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REPORT No. 2309062-8/01_v2

Camberley Fire Station
London Road
Camberley
GU15 3UH

ENVIRONMENTAL NOISE SURVEY & NOISE IMPACT ASSESSMENT REPORT

REPORT V2 PREPARED: 17 November 2023

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1.0 Introduction

1.1 Pellings LLP has commissioned Noico Ltd to conduct an environmental noise survey and plant noise impact assessment at Camberley Fire Station with respect to the external air-source heat pump installation proposal.

1.2 The purpose of the survey is to obtain statistical noise data and to determine the background noise levels at the site. Based on the noise survey data, noise criteria are to be established for limiting noise emissions from the proposed mechanical plant installations which will serve the premises, in line with BS 4142:2014+A1:2019 methodology. The noise criteria are to be set in accordance with the requirements of the local planning authority (Surrey Heath Borough Council).

1.3 The fire station is positioned off the north side of the A30 (London Road) and comprises a two-storey office block with connected, single-storey, fire vehicle garages. The station buildings are surrounded by a tarmacked carpark and training exercise area to the west. As part of the development plans, 6-no. air-source heat pumps are to be installed externally, on an area of flat roof, at first-floor level close to the north east corner of the office block.

1.4 From our observations, the site is surrounded by residential properties. The nearest residential demise is a semi-detached house along Ballard Road to the north of the fire station.

2.0 Instrumentation

2.1 For unattended monitoring, a precision grade Norsonic 140 ‘Type 1’ integrating sound level meter (SLM) was used. It was equipped with a Norsonic omnidirectional measurement microphone and windshield. The microphone was fitted with an outdoor weather protection kit (Nor-1212) and separated from the SLM via a LEMO audio cable. The instrument was powered by an external battery and stored in a weatherproof case.

2.2 Microphone sensitivity was checked prior and subsequent to use, with no calibration drift recorded.

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

Equipment Combination Code	Equipment Type	Serial number	Calibration Certificate	Calibration Date / Calibration Expiry
140 Orange	Norsonic Type 140 Sound Level Meter	1402996	STD179944	Tested: 25/07/2022
	GRAS Type 40AF Microphone	190436	STD179944	
	Norsonic Type 1209 Preamplifier	12265	STD179944	
Field Calibrator	Norsonic Type 1251 Calibrator	28311	STD179950	Tested: 25/07/2022

Table-1: Equipment list including calibration certification

3.0 Survey details

3.1 Unattended monitoring location: The SLM was located externally, on the northeast boundary of the site. The microphone was attached to metal mesh fencing, 4 metres from the nearest faire station building façade, and 2 metres above ground level, as shown in figure-1. Figure-1 also highlights the proposed plant installation location and nearest noise sensitive receptor (NSR) windows relative to the environmental noise monitoring equipment position.

Figure-1: Photograph of unattended sound monitoring equipment setup and observations of the nearest noise sensitive residential windows and proposed plant installation position.

3.2 Period: Noise monitoring was carried out continuously from approximately 14:15 hours on 25th October 2023 through to 09:45 hours on 27th October 2023. The instrument was set up to monitor noise levels continuously, with a 'fast' time weighting, and store data in fifteen-minute intervals.

3.3 Weather: The prevailing weather condition throughout the majority of the entire survey period was satisfactory for noise monitoring, being mostly dry, mild and with little to 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, in particular, along A3 (London Road) to the south of the site – shown in Figure A2 and A3. It is thought that no unusual events occurred during the survey period. The data is considered a true representation of the background noise level that exists at the nearest noise sensitive property.

4.0 Survey Results

4.1 The results of the background noise level monitoring survey are presented in graphical and numerical format in the attached appendices, showing the recorded values of $L_{Aeq,T}$ and $L_{A90,T}$. See appendix-1 for a glossary of terminology.

4.2 With reference to the measured data, the minimum background noise level, 'typical' background noise level and equivalent noise level for each measurement period are detailed in table-2. Statistical analysis of the $L_{A90,15min}$ values, shown in figure-2, is used to determine the typical background noise level referred to in BS 4142:2014 +A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound*.

