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REPORT No. 2204063-7_v2

Holborn Town Hall

193-197 High Holborn
London
WC1V 7BD

ENVIRONMENTAL NOISE SURVEY & NOISE IMPACT ASSESSMENT REPORT

ISSUE 1 PREPARED: 9th December 2022
ISSUE 2 PREPARED: 12th December 2022

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CONTENTS

1.0 Introduction

1.1 Callisia Limited has commissioned Noico Ltd to conduct an environmental noise survey and noise impact assessment at Holborn Town Hall, 193-197 High Holborn, London WC1V 7BD in relation to the proposed office refurbishment works.

1.2 The purpose of the survey is to obtain statistical noise data and to determine representative background noise levels for the site. Based on the noise survey data, noise criteria are to be established for limiting noise emission from a proposed comfort cooling equipment which will serve the premises.

1.3 The development site comprises a Grade II listed building, primarily consisting of offices. As part of the development plans, an array of air-conditioning condensers are proposed to be installed externally at roof level between the building's lift riser block and the west boundary of the site.

1.4 Properties surrounding the site are predominantly used as offices with Commonwealth House to the north, 198 High Holborn to the east, Pearson block to the west, and offices along Stukeley Street to the south. There are also some residential apartments in the area, namely Green Dragon House along Stukeley Street to the southeast of the development site.

2.0 Instrumentation

2.1 A precision grade Norsonic 140 'Type 1' Integrating Sound Level Meter was used for the survey, equipped with a Norsonic outdoor microphone protection kit Nor-1212 and LEMO extension cable. The instrument was powered by an external battery and stored in a weatherproof case.

2.2 The instrument calibration was checked prior and subsequent to use, using a Norsonic Type 1251 field calibrator, with no calibration drift recorded.

2.3 Equipment serial numbers and laboratory calibration certification can be found in the table below.

Equipment Combination Code	Equipment Type	Serial number	Calibration Certificate	Calibration Date
140 Blue	Norsonic Type 140 Sound Level Meter	1402898	39863	Tested: 05/01/2022
	Norsonic Type 1225 Microphone	264811	39862	
	Norsonic Type 1209 Preamplifier	12537	39863	
Field Calibrator	Norsonic Type 1251 Calibrator	28311	28311	Tested: 25/07/2022

Table-1: Equipment list including calibration certification

3.0 Survey Details

3.1 Monitoring position: Environmental noise monitoring was carried out at roof level in the centre of the site, approximately 25 metres back from High Holborn. The sound analyser microphone was attached to a tripod and raised 1.3 metres above roof level. This position was chosen as it was considered to be representative of the background noise environment that exists at the nearest noise-affected properties shown in Figure A2.

3.2 Period: Noise monitoring was carried out continuously from approximately 11:45 hrs on 30th November 2022 through to 06:15 hrs on 5th December 2022. The instrument was set up to monitor noise levels continuously and store data in fifteen-minute intervals.

3.3 Weather: The prevailing weather condition throughout the majority of the survey period was satisfactory for noise monitoring, being cool with and moderate breeze. Windspeed, although not recorded, was considered to be less than 5 m/s throughout the survey period.

3.4 Site Noise Characteristics: The ambient noise level was characterised by road traffic noise along A40 (High Holborn) and items of mechanical plant serving adjacent buildings – shown in Figure A2. Temporal peaks in sound pressure level during the day correlates with construction work being carried out at the premises and adjacent properties. It is thought that no unusual events occurred during the survey period. The data is considered a true representation of the area's background noise level.

4.0 Survey Results

4.1 The results of the environmental survey are presented in graphical and numerical format in the attached appendices, showing the recorded values of L_{Aeq} and L_{A90}.

4.2 See Appendix 1 for a glossary of terms.

4.3 With reference to the measured data and background noise level statistical analysis in figure-1, the environmental noise levels are summarised in table-2 below.

Monitoring period	**Equivalent noise level ($L_{Aeq,T}$)**	**Typical background noise level ($L_{A90,15min}$)**	**Minimum background noise level ($L_{A90,15min}$)**
Daytime (07:00 - 19:00 hours)	55.2 dB $L_{Aeq,8hr}$	52 dB $L_{A90,15min}$	50.3 dB $L_{A90,15min}$
Evening (19:00 - 23:00 hours)	53.3 dB $L_{Aeq,4hr}$	51 dB $L_{A90,15min}$	50.3 dB $L_{A90,15min}$
Night-time (23:00 - 07:00 hours)	50.7 dB $L_{Aeq,12hr}$	47 dB $L_{A90,15min}$	44.4 dB $L_{A90,15min}$

Table-2: Summary of noise monitoring data.

5.0 BS 8233 internal noise level criteria

5.1 The British Standard 8233:2014 provides guidance on noise levels appropriate for various types of space. To control internal ambient noise from mechanical services the following maximum noise limits are specified for offices where privacy is also important.

Design range: 45-50 dB $L_{Aeq,T}$

5.2 It is generally accepted that the sound reduction performance of a partially open window forming part of a building envelope is approximately 10 dBA. Therefore, a 10 dBA correction is applied to the indoor ambient noise limits above to obtain a design noise criterion to be achieved externally at a distance of 1 metre from the nearest noise affected office window.

Design noise criterion (Offices): 55 dB $L_{Aeq.T}$

6.0 Camden Planning Criteria

5.1 Criteria for mechanical services noise emission are normally based upon the prevailing level of background noise in the period of concern and may be set against this to a level as normally defined by the local planning authority.

5.2 London Borough of Camden has published the following guidance in the Camden Local Plan 2017: Industrial and Commercial Noise Sources which relates to residential noise limits to be achieved at the nearest dwelling.

"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."

5.3 To conform to the above criteria, and in accordance with the typical background noise levels measured during the survey (summarised in 4.3 above), noise from the plant installations should not exceed the following values. Note these have been rounded to the nearest whole number for practical purposes.

Plant operation period	Design Noise Criteria
Daytime plant operation (07:00 to 19:00hrs)	42 $L_{Aeq,15min}$
Evening plant operation (19:00 to 23:00hrs)	41 $L_{Aeq,15min}$
Night time plant operation (23:00 to 07:00hrs)	37 $L_{Aeq,15min}$

Table-3: Plant noise level criteria

Note: These levels must be achieved cumulatively with all plant operating, and as measured at 1 metre from the window of the nearest affected property.

