



8 GUILFORD STREET,
LONDON WC1

Plant Noise Assessment

Reference: 13549.RP01.PNA.3

Prepared: 22 January 2025

Revision Number: 3

Potter Raper

101 St Martin's Lane

London

WC2N 4AZ

Plant Noise Assessment



8 GUILFORD STREET, LONDON WC1

Reference: 13549.RP01.PNA.3

Prepared: 22 January 2025

Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	3 May 2023	Doug Shearer	Robert Barlow
1	Updated to Reflect Revised Plant Layout.	14 January 2025	Doug Shearer	Robert Barlow
2	Updated Reference to Camden's Requirements and revised barrier specification.	21 January 2025	Doug Shearer	Robert Barlow
3	Revised Louvre Specification	22 January 2025	Doug Shearer	Robert Barlow

Terms of contract:

RBA Acoustics Ltd have prepared this report in accordance with our Scope of Work 13549.SW01.0.RJB dated 9 April 2024. RBA Acoustics Ltd shall not be responsible for any use of the report or its contents for any purpose other than that for which it was provided. Should the Client require the distribution of the report to other parties for information, the full report should be copied. No professional liability or warranty shall be extended to other parties by RBA Acoustics Ltd without written agreement from RBA Acoustics Ltd.

The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and will need to be developed into full working drawings by the lead designer to incorporate all other design disciplines.



LONDON
44 Borough Road
London, SE1 0AJ
T. +44 (0) 20 7620 1950

MANCHESTER
Bloc, 17 Marble Street
Manchester, M2 3AW
T. +44 (0) 161 661 4504

Contents

1.	INTRODUCTION	1
2.	SITE DESCRIPTION	1
3.	ENVIRONMENTAL NOISE SURVEY	1
4.	PLANT NOISE CRITERIA	3
5.	PLANT NOISE ASSESSMENT	5
6.	VIBRATION CONTROL	8
7.	CONCLUSION	8

Appendix A Acoustic Terminology

Appendix B Instrumentation

Appendix C Calculations

Appendix D CDM Considerations

Appendix E Graphs and Site Plans

1. INTRODUCTION

It is proposed to locate new items of plant at 8 Guilford Street, London WC1N. As part of the planning application, London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment to the nearest noise-sensitive receptors.

RBA Acoustics have been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emission limits in accordance with London Borough of Camden's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

A summary of acoustic terminology is included in Appendix A.

2. SITE DESCRIPTION

The site is a three-storey listed office building sited on the corner of Guilford Street and Doughty Street in Bloomsbury. To the north lies Goodenough College, which is a residential building for postgraduate students. To the east, north and south lie mixed commercial and residential streets with the busy thoroughfare Gray's Inn Road some 80m to the east.

The noise climate is quiet urban, with traffic from adjacent streets generally being light. The site is shown in relation to its surroundings in the site plan in Figure 1 (Appendix E).

3. ENVIRONMENTAL NOISE SURVEY

3.1 Survey Methodology

Monitoring of the prevailing background noise was undertaken over the following 24-hour period:

- 13:00 18 April to 14:00 19th April 2024.

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period. However, based on observations during the site visits and weather reports for the area, conditions were generally considered suitable for obtaining representative noise measurements, being predominantly dry with little wind.

Measurements were made of the L_{A90} , L_{Amax} and L_{Aeq} noise levels over 15-minute sample periods.

3.2 Measurement Location

To determine the existing noise climate around the site measurements were undertaken at the following location:

Table 1 - Survey Measurement Location

Measurement Position	Name / Address	Description
MP1	8 Guilford Street	The microphone was installed at a distance of 1m above the 2 nd floor roof level on a tripod overlooking Guilford Street.

The measurement position is also illustrated on the site plan attached in Figure 1 and photos in Figure 2 (Appendix E).

3.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

3.4 Results

The noise levels measured are shown as time-histories on the attached Graphs 1-3 (Appendix E).

The typical lowest L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised below. The typical lowest $L_{A90,15min}$ is based on a level which represents approximately the lowest 10th percentile of measured $L_{A90,15min}$ measurements during that period.

Table 2 – Measured Baseline Noise Levels

Measurement Period	Measurement Position 1 (MP1) – Roof, Guilford Street	
	Typical Lowest Background Noise Level $L_{A90,15min}$ (dB)	Period-Averaged Noise Level $L_{Aeq,T}$ (dB)
Daytime (07:00 – 23:00)	49	60
Night-time (23:00 – 07:00)	41	55
Office Hours (09:00 – 18:00)	52	60

4. PLANT NOISE CRITERIA

The requirements of London Borough of Camden's Environmental Health Department regarding new building services plant are contained within Appendix 3 of their Local Plan as adopted on 3 July 2017 and in their Camden Planning Guidance: Amenity of January 2021. They are understood to be as follows.