Monitoring period	Minimum background level	Typical background level	Equivalent level
Daytime (07:00–19:00)	47.3 dB $L_{A90,15min}$	50 dB $L_{A90,15min}$	56.0 dB $L_{Aeq,12hr}$
Evening (19:00–23:00)	40.3 dB $L_{A90,15min}$	46 dB $L_{A90,15min}$	54.4 dB $L_{Aeq,4hr}$
Night time (23:00–07:00)	32.0 dB $L_{A90,15min}$	34 dB $L_{A90,15min}$	51.0 dB $L_{Aeq,8hr}$

Table-2: Survey results summary for environmental noise monitoring.

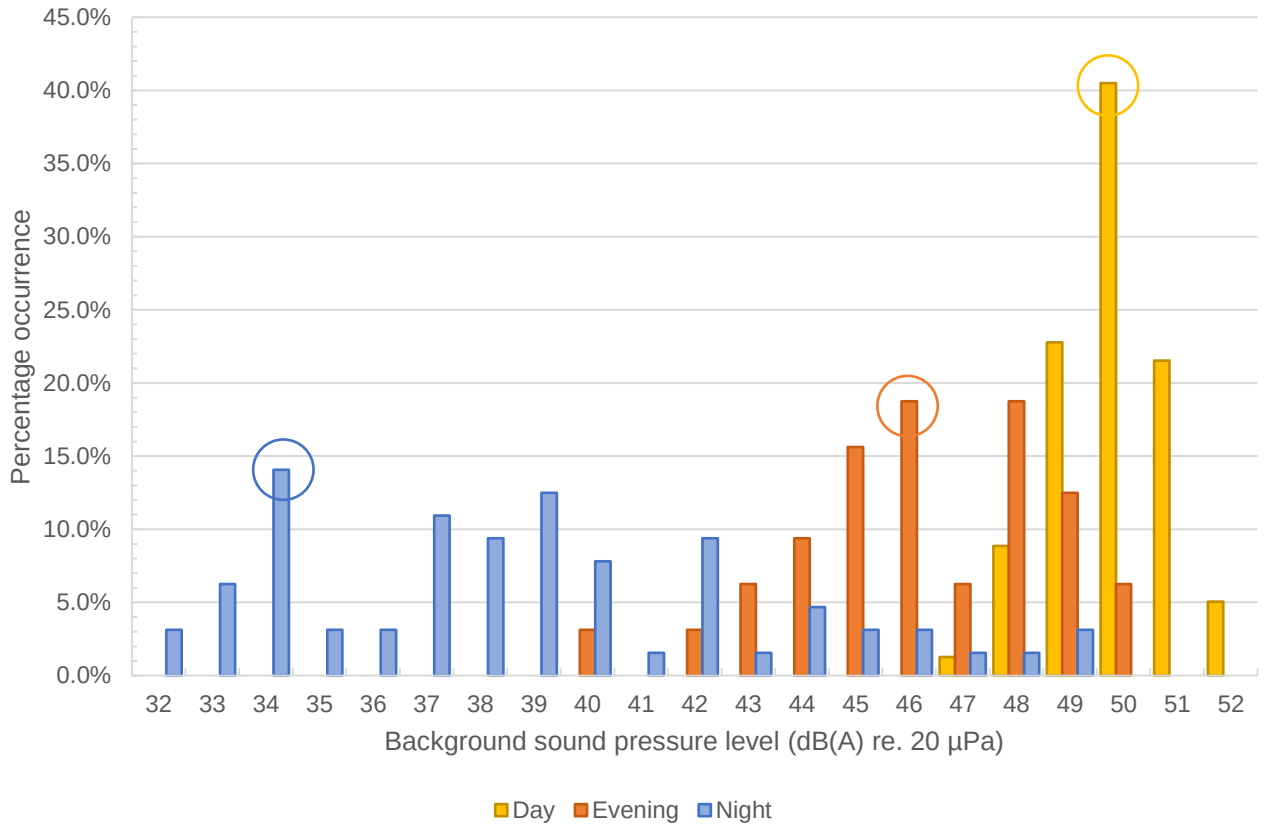

Figure-2: Statistical analysis of $L_{A90,15min}$ values to determine a representative 'typical' background sound level in accordance with BS4142 methodology.

5.0 Council planning noise criteria

5.1 Criteria for mechanical services noise emission are typically 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 Surrey Heath Borough Council advises the following in its 2000 Local Plan:

5.2.1 Policy G20, “The Borough Council will not permit: (a) Development which causes an unacceptable degree of noise disturbance to noise sensitive development or to areas valued for their quietness.” 3.6.4, “Where proposed development is the generator of noise, the Borough Council will expect the prospective developer to demonstrate that any noise impacts can be successfully mitigated.”

