

Report

8th October 2021



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Report for: Thornton Reynolds

T5281 – Holborn Links Estate – 18-19 Southampton Place (Project 4)
Plant Noise Assessment



Document version control

Version	Date	Author	Reviewed by	Reviewed and approved by
1.0	08/10/2021	Sam Logan	Richard Budesha	Nigel Burton

Report for: **Steve Reynolds**
Thornton Reynolds
10A Lant Street
London
SE1 1QR

Main contributors: **Sam Logan**

Copy to:

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Executive Summary

Temple Group (Temple) has been appointed by Thornton Reynolds Ltd to undertake a preliminary plant noise assessment for equipment proposed as a part of the redevelopment of 18-19 Southampton Place. The office development includes installation of condensers in an external lightwell at basement level.

This report presents criteria for plant noise emissions, the methodology, and results of an external noise survey undertaken at the site to establish the background noise levels in the area. These have been used to assess the impact of the proposed plant on the nearest most sensitive receptors.

Camden Council's policy documents express their requirement that the external Rating Level emitted from the building services plant to be lower than the Background sound level by 10dB (15dB if tonal components are present) at the nearest noise sensitive receptors.

Based on the manufacturer's sound power level data, it is predicted that noise emissions will be adequately controlled during the daytime. During the night-time the plant noise levels will be at least 8dBA below the Background, which can be reduced by 2dBA to comply with Camden Council's noise limits by use of a night-time set back on both condenser units.

1.0 Introduction

Proposals are in place to replace existing plant in the basement level lightwell of 18 Southampton Place as part of the redevelopment of 18-19 Southampton Place. Temple has been appointed to undertake a noise assessment for the new building services plant that would be installed.

The purpose of the noise assessment is to assess the impact on nearby noise sensitive receptors and, where required, to provide outline mitigation measures for further noise attenuation. The assessment has been carried out in line with the guidance from Camden Council and relevant national standards.

The following sections of the report describe criteria for plant noise emissions, assessment methodology and the external noise measurement methodology along with results of the assessment.

The acoustic terminology used in this report is explained in **Appendix A**

2.0 Policy, Standards and Guidance related to Noise Emission Limits

2.1 Standards and Guidance

British Standard 7445 – Description and Measurement of Environmental Noise

British Standard 7445 Part 1 (BS 7455-1:2003)¹ defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.

The methods and procedures described in this British Standard are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site.

British Standard 7445 Part 2 (BS 7455-2:1991)² describes methods for the acquisition of data which provide descriptors that enable:

- a) a description of the environmental noise in a specified area of land to be made in a uniform way;
- b) the compatibility of any land use activity or projected activity to be assessed with respect to existing or predicted noise; and
- c) Using the data as a basis, authorities may establish a system for selecting the appropriate land use, as far as levels of noise are concerned, for a specified area, or the sources of noise - existing or planned - which are acceptable with respect to land use, existing or planned.

British Standard 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

British Standard 4142:2014+A1:2019³ describes methods to use outdoor sound levels to assess the likely effects of sound of an industrial and/or commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

The standard requires determination of the following:

- Rating level - $L_{Aeq,T}$ sound level produced by the specific sound source at the assessment location with any adjustment added to the specific sound level if a tone, impulse or other acoustic characteristic occurs, or is expected to be present.
- Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T.

¹ British Standards Institute (BSI), (2003): 'BS 7445 – Description and Measurement of Environmental Noise. Part 1: Guide to Quantities and Procedures'. BSI, London.

² British Standards Institute (BSI), (1991): 'BS 7445 – Description and Measurement of Environmental Noise. Part 2: Guide to the Acquisition of Data Pertinent to Land Use'. BSI, London.

³ British Standards Institute (BSI), (2014+A1:2019): 'BS 4142 – Methods for rating and assessing industrial and commercial sound

- T_r is the reference time interval over which the specific sound level is determined. This is 1-hour for daytime (07:00-23:00 h) and 15-minutes for night-time (23:00-07:00 h).

An estimate of the impact of the specific sound generated can be obtained by subtracting the measured background sound level from the rating level, and the following is considered:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The assessment methodology considers the Specific Sound Level, as measured or calculated at a potential noise sensitive receptor, due to the sound under investigation. A correction factor is added to this level to account for the acoustic character of the sound as follows:

- Tonality – A correction of up to 6dB depending on the prominence of tones;
- Impulsivity – A correction of up to 9dB depending on the prominence of impulsivity;
- Other sound characteristics – A 3dB correction may be applied where a distinctive acoustic character is present that is neither tonal nor impulsive;
- Intermittency – A 3dB correction may be applied where the specific sound has identifiable on-off conditions.

All pertinent factors should be taken into consideration when assessing the impact, including the following:

- Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor.

2.2 Local Authority Requirements

Camden Local Plan 2017

The Camden Local Plan⁴ was adopted by council on the 3rd of July 2017. It replaces the core strategy and Camden Development Policies as the basis for planning decisions and future development in Camden.

Policy A1 Managing the Impact of development states:

“The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity”

Noise and vibration levels are factors that are considered under Policy A1.

Policy A4 Noise and vibration states:

“The council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden’s Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

- *Development likely to generate unacceptable noise and vibration impacts; or*
- *Development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.”

Appendix 3 of the Camden Local Plan 2017 sets out the noise thresholds for industrial and commercial noise sources, it states the following:

“A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ (BS 4142) will be used. For such cases a ‘Rating Level’ of 10 dB below background (15 dB if tonal components are present) should be considered as the design criterion.

⁴ Camden Local Plan, 2017. Camden Council

Table 2.1 Camden Local Plan Appendix 3 Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing noise sensitive receptor	Assessment location	Design period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Dwellings	Garden used for main amenity (free field) and outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings	Outside bedroom window (façade)	Night	'Rating level' 10dB below background and no events exceeding 57dBL _{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL _{Amax}	'Rating level' greater than 5dB above background or events exceeding 88dBL _{Amax}

2.3 Consultation

On Wednesday 21st April, Richard Budesha, a consultant at Temple contacted the Camden Council noise team (RegulatoryServices@camden.gov.uk) via email. The correspondence summarised the proposed methodology for undertaking the noise survey and subsequent plant noise assessment. At the time of writing this report (8th October 2021) no response has been received.

3.0 The Site and its Surroundings

The site at 18-19 Southampton Place is located on the west of Southampton Place, WC1A 2AL, London. The location of the site is indicated in Error! Reference source not found. in **Appendix B**

The site is close to Holborn station and the surroundings include residential and commercial use buildings. The nearest noise sensitive receptors to the proposed plant locations were noted to be the residential properties on the southern elevation (overlooking Barter Street) of 21 Barter Street; approximately 25m away from the lightwell of 18 Southampton Place. Additional residential receptors were identified as the flats above the businesses on the opposite side of Southampton Place; approximately 50m away from the existing plant.