7.0 Plant noise impact assessment

7.1 Plant details and location: It is proposed that an array of 14-no. Daikin air-conditioning condensers are to be installed at roof level. The array includes 8-no. REYQ8U units, 2-no. REYQ10U units, and 4-no. REYQ12U units. The condensers are to positioned in an 'L' shape surrounding the central lift riser of the Town Hall. The plant in question is detailed in table-5 together with the manufacturer's certified noise data.

7.2 It should be noted, the plant will only operate during office opening hours, typically 07:00 and 19:00.

Daikin Condenser Model	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
REYQ8U – SWL	88	81	79	77	71	68	64	59	**78**
REYQ10U – SWL	88	82	80	78	72	71	68	61	**80**
REYQ12U – SWL	90	85	83	81	76	75	76	68	**84**

Table-5: Manufacturers certified sound power level (SWL) noise data.

7.3 Nearest commercial/office receptor: From observations made on site, the nearest neighbouring commercial properties are Pearson offices at 192 High Holborn to the west and Ledger Link offices along Stukeley Street to the south. Windows at Pearson offices do not have direct line of sight of the plant installation and are significantly shielded by the building envelope. Similarly, Windows at fourth floor level on the north side of Ledger Link offices have a partial line of sight of the plant 25 metres away. However, in order to protect the occupants of Holborn Town Hall the nearest noise sensitive windows are considered to be those at first floor level to the south of the installation. View of the installation will be obstructed by the building's roofline so the reflected noise path (approximately 20 metres) will dominate.

7.3.1 Plant noise emissions have been assessed to Holborn Town Hall windows at fourth floor level to the south of the plant installation (Commercial receptor 1).

7.4 Nearest residential receptor: From observations made on site, the nearest noise affected residential property to the proposed mechanical plant installation is Green Dragon House, an apartment block accessed via Stukeley Street, to the southeast of the site. Windows at fourth floor level on the west side of the premises are approximately 45 metres from the plant which is obscured from view by the lift riser block and roof parapets.

7.4.1 Plant noise emissions have been assessed to the noise sensitive locations described above (Residential receptor 1).

7.5 Noise impact assessment calculations: Calculations predicting the resultant noise level at 1 metre from the nearest noise sensitive windows of the locations identified above are detailed as follows for the most stringent plant operation periods. To simplify the noise impact assessment calculation, the condenser array has been separated into two groups each containing 4-no. REYQ8U, 1-no. REYQ10U, and 2-no. REYQ12U units. Group 1 – condensers to the north of the lift riser block, and Group 2 – condensers to the west of the lift riser block. Condensers within each group have very similar sound transmission paths to the nearest noise sensitive receptors and so the groups are treated as two distinct point noise sources:

7.5.1

Commercial receptor 1 – Daytime	**Sound pressure level**
Group 1 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (19 metres)	-26 dB
Barrier loss (partial line-of-sight)	-5 dB
Façade correction	+3 dB
Group 1 - Sound pressure level at receptor location	***59 dB(A)***
Group 2 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (21 metres)	-27 dB
Barrier loss	-12 dB
Façade correction	+3 dB
Group 2 - Sound pressure level at receptor location	***51 dB(A)***
Combined SPL at receptor location	**60 dB(A)**
BS 8233 Design noise criterion	55 dB $L_{Aeq,T}$
Level exceeding design noise criterion	**5 dB(A)**

Table-6: Noise impact assessment calculation for commercial receptor 1 during daytime plant operation periods.

7.5.2

Residential receptor 1 – Daytime	**Sound pressure level**
Group 1 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (45 metres)	-33 dB
Barrier losses	-12 dB
Group 1 - Sound pressure level at receptor location	***42 dB(A)***
Group 2 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (21 metres)	-33 dB
Barrier losses	-15 dB
Group 2 - Sound pressure level at receptor location	***39 dB(A)***
Combined SPL at receptor location	**44 dB(A)**
Camden planning criterion (Daytime)	42 dBA
Level exceeding design noise criterion	**2 dB(A)**

Table-7: Noise impact assessment calculation for residential receptor 1 during daytime plant operation periods.

7.6 The results of the noise impact assessments show that the sound pressure level of the plant at the nearest commercial receptor location is predicted to exceed the design noise criterion by 5 dB(A), hence, noise control measures are required in order to achieve suitable indoor ambient noise levels.

7.7 The residential noise impact assessment concludes the plant may exceed the daytime design noise criteria by 2 dB(A). Therefore, noise control measures are required in order to satisfy the requirements of the local planning authority.

8.0 Noise Mitigation Measures

8.1 The following measures are aimed at reducing noise emissions by a minimum of 5 dB(A), in order to satisfy the commercial and residential design noise criteria.

8.2 An acoustic screen is proposed to span the opening between the lift riser block and the adjacent building to the west. The screen will completely shield the nearest commercial windows, resulting in an increased barrier loss, and increase the barrier losses between condenser Group 1 and the nearest residential location by at least 3 dB(A). The screen will be formed from 270 mm deep acoustic louvre panels and comprise a solid outer face and perforated/expanded inner surface and 45 kg/m³ mineral wool infill. The following component performances would achieve the required noise reduction in this arrangement.

Item	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**
270mm acoustic louvre – Transmission loss	4	7	10	12	15	16	13	12

Table-8: Acoustic component performance specification.

8.3 The following calculation proves compliance with the design noise criteria during the most stringent plant operating periods.

8.3.1

Commercial receptor 1 – Daytime	**Sound pressure level**
Group 1 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (19 metres)	-26 dB
Barrier loss (including mitigation)	-12 dB
Façade correction	+3 dB
Group 1 - Sound pressure level at receptor location	***52 dB(A)***
Group 2 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (21 metres)	-27 dB
Barrier loss	-13 dB
Façade correction	+3 dB
Group 2 - Sound pressure level at receptor location	***50 dB(A)***
Combined SPL at receptor location	**54 dB(A)**
BS 8233 Design noise criterion	55 dB $L_{Aeq,T}$
Level exceeding design noise criterion	**-1 dB(A)**

Table-9: Noise impact assessment calculation for commercial receptor 1 during daytime plant operation periods including recommended mitigation measures.

