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117-119 Portland Street, Manchester

Environmental and Intrusive Noise Assessment

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PROJECT:	117-119 Portland Street, Manchester Environmental and Intrusive Noise Assessment
CLIENT:	Bruntwood Ltd Union 2-10 Albert Square Manchester M2 6LW
DOCUMENT REFERENCE:	2285-REP01-JLS P02
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DATE:	8 July 2024

SUMMARY

Sol Acoustics Ltd ("Sol") has been commissioned by Bruntwood Ltd ("Bruntwood") to undertake an acoustic design assessment of the proposed refurbishment and fitout works at 117-119 Portland Street in Manchester.

The purpose of this report is to assess the scheme in terms of environmental and intrusive noise and to determine an appropriate acoustic performance specification for the building envelope, as based on the pre-existing environmental noise climate on site as surveyed in January 2024, together with the outputs from the Sol 3D noise model, intrusive noise requirements of the British Council for Office ("BCO"), BS 8233:2014, and the currently available Architectural design drawings.

This report demonstrates that appropriate indoor ambient noise limits can be achieved within all noise sensitive spaces across the proposed new office building with windows closed, and acoustic design guidance concerning the required building envelope and external glazing specifications has been provided. When windows are open internal noise levels are likely to exceed the target noise levels.

Additionally, appropriate M&E plant daytime and night time environmental noise limits and internal noise limits for the lower ground floor gym have been set herein, all as based on the measured, pre-existing environmental noise levels at surrounding noise sensitive receptors and current design proposals.

Please refer to the main report and appendices for further details.

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1 INTRODUCTION

Sol Acoustics Ltd ("Sol") has been commissioned by Bruntwood Ltd ("Bruntwood") to undertake an acoustic design assessment of the proposed refurbishment and fitout of 117-119 Portland Street in Manchester.

The purpose of this report is to assess the scheme in terms of environmental and intrusive noise and to determine an appropriate acoustic performance specification for the building envelope, as based on the pre-existing environmental noise climate on site as surveyed in January 2024, together with the outputs from the Sol 3D noise model, intrusive noise requirements of the British Council for Office ("BCO"), BS 8233:2014 and the currently available Architectural design drawings.

This report demonstrates that indoor ambient noise limits can be achieved within all noise sensitive spaces across the proposed new office building with windows closed, and acoustic design guidance concerning the required building envelope and external glazing specifications has been provided. When windows are open internal noise levels are likely to exceed the target noise levels.

Additionally, appropriate M&E plant daytime and night time environmental noise limits have been set herein, all as based on the measured, pre-existing environmental noise levels at surrounding noise sensitive receptors.

2 PROPOSED DEVELOPMENT

The proposed development comprises the refurbishment and fitout of the existing office building at 117-119 Portland Street to form new tenanted office spaces fit out to a CAT B standard consisting of meeting rooms and multi-occupancy offices of varying sizes, together with staff welfare facilities and basement level amenity (e.g. gym).

2.1 General Overview of the Site and Surroundings

The development site is located on Portland Street, Manchester. It lies within the remit of Manchester City Council.

The existing site comprises of currently unoccupied office space. The site is located amidst a number of commercial premises; it is bounded to the northeast by 113 Portland Street which comprises commercial offices. To the northwest and west the site it bound by Portland Street and Dickinson Street respectively. The nearest noise sensitive receptors are identified as the office windows of 113 Portland Street to the east, and the hotel windows of the Novotel to the north across Portland Street. An overview of the site and the surroundings is presented in Figure 1.

Figure 1: Proposed development site and surroundings (Google Maps, 2024)

3 ACOUSTIC DESIGN CRITERIA

To provide an office building that is suitable for typical office use the following guidance documents have been considered:

- British Standard 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*
- British Council for Offices (BCO) *'Guide to Specification 2019'*
- British Council for Offices (BCO) *'Guide to Fit-out 2011'*

3.1 BS 8233:2014

BS 8233:2014 sets out acoustic performance standards recommended to be achieved in a variety of different building types. It is considered to be applicable to both new-build and refurbished developments. Specifically, it provides design targets for the following acoustic considerations for office buildings:

- Indoor ambient noise levels
- Airborne sound insulation between internal spaces

3.2 BCO Guide to Specification 2019

BCO Guide to Specification 2019 provides recommended performance standards for commercial office buildings up to "Cat A" fit-out. It provides design targets for the following areas that are considered relevant to the proposed development:

- External noise intrusion
- Sound insulation between internal spaces
- Flanking performance

3.3 BCO Guide to Fit-out 2011

BCO Guide to Fit-out 2011 provides recommended performance standards for the fit-out of commercial office buildings. It provides design targets and guidance for the following areas:

- Internal ambient noise levels
- Sound insulation between internal spaces
- Building services plant noise

3.4 Employers Requirements

It is understood that there are no specific alternative design requirements and Sol have not been made aware of any employer or end user aspirations above or beyond the standards set out above. Where these are required, enhancement above the performances set out in this report may be required.

4 BASELINE ENVIRONMENTAL NOISE SURVEY

An environmental noise survey was conducted by Sol between 12th January and 16th January 2024. This consisted of two measurement positions, as shown in Figure 2, and as described in Table 1:

Measurement Position	Description
MP1	Pole-mounted microphone sited in "façade" conditions, at first floor level c.5.5 metres above local ground level. Positioned along the Portland Street elevation.
MP2	Pole-mounted microphone sited in "façade" conditions, at first floor level c.6.5 metres above local ground level. Positioned along the Dickinson Street elevation towards the rear of the building.

Table 1: Noise monitoring measurement positions summary

Measurement positions MP1 and MP2 were long-term unattended measurement positions intended to quantify the pre-existing baseline noise levels incident on the facades of the existing building as well as the closest noise sensitive receptors.

Type 1 Precision Grade sound measuring instrumentation was exclusively used and microphone windshields were fitted at all times. Full details of all the instrumentation used and corresponding traceable calibration records are retained on file by Sol and is available for inspection if required.

The prevailing weather conditions were generally suitable for the purposes of environmental noise measurements during the noise survey. Notwithstanding the weather conditions, the long-term microphone systems were entirely weatherproofed and fitted with all-weather environmental windshields, each with a bird spike.

