

Dormitory Eradication, Edward Street Hospital

Planning report - Acoustics

Integrated Healthcare Projects

Job No: 1030333

Doc Ref: RB0002-CDLL-XX-XX-RP-AC-4502

Revision: P01

Revision Date: 18 February 2022

Project title	Dormitory Eradication, Edward Street Hospital	Job Number
Report title	Planning report - Acoustics	1030333

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
P01	18 February 2022	First Issue

Document Validation (latest issue)

<div style="display: flex; justify-content: center; align-items: center;"> <div style="background-color: black; width: 150px; height: 30px; margin-right: 5px;"></div> <div style="margin-left: 5px;">18/02/2022</div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-top: 5px;"> <div style="background-color: black; width: 150px; height: 30px; margin-right: 5px;"></div> <div style="margin-left: 5px;">/02/2022</div> </div> <hr style="width: 100%; border: 0.5px solid black; margin-top: 5px;"/> <p style="font-size: small; margin: 0;">Principal author</p> <p style="font-size: x-small; margin-top: 5px;">Signed by: Fichera, Ilaria</p>	<div style="display: flex; justify-content: center; align-items: center;"> <div style="background-color: black; width: 150px; height: 30px; margin-right: 5px;"></div> <div style="margin-left: 5px;">/02/2022</div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-top: 5px;"> <div style="font-size: 2em; margin-right: 5px;">X</div> <div style="background-color: black; width: 150px; height: 30px; margin-right: 5px;"></div> <div style="margin-left: 5px;">/02/2022</div> </div> <hr style="width: 100%; border: 0.5px solid black; margin-top: 5px;"/> <p style="font-size: small; margin: 0;">Checked by</p> <p style="font-size: x-small; margin-top: 5px;">Signed by: Nightingale, Tom</p>	<div style="display: flex; justify-content: center; align-items: center;"> <div style="background-color: black; width: 150px; height: 30px; margin-right: 5px;"></div> <div style="margin-left: 5px;">18/02/2022</div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-top: 5px;"> <div style="font-size: 2em; margin-right: 5px;">X</div> <div style="background-color: black; width: 150px; height: 30px; margin-right: 5px;"></div> <div style="margin-left: 5px;">18/02/2022</div> </div> <hr style="width: 100%; border: 0.5px solid black; margin-top: 5px;"/> <p style="font-size: small; margin: 0;">Verified by</p> <p style="font-size: x-small; margin-top: 5px;">Signed by: Evans, Mark</p>
---	--	--

© Cundall Johnston & Partners LLP (“Cundall”) owns the copyright in this report and it has been written for the sole and confidential use of Integrated Healthcare Projects. It must not be reproduced in whole or in part or relied upon by any third party for any use whatsoever without the express written authorisation of Cundall. If any third party whatsoever comes into possession of this report, they rely on it at their own risk and Cundall accepts no duty or responsibility (including in negligence) to any such third party.

Contents

1.0	Introduction	3
2.0	Assessment criteria	4
2.1	Noise Policy Statement for England	4
2.2	National Planning Policy Framework	4
2.3	Local Authority criteria	5
2.4	BS 4142: 2014 + A1: 2019 Methods for rating and assessing industrial and commercial sound	5
2.5	Health Technical Memorandum 08-01: Acoustics – Paragraph 2.47	5
2.6	BREEAM UK New Construction 2018	6
2.7	Project specific requirements	7
3.0	Existing and proposed site details	8
3.1	Site location	8
3.2	Proposed site	8
4.0	Environmental noise	10
4.1	Survey locations	10
4.2	Equipment used in measurements	11
4.3	Weather conditions	11
4.4	Survey results	11
5.0	External façade elements	13
5.1	Ventilation and control of overheating - bedrooms	13
5.2	Ventilation – community areas	14
5.3	External walls	14
5.4	Roof construction	14
6.0	Noise emission to atmosphere	15
6.1	Demonstration of compliance	15
7.0	Conclusion	16
7.1	BREEAM assessment	16

1.0 Introduction

Cundall has been instructed to undertake a noise assessment in relation to the redevelopment and remodelling of Edward Street Hospital in West Bromwich. The proposed scheme includes the construction of a new two-storey dementia ward that eradicates dormitory accommodation in the two existing older adult mental health wards. The scheme will accommodate 30 beds, in addition to community/staff facilities such as multi-activity rooms, dining, day space and lounges for patients.

In addition, refurbishment is also to be undertaken in areas of the existing hospital adjacent to the new ward.

The purpose of this report is to:

- Set out acoustics criteria relevant to planning;
- Document measured noise levels around the site;
- Review external building fabric;
- Review building services plant noise emissions.

