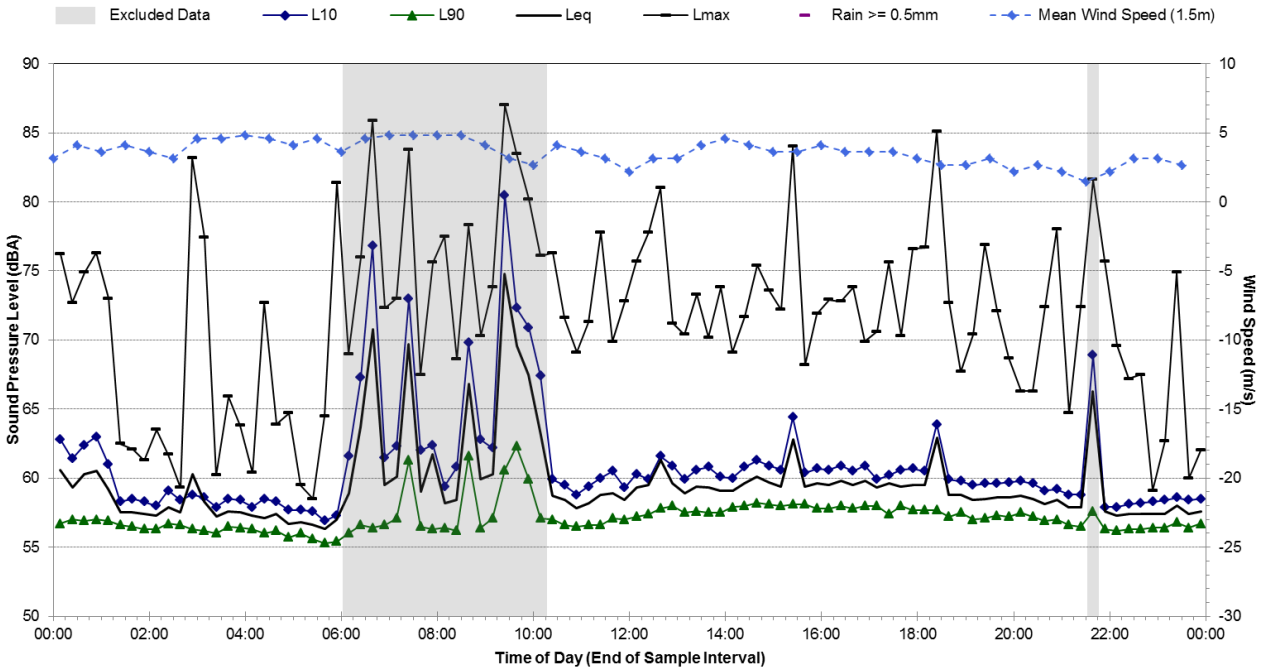


Statistical Ambient Noise Levels
Nurses Walk (20668) - Saturday, 16 September 2017