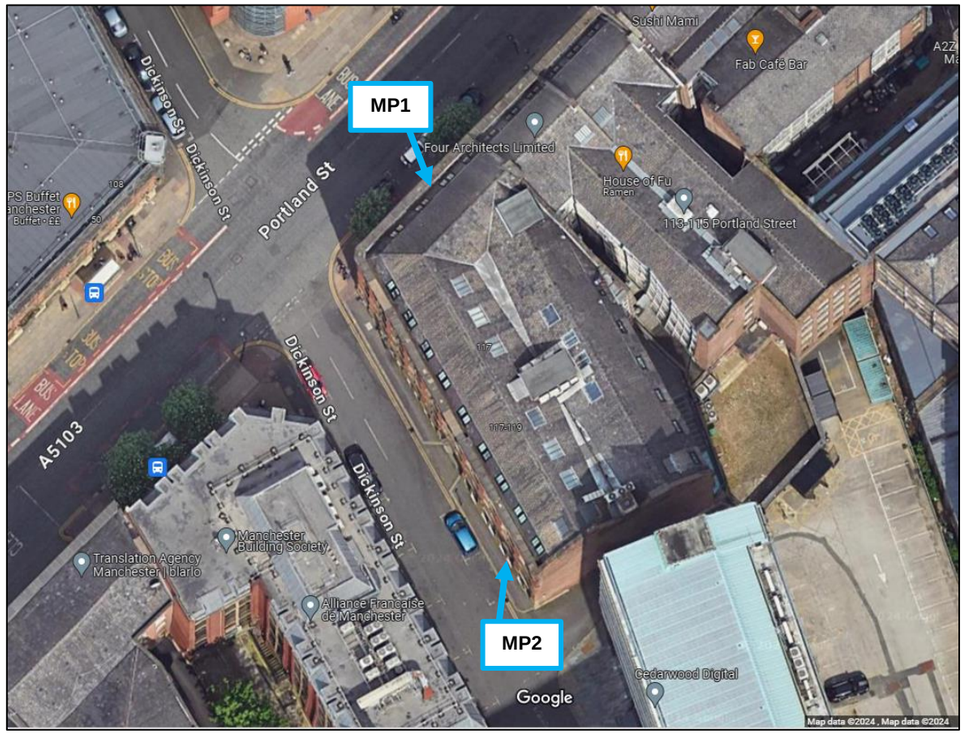


Figure 2: Aerial image showing baseline environmental noise monitoring locations (Google Maps, 2024)

Table 2 provides a basic summary of the free-field baseline environmental noise levels measured during the survey:

Measurement Location	Typical Measured Noise Level (dB, Range L_{Aeq}, L_{Amax}, L_{A1} and L_{A90})					
	Daytime (07:00 – 23:00)				Night time (23:00 – 07:00)	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$ (09:00-17:00)	$L_{A1,1h}$	$L_{A90,15min}$	$L_{Aeq,8h}$	$L_{A90,15min}$
MP1	67	67	73-76	60	65-67	57
MP2	58-60	58-61	64-77	52	57-59	48

Table 2: Summary of typical, measured environmental noise levels, broadband terms

Table 3 summarises the corresponding free-field time-averaged ($L_{Aeq,T}$) daytime and night time period ambient noise levels used for the assessment, in linear octave band frequency terms:

Measurement Location	Time Period (T)	Broadband (A-Weighted) Noise Level, dB $L_{Aeq,T}$	Unweighted Sound Pressure Level ($L_{eq,T}$, dB) @ Octave Band Centre Frequency (Hz)						
			63	**125**	**250**	**500**	**1k**	**2k**	**4k**
MP1	8 hour (09:00-17:00)	**67**	71	65	64	62	63	59	53
	8 hour (23:00-07:00)	**67**	68	62	61	61	63	59	54
MP2	8 hour (09:00-17:00)	**61**	68	58	58	56	56	54	49
	8 hour (23:00-07:00)	**59**	67	58	60	54	55	51	48

Table 3: Summary of time-averaged environmental noise levels, in octave band terms

A full summary of all data measured at Measurement Positions MP1 and MP2 is available in Appendix A.

5 INTERNAL AMBIENT NOISE LEVELS

5.1 Guidance

5.1.1 BS 8233:2014

British Standard BS 8233:2014 *'Guidance on sound insulation and noise reduction in buildings'* provides guidance for indoor ambient noise levels in unoccupied shared spaces, as a combination of external noise ingress and buildings services noise. Table 4 summarises the relevant design ranges presented in BS 8233:2014:

Space	Design Range dB $L_{Aeq,T}$
Executive office	35 - 40
Staff/meeting room, training room	35 - 45
Open-plan Office	45 - 50
Concourse, corridor, circulation space	45 - 55
Cafeteria, canteen, kitchen	50 - 55

Table 4: BS 8233:2014 internal ambient noise level design ranges

5.1.2 BCO 'Guide to Fit-out 2011'

BCO '*Guide to Fit Out 2011*' provides recommendations with regards to combined building services noise and external noise ingress within typical office areas. The relevant recommendations given in this document are presented below:

Space	Noise Rating
Cellular office	NR35
Open plan office	NR38
Audio/visual suite	NR35
Conference room (small)	NR35 @ < 20 Persons
Conference room (large)	NR30 @ > 50 Persons

Table 5: BCO Guide to Fit-out internal ambient noise level guidance

5.1.3 BCO 'Guide to Specification 2019'

BCO '*Guide to Specification 2019'* recommends that noise intrusion levels should not normally exceed more than 55dB $L_{A01,1hour}$ in open plan or 50dB $L_{A01,1hour}$ in cellular offices/meeting rooms. Rain noise should be controlled so that it does not exceed 60dB $L_{Aeq,T}$ in office spaces during heavy rainfall.

BCO also states that:

> *'… Acoustic privacy, whether in an open plan or cellular situation requires moderate background sound to mask unwanted noise. Modern energy efficient air-conditioning systems, such as chilled beams or variable speed fan coil units (FCU's), and office IT equipment can be very quiet. As a result offices are often too quiet to achieve reasonable acoustic privacy. Where building services noise levels in office areas are likely to be significantly below criteria mentioned previously, provision should exist to install an electronic sound masking system'.*

5.2 Assessment Criteria

Based on the guidance in the previous section, the following design criteria are recommended to be met as a result of a combination of external noise intrusion and building services noise:

Locations	Noise Rating Upper Limit	Target Ambient Noise Level dB L_{Aeq}	Maximum Short-Term Noise Level dB $L_{A1,1hour}$
Meeting room	NR35	35 - 40	50
Multi-occupancy Office	NR40	45 - 50	55
Circulation	NR40	45 - 50	-
WC / showers / changing room	NR45	50 - 55	-
Plant room	NR65	-	-

Table 6: Internal ambient noise level criteria

5.3 External Noise Intrusion Assessment

5.3.1 Predicted Development Environmental Noise Levels

In order to predict the likely resultant environmental noise levels across the future façades of the proposed development, a 3D computer based environmental noise model has been created using the proprietary DataKustik "CadnaA" Noise Mapping software. The following assumptions have been made in the generation of the noise model:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: '*Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation';*
- The model was set to include up to second order reflected noise from solid structures;
- Ground absorption was set to G=1 to represent soft ground with the exception of large paved/tarmacked areas (G=0);
- The existing land topography has been taken into consideration in the assessment. Third party topographical information has been obtained from the Department for Environment, Food and Rural Affairs (DEFRA) via https://environment.data.gov.uk/DefraDataDownload/?Mode=survey;
- Acoustic screening and reflections afforded by nearby buildings and solid structures.

Based upon the above, the daytime and night time free field noise levels have been predicted across all proposed external facades of the development as shown in Appendix B, Figure B1.A 3D example of the predicted daytime ambient noise map is shown in Figure 3.