5.3 The planning terminology implies that the rating level of the specific sound source should have a low adverse impact at the assessment position according to BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. In practical terms this means that the rating level—inclusive of acoustic feature corrections for tonality, intermittency, and impulsivity—must not exceed the background noise level at the assessment position. To conform to this criterion, and in accordance with the typical background noise levels measured during the survey (summarised in table-2), noise from the plant installations should not exceed the following values. Note, values have been rounded to the nearest whole number for practical purposes. These levels must be achieved cumulatively with all plant operating, and as measured at 1 metre from the window of the most noise affected residential property.

Operation period	Sound pressure level
Daytime operation (07:00 to 19:00 hours)	50 dB $L_{Aeq,Tr}$
Evening operation (19:00 to 23:00 hours)	46 dB $L_{Aeq,Tr}$
Night-time operation (23:00 to 07:00 hours)	34 dB $L_{Aeq,Tr}$

Table-3: Design noise level criteria specification for residential premises.

6.0 Plant noise assessment

6.1 Plant details and location: It is proposed that 6-no. Vaillant aroTherm plus VWL 125/6 air-source heat pumps (ASHP) are to be installed at the premises. The ASHP will be positioned on an area of flat roof at first-floor level, against the northern façade of the fire station which is two-stories high.

6.2 The plant in question is detailed in table-4 below, together with the manufacturers certified noise data. It should be noted the plant will have the capacity to operate 24 hours a day, in line with the heating requirements of the premises. The equipment will operate continuously and there is no evidence of tonal features from the data received from the manufacturers. However, air-source heat pumps comprise a fan and compressor which, by their cyclic nature, may emit tonal frequencies. Therefore, a tonality correction of +2 dB shall be included in the rating level calculation.

Equipment model	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	**dBA**
Vaillant VWL 125/6	-	-	-	-	-	-	-	-	60

Table-4: Manufacturers certified sound power level data (dB L_w re. 20 µPa), tested in accordance with EN 12102 and EN 14511 with an ambient temperature of 7°C and a water flow temperature of 55°C.

6.3 Residential noise sensitive receptor (NSR): From observations made on site, the nearest noise sensitive residential property to the proposed mechanical plant is 38 Ballard Road to the north. The prospective plant position is 16 metres away from the south façade of the demise with windows at first floor level having an unobstructed view of the ASHP.

6.4 Noise assessment calculations: Our 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.

6.4.1

Residential NSR 1	**Noise impact assessment calculation**
Vaillant VWL 125/6 (sound power level)	60 dB L_{wA}
Combination of 6-no. units (sound power level)	68 dB L_{wA}
Sound pressure level at 15 metres (Q=4)	40 dB L_{pA}
Acoustic feature correction (tonality)	+2 dB
Noise rating level at receptor	**42 dB $L_{Aeq,Tr}$**
Planning noise criteria (night-time)	34 dBA
Level exceeding planning noise criteria	**8 dBA**

Table-5: Noise impact assessment calculation for residential noise sensitive receptor (NSR) 1.

6.5 The result of the noise impact assessment indicates that the noise rating level at the nearest noise sensitive receptor may exceed the night-time design noise criteria by 8 dBA, during 24-hour plant operation. An exceedance of 8 dBA above background is an indication of 'significant adverse impact' and the likelihood of complaint is high. Further noise control measures are necessary to satisfy the requirements of the local planning authority.

7.0 Noise mitigation measures

7.1 The following measures are aimed at reducing noise emissions from plant installed externally at first-floor level of the premises by a minimum of 8 dBA in order to satisfy the requirements of the local planning authority.

7.2 A thee-sided acoustic barrier should be formed around the installation, screening the nearest noise sensitive properties from the installation. The screen should be at least 500mm taller than the completed plant installation. The screen should be manufactured from a high-mass, solid acoustic panel. Where the fire station forms the fourth elevation of the screen, an absorptive wall lining panel should be fitted to the façade with a fibre wool density of 45 kg/m^3 or greater. Table-9 includes an acoustic performance specification for the screen material and absorptive wall lining product.

7.3 The following component performances would achieve the required barrier loss in the arrangement described above.

Item	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**
Solid acoustic panel-work – Sound reduction index	19	19	25	31	40	42	45	41
Absorptive wall lining – Sound absorption coefficient	0.18	0.34	0.64	0.82	0.76	0.74	0.65	0.37

Table-6: Acoustic component performance specification.