8.3.2

Residential receptor 1 – Daytime	**Sound pressure level**
Group 1 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (45 metres)	-33 dB
Barrier losses	-15 dB
Group 1 - Sound pressure level at receptor location	***39 dB(A)***
Group 2 – Combined SWL	*89 dB(A)*
Sound pressure level at 1 metre in free-field	-11 dB
Adjacent reflecting surfaces Q=8	+9 dB
Distance loss (21 metres)	-33 dB
Barrier losses	-15 dB
Group 2 - Sound pressure level at receptor location	***39 dB(A)***
Combined SPL at receptor location	**42 dB(A)**
Camden planning criterion (Daytime)	42 dBA
Level exceeding design noise criterion	**0 dB(A)**

Table-10: Noise impact assessment calculation for residential receptor 1 during daytime plant operation periods including mitigation measures.

9.0 Conclusion

9.1 A background noise level survey has been carried out at Holborn Town Hall, 193-197 High Holborn, London WC1V 7BD.

9.2 Based upon the survey results, discussions with the local planning authority, and knowledge of relevant environmental design standards, criteria applicable to noise from the mechanical services plant have been established.

9.3 A noise assessment has been carried out on the proposed mechanical plant installations and it has been determined that the design noise criteria will be exceeded by a maximum of 5 dB(A).

9.4 Recommendations have been given for suitable noise control measures which if implemented in full will achieve the design noise criteria, and as such meet the planning noise requirements of the local planning authority.

Appendix 1 - Glossary of Terms

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (Lp) the reference quantity is $2x10^{-5}$ N/m^2. The sound pressure level existing when microphone measured pressure is $2x10^{-5}$ N/m^2 is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (Lp).
Frequency	Is related to sound pitch; frequency equals the ratio between velocity of sound and wavelength.
A weighting	Arithmetic corrections applied to values of Lp according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of Lp actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of Lp actually measured.
$L_{n,T}$	Lp which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T.
Background noise level	The value of $L_{A90,T}$, ref. BS4142:2014.
Typical background noise level	The lowest most common $L_{A90,15min}$ rounded to the nearest decibel, for each reference period.
Traffic Noise Level	The value of $L_{A10,T}$.
Specific Noise Level	The value of $L_{Aeq,T}$ at the assessment position produced by the specific noise source, ref. BS4142:2014.
Rating Level	The specific noise level, corrected to account for any characteristic features of the noise, by adding a 5 dBA penalty for any tonal, impulsive or irregular qualities, ref. BS4142:2014.
Specific Noise Source	The noise source under consideration when assessing the likelihood of complaint.
Assessment Position	Unless otherwise noted, is a point at 1 m from the façade of the nearest affected sensitive property.

Appendix 2 - Environmental Noise Monitoring Data

Date	LAeq	LA90
(2022/11/30 11:45:34.00)	57.3	52.6
(2022/11/30 12:00:01.00)	55.4	52.8
(2022/11/30 12:15:01.00)	56.5	52.5
(2022/11/30 12:30:02.00)	53.9	52.7
(2022/11/30 12:45:01.00)	53.4	52.4
(2022/11/30 13:00:01.00)	54	52.8
(2022/11/30 13:15:01.00)	54.6	53.5
(2022/11/30 13:30:01.00)	55	53.5
(2022/11/30 13:45:01.00)	54.2	53.2
(2022/11/30 14:00:01.00)	57.7	53.7
(2022/11/30 14:15:01.00)	54.7	53
(2022/11/30 14:30:01.00)	54.5	53.3
(2022/11/30 14:45:01.00)	54.9	53.2
(2022/11/30 15:00:01.00)	54.3	52.8
(2022/11/30 15:15:01.00)	54.5	52.9
(2022/11/30 15:30:01.00)	54.5	53.1
(2022/11/30 15:45:01.00)	53.9	52.5
(2022/11/30 16:00:01.00)	53.9	52.5
(2022/11/30 16:15:02.00)	53.9	52.5
(2022/11/30 16:30:02.00)	53.9	52.6
(2022/11/30 16:45:02.00)	53	51.7
(2022/11/30 17:00:01.00)	53.3	51.6
(2022/11/30 17:15:02.00)	53.4	52.1
(2022/11/30 17:30:02.00)	54	52.4
(2022/11/30 17:45:02.00)	53.2	51.7
(2022/11/30 18:00:02.00)	52	51.4
(2022/11/30 18:15:02.00)	55.1	51.4
(2022/11/30 18:30:02.00)	55.8	51.3
(2022/11/30 18:45:02.00)	52.1	51.3
(2022/11/30 19:00:02.00)	52.2	51.1
(2022/11/30 19:15:02.00)	52.2	50.9
(2022/11/30 19:30:02.00)	52.3	51.5
(2022/11/30 19:45:02.00)	51.6	50.8
(2022/11/30 20:00:02.00)	52.6	51
(2022/11/30 20:15:02.00)	51.8	51.1
(2022/11/30 20:30:02.00)	57.9	51.2
(2022/11/30 20:45:02.00)	51.8	51.1
(2022/11/30 21:00:02.00)	52.1	51
(2022/11/30 21:15:02.00)	52	51
(2022/11/30 21:30:02.00)	51.9	51.1
(2022/11/30 21:45:02.00)	51.4	50.6
(2022/11/30 22:00:02.00)	51.4	50.7
(2022/11/30 22:15:02.00)	51.7	50.6
(2022/11/30 22:30:02.00)	51.2	50.4
(2022/11/30 22:45:02.00)	51.4	50.3
(2022/11/30 23:00:02.00)	49.7	48.6
(2022/11/30 23:15:02.00)	50	48.8
(2022/11/30 23:30:02.00)	49.8	48.6
(2022/11/30 23:45:02.00)	50	47.6
(2022/12/01 00:00:02.00)	49.9	46.5
(2022/12/01 00:15:01.00)	49.7	48.3
(2022/12/01 00:30:01.00)	49.6	48.3
(2022/12/01 00:45:01.00)	48.8	47.6
(2022/12/01 01:00:01.00)	48.8	47.5
(2022/12/01 01:15:01.00)	48.6	47.5
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(2022/12/01 02:00:01.00)	46.4	44.8
(2022/12/01 02:15:01.00)	46	44.4
(2022/12/01 02:30:02.00)	46.1	44.5
(2022/12/01 02:45:01.00)	46.5	44.4
(2022/12/01 03:00:02.00)	46.3	44.4
(2022/12/01 03:15:01.00)	46.8	45
(2022/12/01 03:30:01.00)	46.6	45.3
(2022/12/01 03:45:02.00)	46	44.4
(2022/12/01 04:00:01.00)	47	45.4
(2022/12/01 04:15:01.00)	46.5	45
(2022/12/01 04:30:01.00)	47.6	45.5
(2022/12/01 04:45:02.00)	48.3	46.7
(2022/12/01 05:00:02.00)	47.4	45.5
(2022/12/01 05:15:02.00)	49.9	47.1
(2022/12/01 05:30:02.00)	50.2	48.1
(2022/12/01 05:45:02.00)	52.7	51.1
(2022/12/01 06:00:02.00)	52.7	51
(2022/12/01 06:15:02.00)	53.4	51.2
(2022/12/01 06:30:02.00)	54.3	52.5
(2022/12/01 06:45:02.00)	53.2	51.7
(2022/12/01 07:00:02.00)	53.8	52.4
(2022/12/01 07:15:02.00)	54	52.3
(2022/12/01 07:30:02.00)	55.1	52.7
(2022/12/01 07:45:02.00)	54.2	52.4
(2022/12/01 08:00:02.00)	55.2	52.9
(2022/12/01 08:15:02.00)	53.9	53.1
(2022/12/01 08:30:02.00)	56.4	53.1
(2022/12/01 08:45:02.00)	56	53
(2022/12/01 09:00:02.00)	55	53
(2022/12/01 09:15:02.00)	55.1	53.1
(2022/12/01 09:30:02.00)	58.3	53.3
(2022/12/01 09:45:02.00)	55.5	52.5
(2022/12/01 10:00:02.00)	53.6	52.2
(2022/12/01 10:15:02.00)	58.1	52.6
(2022/12/01 10:30:02.00)	54.3	53.1
(2022/12/01 10:45:02.00)	55.6	53.2
(2022/12/01 11:00:02.00)	54.5	53.2
(2022/12/01 11:15:02.00)	54.2	52.6
(2022/12/01 11:30:02.00)	54.3	53
(2022/12/01 11:45:02.00)	54.6	53.1
(2022/12/01 12:00:02.00)	55	53
(2022/12/01 12:15:02.00)	55.1	52.5