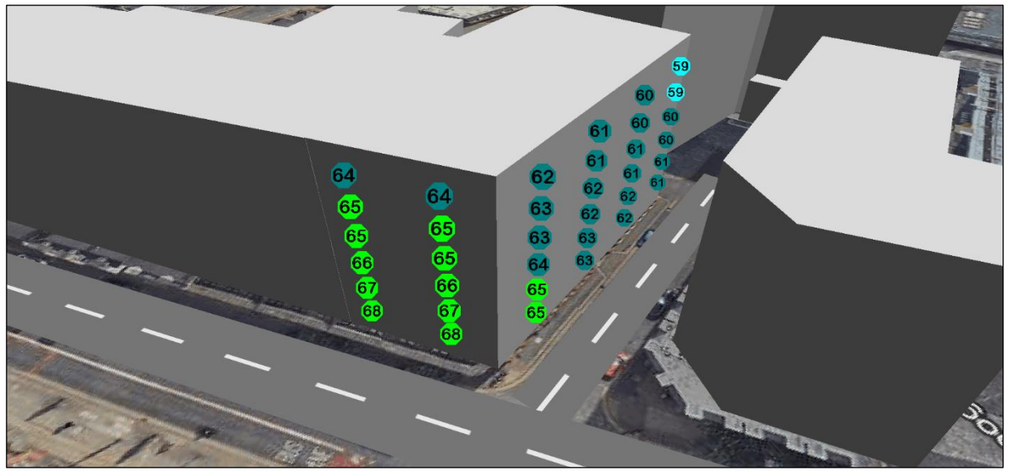


Figure 3: Example of 3D noise map

5.4 Building Envelope

The project proposals are the retain the external wall and primary glazing systems (historic timber sash single glazed pane to from elevations and glazed curtain walling at the rear) throughout with all existing internal secondary glazing systems being replaced.

Based on the predicted noise levels incident on the façade of the proposed development and the measured noise level on site, an assessment of the required sound insulation performance of the façade elements has been undertaken.

The assessment is based on achieving suitable internal noise levels as set out in BCO and BS 8233 with windows closed. When windows are open, which forms part of the ventilation strategy throughout the building from Ground Floor and above, internal noise levels will be compromised. This is discussed further in Section 5.5.

5.4.1 External walls

The external walls are generally understood to comprise traditional heavy masonry or cavity blockwork with internal plasterboard linings. These configurations are expected to comfortably surpass the minimum sound insulation performance requirements for the schemes.

There is existing glazed curtain walling to the courtyard elevation; all vision areas will be lined with a secondary glazing system specified to achieve compliance with the acoustic specification set out below in Section 5.4.2. Non-vision spandrel areas should be lined with 2No. layers of plasterboard on SFS.

Detailed construction proposals must be submitted to Sol for review as they become available, and prior to any finalisation of the detailed architectural design.

5.4.2 Acoustic Specification for Glazing & Curtain Walling

Based on the calculation methodology in BS EN ISO 12354-3:2017, Table 7 provides preliminary minimum acoustic performance requirements for the glazing in order to meet the requirements in Table 7:

Room Type	Example Double Glazing Configuration	Minimum Weighted Sound Reduction Index dB ($R'_w + C_{tr}$)
All	6mm / 16mm / 6mm	29

Table 7: Recommended minimum glazing system acoustic specification

Please Note: The exact glazing specifications are subject to confirmation during the detailed design stage.

All glazing and glazed doors, inclusive of framing systems, seals, and hardware must achieve the minimum acoustic performance specifications as indicated, *all to be as confirmed and corroborated by independent acoustic laboratory test data in accordance with BS EN ISO 10140-2:2010 for identical constructions which must be submitted to Sol for approval.*

Please note that the values in Table 7 are given in terms of the on-site performance requirement $R'_w + C_{tr}$ and a suitable correction should be included and allowed for from standard laboratory test data, which will be derived from idealised laboratory conditions.

For large glazing units, this correction to be applied is typically c.2dB (i.e. 2dB is to be subtracted from laboratory test data, and this must relate to complete framed constructions, not simply glazing cores).

Thermal cavities must be specified by others, albeit these must not impinge upon the minimum required acoustic performance specification requirements.

5.5 Open Windows

The existing and proposed ventilation strategy for the building, with the exception of the basement level, relies on windows being open at the occupants' discretion along the Portland Street and Dickinson Street elevations.

When windows are open the effective sound insulation performance of the façade will be greatly reduced and internal noise levels will likely exceed the BCO and BS8233 design targets as set out above in Section 0.

Industry guidance published by the Institute of Acoustics and Association of Noise Consultants for the design of School (Acoustics of Schools: a design guide) states that an external to internal sound insulation performance of 20-25dB can be assumed for a partially opened secondary glazed system with staggered openings as illustrated in Figure 4.

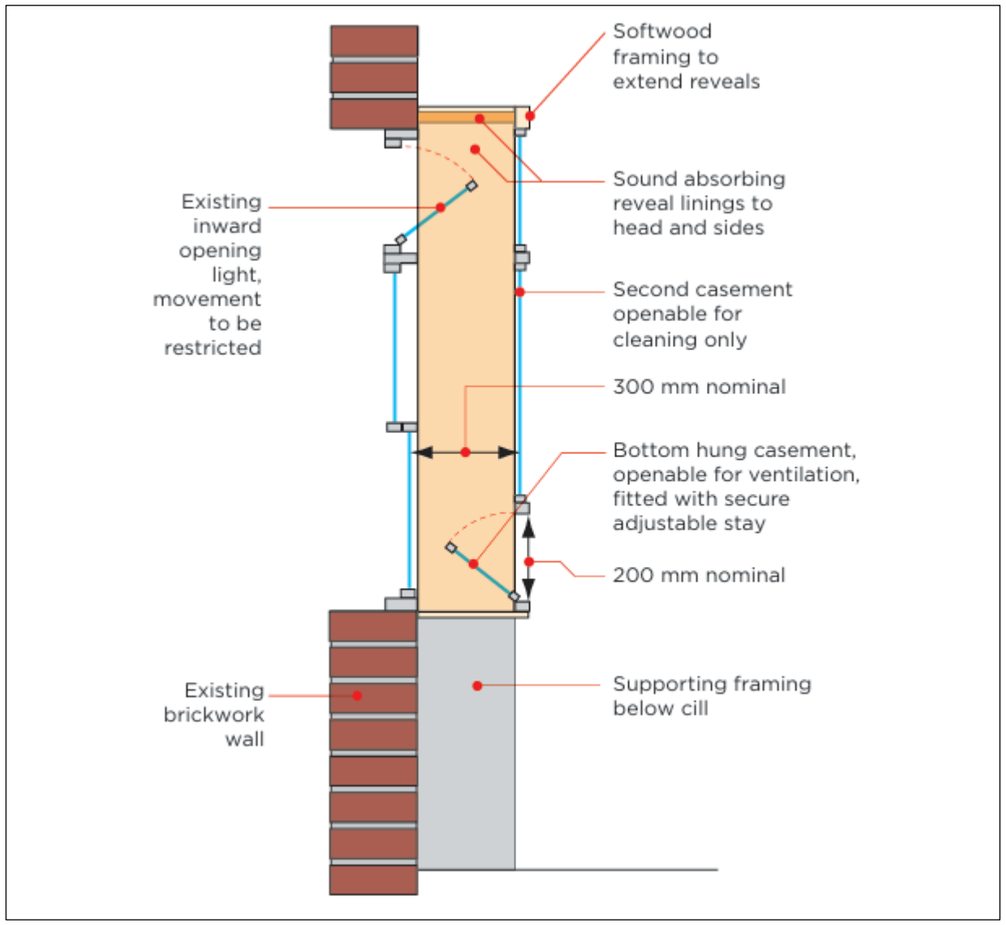


Figure 4: Example configuration of secondary glazing producing a staggered air flow path

Table 8 below summarises the predicted internal noise levels along the Portland Street and Dickinson Street facades with windows partially open (with staggered openings as illustrated in Figure 4) for ventilation purposes.