7.4 Table-7 details the noise impact assessment calculations accounting for the specified noise control measures.

7.4.1

Residential NSR 1	**Noise impact assessment calculation**
Vaillant VWL 125/6 (sound power level)	60 dB L_{wA}
Combination of 6-no. units (sound power level)	68 dB L_{wA}
Sound pressure level at 15 metres (Q=2)	37 dB L_{pA}
Barrier loss	-8 dBA
Acoustic feature correction (tonality)	+2 dB
Noise rating level at receptor	**31 dB $L_{Aeq,Tr}$**
Planning noise criteria (night-time)	34 dBA
Level exceeding planning noise criteria	**-3 dBA**

Table-7: Noise impact assessment calculation for residential noise sensitive receptor (NSR) 1 accounting for noise control measures.

8.0 Conclusion

8.1 An unattended background noise level monitoring survey has been carried out at Camberley Fire Station, London Road, Camberley GU15 3UH.

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

8.3 A noise impact assessment, in line with BS 4142, has been carried out on the proposed mechanical plant installations; it is determined that the design noise criteria will be exceeded by a maximum of 8 dBA.

8.4 Recommendations have been given for suitable noise mitigation 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.
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	L_{Aeq}	L_{A90}
(2023/10/25 14:15:01.00)	56.3	50.4
(2023/10/25 14:30:01.00)	56.2	50.6
(2023/10/25 14:45:01.00)	55.6	50.0
(2023/10/25 15:00:01.00)	56.7	50.3
(2023/10/25 15:15:01.00)	56.0	49.6
(2023/10/25 15:30:01.00)	56.0	49.2
(2023/10/25 15:45:01.00)	55.8	49.7
(2023/10/25 16:00:01.00)	56.2	48.2
(2023/10/25 16:15:01.00)	56.6	49.0
(2023/10/25 16:30:01.00)	56.7	49.6
(2023/10/25 16:45:01.00)	56.1	49.3
(2023/10/25 17:00:01.00)	56.4	49.6
(2023/10/25 17:15:01.00)	56.7	51.0
(2023/10/25 17:30:01.00)	56.9	50.4
(2023/10/25 17:45:01.00)	57.3	51.5
(2023/10/25 18:00:01.00)	58.6	51.0
(2023/10/25 18:15:01.00)	56.3	51.3
(2023/10/25 18:30:01.00)	57.2	49.9
(2023/10/25 18:45:01.00)	55.4	49.9
(2023/10/25 19:00:01.00)	55.7	49.6
(2023/10/25 19:15:01.00)	55.2	48.7
(2023/10/25 19:30:01.00)	55.0	47.4
(2023/10/25 19:45:01.00)	56.4	48.0
(2023/10/25 20:00:01.00)	55.2	48.2
(2023/10/25 20:15:01.00)	54.8	47.9
(2023/10/25 20:30:01.00)	55.6	47.9
(2023/10/25 20:45:01.00)	54.3	44.2
(2023/10/25 21:00:01.00)	53.7	45.4
(2023/10/25 21:15:01.00)	54.3	46.1
(2023/10/25 21:30:01.00)	54.4	47.2
(2023/10/25 21:45:01.00)	54.1	46.4
(2023/10/25 22:00:01.00)	53.6	45.6
(2023/10/25 22:15:01.00)	53.5	45.8
(2023/10/25 22:30:01.00)	53.5	45.4
(2023/10/25 22:45:01.00)	57.7	44.7
(2023/10/25 23:00:01.00)	53.4	43.8
(2023/10/25 23:15:01.00)	50.7	42.1
(2023/10/25 23:30:01.00)	49.4	41.6
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(2023/10/26 07:15:01.00)	55.7	50.1
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(2023/10/26 10:15:01.00)	55.6	49.9
(2023/10/26 10:30:01.00)	56.1	51.0
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(2023/10/26 11:15:01.00)	54.7	48.0
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(2023/10/26 14:00:01.00)	55.5	50.4
(2023/10/26 14:15:01.00)	55.6	50.9