Date	LAeq	LA90
(2022/12/01 12:30:02.00)	61	52.9
(2022/12/01 12:45:02.00)	57.2	53.2
(2022/12/01 13:00:02.00)	58.4	53.7
(2022/12/01 13:15:02.00)	56.8	53.2
(2022/12/01 13:30:02.00)	56.8	52.8
(2022/12/01 13:45:02.00)	55.9	53.1
(2022/12/01 14:00:02.00)	55.6	53.3
(2022/12/01 14:15:02.00)	55.4	52.9
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(2022/12/01 15:15:02.00)	55	52.9
(2022/12/01 15:30:02.00)	55	53.3
(2022/12/01 15:45:02.00)	54.8	53
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(2022/12/01 19:00:02.00)	53.2	51.9
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(2022/12/01 20:00:02.00)	54.3	52.3
(2022/12/01 20:15:02.00)	55.7	51.6
(2022/12/01 20:30:02.00)	53.8	51.8
(2022/12/01 20:45:02.00)	52.6	51.6
(2022/12/01 21:00:02.00)	52.4	51.5
(2022/12/01 21:15:02.00)	52.8	51.5
(2022/12/01 21:30:02.00)	52	51.1
(2022/12/01 21:45:02.00)	52.8	51.6
(2022/12/01 22:00:02.00)	51.7	51
(2022/12/01 22:15:02.00)	51.9	50.9
(2022/12/01 22:30:02.00)	51.9	50.7
(2022/12/01 22:45:02.00)	51.6	50.8
(2022/12/01 23:00:02.00)	53.4	49.6
(2022/12/01 23:15:02.00)	50.9	49.9
(2022/12/01 23:30:02.00)	50.6	49.6
(2022/12/01 23:45:03.00)	49.6	47.3
(2022/12/02 00:00:02.00)	48.8	47.1
(2022/12/02 00:15:01.00)	48.9	46.6
(2022/12/02 00:30:01.00)	48.4	47.1
(2022/12/02 00:45:01.00)	49.1	47.1
(2022/12/02 01:00:01.00)	49.2	47.9
(2022/12/02 01:15:01.00)	49.5	48.1
(2022/12/02 01:30:01.00)	49.6	48.6
(2022/12/02 01:45:01.00)	48.5	46.6
(2022/12/02 02:00:01.00)	48.2	46.2
(2022/12/02 02:15:01.00)	47.8	46.4
(2022/12/02 02:30:01.00)	47.8	46.2
(2022/12/02 02:45:01.00)	46.9	44.7
(2022/12/02 03:00:01.00)	46.9	44.6
(2022/12/02 03:15:01.00)	47.1	45
(2022/12/02 03:30:01.00)	47.2	45.6
(2022/12/02 03:45:01.00)	46.5	44.4
(2022/12/02 04:00:01.00)	47.1	45
(2022/12/02 04:15:02.00)	48.4	47
(2022/12/02 04:30:01.00)	47.9	46.7
(2022/12/02 04:45:02.00)	48	46.1
(2022/12/02 05:00:02.00)	48	46.7
(2022/12/02 05:15:02.00)	49.8	47.9
(2022/12/02 05:30:02.00)	51.3	49
(2022/12/02 05:45:02.00)	52.9	50.7
(2022/12/02 06:00:02.00)	52.1	51.1
(2022/12/02 06:15:02.00)	52.4	51.3
(2022/12/02 06:30:02.00)	53.3	51.9
(2022/12/02 06:45:02.00)	53.7	52.5
(2022/12/02 07:00:02.00)	53.2	51.6
(2022/12/02 07:15:02.00)	53.7	51.8
(2022/12/02 07:30:02.00)	53.4	52.2
(2022/12/02 07:45:02.00)	53.7	52.3
(2022/12/02 08:00:02.00)	55.1	53.1
(2022/12/02 08:15:02.00)	60.1	53.3
(2022/12/02 08:30:02.00)	58.7	53.8
(2022/12/02 08:45:02.00)	57.1	53.7
(2022/12/02 09:00:02.00)	57.3	53.8
(2022/12/02 09:15:02.00)	56.9	54
(2022/12/02 09:30:02.00)	55.4	54.1
(2022/12/02 09:45:02.00)	55.9	53.7
(2022/12/02 10:00:02.00)	56.8	54.4
(2022/12/02 10:15:02.00)	56.4	53.9
(2022/12/02 10:30:02.00)	56.9	53.9
(2022/12/02 10:45:02.00)	54.5	53.5
(2022/12/02 11:00:02.00)	55	53.7
(2022/12/02 11:15:02.00)	57.3	56.2
(2022/12/02 11:30:02.00)	58	54.2
(2022/12/02 11:45:02.00)	57.4	53.8
(2022/12/02 12:00:02.00)	56.7	54
(2022/12/02 12:15:02.00)	58.7	54.2
(2022/12/02 12:30:02.00)	59.3	56.3
(2022/12/02 12:45:02.00)	60	57.3
(2022/12/02 13:00:02.00)	60.8	57
(2022/12/02 13:15:02.00)	55.6	53.8
(2022/12/02 13:30:02.00)	60	55.5