Location	Predicted Internal Noise Level with Partially Open Window	
	$L_{Aeq,8h}$ *(09:00-17:00)*	$L_{A1,1h}$ *(09:00-17:00)*
Along and in proximity to Portland Street	42	48-51
Along Dickinson Street set back from Portland Street	33-36	39-42

Table 8: Predicted internal noise levels with windows open

6 NOISE EGRESS

6.1 Guidance

6.1.1 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019: *'Method for rating and assessing industrial and commercial sound'* ("BS 4142") is intended to be used to assess noise of an industrial nature, which includes sound from fixed installations comprising mechanical and electrical plant and equipment.

The procedure contained in BS 4142 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question, the "Specific Sound Level" immediately outside the noise sensitive premises, with the corresponding representative "Background Sound Level". Where the noise contains attention attracting characteristics such as tonal, impulsive and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level to obtain the "Rating Level".

BS 4142 states that the significance of sound arising from an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, and also the context in which the sound occurs:

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.

For the daytime, the assessment is carried out over a one-hour period, and over a 15-minute period at night. The daytime and night time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

6.1.2 Local Authority

Manchester City Council's *'Planning and Noise Technical Guidance'* published in October 2022 states that with regards to noise from commercial developments and proposed fixed building services plant respectively:

'…The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location…"

'… Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location…'

6.2 Criteria

In line with the guidance and the requirements of the above operational noise from internal activities associated with the proposed development should not exceed the limits set out in Table 9 below when measured at the nearest noise sensitive window.

Location	Maximum permissible Rating Level, dB $L_{Ar,Tr}$	
	Daytime (07:00hrs to 23:00hrs)	Night time (23:00hrs to 07:00hrs)
Any noise sensitive façade	47	43

Table 9: Plant rating limits

In line with the guidance and the requirements above, the total, aggregate environmental noise from all M&E plant, when operating simultaneously, should be limited to a Rating Level at least 5dB below the typical pre-existing background noise level at any residential property façade in L_{A90} terms.

Based upon the results of the background noise survey, Table 10 provides the maximum permissible Rating Level to be achieved by the proposed M&E plant associated with the development at the nearest noise sensitive premises:

Location	Maximum permissible Rating Level, dB $L_{Ar,Tr}$	
	Daytime (07:00hrs to 23:00hrs)	Night time (23:00hrs to 07:00hrs)
Any noise sensitive façade	47	43

Table 10: Plant rating limits

The above noise level limits are specified as Rating Levels and as such it will be necessary to consider the acoustic character associated with any of the proposed M&E plant associated with the scheme when predicting the noise impact expected.

Any proposed new plant should, in the first instance, be designed to avoid having any significant tonal, impulsive or intermittent acoustic characteristics. However, where such features are expected to be

present, this must be taken into consideration and suitable corrections must be applied to the predicted noise level impact when determining the predicted Rating Level from the development.

These noise level limits have been determined in accordance with the requirements of BS 4142:2014+A1:2019 and Manchester City Council. **However, they will need to be reviewed at planning stage and are subject to the approval of Manchester City Council.**

6.3 Gym Noise

A small gym area is proposed at lower ground floor level which has the potential to generate noise levels that could breakout from the space; egressing through the façade or transferring to other internal spaces. Figure 5 below shows the proposed gym area in context at lower ground floor level.

Figure 5: Lower Ground Floor Gym and Surrounding Spaces

The exact details of the proposed internal partitioning and resilient gym flooring solutions is still being developed, however the design intent is to ensure that the gym and adjacent flexible lounge space be usable at the same time. At this stage it is envisaged that the separating partition between the gym and adjacent lounge space will be of a twin stud lightweight construction.

Above the gym at ground floor level is the reception and associated hot desking workspace as well as 2No. cellular work booths. The existing flooring, which is to be retained separating the lower ground floor and ground floor is understood to comprise a minimum of:

- 40mm Sand and Cement Screed;
- 70mm Timber Floorboards;
- 220mm Timber Joists;
- MF System to create ca. 100mm void with 100mm Mineral Wool Insulation;
- 2 x 15mm Fire Rated Plasterboard.

The external façade of the gym in understood to comprise partially subterranean traditional heavy masonry with new 4 / 16 / 4mm double glazing to be installed within existing listed timber frames.

The maximum allowable operational internal noise levels in the gym are set out in Table 11 below. These noise levels have been calculated based on the following (note G curves are as defined in ProPG: Gym Acoustics Guidance)

- L_{Aeq} noise levels not exceeding G30 in the adjacent lounge or reception areas;
- L_{Amax} noise levels not exceeding G35 in the adjacent lounge or reception areas;
- L_{Aeq} noise levels not exceeding G20 in the vertically adjacent work pods;
- L_{Amax} noise levels not exceeding G25 in the adjacent lounge or reception areas;
- L_{Aeq} noise levels not exceeding 43 dBA (5dB below the existing background at night) when measured at an approximate distance of 3m from the façade (representative of own development windows directly above gym).

Description	Maximum Internal Noise Level (dB) in each Octave Band (Hz)						
	63	125	250	500	1000	2000	4000
$L_{Aeq,5mins}$	89	87	76	74	73	75	73
L_{Amax}	93	92	88	79	78	80	78

Table 11: Plant rating limits

These limits would be suitable to permit amplified background music and should not be excessively restrictive given the size and setting of the proposed gym, however it should be noted that it will be necessary to manage the use of the gym space as if left unchecked users have the potential to misuse equipment in a manner which may result in noise levels exceeding the above limits.

The exact flooring build-up of the gym will be subject to confirmation following in-situ testing undertaken during construction in line with the guidance contained within ProPG Gym Acoustics Guidance, however at this stage it is envisaged that an allowance for up to 150mm of varying thicknesses of specialist rubber matting flooring systems dependant on equipment usage and floor areas will be sufficient.

6.4 Plant Noise Emission

6.4.1 Proposed External Plant Noise Limits

On the basis of the results of the noise survey and the requirements of MCC, Table 2 sets out the maximum permissible Rating Level to be achieved by the proposed M&E plant associates with the development at the nearest noise sensitive premises: **Table 12:** Plant Rating Limits

Location	Maximum Permissible Rating Level, dB $L_{A,Tr}$	
	Daytime (07:00-23:00hrs)	Night-time (23:00-07:00hrs)
Any noise sensitive façade	47	43

Table 12: Plant Rating Limits

The above noise level limits are specified as Rating Levels and as such it will be necessary to consider the acoustic character associated with any of the proposed M&E plant associated with the scheme when predicting the noise impact expected.