"Camden's thresholds for noise and vibration evaluate noise impact in terms of various 'effect levels' described in the National Planning Policy Framework and Planning Practice Guidance:

- NOEL – No Observed Effect Level
- LOAEL – Lowest Observed Adverse Effect Level
- SOAEL – Significant Observed Adverse Effect Level

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 (15dB if tonal components are present) should be considered as the design criterion).

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)	SOAL (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 88dB L _{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL _{Amax}

** 10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

*** levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area."

In line with the above requirements, we would propose items of mechanical services be designed so that noise emissions from the plant do not exceed a level 10dB below background and thus are below the threshold of LOAEL as stated above. This corresponds to the following levels when assessed at the nearest noise sensitive location:

Table 3 – Plant Noise Limits

Assessment Period	Plant Noise Criteria to be achieved at 1m outside the window of the nearest Noise-Sensitive Receptors
Daytime (07:00 – 23:00)	39
Night-time (23:00 – 07:00)	31
Office Hours (07:00 – 18:00)	42

In line with BS 4142: 2014, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

London Borough of Camden's Local Plan does not state a requirement for commercial receptors. Generally, our guidance for the impact of noise from fixed plant items on commercial receptors is to ensure a sound level of 50-55dBA is not exceeded at 1 metre from the outside of the windows, so as BS 8233 noise level recommendations within commercial offices are not exceeded, even if windows were to be partially open for ventilation.

5. PLANT NOISE ASSESSMENT

This assessment has been based on the information provided to RBA by RHB Partnership, the project M&E Consultants and is described in the following sections.

5.1 Proposed Plant Items

The following plant is proposed for the scheme:

Table 4 – Proposed Plant Items

Ref.	Manufacturer/Model/Duty	Plant Type
R1	Daikin RXYSQ4TV9	Condenser (Residential Cooling)
R2	Daikin EDLQ016CA	Heat Pump (Residential Heating)
O1 & O2	Daikin REYQ10U	Condenser (Office)

5.2 Plant Locations

The plant is to be installed in two groups as follows:

Residential Plant

Firstly, items R1 and R2 are to service the residential portion of the development. They are to be installed at the western end of a second-floor rooftop area at the rear of the building. The existing mansard roof on the north façade of the building will be extended to cover the extents of the site and hence provide visual and acoustic screening between the plant location and neighbouring windows. To the south of the plant location, an impermeate acoustic screen of at least 20kg/m² mass and 2m high will be installed to provide screening to the south.

Office Plant

Items O1 and O2 are to serve the office part of the development. They are to be located within a basement level plant room within a lightwell area at the northeast east corner of the site on the Guilford Street façade. Exhaust air is to be via a ducted connection to ground level. Fresh Air supply to the plant room will also be via a weather louvre at ground level. The office plant is proposed to operate from 08:00 to 18:00hrs.

The equipment positions are indicated on the site plan in Figure 1 in Appendix E.

5.3 Plant Noise Levels

Information regarding the noise levels of the proposed plant has been provided by Daikin, the manufacturer of the units. The associated plant noise levels are detailed as follows:

Table 5 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Daikin RXYSQ4TV9 (Cooling)	L _{P@1m}	56	52	50	47.5	45	42.5	36	24
Daikin EDLQ016CA (Heating)	L _{P@1m}	51	51	52	50	47	43	38	36
Daikin REYQ10U	L _w	82	83	81	78	73	67	64	57

Review of the octave band data provides no indication of any tonal characteristics associated with the proposed plant.

5.4 Noise-Sensitive Receptors

Based on observations made on site and discussions with the design team we understand the nearest noise-sensitive receptors to the proposed plant to be as follows:

Table 6 – Noise Sensitive Receptors (NSRs)

Noise-Sensitive Receptor	Name / Address	Description	Primary Sound Sources Impacting Receptor
NSR1	9 Guilford Street	3 rd Floor Residential Window, Front	O1&2 & R1&2
NSR2	19 Doughty Street	3 rd Floor Residential Window, Rear	R1&2
NSR3	Goodenough College	1 st Floor Residential Window, Front	O1&2

The receptors are shown in the site plan in Figure 1 in Appendix E.

5.5 Office Plant: Predicted Noise Levels

Our calculation method for predicting noise levels from the proposed external plant at the nearest noise-sensitive receptors, based on the information above, is summarised below.

- Source Term SWL
- Distance Attenuation
- Reflections

Mitigation

It is recommended that the basement plant area housing items O1 & O2 be fitted with 150mm thick absorbent panels such as CMS Danskin ISO Panels or equivalent. These are a perforated metal panel backed with mineral wool. It is recommended that this finish be fitted to 8m² of the plant area wall.