Date	LAeq	LA90
(2022/12/02 13:45:02.00)	58.5	54.8
(2022/12/02 14:00:01.00)	59.4	56.4
(2022/12/02 14:15:02.00)	60.1	57
(2022/12/02 14:30:02.00)	60.4	54.2
(2022/12/02 14:45:02.00)	61.1	54.2
(2022/12/02 15:00:02.00)	55.9	54
(2022/12/02 15:15:02.00)	56.5	54
(2022/12/02 15:30:02.00)	55.5	54.4
(2022/12/02 15:45:02.00)	54.4	53
(2022/12/02 16:00:02.00)	54.6	53.1
(2022/12/02 16:15:02.00)	54.5	53.5
(2022/12/02 16:30:02.00)	54.8	53.2
(2022/12/02 16:45:02.00)	53.9	52.6
(2022/12/02 17:00:02.00)	54.2	52.8
(2022/12/02 17:15:02.00)	53.9	53
(2022/12/02 17:30:02.00)	54.1	53.1
(2022/12/02 17:45:02.00)	54.2	52.9
(2022/12/02 18:00:02.00)	54.2	52.8
(2022/12/02 18:15:02.00)	54.3	52.8
(2022/12/02 18:30:02.00)	54.9	52.9
(2022/12/02 18:45:02.00)	54	52.6
(2022/12/02 19:00:02.00)	53.7	52.8
(2022/12/02 19:15:02.00)	53.5	52.5
(2022/12/02 19:30:02.00)	54.3	52.7
(2022/12/02 19:45:02.00)	54.5	53
(2022/12/02 20:00:02.00)	53.5	52.8
(2022/12/02 20:15:02.00)	53.2	52.5
(2022/12/02 20:30:02.00)	53.8	52.5
(2022/12/02 20:45:03.00)	52.8	52.1
(2022/12/02 21:00:02.00)	53.2	51.9
(2022/12/02 21:15:02.00)	53.1	52.1
(2022/12/02 21:30:02.00)	53.7	52.5
(2022/12/02 21:45:02.00)	53.8	52.6
(2022/12/02 22:00:02.00)	53.7	52.4
(2022/12/02 22:15:02.00)	53.5	52.6
(2022/12/02 22:30:02.00)	53	52.1
(2022/12/02 22:45:02.00)	53.6	52.2
(2022/12/02 23:00:02.00)	53.1	52.2
(2022/12/02 23:15:02.00)	54.7	52.1
(2022/12/02 23:30:02.00)	53.2	52.1
(2022/12/02 23:45:02.00)	52.5	50.9
(2022/12/03 00:00:02.00)	51.7	50.4
(2022/12/03 00:15:01.00)	51.1	50.1
(2022/12/03 00:30:01.00)	51.4	50.1
(2022/12/03 00:45:02.00)	51.4	49.8
(2022/12/03 01:00:01.00)	51.1	49.5
(2022/12/03 01:15:01.00)	51.7	49.4
(2022/12/03 01:30:01.00)	52.1	49.7
(2022/12/03 01:45:01.00)	52.2	50
(2022/12/03 02:00:01.00)	52	50.2
(2022/12/03 02:15:02.00)	51.7	49.8
(2022/12/03 02:30:02.00)	52.1	49.6
(2022/12/03 02:45:01.00)	50.4	49.3
(2022/12/03 03:00:02.00)	49.3	46.9
(2022/12/03 03:15:01.00)	49.4	47.1
(2022/12/03 03:30:02.00)	50.8	47.9
(2022/12/03 03:45:02.00)	50.2	48
(2022/12/03 04:00:02.00)	50.1	47.7
(2022/12/03 04:15:02.00)	49.5	47.5
(2022/12/03 04:30:02.00)	50.6	46.5
(2022/12/03 04:45:02.00)	48.6	46.7
(2022/12/03 05:00:02.00)	48.7	46.9
(2022/12/03 05:15:02.00)	52.8	47.1
(2022/12/03 05:30:02.00)	53.7	48.6
(2022/12/03 05:45:02.00)	51.3	49.8
(2022/12/03 06:00:01.00)	52.3	49.9
(2022/12/03 06:15:02.00)	51.6	50.4
(2022/12/03 06:30:02.00)	53.2	51.4
(2022/12/03 06:45:02.00)	52.8	51.2
(2022/12/03 07:00:02.00)	51.6	50.6
(2022/12/03 07:15:02.00)	52.4	50.8
(2022/12/03 07:30:02.00)	51.8	50.5
(2022/12/03 07:45:02.00)	52.8	51
(2022/12/03 08:00:02.00)	52.3	51.1
(2022/12/03 08:15:02.00)	52.4	51.4
(2022/12/03 08:30:02.00)	53.2	51.4
(2022/12/03 08:45:02.00)	53.3	51.5
(2022/12/03 09:00:02.00)	53.1	51.4
(2022/12/03 09:15:02.00)	53.8	51.7
(2022/12/03 09:30:02.00)	54.8	52.3
(2022/12/03 09:45:02.00)	54.3	52.3
(2022/12/03 10:00:02.00)	55.2	52.5
(2022/12/03 10:15:02.00)	55.2	52.9
(2022/12/03 10:30:02.00)	55	52.1
(2022/12/03 10:45:02.00)	55.5	52.6
(2022/12/03 11:00:02.00)	54.6	52.4
(2022/12/03 11:15:02.00)	57.5	52.7
(2022/12/03 11:30:02.00)	53.8	52.4
(2022/12/03 11:45:02.00)	54.3	52.7
(2022/12/03 12:00:02.00)	54.3	52.3
(2022/12/03 12:15:02.00)	53.7	52.1
(2022/12/03 12:30:02.00)	53.6	52.3
(2022/12/03 12:45:02.00)	53.5	52.6
(2022/12/03 13:00:02.00)	55.1	53
(2022/12/03 13:15:02.00)	54.4	52.3
(2022/12/03 13:30:02.00)	53.8	52.4
(2022/12/03 13:45:02.00)	54.4	52.6
(2022/12/03 14:00:02.00)	53.5	52.5
(2022/12/03 14:15:02.00)	53.8	52.9
(2022/12/03 14:30:02.00)	53.7	52.4
(2022/12/03 14:45:02.00)	53.7	52.4