6.4.2 Proposed External Plant Items

Based on the information provided to Sol it is understood that the items of new and relocated plant are to be installed within the condenser compound as set out in Table 1 below.

Plant Item	Quantity	Manufacturer	Model	Status
Condenser	1	Mitsubishi Electric	PURY-P450	Relocated
Condenser	2	Midea	MDV-V160	Relocated
Condenser	2	Midea	MDV-V180	Relocated
Condenser	1	Midea	M20E-18HFN8	Relocated
Condenser	1	Mitsubishi Electric	PURY EP300YNW-A2	New
Condenser	2	Mitsubishi Electric	PURY EP350YNW-A2	New
Condenser	1	Mitsubishi Electric	PURY EP400YNW-A2	New
Condenser	2	Mitsubishi Electric	PURY EP500YNW-A2	New
Condenser	1	Mitsubishi Electric	PURY EP850YNW-A2	New
Condenser	2	Mitsubishi Electric	PUZ-ZM35VKA2	New
Condenser	3	Mitsubishi Electric	PUZ-ZM50VKA2	New
Condenser	1	Mitsubishi Electric	PUZ-ZM71VHA2	New
Condenser	1	Mitsubishi Electric	PUZ-ZM100VHA2	New
Condenser	1	Mitsubishi Electric	PUZ-ZM140VHA2	New
Condenser	3	Mitsubishi Electric	FDC100CSX	Relocated
Condenser	3	Mitsubishi Electric	FDC125VSX	Relocated

Table 1: Proposed Plant Items

6.4.3 Proposed Plant Locations

It is proposed to primarily locate the condensers with a ground level plant compound at the rear of the building. Existing units will be relocated across the compound and new items will be installed along the eastern boundary of the compound. The compound is walled but open topped.

There are also a number of units to be installed on the existing roof of 117-119 Portland Street.

Figures 9 and 10 show the proposed locations of the new and relocated plant:

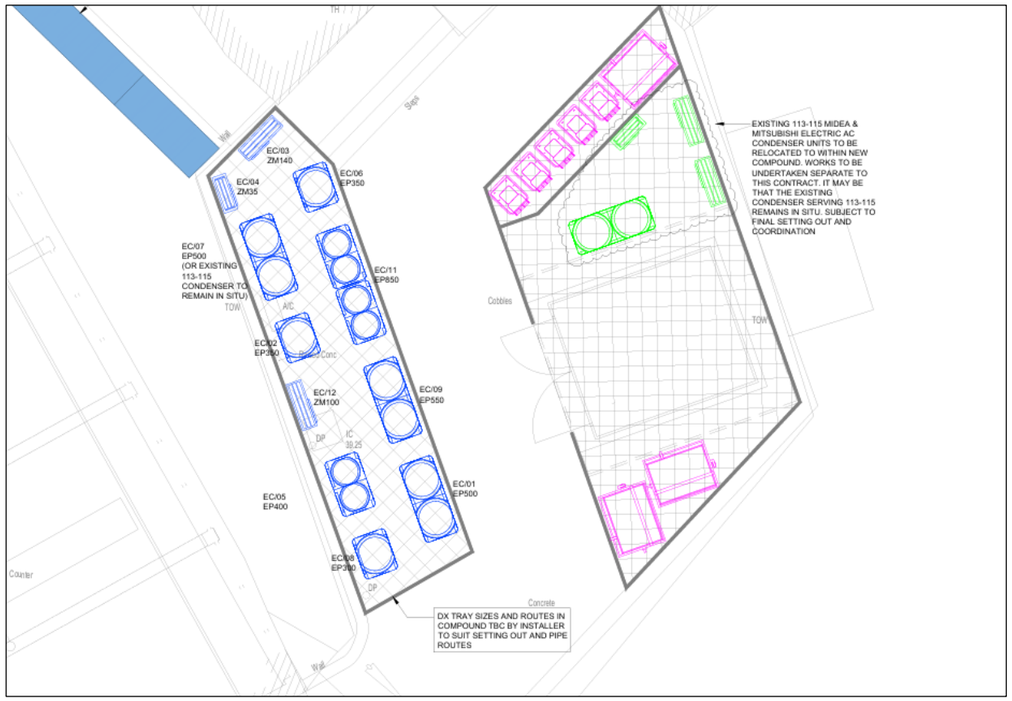


Figure 9: Plan Showing Proposed Courtyard Plant Locations (c/o Kaizen Consulting Engineers)

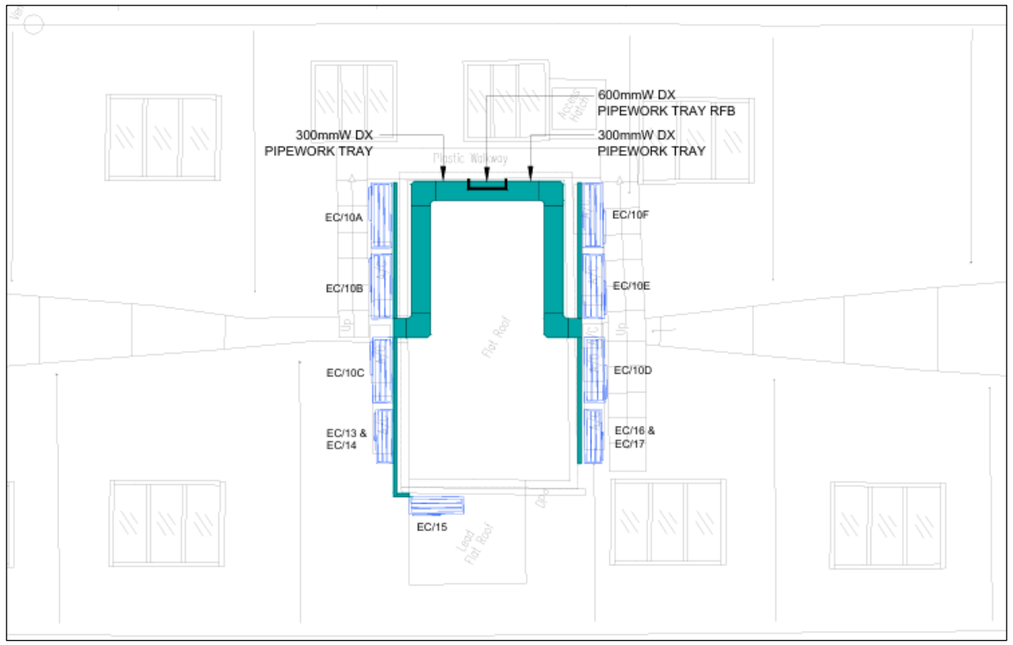


Figure 10: Plan Showing Proposed Rooftop Plant Locations (c/o Kaizen Consulting Engineers)

Internal heat recovery plant will be ducted to external louvres along the eastern façade of the building, to the west of the outdoor plant area. Noise from these ducted units will be controlled by means of in-line attenuator installed in the ductwork between the unit and the louvres such that contribution form the internal plant cannot give rise to an exceedance of the external plant noise limits when considered in tandem with the external plant.