Additionally, the exhaust fans of plant items O1 and O2 should be fitted with inline attenuators with the following minimum performance.

Table 7 – Minimum Required Attenuator Performance, Exhaust Path of Office Plant Items

Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
3	5	9	13	15	16	11	9

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 8 – Predicted Noise Levels due to Office Plant with Mitigation Included

Operating Period	Noise Level (dB) at NSR1 – 9 Guilford Street		Noise Level (dB) at NSR3 – Goodenough College	
	Prediction	Criterion	Prediction	Criterion
Office Operating Hours (09:00 – 18:00)	39	42	39	42

Noise from the proposed plant is within the Local Authority criteria.

5.6 Residential Plant: Predicted Noise Levels

Likewise, our calculation method for predicting noise levels from the proposed external plant at the nearest noise-sensitive receptors, based on the information above, is summarised below.

- Source Term SPL / SWL
- Distance Attenuation
- Reflections
- Screening

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 9 – Predicted Noise Levels with Recommended Mitigation

Operating Period	Noise Level (dB) at NSR1 – 9 Guilford Street 4 th Floor Front		Noise Level (dB) at NSR1 – 19 Doughty Street 4 th Floor Rear	
	Prediction	Criterion	Prediction	Criterion
Daytime (07:00 – 23:00)	29	39	31	39
Night-time (23:00 – 07:00)	29	31	31	31

5.7 Total Levels Incident at 9 Guilford Street

The receptor at 4th floor Guilford Street is subject to noise from both office and residential plant sources. The total noise level at this location is as follows:

Table 10 – Predicted Noise Levels at 9 Guilford Street 4th Floor – All Sources

Operating Period	Noise Level (dB) at NSR1 – 9 Guilford Street 4 th Floor Front	
	Prediction	Criterion
Daytime (07:00 – 23:00)	39	39
Night-time (23:00 – 07:00)	29	31
Office Operating Hours (09:00 – 18:00)	39	42

Noise from the proposed plant is within the Local Authority criteria.

6. VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that condensing units and heat pumps be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not “short-circuited” by associated pipework or conduits. To this end, any conduits should be looped, and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

7. CONCLUSION

RBA Acoustics have undertaken noise monitoring at 8 Guilford Street, London WC1. The measured noise levels are presented within this report. The resultant noise levels have been used to determine the required criteria for atmospheric noise emissions from the proposed plant installations.

The following mitigation measures are proposed within this report:

- The plant area housing plant items O1 & O2 should be lined with 150mm absorber such as CMS Danskin ISO Panels or equivalent, to an area of 8m².
- The exhaust vent of plant items O1 and O2 should be fitted with attenuators with minimum performance outlined in Table 7.
- The rooftop plant area housing condenser units R1 & R2 is to be surrounded on the Guilford Street façade by a new mansard roof. On the rear façade, an impermeable barrier of height 2 metres and at least 20kg/m² should be installed.

Provided the above mitigation measures are included in the design and installation, the results of the assessment indicate atmospheric noise emissions from the proposed plant are within the criteria required by London Borough of Camden and, as such, can be considered acceptable in terms of noise.

Appendix A Acoustic Terminology

A-weighting (e.g. dB(A))	A correction applied across the frequency bands to take into account the response of the human ear, and therefore considered to be more representative of the sound levels people hear.
DeciBel (dB)	Unit used for many different acoustic parameters. It is the logarithmic ratio of the level being assessed to a standard reference level.
L_{eq}	The level of a notional steady sound which, over a stated period of time, T , would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
$L_{Aeq,T}$	The A-weighted level of a notional steady sound which, over a stated period of time, T , would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
L_{An} (e.g. L_{A10} , L_{A90})	The sound level exceeded for n% of the time. E.g. L_{A10} is the A-weighted level exceeded for 10% of the time and as such can be used to represent a typical maximum level. Similarly, L_{A90} is the level exceeded for 90% of the measurement period, and is often used to describe the underlying background noise.
NR	Noise Rating – A single figure term to describe a measured noise level which considers the frequency content of the noise, generally used for internal noise level measurements (particularly mechanical services plant).

Appendix B Instrumentation

The following equipment was used for the measurements.