Date	LAeq	LA90
(2022/12/03 15:00:02.00)	54.8	52.9
(2022/12/03 15:15:02.00)	54.3	52.4
(2022/12/03 15:30:02.00)	54.2	52.7
(2022/12/03 15:45:02.00)	53.6	52.4
(2022/12/03 16:00:02.00)	53.8	52.1
(2022/12/03 16:15:02.00)	53.7	52.5
(2022/12/03 16:30:02.00)	53.9	52.7
(2022/12/03 16:45:02.00)	53.9	52.9
(2022/12/03 17:00:02.00)	54.1	52.9
(2022/12/03 17:15:02.00)	53.9	52.8
(2022/12/03 17:30:02.00)	53.5	52.6
(2022/12/03 17:45:02.00)	53.3	52.4
(2022/12/03 18:00:03.00)	54.3	52.7
(2022/12/03 18:15:02.00)	53	52.1
(2022/12/03 18:30:02.00)	52.7	51.8
(2022/12/03 18:45:02.00)	52.7	52.2
(2022/12/03 19:00:02.00)	52.5	51.9
(2022/12/03 19:15:02.00)	52.6	51.9
(2022/12/03 19:30:02.00)	53.5	52
(2022/12/03 19:45:02.00)	52.9	52.1
(2022/12/03 20:00:02.00)	53.7	52.2
(2022/12/03 20:15:02.00)	52.7	52
(2022/12/03 20:30:02.00)	52.1	51.6
(2022/12/03 20:45:02.00)	53.9	51.7
(2022/12/03 21:00:02.00)	53.3	51.5
(2022/12/03 21:15:02.00)	52.7	52
(2022/12/03 21:30:02.00)	52.7	52.1
(2022/12/03 21:45:02.00)	55.3	51.7
(2022/12/03 22:00:02.00)	52.8	51.9
(2022/12/03 22:15:02.00)	56.7	52.6
(2022/12/03 22:30:02.00)	53.1	52.1
(2022/12/03 22:45:02.00)	52.8	51.9
(2022/12/03 23:00:02.00)	56.2	51.8
(2022/12/03 23:15:02.00)	53	51.5
(2022/12/03 23:30:02.00)	52.6	51.5
(2022/12/03 23:45:02.00)	51.2	49.9
(2022/12/04 00:00:02.00)	51	50.3
(2022/12/04 00:15:01.00)	51.3	50.5
(2022/12/04 00:30:01.00)	51.5	50.4
(2022/12/04 00:45:01.00)	51.5	50.6
(2022/12/04 01:00:01.00)	51.2	50.1
(2022/12/04 01:15:01.00)	50.9	49.9
(2022/12/04 01:30:01.00)	50.4	49.3
(2022/12/04 01:45:01.00)	51.3	49.7
(2022/12/04 02:00:02.00)	51	50.1
(2022/12/04 02:15:01.00)	51.7	50.3
(2022/12/04 02:30:01.00)	50.3	49.2
(2022/12/04 02:45:02.00)	50.8	49.2
(2022/12/04 03:00:01.00)	51.7	49
(2022/12/04 03:15:01.00)	50.2	48
(2022/12/04 03:30:01.00)	49.9	48.6
(2022/12/04 03:45:01.00)	49.2	47.8
(2022/12/04 04:00:01.00)	50.3	48.3
(2022/12/04 04:15:02.00)	49.6	48.6
(2022/12/04 04:30:02.00)	49.7	48.8
(2022/12/04 04:45:02.00)	49.7	48.7
(2022/12/04 05:00:02.00)	49.1	48.2
(2022/12/04 05:15:01.00)	49.3	48.1
(2022/12/04 05:30:02.00)	50.2	48.3
(2022/12/04 05:45:02.00)	51.2	50
(2022/12/04 06:00:02.00)	50.4	49.5
(2022/12/04 06:15:02.00)	50.5	49.7
(2022/12/04 06:30:02.00)	50.9	50.1
(2022/12/04 06:45:02.00)	51	49.9
(2022/12/04 07:00:02.00)	51.9	50.3
(2022/12/04 07:15:02.00)	51.4	50.6
(2022/12/04 07:30:02.00)	51.3	50.3
(2022/12/04 07:45:02.00)	51.3	50.3
(2022/12/04 08:00:02.00)	51	50.3
(2022/12/04 08:15:02.00)	51.2	50.4
(2022/12/04 08:30:02.00)	51.8	51.1
(2022/12/04 08:45:02.00)	51.4	50.7
(2022/12/04 09:00:02.00)	51.7	50.9
(2022/12/04 09:15:02.00)	51.4	50.5
(2022/12/04 09:30:02.00)	51.8	50.9
(2022/12/04 09:45:02.00)	52.2	51.4
(2022/12/04 10:00:02.00)	52.4	51.6
(2022/12/04 10:15:02.00)	52.3	51.6
(2022/12/04 10:30:02.00)	52.4	51.5
(2022/12/04 10:45:02.00)	52.7	51.7
(2022/12/04 11:00:02.00)	52.8	51.5
(2022/12/04 11:15:02.00)	53.1	52.1
(2022/12/04 11:30:02.00)	52.8	51.9
(2022/12/04 11:45:02.00)	52.8	51.9
(2022/12/04 12:00:02.00)	53.8	52.1
(2022/12/04 12:15:02.00)	53.1	52.1
(2022/12/04 12:30:02.00)	53.2	52.1
(2022/12/04 12:45:02.00)	56.9	52.5
(2022/12/04 13:00:02.00)	57.4	52.8
(2022/12/04 13:15:02.00)	53.5	52.5
(2022/12/04 13:30:02.00)	53.9	52.1
(2022/12/04 13:45:02.00)	58.7	52.6
(2022/12/04 14:00:02.00)	54.2	52.2
(2022/12/04 14:15:02.00)	53.6	52.3
(2022/12/04 14:30:02.00)	53.5	52
(2022/12/04 14:45:02.00)	54.1	52.4
(2022/12/04 15:00:02.00)	55.9	52
(2022/12/04 15:15:02.00)	53.2	52
(2022/12/04 15:30:02.00)	53.3	52.1
(2022/12/04 15:45:02.00)	53.7	52.5
(2022/12/04 16:00:02.00)	54.2	52.6