3.1 Plant Details

The client has proposed to install the following external plant (assumed to be operating 24/7):

18 Southampton Place

- 1 Large Double Unit Condenser (Daikin REYQ-18U)
- 1 Large Double Unit Condenser (Daikin REYQ-20U)

Figure C.1 in **Appendix C** shows the layout of the proposed plant in the lightwell of 18-19 Southampton Place.

Plant Specification sheet data can be found in **Appendix D**, the data from which has been summarised below in **Table 3.1** and **Table 3.2**.

Table 3.1 Condenser noise data during heating (Sound Power Level)

	Octave Band Sound Power Level (dB)							
Model	63	125	250	500	1000	2000	4000	8000
REYQ-18U	92.0	83.5	81.5	83.0	76.5	73.5	73.0	69.0
REYQ-20U	96.5	87.0	86.5	88.0	81.0	76.5	74.0	69.5

4.0 Measurement Methodology

4.1 Unattended Monitoring

An unattended environmental noise survey was carried out between Tuesday 4th and Monday 10th May 2021 to obtain prevailing noise levels at the site.

Measurement Position 1 (MP1) was located on the western edge of the roof of 17 Southampton Place facing towards the closest residential receptors on the southern façade of 21 Barter Street. Measurement Position 2 (MP2) was located on the eastern edge of 19 Southampton Place facing towards the opposite side of Southampton Place. These locations were chosen to measure noise levels representative of those at the nearest/worst affected noise sensitive locations.

Measurements were undertaken with the existing plant turned off. At MP1 the measurement microphone was positioned at a height of approximately 2m above the roof level and 1m away from the building edge, and therefore is considered a free field measurement. At MP2 the measurement microphone was positioned inside the parapet of the top floor at a height of approximately 2m but within 1m from the building face, and therefore is considered a façade measurement. Measurement positions are shown in **Figures B.1, B.2 and B.3** in **Appendix B**

The noise monitors were set up to automatically store statistical and spectral data every 15 minutes during the measurement period. Continuous road traffic noise from High Holborn (A40) to the south and Bloomsbury Square to the north was observed to be the dominant noise sources. Occasional traffic movements along Southampton place were also audible at the measurement position, sirens were also noted from the west and on High Holborn during installation and collection of the monitors. Traffic rarely travelled along Barter Street, and only ever at low speed.

4.2 Equipment

The measurement equipment used is detailed in **Table 4.** Both microphones were fitted with a windshield and appropriate corrections applied. Field calibration checks were carried out prior to and post measurement and no significant variation occurred. Calibration certificates are available upon request.

Table 4.1 - Survey Equipment

Manufacturer	Item	Type	Serial Number
RION	Sound Level Meter	NL-52	00410086
RION	Sound Level Meter	NL-52	00510141
RION	Calibrator	NC-74	34936353

4.3 Meteorological Conditions

To verify that periods of adverse weather conditions did not significantly impact the results, the local precipitation and wind speed levels were collected using Wundermap⁵ weather data from weather station ILONDO341, 1.75 km from Southampton Place. Where data was not available from this weather station supplementary weather data from London City Airport, approximately 10km away, was used.

Appendix E shows the L_{A90} results and the precipitation and wind speed data for the duration of the survey. Periods of the survey in which wind speeds exceeded the recommended maximum limits of 5 m/s were removed in accordance with guidance set out in British Standard 4142. It was established there were no periods of heavy precipitation that affected results during the survey.

⁵ Weather Underground <https://www.wunderground.com/weather/gb/london-city/EGLC>

5.0 Noise Survey Results

5.1 Unattended Measurement Results

In line with British Standard 4142, representative typical background sound levels have been determined using statistical analysis of the continuous measurements. Day and night-time $L_{A90,15min}$ representative background sound levels measured during the unattended survey for each measurement position are presented in **Table 5.1**. A -3db correction has been applied to results at MP2 to obtain a free field value. MP1 represents the southern façade of the closest residential receptor at 21 Barter Street.

Full statistical measurement data is presented in **Figures F.1 to F.4** in **Appendix F** with spectral data available on request.

Table 5.1 - Representative typical background noise levels.

Measurement Position	Representative Receptor	Daytime $L_{A90, 15mins}$	Night-time $L_{A90, 15mins}$
MP1	21 Barter Street (southern façade)	51dB	49dB
MP2	Southampton Place	47dB	43dB

6.0 Assessment

6.1 Roof Plant Noise Assessment

Due to the distance separation, screening from the lightwell, and various types of plant, a 3D CadnaA noise model was prepared to predict the resultant noise levels at the identified sensitive receptors. Screenshots from the model are shown in **Appendix G**.

Calculations for the condenser units have been based on the manufacturer's octave band sound power level data.

Table 6.1 - BS4142 assessment of residential receptor at 21 Barter Street, from MP1

Results		dB (day)	dB(night)	
Background Sound Level	L _{A90,15mins}	51	49	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, 15 minutes. This is representative of the southern façade of the closest residential receptor, 21 Barter Street
Assessment made for seven consecutive days; reference time interval is 15mins. The plant is proposed to be operating 24/7 as described in Section 3.0.				
Distance Attenuation	N/A	N/A	N/A	Considered in noise modelling software
On Time Correction	N/A	N/A	N/A	Considered in noise modelling software
Specific Sound Level	L _{Aeq,T}	41	41	Specific sound level at worst affected receptor calculated in CadnaA.
Acoustic feature correction	Tonality	0	0	1/3 rd Octave band data not available.
	Intermittency	0	0	Normal use of the plant means that it is on constantly. As such, it is assumed that correction is not required.
	Impulsivity	0	0	Temple was not provided with information that the proposed plant will have impulsive sound features, but experience of similar equipment indicates that this is unlikely to be the case.
	Other Sound Characteristics	0	0	No other sound characteristics are known at this stage of the assessment.
Rating Level		41	41	Rating level including acoustic feature corrections
Excess of rating level over background sound level		-10	-8	The rating level is predicted to be 10dB and 8dB below the day and night-time background sound levels respectively. The assessment indicates that the specific sound source is likely to have a low impact in accordance with BS 4142 during the day and night and is below the LOAEL during the daytime. During the night-time the specific sound source is between the LOAEL and SOAEL in accordance with Camden criteria.
It should be noted that the above assessment assumes no correction for tonality, impulsivity, other distinctive acoustic character, or intermittency. Consequently, all sources should be controlled so that these issues are not present at noise sensitive locations or else corrections will need to be applied.				

Calculations undertaken have assumed omnidirectional radiation from all condenser units and therefore provides a worst-case assessment. In practice, the specific sound level is likely to be lower than stated at the nearest sensitive receptors due to the directionality of the units (which we were unable to account for in the model) and their layout (perpendicular to the nearest sensitive receptors). Hence it is likely that in practice the noise level will be marginally more than 10dB below the background during the night-time and comply with the Camden Council criteria.