Table B1 - Equipment Calibration Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1407477	U45669	18 October 2025
Norsonic Pre Amplifier	1209	22341		
Norsonic ½" Microphone	1225	358196	45668	
Norsonic Sound Calibrator	1255	125525259	U45667	18 October 2025

Appendix C Calculations

Table C1 – Calculation; Residential Location (Heating) to Rear, 19 Doughty Street

Calculation	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Source Sound Pressure Level (Lp@1m)	51	51	52	50	47	43	38	36	52
Distance Loss (Point Source) (7m)	-17	-17	-17	-17	-17	-17	-17	-17	
	34	34	35	33	30	26	21	19	35
Reflections	5	5	5	5	5	5	5	5	
	39	39	40	38	35	31	26	24	40
Screening Loss	-6	-7	-8	-10	-12	-15	-18	-20	
Resulting Level at Receptor (Leq)	33	32	32	28	22	16	8	4	29

Table C2 – Calculation; Office Location to Front, Goodenough College

Calculation	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Source Sound Power Level	82	83	81	78	73	67	64	57	79
Conversion to Lp (Hemispheric)	-11	-11	-11	-11	-11	-11	-11	-11	
	71	72	70	67	62	56	53	46	68
Quantity Correction (2 no.)	3	3	3	3	3	3	3	3	
	74	75	73	70	65	59	56	49	71
Distance Loss (Point Source) (17m)	-25	-25	-25	-25	-25	-25	-25	-25	
	49	50	48	45	40	34	31	24	46
Reflections	3	3	3	3	3	3	3	3	
	52	53	51	48	43	37	34	27	49
Attenuator	-3	-5	-9	-13	-15	-16	-11	-9	
Resultant Level due to Exhausts	49	48	42	35	28	21	23	18	38
Resultant Level due to Fresh Air Inlets	37	38	36	31	26	20	17	10	33
Resulting Total Level at Receptor (Leq)	49	49	43	37	30	24	24	19	39

Appendix D CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 – Remote (almost never)
- 2 – Unlikely (occurs rarely)
- 3 – Possible (could occur, but uncommon)
- 4 – Likely (recurrent but not frequent)
- 5 – Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
- 2 – Minor (e.g. small cut, abrasion, basic first aid need)
- 3 – Moderate (e.g. strain, sprain, incapacitation for more than 3 days)
- 4 – Serious (e.g. fracture, hospitalisation for more than 24 hours, incapacitation for more than 4 weeks)
- 5 – Fatal (single or multiple)

The rating value is obtained by multiplying the two scores and is then used to determine the course of action.

Table 7 - Risk Ratings

Rating Bands (Severity x Likelihood)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonably practicable controls where possible	Avoidance action is required; therefore, alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Table 8 – Risk Assessment

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Vibration Isolators	Injury to hands	Contractors	3	3	9	Care needs to be taken during adjustment. Follow manufacturers guidance	1	3	3
Attenuators/ Acoustic Lagging	Strain of neck, limbs or back.	Contractors	3	4	12	Provide sufficient manpower/ lifting gear	1	4	4
Attenuators/ Acoustic Lagging	Skin & respiratory irritation	Contractors	4	3	12	Wear gloves and mask	1	3	3