6.4.4 *External Plant Operational Hours*

It is understood that the proposed plant could operate at all hours during both the daytime (07:00-23:00) and the night-time (23:00-07:00).

6.4.5 *External Plant Noise Levels*

Limited noise information has been provided to Sol at this stage; single figure broadband data has been provided for all new units, and a supporting single figure broadband data has been provided for the existing units where possible based on inspection and identification by others.

Sol have gathered octave band sound pressure level data for the majority of new and existing units from various manufacturer websites and manuals, however at this stage this data should be considered indicative, and it should also be noted to be incomplete with regards to octave band data for the existing Midea units.

Sol have requested the missing data from Midea who in turn have requested the information from the manufacturer however at the time of writing no data has been received and as such the relative level of the individual octave bands from the existing PURY-P450 unit have been adopted and attenuated evenly across all bands to produce a spectrum equivalent to the provided single figure broadband sound pressure level.

Table 2 below sets out the manufacturers or adopted/assumed sound pressure levels at 1 metre from each of the relocated or new units gathered by Sol to enable an assessment. Items marked with an asterisk denote units for which no suitable source noise data has been identified and an assumed spectrum shape has been used:

Manufacturer	Model	Sound Pressure Level @ 1m, dB per Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	dBA
Mitsubishi	PURY-P450	81	65	64	62	55	52	50	63
Midea	MDV-V160*	77*	61*	60*	58*	51*	48*	46*	59*
Midea	MDV-V180*	77*	61*	60*	58*	51*	48*	46*	59*
Midea	M20E-18HFN8	62	58	54	54	50	44	39	55
Mitsubishi	PURY EP300YNW-A2	75	70	69	66	61	57	52	67
Mitsubishi	PURY EP350YNW-A2	69	64	64	62	57	52	47	40
Mitsubishi	PURY EP400YNW-A2	74	64	66	64	59	55	49	65
Mitsubishi	PURY EP500YNW-A2	77	68	66	61	56	54	51	64
Mitsubishi	PURY EP550YNW-A2	80	69	68	64	59	56	52	47
Mitsubishi	PURY EP850YNW-A2	77	67	70	68	63	58	53	69
Mitsubishi	PUZ-ZM35VKA2	58	51	45	44	40	37	32	31
Mitsubishi	PUZ-ZM50VKA2	58	51	45	44	40	37	32	31
Mitsubishi	PUZ-ZM71VHA2	54	53	51	45	45	39	34	31
Mitsubishi	PUZ-ZM100VHA2	65	56	51	49	45	42	38	34
Mitsubishi	PUZ-ZM140VHA2	62	54	52	50	46	42	42	35
Mitsubishi	FDC100CSX	35	42	46	48	45	42	38	30
Mitsubishi	FDC125VSX	34	44	45	48	46	41	39	32

Table 2: Plant Noise Data

6.4.6 External Plant Noise Assessment

In order to predict the likely resultant plant noise levels at the identified noise sensitive receptors, a 3D computer based environmental noise model has been created using the proprietary DataKustik "CadnaA" Noise Mapping software. The following assumptions have been made in the generation of the noise model:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: '*Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation';*
- The model was set to include up to second-order reflected noise from solid structures;
- Acoustic screening and reflections afforded by nearby buildings and solid structures.

The model predicts the resultant plant noise Specific Level at the noise sensitive receptors with all plant running simultaneously.

A visualisation of the noise model is presented in Figure 10 below.

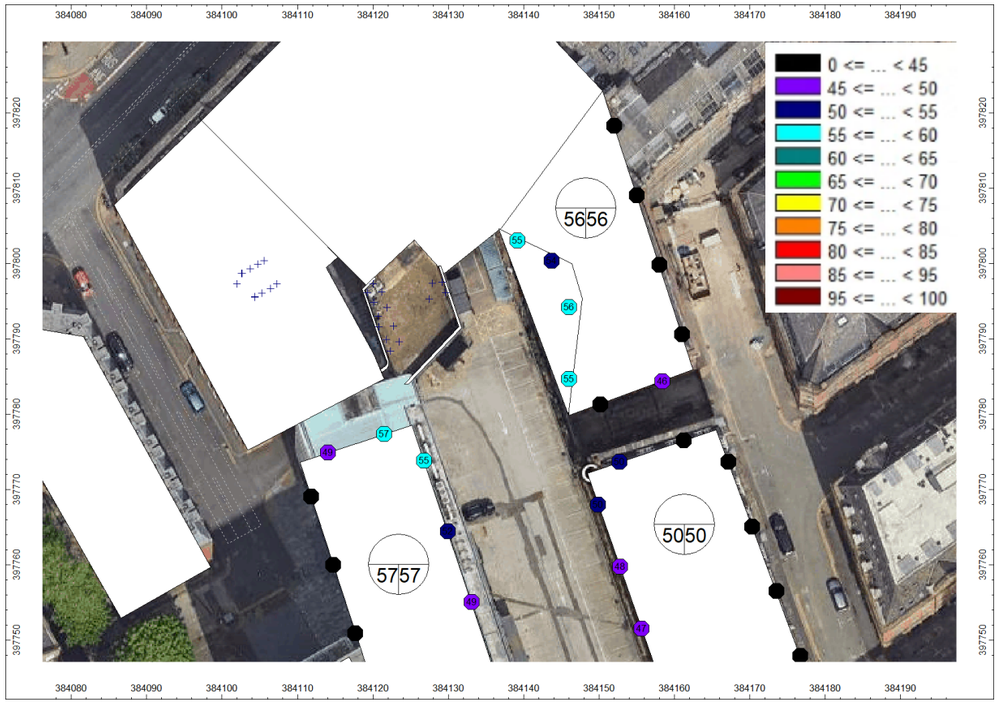


Figure 10: Visualisation of 3D plant noise model, Specific Sound level, dB, L_{Aeq}

6.4.6.1. BS 4142 Rating Penalty

As the condensers are fan-driven there is a significant probability that the noise generated will be perceptibly tonal at the noise-sensitive receptors. Therefore, a 4dB rating penalty is deemed to be applicable in line with current BS 4142 guidance.

6.4.6.2. Context

In full accordance with BS 4142 methodology, the context in which the sound occurs must be taken into consideration when demining the magnitude of the noise impact. In this case, the background noise level at site is dominated by transportation noise and other noise sources typical of an urban location. As such, the context of the site is not expected to affect the BS 4142 predicted magnitude of the noise impact generated.

6.4.6.2.1. Summary

Table 3 below summarises the results of the preliminary plant noise impact assessment.

Receptor	Specific Noise Level, dB, $L_{Aeq,T}$	Rating Level, dB, $L_{Ar,Tr}$	Maximum Permissible Rating Level, dB $L_{A,Tr}$	Exceedance, dB
Linley House Offices	57	61	47	+14
Harter Street Offices	56	60	47	+13
Harter Street Residential	50	54	43	+11

Table 3: Summary of Preliminary Plant Noise Assessment

6.4.7 Plant Noise Mitigation

Based on the assessment of the condenser units, in order to comply with the proposed plant noise limits at the worst affected residential windows it will be necessary to reduce the overall noise emissions by a minimum of 14 dBA.