Should a 2dB attenuation be required, it is proposed that a night-time set back is applied to both condenser units to reduce noise levels at the nearest noise sensitive receptor so that they comply with Camden Council's noise limits.

7.0 Conclusion

Temple Group has been appointed by Thornton Reynolds Ltd to undertake a preliminary plant noise assessment for equipment proposed as a part of the redevelopment of 18-19 Southampton Place.

Temple has undertaken an unattended noise survey and calculations of the rating noise level of the proposed mechanical plant, which have been used to assess the effects of the noise levels on the nearest noise sensitive receptors. This has been assessed in line with the Camden Council guidance and relevant national standards.

The assessment indicates that the predicted rating noise level of the mechanical plant will be 10dB and 8dB below the typical background sound level at the nearest noise sensitive receptors. This complies with the Camden Council criteria during the day but exceeds the criteria by 2dB at night. The calculation is, however, worst case and due to the directionality of the sound propagation from the units (which we were unable to account for in the model). It is therefore likely that in practice, the noise level will be marginally more than 10dB below the background during the night-time and comply with the Camden Council criteria.

Should further mitigation be required a further 2dB attenuation may be achieved by use of night-time set back mode applied to both condenser units.

Appendix A. Acoustic Terminology

Noise/Sound

Noise and sound need to be carefully distinguished. Sound is a term used to describe wave-like variations in air pressure that occur at frequencies that can stimulate receptors in the inner ear and, if sufficiently powerful, be appreciated at a conscious level. Noise implies the presence of sound but also implies a response to sound: noise is often defined as unwanted sound.

Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic, and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 20 μ Pa) and the threshold of pain is around 120 dB.

Frequency, Hz

Frequency is the number of occurrences of a repeating event per unit second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is usually divided up into octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency. The bands are described by their centre frequency value. In environmental acoustics the ranges typically used are from 63 Hz to 8 kHz.

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Ambient sound

Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far.

Ambient sound level ($LA_{eq,T}$)

Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.

Background sound level ($LA_{90,T}$)

A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 % of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Rating level

Specific sound level plus any adjustment for the characteristic features of the sound.

Reference time interval

Specified interval over which the specific sound level is determined. This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.

Residual sound

Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

Residual sound level ($LA_{eq,T}$)

Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.

Specific sound level

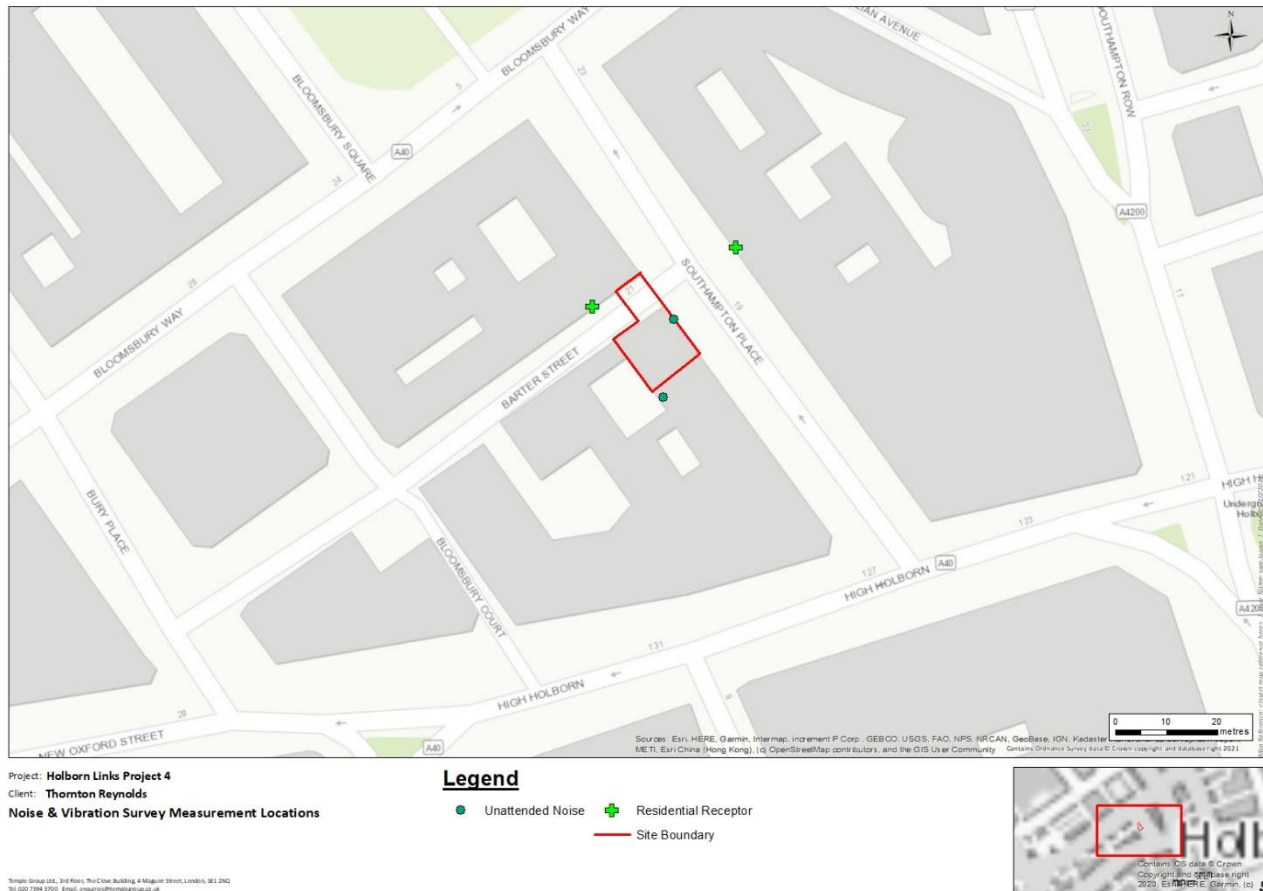
Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval.

Specific sound source

Sound source being assessed.

Appendix B. Current Site Layout and Measurement Positions

Figure B.1 Current site layout and survey locations.



Approximate position of the nearest noise sensitive receptors; properties on Barter Street and the other side of Southampton Place, are marked with a green cross.

Figure B.2 Measurement Position 1 (MP1), Western boundary of 17 Southampton Place facing the residential receptors on the opposite side of Barter Street.