Date	L_{Aeq}	L_{A90}
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(2023/10/26 14:45:01.00)	54.9	49.3
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(2023/10/26 15:15:02.00)	54.9	47.5
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(2023/10/27 05:45:01.00)	51.0	38.1
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(2023/10/27 06:30:01.00)	53.9	43.4
(2023/10/27 06:45:01.00)	63.8	48.7
(2023/10/27 07:00:01.00)	54.7	48.9
(2023/10/27 07:15:01.00)	56.4	48.4
(2023/10/27 07:30:01.00)	56.3	48.3
(2023/10/27 07:45:01.00)	55.2	48.5
(2023/10/27 08:00:01.00)	55.1	48.7
(2023/10/27 08:15:01.00)	55.3	49.9
(2023/10/27 08:30:01.00)	55.5	49.9
(2023/10/27 08:45:01.00)	55.9	50.5
(2023/10/27 09:00:01.00)	58.6	51.9
(2023/10/27 09:15:01.00)	58.5	50.8
(2023/10/27 09:30:01.00)	56.8	51.3
(2023/10/27 09:45:02.00)	56.2	50.4

Table-A1: Tabulated results of environmental sound monitoring.

Figure A1

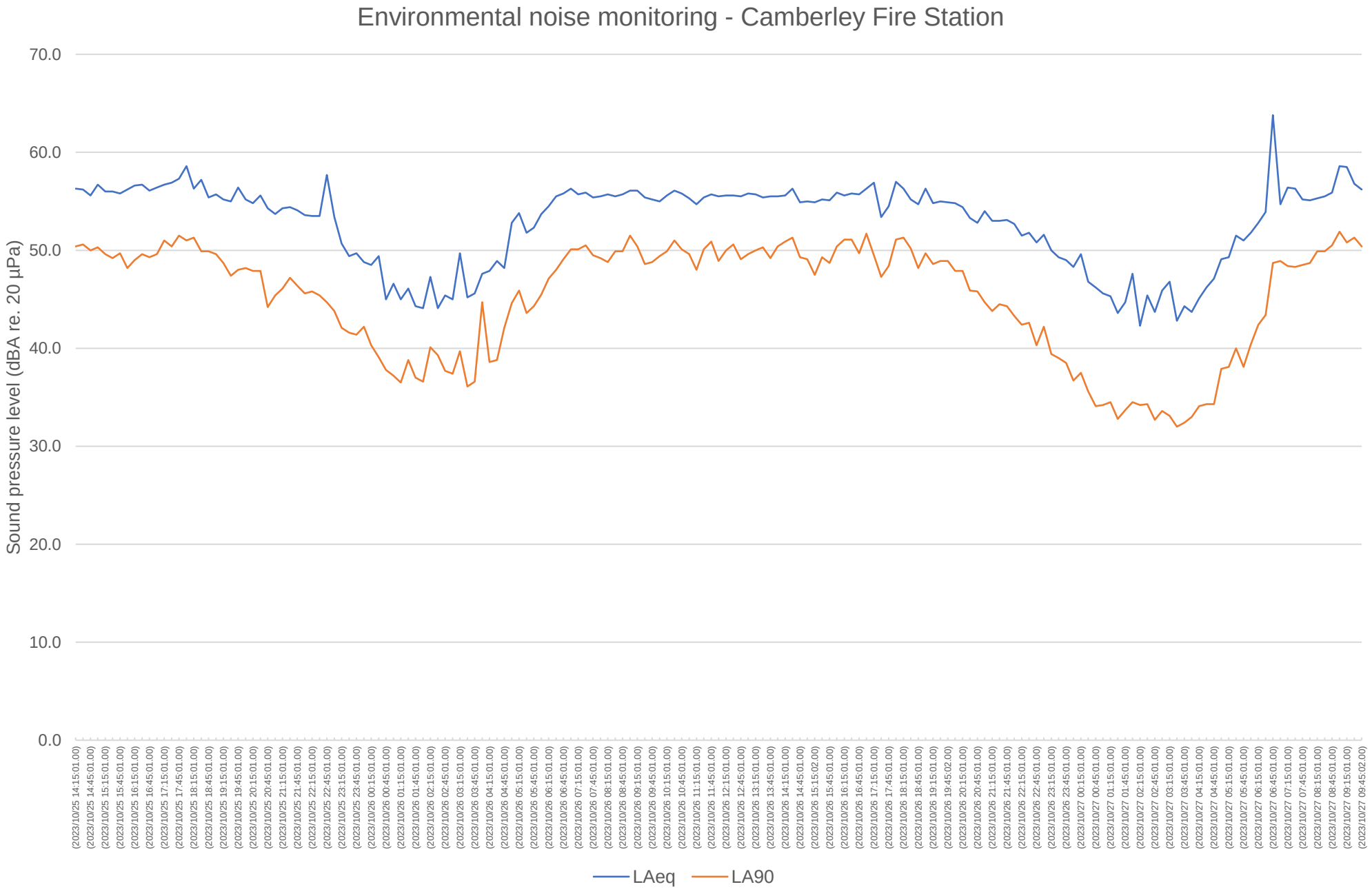
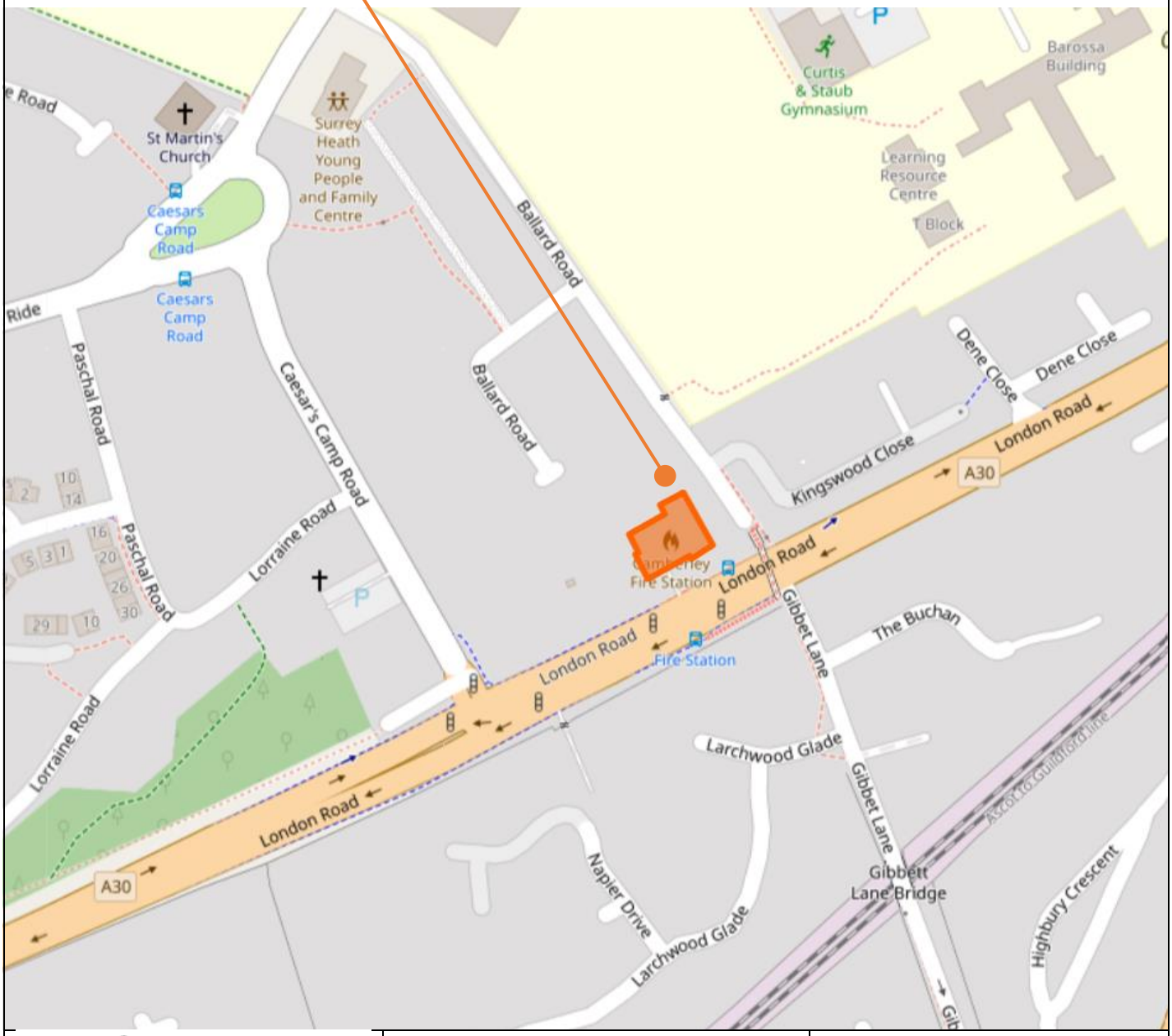

Environmental noise monitoring - Camberley Fire Station
Sound pressure level (dBA re. 20 µPa)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
LAeq
LA90