This can likely be achieved by individual enclosure of the condenser units, or by constructing a louvred covering to the plant compound which would be subject to design by a specialist supplier/manufacturer.

The following companies can be contacted to develop a specific solution to achieve the required attenuation:

- Noico Ltd, (Noico | Noise Control Engineers | Industrial Noise Reduction | Hampshire);
- Caice, (Market Leader in Acoustics and Air Movement Products | Caice);
- Wakefield Acoustics, (Industrial Noise Control Solutions | Wakefield Acoustics)

7 CONCLUSION

Sol Acoustics Ltd ("Sol") has been commissioned by Bruntwood Ltd ("Bruntwood") to undertake an acoustic design assessment of the proposed office refurbishment of 117-119 Portland Street in Manchester.

This report provides the acoustic performance specification for the building envelope, as based on the pre-existing environmental noise climate on site as surveyed in January 2024, together with the outputs from the Sol 3D noise model, intrusive noise requirements of the BCO and BS 8233:2014 and the currently available Architectural design drawings.

This report demonstrates that indoor ambient noise limits can be achieved within all noise sensitive spaces across the proposed new office building with windows closed and acoustic design guidance concerning the required building envelope and external glazing specifications has been provided. Internal noise targets are likely to be exceeded when windows are open.

Additionally, appropriate M&E plant daytime and night time environmental noise limits and internal noise limits for the lower ground floor gym have been set herein, all as based on the measured, pre-existing environmental noise levels at surrounding noise sensitive receptors and current design proposals.

APPENDIX A NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

117-119 Portland Street, Manchester

DATES & TIMES

12 January 2024 to 16 January 2024

WEATHER CONDITIONS

Weather conditions were understood to be typically dry with light winds, dry ground surfaces and minor cloud cover.

PERSONNEL PRESENT DURING MEASUREMENTS

Chris Downing – Sol Acoustics Ltd

INSTRUMENTATION

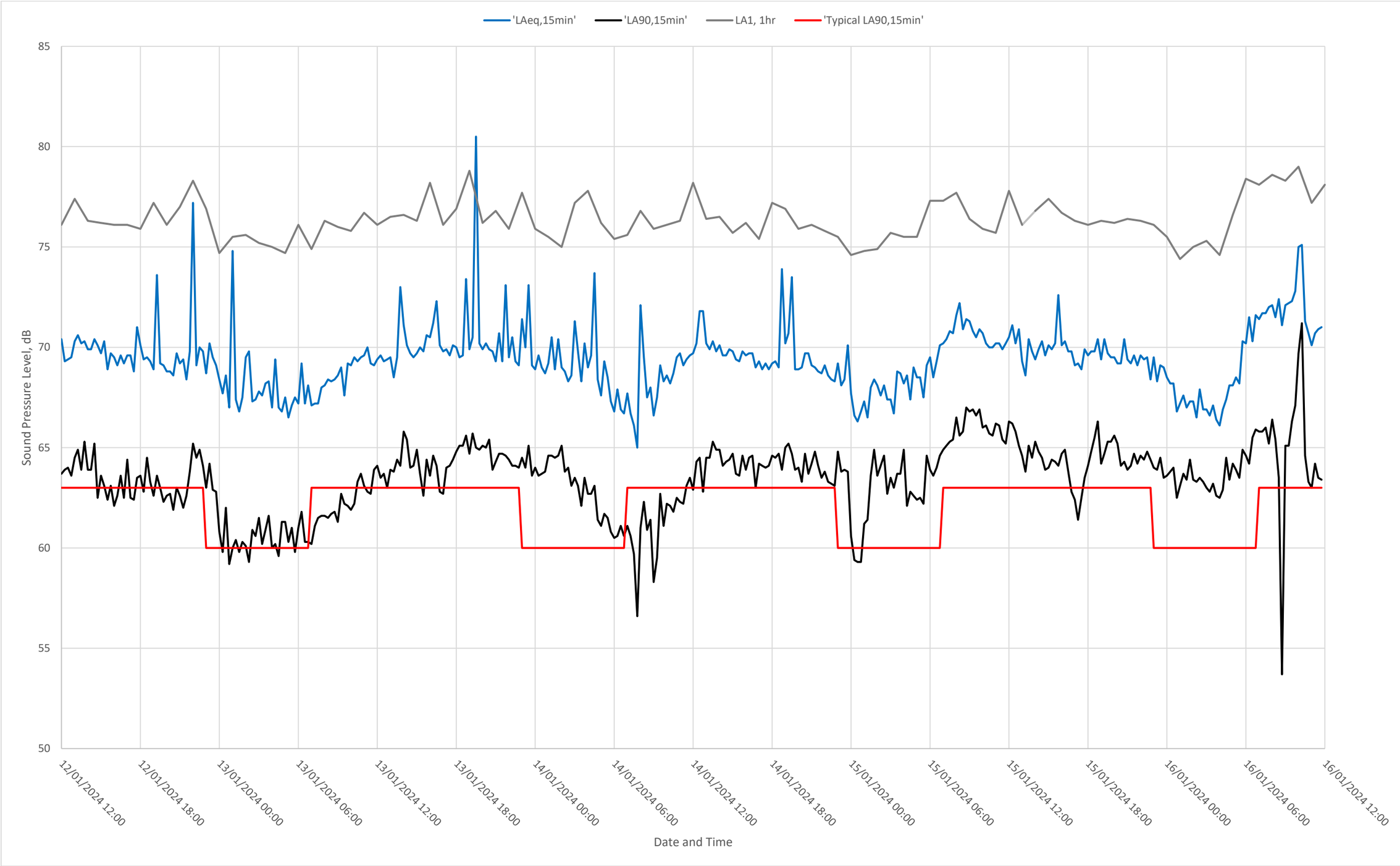
01dB Cube Sound Level Meter (serial no. 12070)
01dB Cube Sound Level Meter (serial no. 14027)
CAL21 Acoustic Calibrator (serial no. 34375244)