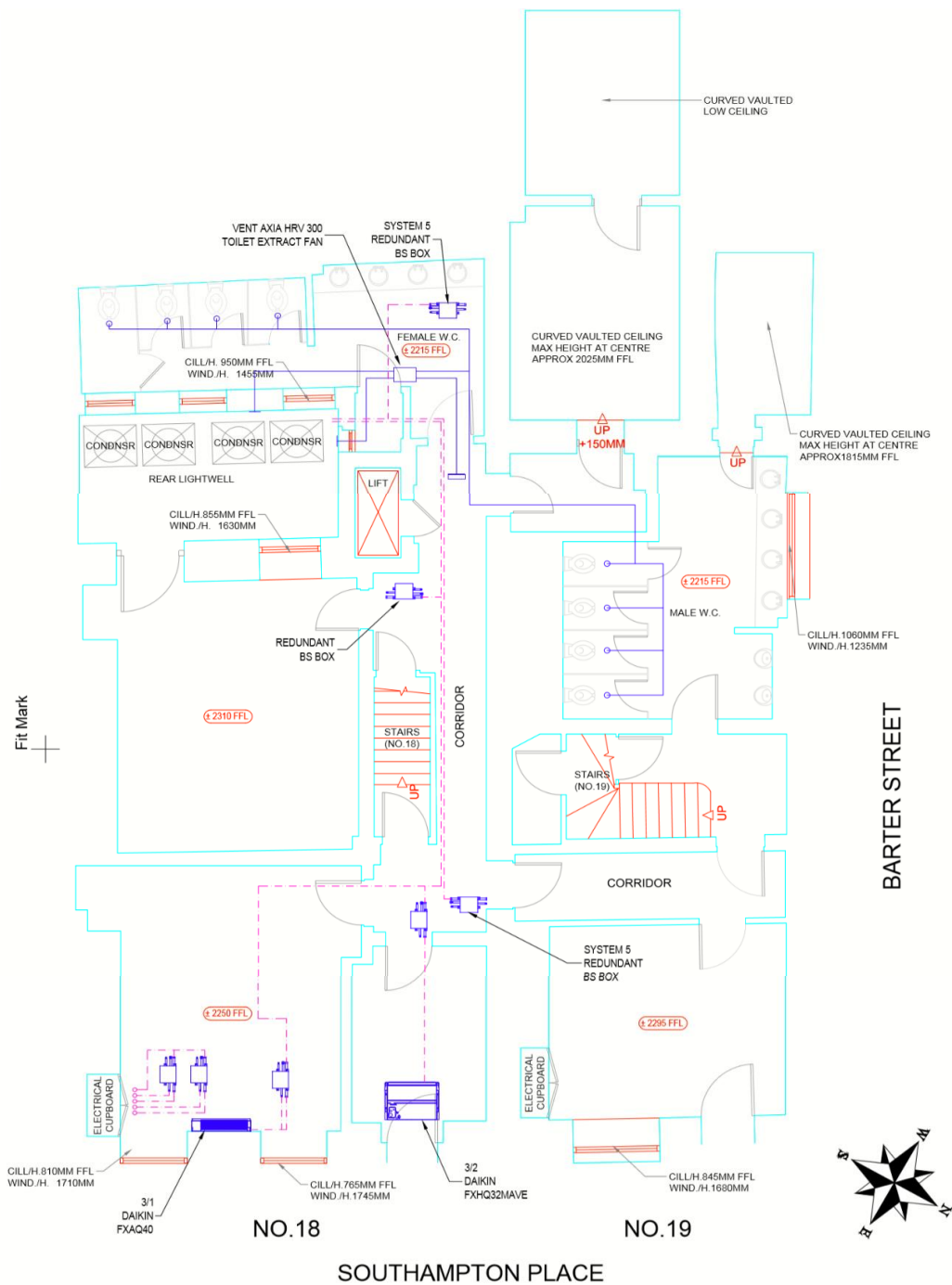


Figure B.3 Measurement Position 2 (MP2), Eastern boundary of Norfolk House facing the residential receptors on the opposite side of Southampton Place.