L: Likelihood S: Severity R: Rating

8 Guildford Street

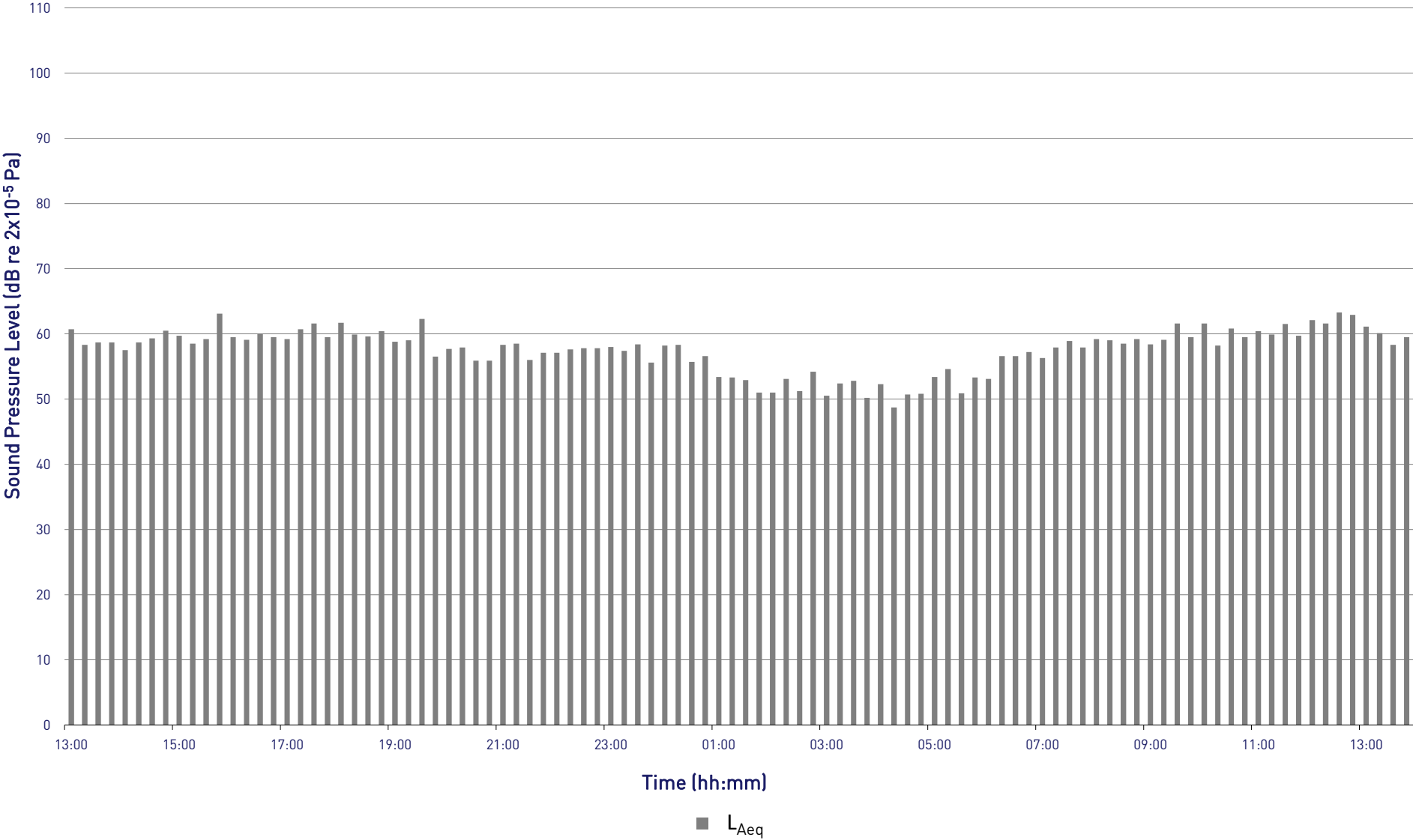
L_{Aeq} Time History

Roof, Guildford St Façade



Project: 13549

Graph 1



8 Guildford Street

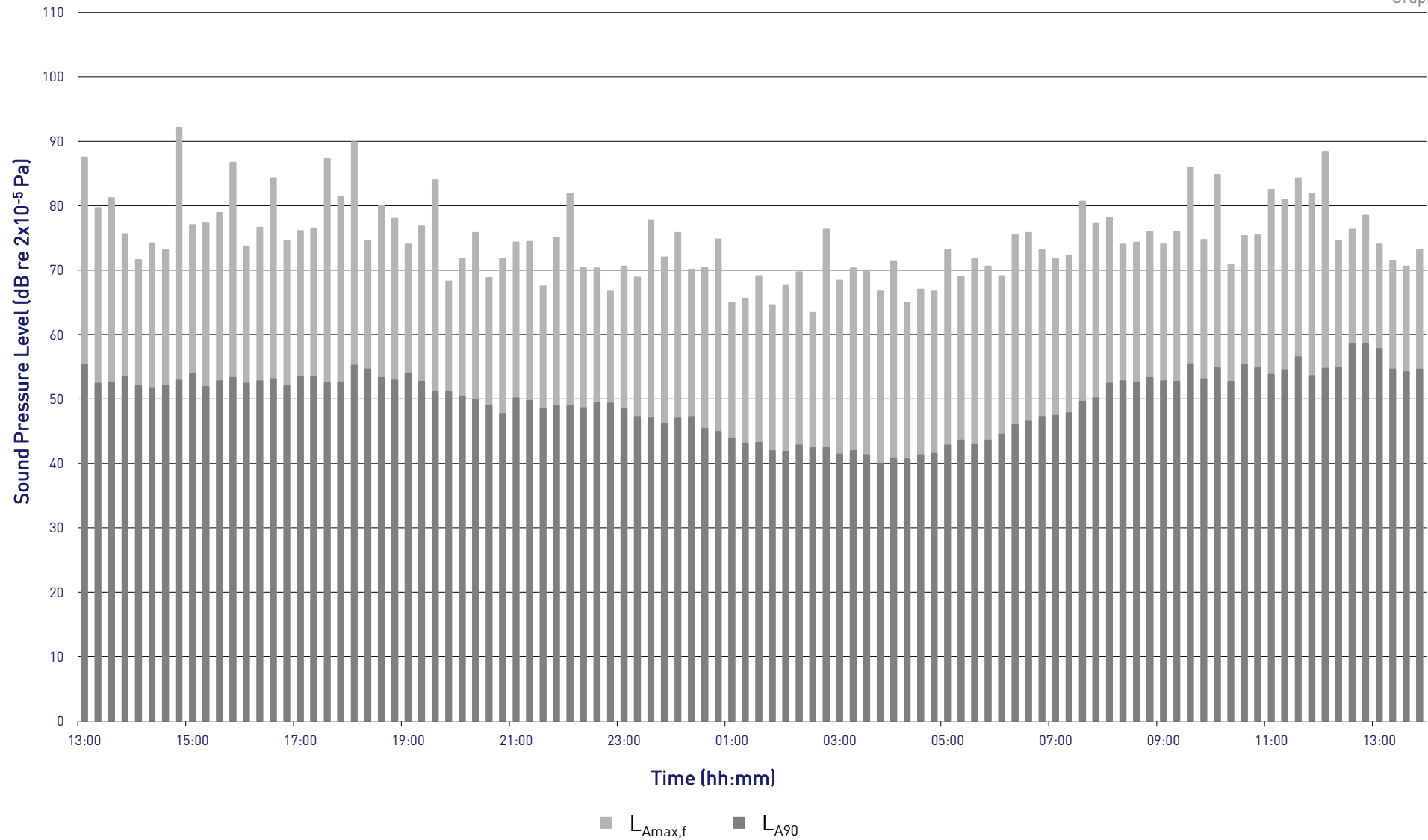
$L_{Amax,f}$ and L_{A90} Time History

Roof, Guildford St Façade