METHODOLOGY

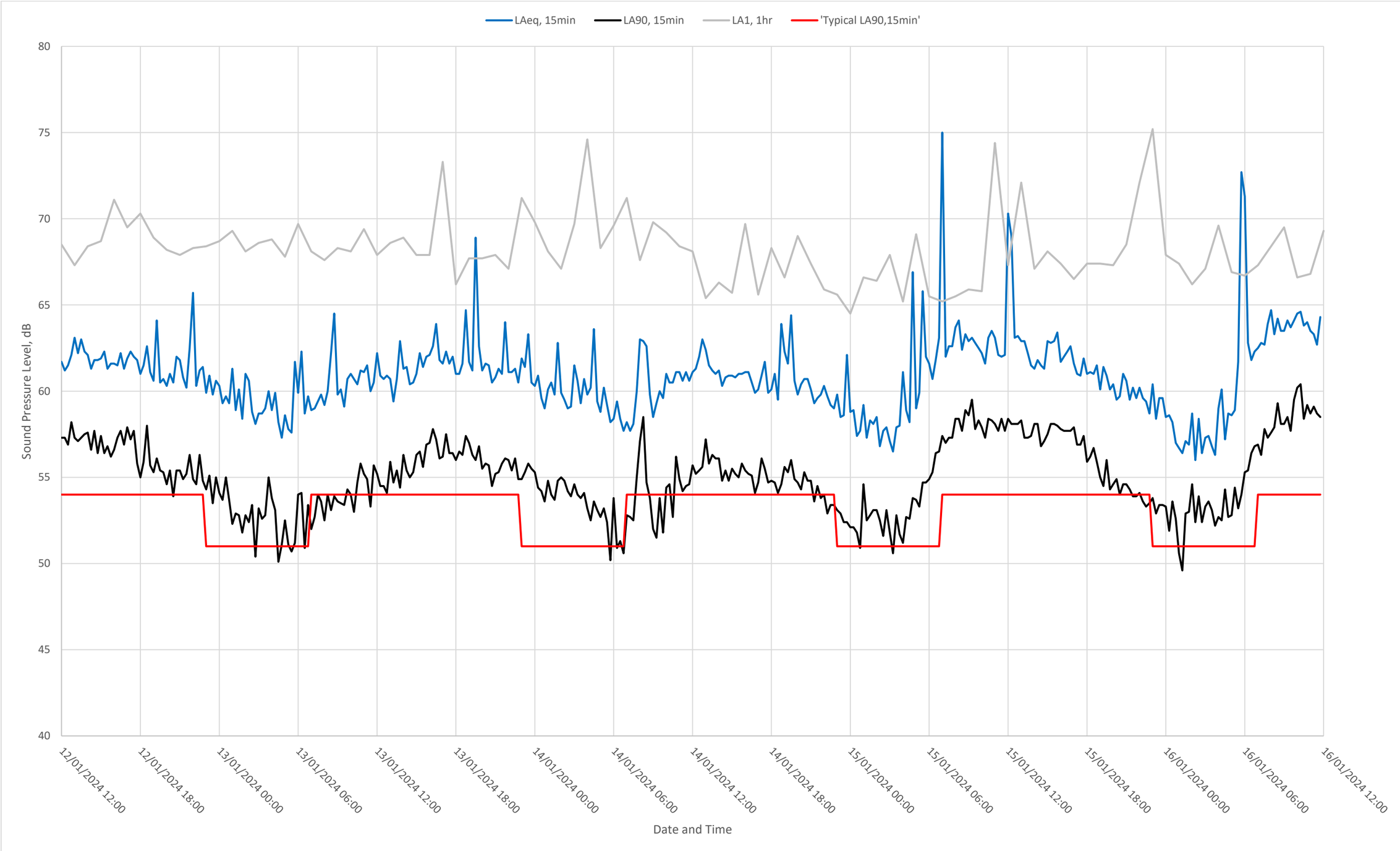
Before and after the measurements the sound level meters were checked and calibrated to an accuracy of ±0.4dB using the 01dB CAL 21 Calibrator. The calibrator produces a sound pressure level of 94 dB re 2x10-5 Pa @ 1kHz.

MEASUREMENT RESULTS

Graph A1 and A2 summarise the results obtained from the noise survey at Measurement Position MP1 and MP2 respectively.



Graph A1: Graph showing measured environmental noise levels as measured at Measurement Position MP1



Graph A2: Graph showing measured environmental noise levels as measured at Measurement Position MP2

APPENDIX B 3D NOISE MAP

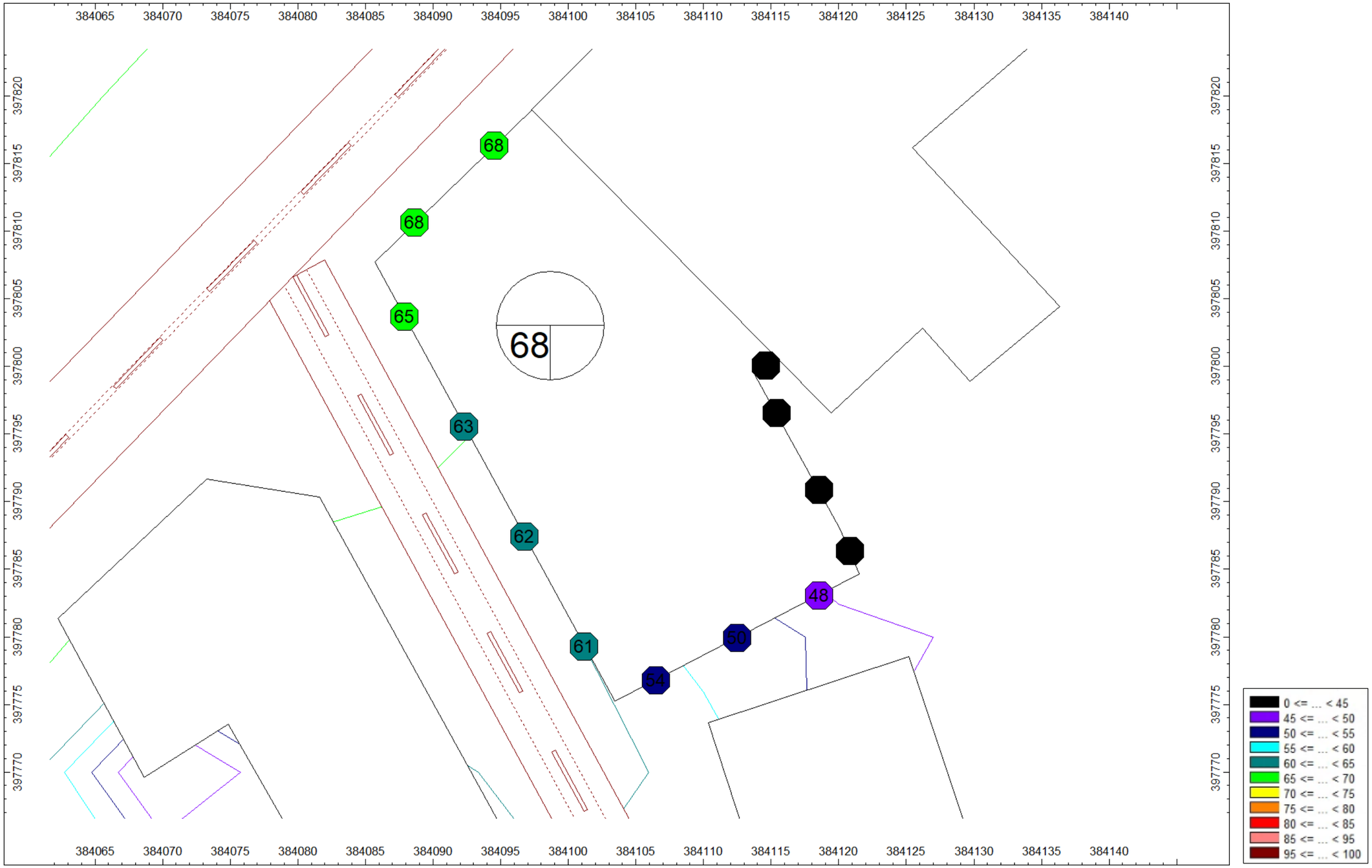


Figure B1: Predicted Office Hours (09:00-17:00) ambient noise levels ($L_{Aeq,T}$) at a grid height of 1.5 metres