Appendix C. Layout of Proposed Plant

Figure C.1 – Proposed Plant



Appendix D. Preliminary Plant Data

Figure D.1 REYQ18U Condensers

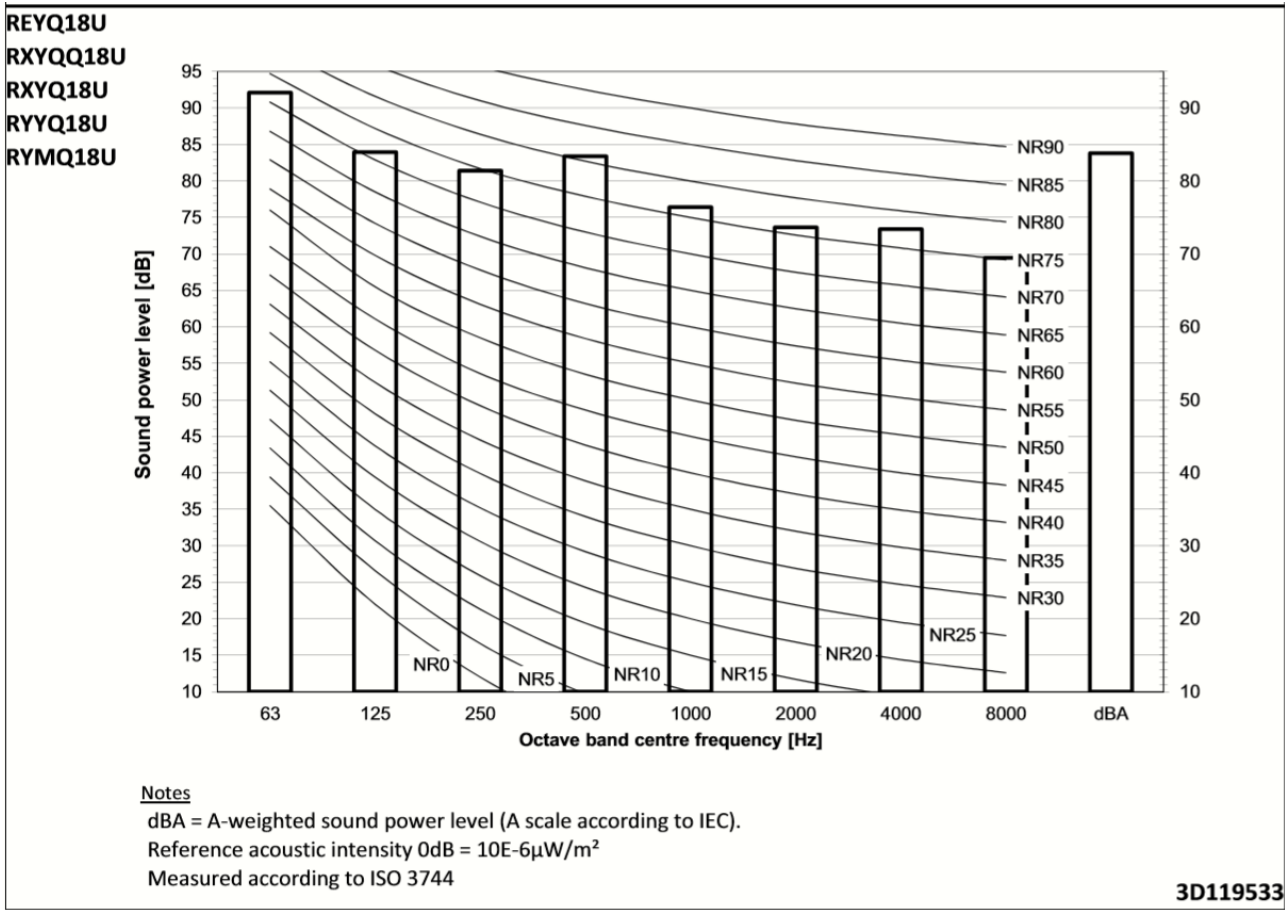
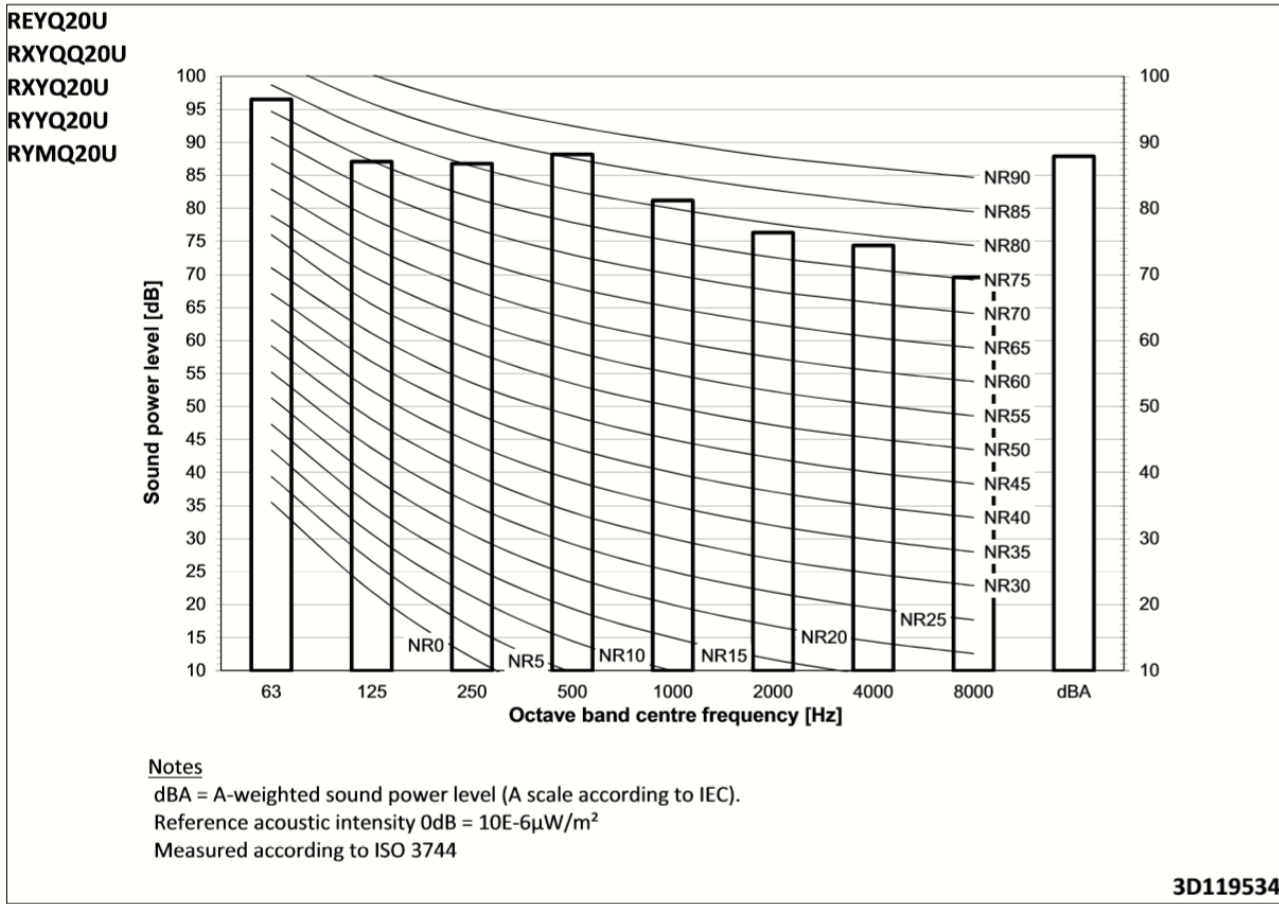


Figure D.2 REYQ20U Condensers



Appendix E. **Measurement Data and Weather Data**

Figure E.1 - Wind Speed and Precipitation Values for the period 04/05/21-10/05/21