Date	LAeq	LA90
(2022/12/04 16:15:02.00)	53.9	52.4
(2022/12/04 16:30:02.00)	53.2	52.2
(2022/12/04 16:45:02.00)	53	51.9
(2022/12/04 17:00:02.00)	53.1	52.2
(2022/12/04 17:15:02.00)	54.6	53.1
(2022/12/04 17:30:02.00)	53.9	52.9
(2022/12/04 17:45:02.00)	54.4	53
(2022/12/04 18:00:02.00)	54.9	52.8
(2022/12/04 18:15:02.00)	54.3	52.5
(2022/12/04 18:30:02.00)	53.5	52.2
(2022/12/04 18:45:02.00)	53.8	52.7
(2022/12/04 19:00:02.00)	53.3	52.3
(2022/12/04 19:15:02.00)	54.7	52.5
(2022/12/04 19:30:02.00)	53.6	52.6
(2022/12/04 19:45:02.00)	54.4	52.5
(2022/12/04 20:00:02.00)	53.1	52.4
(2022/12/04 20:15:02.00)	53	52.3
(2022/12/04 20:30:02.00)	53.2	52.4
(2022/12/04 20:45:02.00)	54.3	52.4
(2022/12/04 21:00:02.00)	54.1	52.5
(2022/12/04 21:15:02.00)	54	52.5
(2022/12/04 21:30:02.00)	53.4	52.5
(2022/12/04 21:45:02.00)	53.1	52.3
(2022/12/04 22:00:02.00)	54.1	52.1
(2022/12/04 22:15:02.00)	53	52.2
(2022/12/04 22:30:02.00)	53	52.3
(2022/12/04 22:45:02.00)	52.7	52
(2022/12/04 23:00:02.00)	52.7	51.9
(2022/12/04 23:15:02.00)	55.2	52.2
(2022/12/04 23:30:02.00)	52.8	52.1
(2022/12/04 23:45:02.00)	51.8	50.2
(2022/12/05 00:00:02.00)	51	49.8
(2022/12/05 00:15:01.00)	51.1	50.3
(2022/12/05 00:30:02.00)	53.6	50.5
(2022/12/05 00:45:02.00)	50.9	49.9
(2022/12/05 01:00:02.00)	49.5	47.9
(2022/12/05 01:15:02.00)	49.2	48
(2022/12/05 01:30:01.00)	48.8	47.4
(2022/12/05 01:45:02.00)	48.6	47.5
(2022/12/05 02:00:01.00)	48.7	47.4
(2022/12/05 02:15:01.00)	49	48
(2022/12/05 02:30:01.00)	49.5	48.4
(2022/12/05 02:45:02.00)	49.1	48.1
(2022/12/05 03:00:02.00)	49	47.7
(2022/12/05 03:15:02.00)	49	48
(2022/12/05 03:30:02.00)	52.3	47.9
(2022/12/05 03:45:02.00)	50.9	47.9
(2022/12/05 04:00:02.00)	48.1	46.8
(2022/12/05 04:15:02.00)	48.3	46.7
(2022/12/05 04:30:02.00)	48.9	47.1
(2022/12/05 04:45:02.00)	47.6	46.2
(2022/12/05 05:00:02.00)	48.3	46.5
(2022/12/05 05:15:02.00)	50	48.5
(2022/12/05 05:30:02.00)	52	50.3
(2022/12/05 05:45:02.00)	52.2	51.2
(2022/12/05 06:00:02.00)	52.8	51.5
(2022/12/05 06:15:02.00)	52.9	52.2

Table-A1: Tabulated survey data.