For internal noise level criteria (internal ambient noise levels), the development is being designed in accordance with the requirements of Health Technical Memorandum 08-01 (HTM 08-01).

For noise emissions to atmosphere, best practice guidance on the assessment and criteria from BS 4142: 2014+A1(2019) has been used, as required by the Local Authority.

In addition to the above, the scheme is also targeting a rating in accordance with the BREEAM scheme. There are two BREEAM Issues relating to acoustics:

1. Health and Wellbeing 05 (Hea 05): requires internal noise levels to meet HTM 08-01 criteria; and
2. Pollution 05 (Pol 05): requires an assessment of noise to atmosphere.

2.0 Assessment criteria

This report is based on industry good practice, national and local guidance documents, including:

- Noise Policy Statement for England (NPSE);
- National Planning Policy Framework (NPPF);
- Sandwell Metropolitan Borough Council criteria;
- BS 4142: 2014 + A1: 2019 Methods for rating and assessing industrial and commercial sound (BS 4142);
- Health Technical Memorandum 08-01: Acoustics – Paragraph 2.47;
- BREEAM UK New Construction 2018.

2.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy, to ‘Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.’

The NPSE long term vision is supported by the following aims:

‘Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.’

2.2 National Planning Policy Framework

The revised National Planning Policy Framework NPPF was updated in July 2021 and sets out the Government’s planning policies for England and how these are expected to be applied.

Specifically, on the subject of noise, paragraph 185 of NPPF states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;...*”

On the general issue of amenity, paragraph 130 states that planning policies and decisions should ensure that developments:

“create places that [...] promote health and well-being, with a high standard of amenity for existing and future users...”

Further to this, paragraph 174 states that planning policies and decisions should contribute to and enhance the natural and local environment by: *“preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of [...] noise pollution...”*

2.3 Local Authority criteria

The site falls within Sandwell Metropolitan Borough Council’s (SMBC) jurisdiction. Cundall have received confirmation from SMBC¹ that their typical criteria, in terms of plant and equipment, would normally be as follows:

‘The rating level of operational noise, when measured as a 60-minute L_{Aeq} between the hours of 07:00 and 23:00, shall not exceed the background 60-minute L_{A90} by more than 5 dBA on any day.

The rating level of operational noise, when measured as a 15-minute L_{Aeq} between the hours of 23:00 and 07:00, shall not exceed the background 15-minute L_{A90} on any day.

All measurements are to be taken in accordance with BS4142: 2014+A1(2019) at the nearest noise sensitive premises.’

2.4 BS 4142: 2014 + A1: 2019 Methods for rating and assessing industrial and commercial sound

Based on the guidance within BS 4142: 2014, it is possible to set limiting noise levels for building services plant associated with the proposed development to see that any new specific sound sources introduced would have a low impact on existing or new-build noise sensitive receptors.

BS 4142: 2014 provides a method for rating and assessing sound of an industrial and/or commercial nature, which includes fixed building services plant.

The magnitude of impact is assessed by subtracting the measured background sound level (dB L_{A90}) at a location representative of the nearest noise-sensitive receiver, from the ‘rating level’ (dB $L_{A,r,T,r}$) – the specific sound source to be introduced into the locality, corrected for acoustically distinguishing characteristics which may make it more subjectively prominent, over a reference time interval of 1 hour during the day and 15 minutes at night.

As a guideline, BS 4142 states that:

- a) *“Typically, the greater this difference, the greater the magnitude of the impact.*
- b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) *A difference of around +5 dB 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.”*

Although it is noted above that ‘where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact’, the BREEAM criteria (see below) is more onerous, stating that the rating level should not exceed 5 dB below the background sound level.

2.5 Health Technical Memorandum 08-01: Acoustics – Paragraph 2.47

2.5.1 Internal noise criteria

Table 1 in HTM 08-01 gives criteria for internal ambient noise levels for each type of area within the development.

The following table summarises the internal ambient noise level criteria relevant to this project:

Room Type	Example	Criteria for noise intrusion
Ward – single bed	Single bed ward	<ul style="list-style-type: none"> ▪ 40 dBA $L_{eq,1hr}$ during daytime periods; ▪ 35 dBA $L_{eq,1hr}$ during night-time periods; ▪ 45 dBA $L_{max,f}$ during night-time periods
Small office type spaces	Interview, Ward Manager, Meds Management, Staff Base, Reminiscent Space	40 dB $L_{Aeq,1hr}$

¹ Email received from Margaret Gardiner, Senior Environmental Health Office at SMBC, on 18 February 2022.