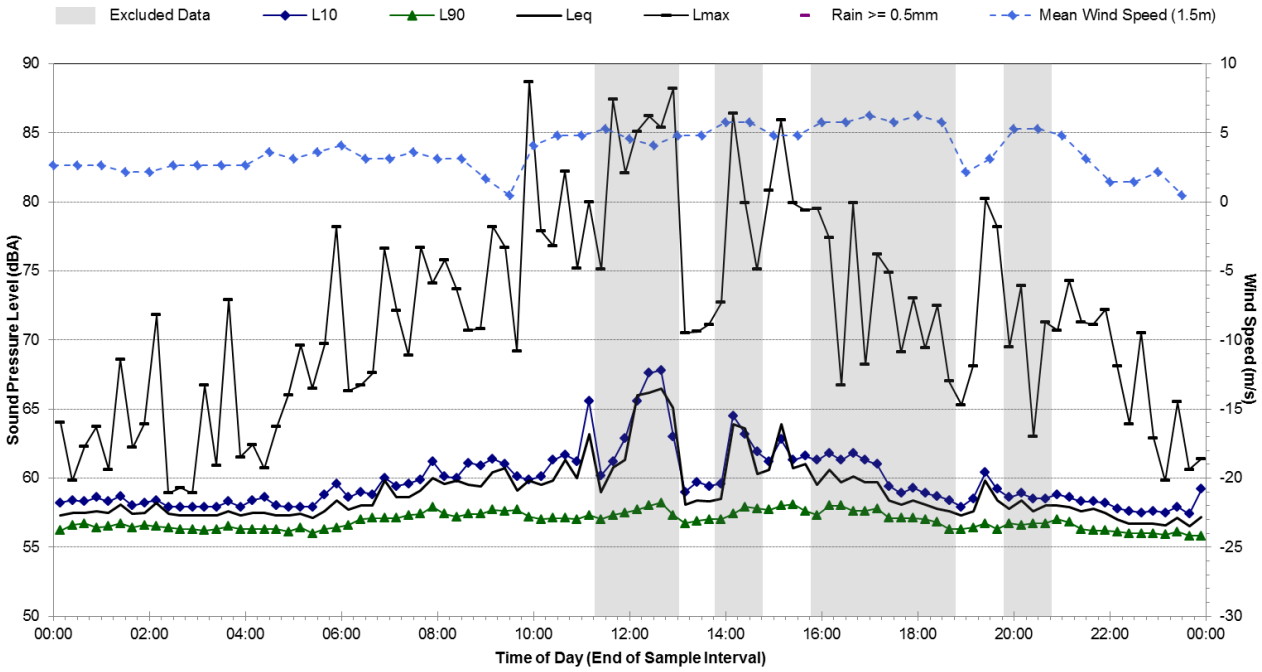
Statistical Ambient Noise Levels

Nurses Walk (20668) - Sunday, 17 September 2017

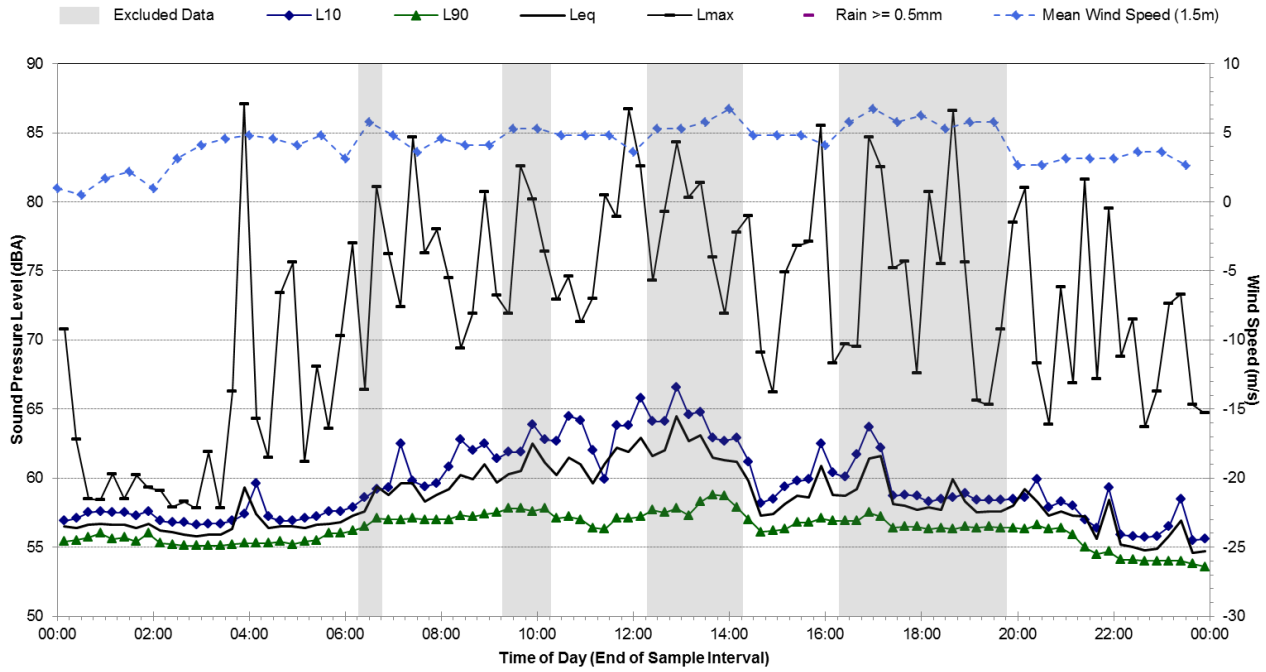


Statistical Ambient Noise Levels

Nurses Walk (20668) - Monday, 18 September 2017



Statistical Ambient Noise Levels
Nurses Walk (20668) - Tuesday, 19 September 2017



Statistical Ambient Noise Levels
Nurses Walk (20668) - Wednesday, 20 September 2017