Figure A1

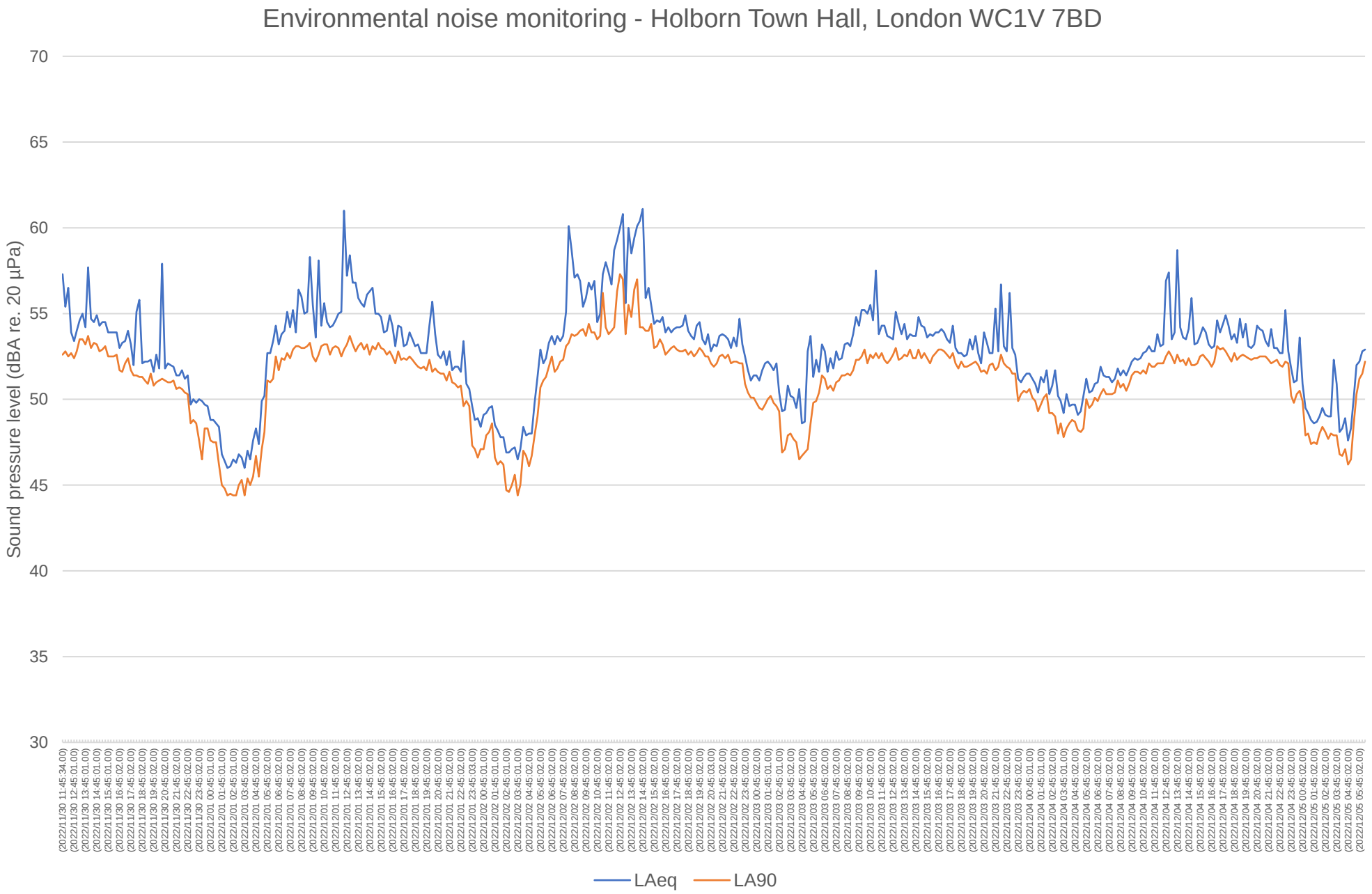
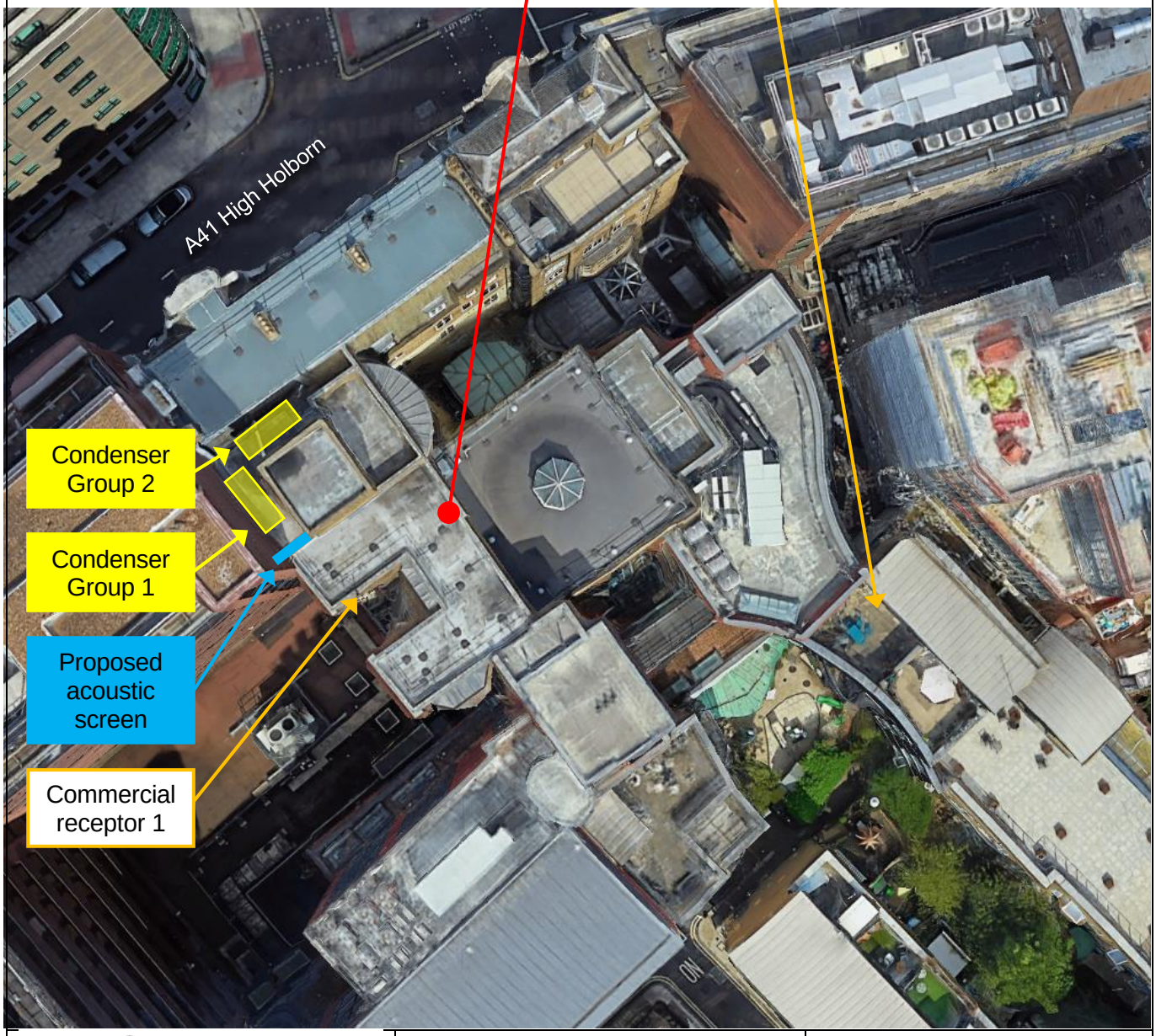

Environmental noise monitoring - Holborn Town Hall, London WC1V 7BD
Sound pressure level (dBA re. 20 µPa)
70
65
60
55
50
45
40
35
30
LAeq
LA90

Figure A2



Project: Holborn Town Hall, London	Title: Noise Survey Position
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NOICO NOISE CONTROL

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