Figure A2



Project: Camberley Fire Station	Title: OS Site Map
Dwg No: 2309062-8/01_v2 drg 01	Date: 17 November 2023

NOICO NOISE CONTROL

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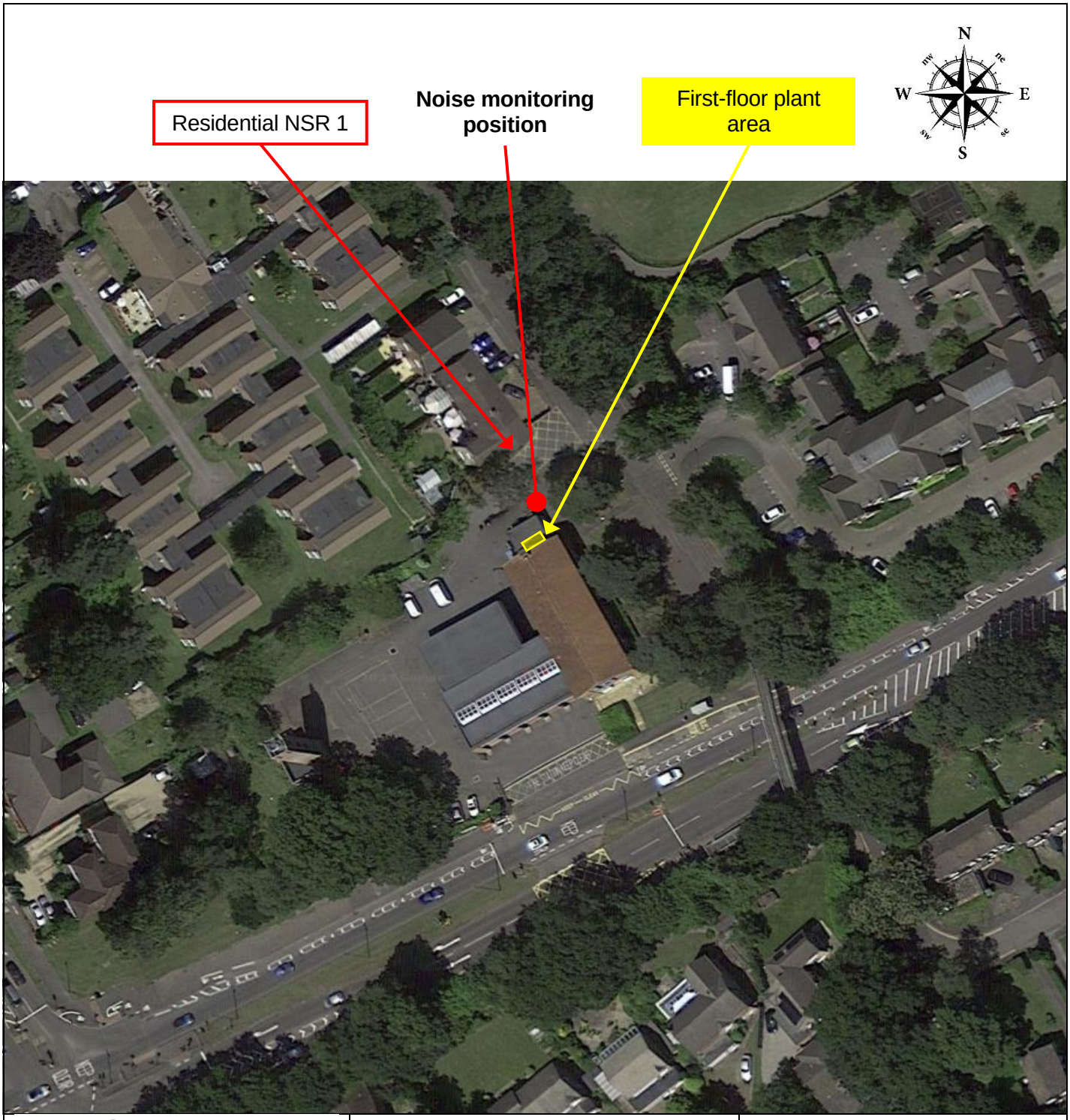
Figure A3



NOICO NOISE CONTROL	Project: Camberley Fire Station	Title: Satellite – Unattended monitoring position
	Dwg No: 2309062-8/01_v2 drg 02	Date: 17 November 2023

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