Project: 13549

Graph 2

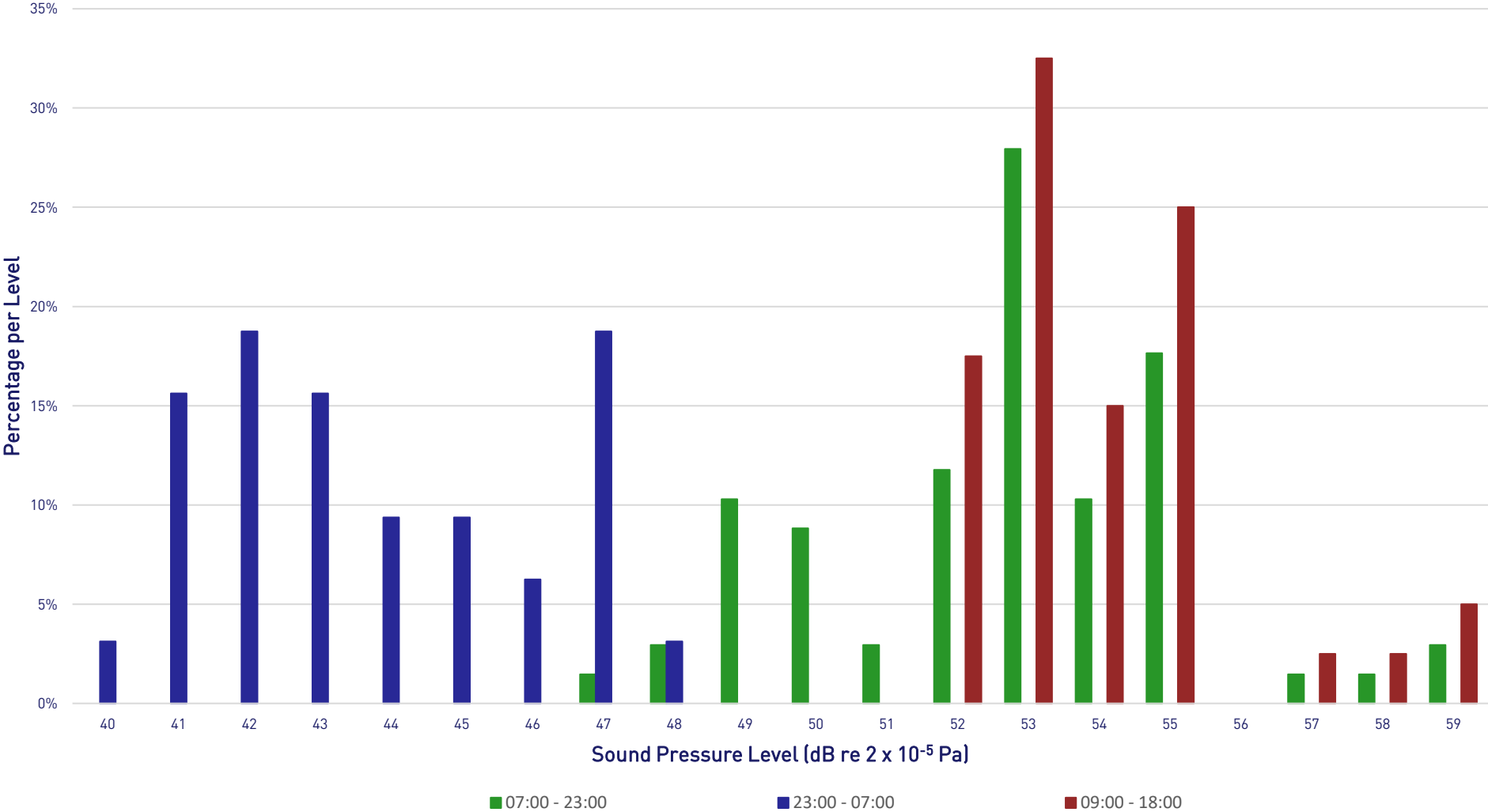


8 Guildford Street
L_{A90,15 minutes} Histogram
Roof, Guildford St Façade



Project: 13549

Graph 3



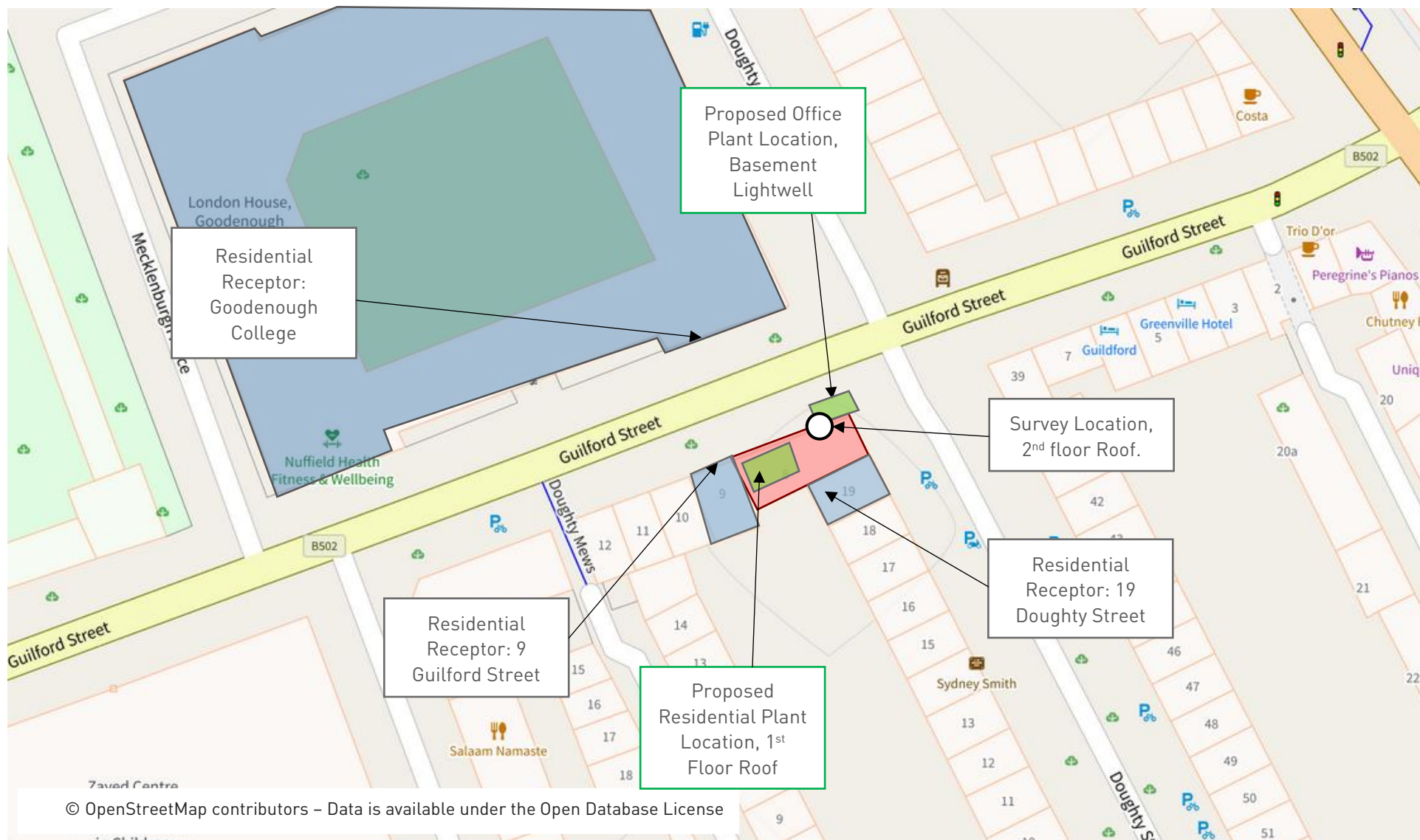


Figure 1 – Site Map Showing Survey and Plant Locations