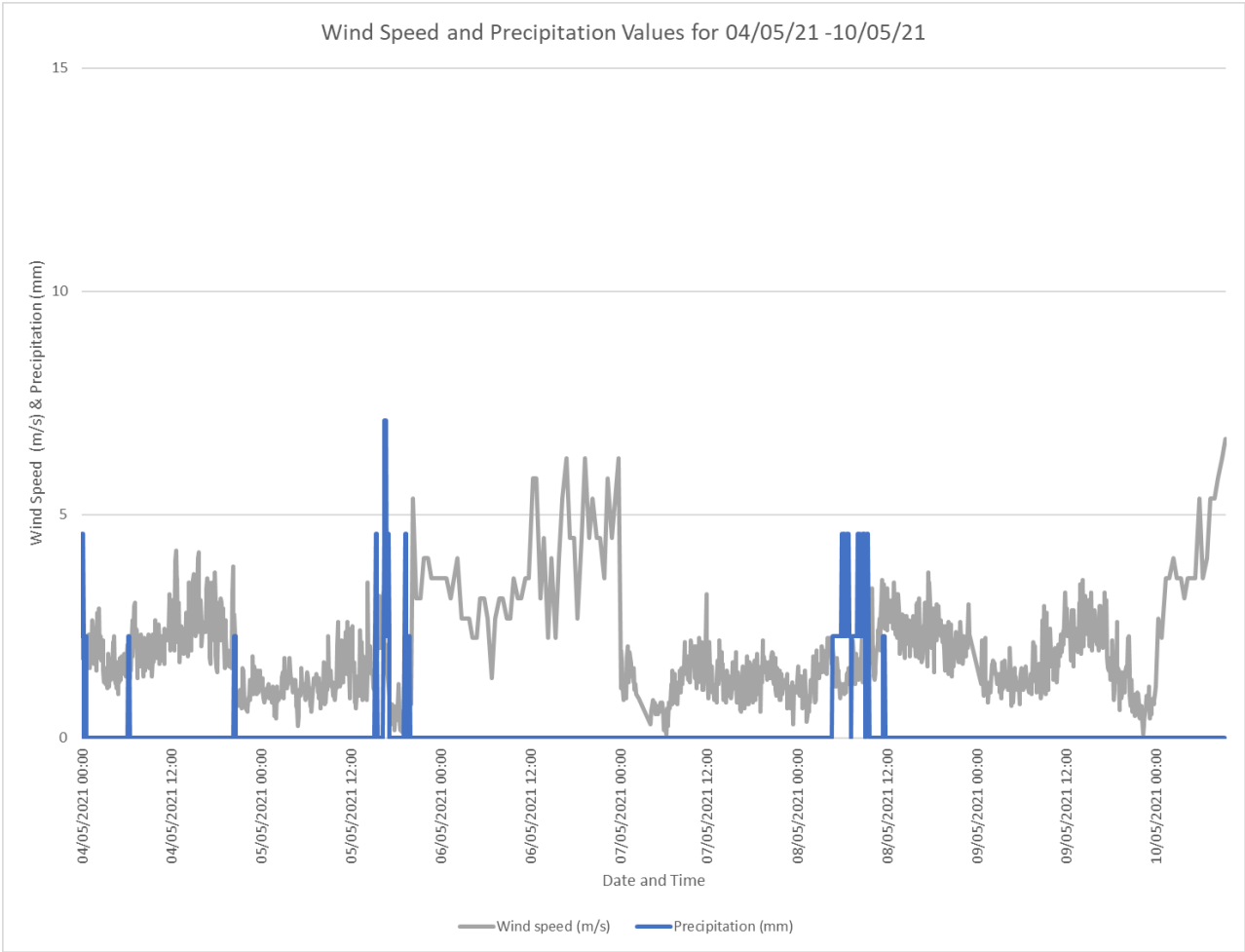


Figure E.2 - L_{A90} Values for the period 04/05/21- 10/05/21

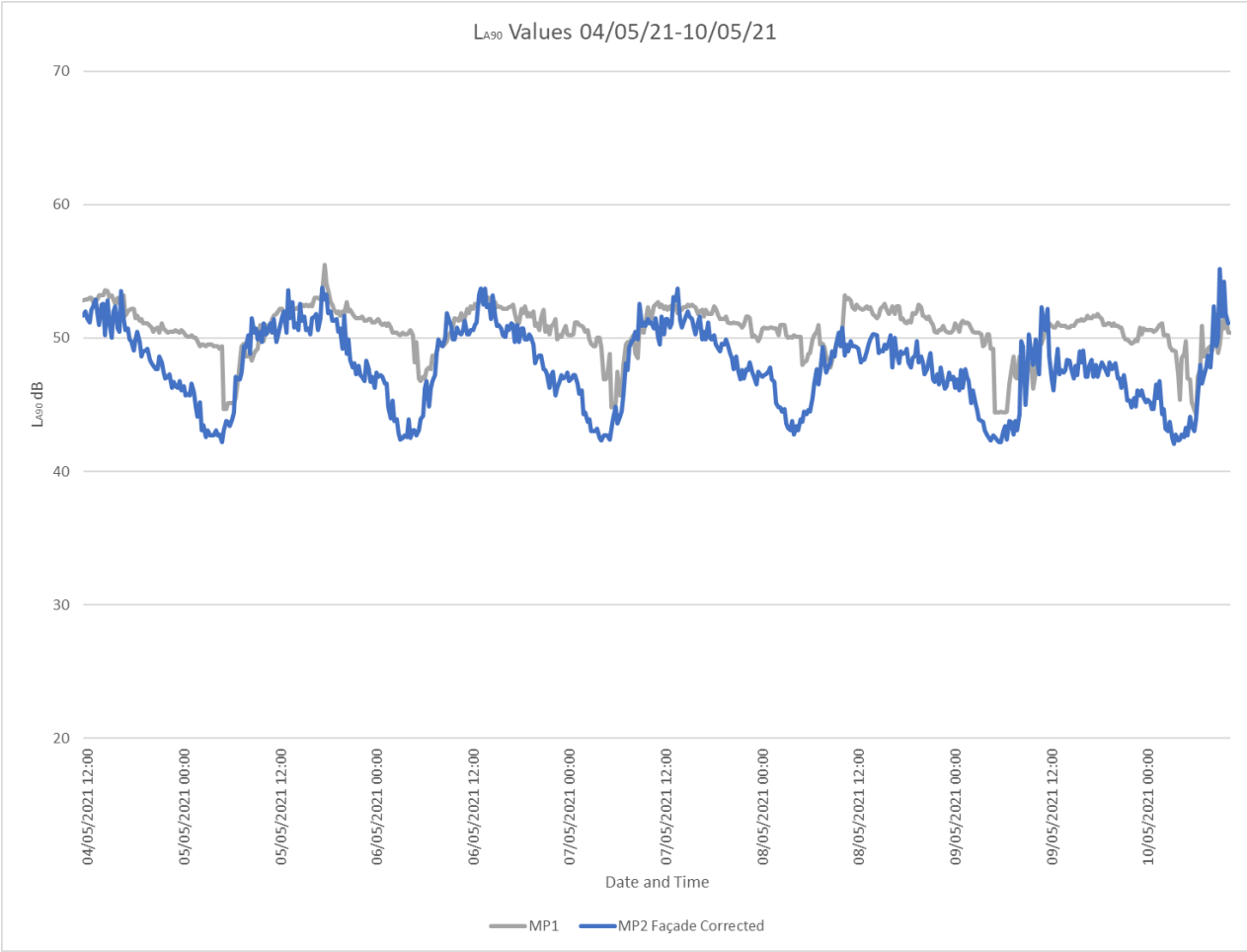
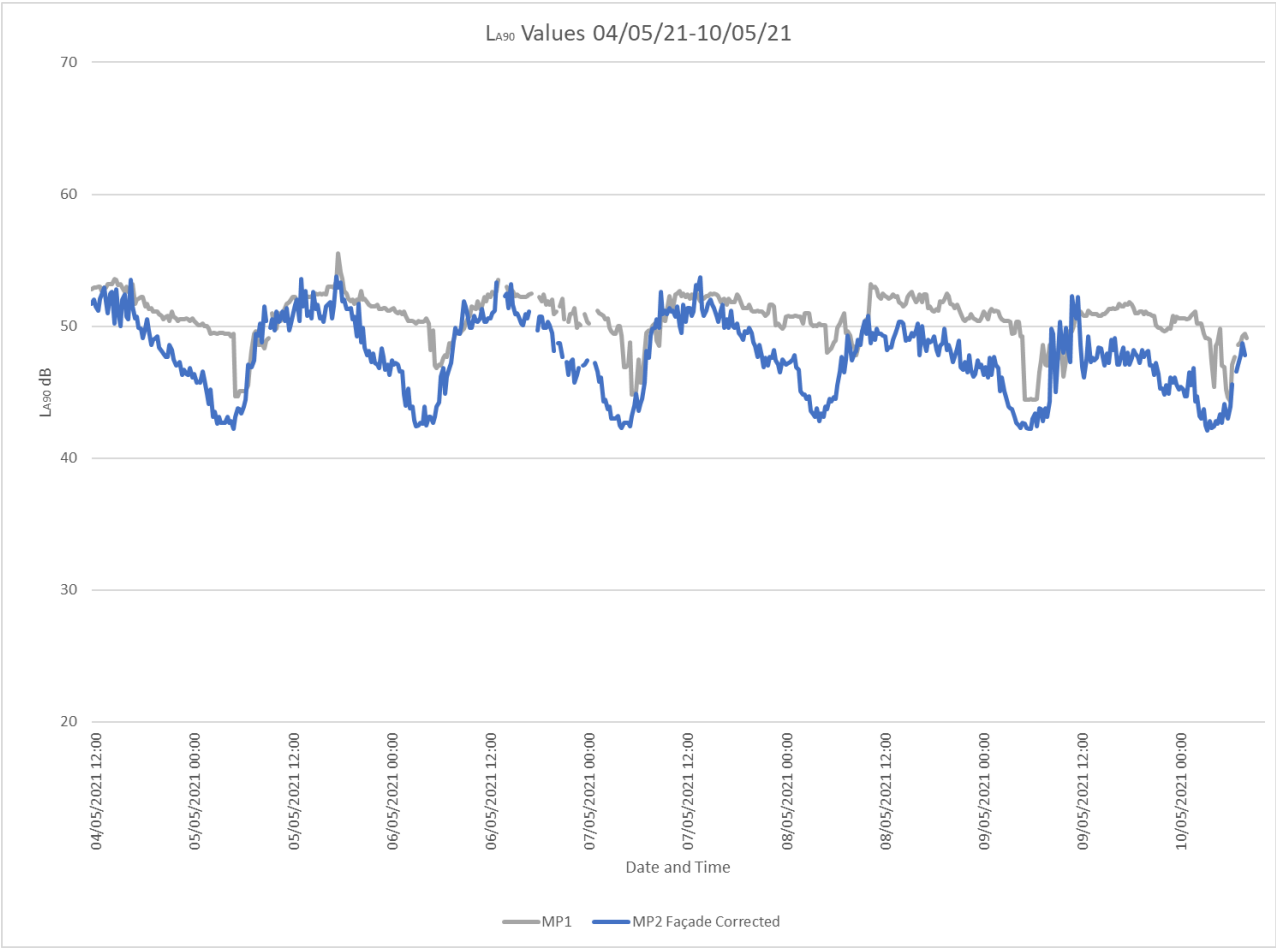


Figure E.3 - L_{A90} Values for the period 04/05/21- 10/05/21 with data removed when wind speed > 5m/s



Appendix F. **L_{A90, 15mins} Statistical Analysis**

Figure F.1 - Statistical analysis of the daytime (07:00-23:00) L_{A90} measurements to determine background sound level at MP1.

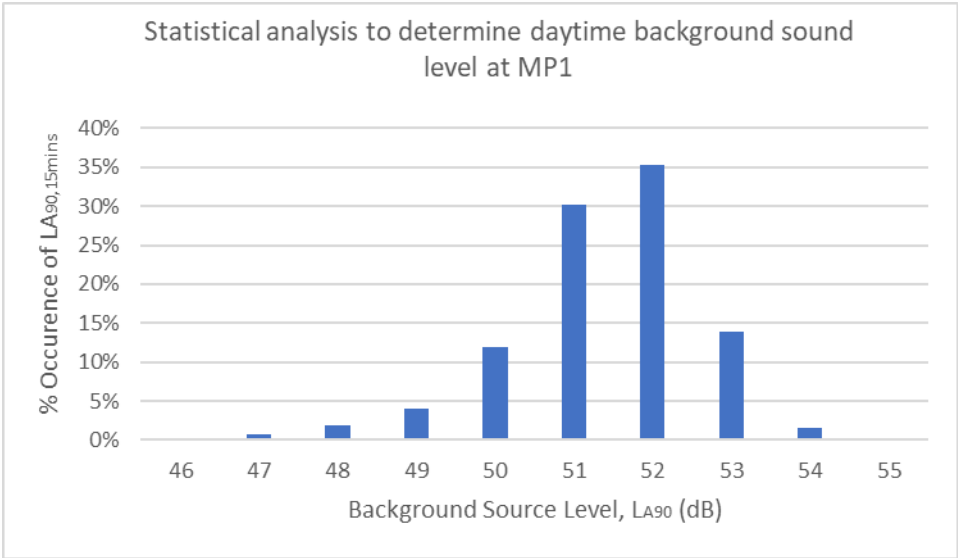


Figure F.2 - Statistical analysis of the daytime (23:00-07:00) L_{A90} measurements to determine background sound level at MP1.

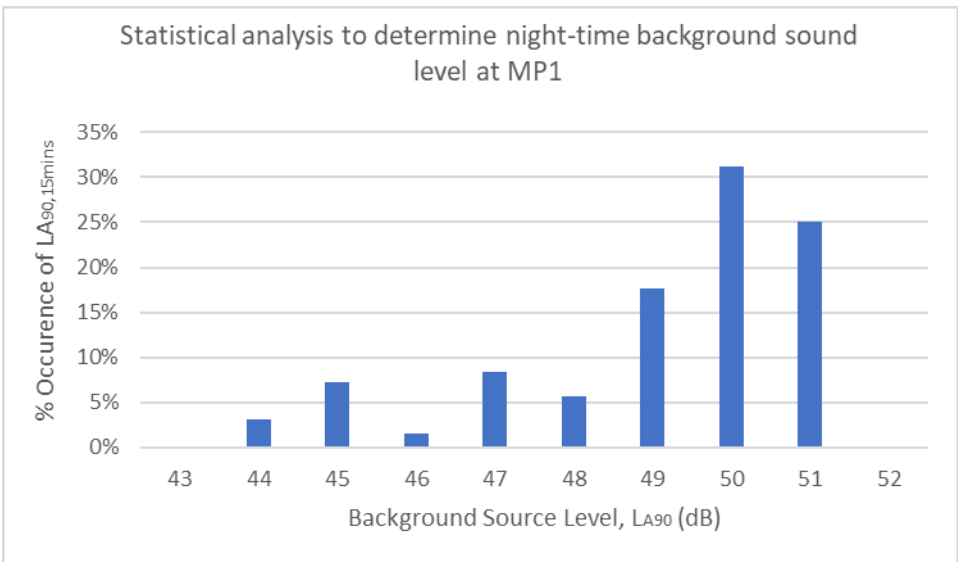


Figure F.3 - Statistical analysis of the daytime (07:00-23:00) LA90 measurements to determine background sound level at MP2.