8 GUILFORD STREET, LONDON WC1
PROJECT 13549

22 JANUARY 2025
NOT TO SCALE



Figure 2 – Photographs Showing the Survey Position

8 GUILFORD STREET, LONDON WC1
PROJECT 13549

22 JANUARY 2025
NOT TO SCALE

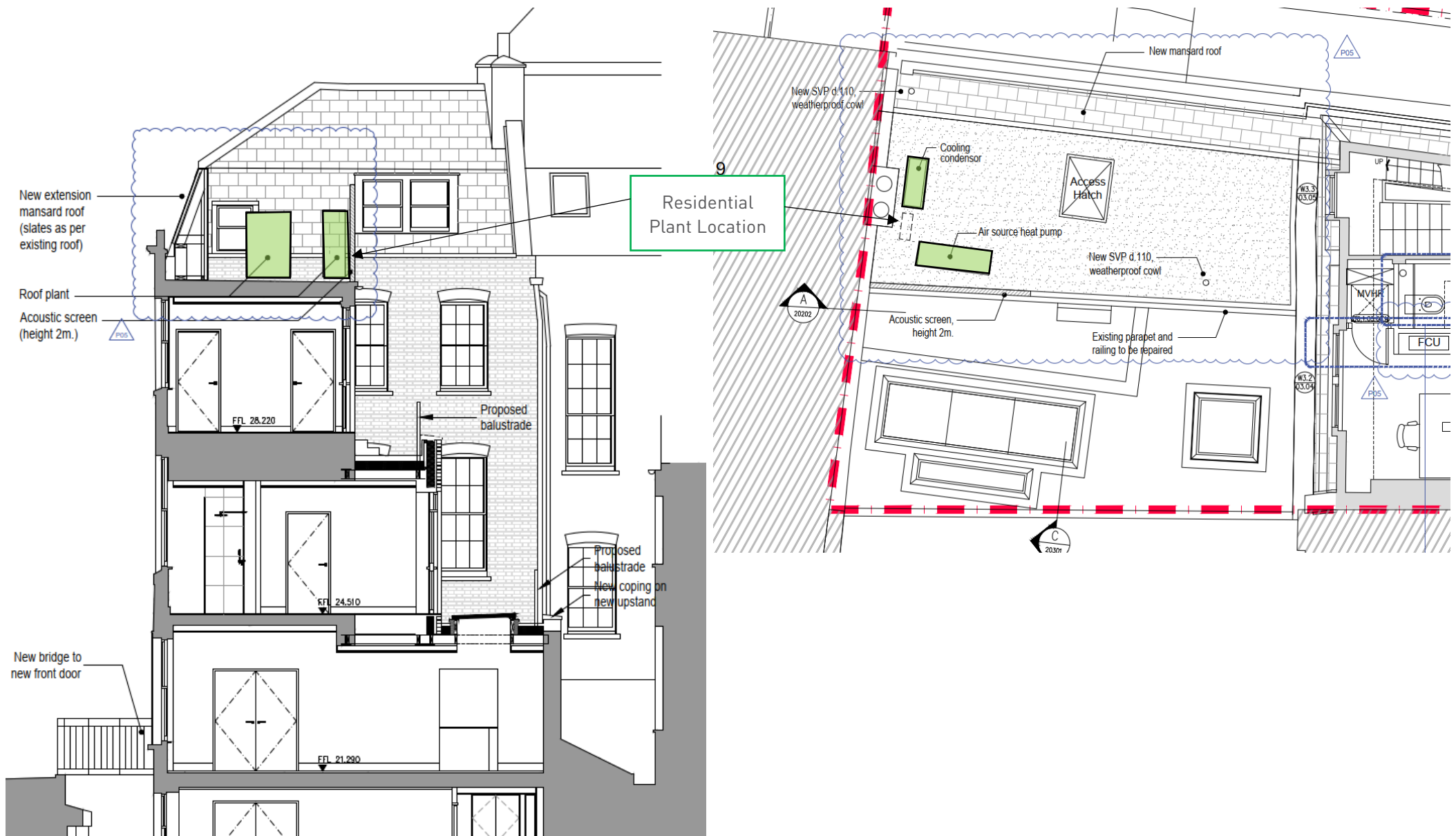


Figure 3 – Plan Showing Residential Plant Location

8 GUILFORD STREET, LONDON WC1
PROJECT 13549

22 JANUARY 2025
NOT TO SCALE

RBA ACOUSTICS
W. www.rba-acoustics.co.uk
E. info@rba-acoustics.co.uk

London:
44 Borough Road
London, SE1 0AJ
T. +44 (0) 20 7620 1950

Manchester:
Bloc, 17 Marble Street
Manchester, M2 3AW
T. +44 (0) 161 661 4504