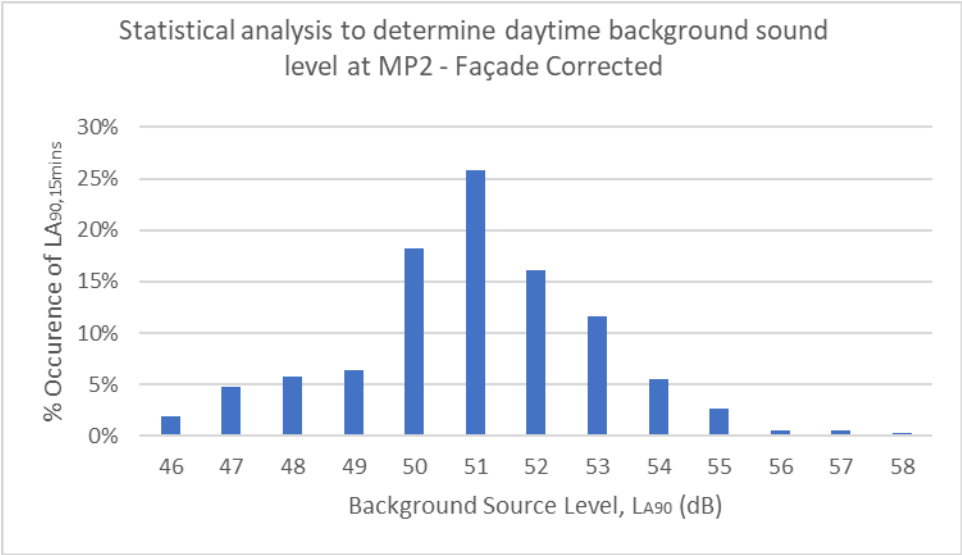
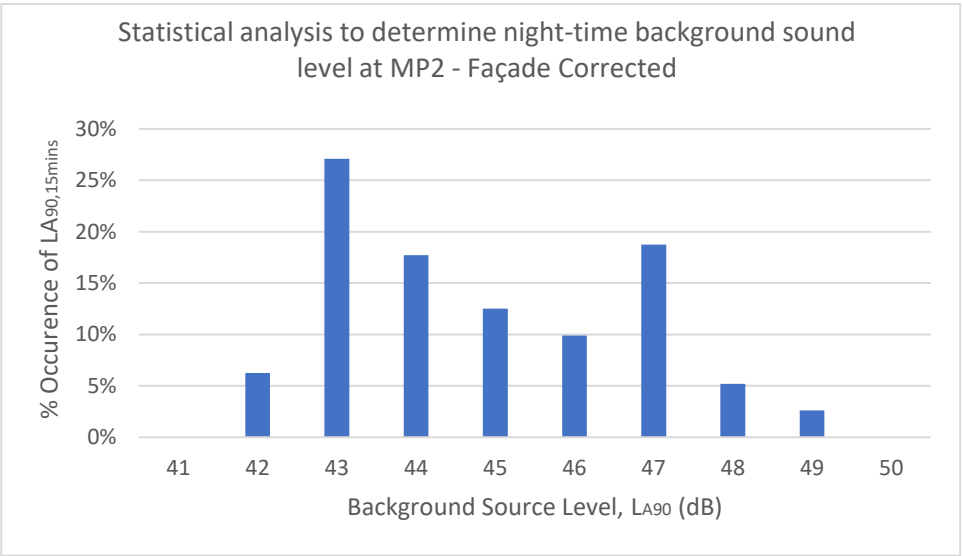
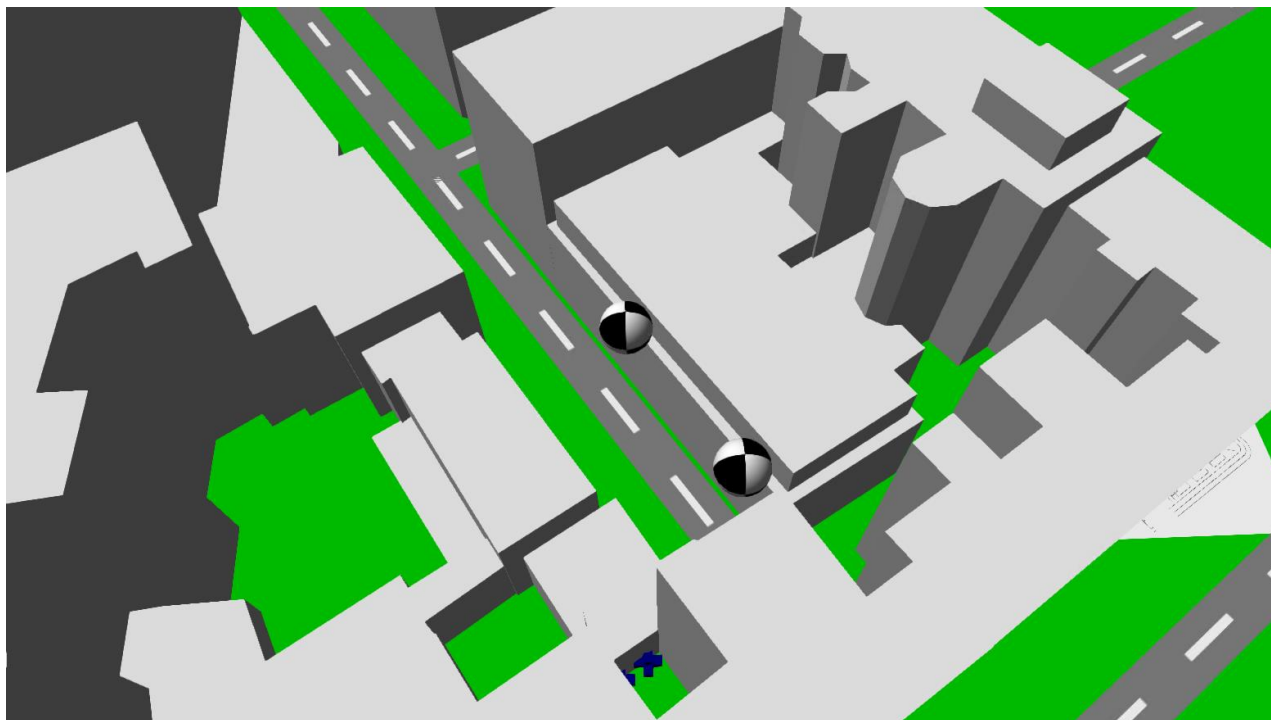


Figure F.4 - Statistical analysis of the night-time (23:00-07:00) LA90 measurements to determine background sound level at MP2.



Appendix G. CadnaA Model

Figure G.1 - CadnaA Model Screenshot





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