Room Type	Example	Criteria for noise intrusion
Small Meeting Areas	Female only lounge, multi-activity room, MDT	40 dB LA _{eq,1hr}
Public Areas	Dining, Day space	50 dB LA _{eq,1hr}
Small food-preparation areas	ADL Kitchen	40 dB LA _{eq,1hr}
Operating theatres	Clinic / Treatment	<ul style="list-style-type: none"> ▪ 40 dBA LA_{eq,1hr}; ▪ 50 dBA LA_{max,f}
Personal hygiene (en-suite)	Disposal Hold + Chute	45 dB LA _{eq,1hr}
Circulation spaces	Corridors, Main Stairs	55 dB LA _{eq,1hr}

Table 1 Criteria for noise intrusion from external sources (ref. Table 1, HTM 08-01)

The internal noise criteria for all spaces are marked in the acoustics strategy drawings in Appendix A.

HTM 08-01 also gives the following noise criteria for noise emission from building services plant to atmosphere:

“Open external areas should be protected. Noise from services should not exceed the existing daytime background noise level or 50 dB LA₉₀, whichever is the higher. This limit should be achieved in any areas normally occupied by staff (except maintenance staff, notwithstanding the requirements of the Control of Noise at Work Regulations 2005) or the public (for example open courtyards and accessible landscaped areas). This means that noisy plantrooms should not face normally occupied external areas unless adequate acoustic control is provided.”

2.6 BREEAM UK New Construction 2018

2.6.1 Health and Wellbeing 05

For the purposes of this report, a single credit relating to acoustics is relevant under BREEAM Issue Hea 05; Healthcare Buildings, as follows:

- The indoor ambient noise requirements for noise intrusion from external sources in Table 1 of HTM 08-01 are not exceeded;
- A programme of acoustic measurements is carried out by a compliant test body in accordance with the Section 7 of HTM 08-01: Acoustics.

2.6.2 Pollution 05

A single credit is available within BREEAM Issue Pol 05, as follows.

- Awarded by default where there are no noise sensitive areas within an 800 m radius of the assessed site; or
- Where there are noise sensitive areas within 800 m, a noise impact assessment compliant with BS 4142: 2014 is commissioned. The noise level from the assessed building, as measured at the nearest noise sensitive premises, must be at least 5 dB lower than the background noise through the day and night.

2.6.3 Suitably Qualified Acoustician

For the purposes of BREEAM, the following table sets out credentials to confirm that the assessment has been carried out by a Suitably Qualified Acoustician. It is also noted that Cundall are full members of the Association of Noise Consultants and are registered with their testing scheme³.

³ It is noted that the testing scheme only applies to residential testing, but is also a demonstration of competence.

Role	Name	Years in Acoustics Consultancy	Accreditations
Author	Ilaria Fichera	4 years	Master's in civil engineering and Architecture, DiploA, Associate Member of the IOA (AMIOA)
Checker	Tom Nightingale	21 years	BSc Environmental Risk Management, DipIOA, Member of the IOA (MIOA), Fellow of IHEEM
Checker/Verifier	Mark Evans	19 years	BEng(Hons) Electroacoustics Member of the IOA (MIOA), Member of IHEEM

Table 2 - Suitably Qualified Acoustician details

2.7 Project specific requirements

2.7.1 Internal ambient noise levels

Internal noise levels are to be designed to meet the criteria in HTM 08-01, as summarised in the following table:

Room Type	Example	Criteria for noise intrusion
Ward – single bed	Single bed ward	40 dBA $L_{eq,1hr}$ during daytime periods; 35 dBA $L_{eq,1hr}$ during night-time periods; 45 dBA $L_{max,f}$ during night-time periods
Small office type spaces	Interview, Ward Manager, Meds Management, Staff Base, Reminiscent Space	40 dB $LA_{eq,1hr}$
Small Meeting Areas	Female only lounge, multi-activity room, MDT	40 dB $LA_{eq,1hr}$
Public Areas	Dining, Day space	50 dB $LA_{eq,1hr}$
Small food-preparation areas	ADL Kitchen	40 dB $LA_{eq,1hr}$
Operating theatres	Clinic / Treatment	40 dBA $LA_{eq,1hr}$; 50 dBA $L_{Amax,f}$
Personal hygiene (en-suite)	Disposal Hold + Chute	45 dB $LA_{eq,1hr}$
Circulation spaces	Corridors, Main Stairs	55 dB $LA_{eq,1hr}$

Table 3 – Project specific Internal ambient noise levels

2.7.2 Noise emissions to atmosphere

Criteria for plant and equipment is based on both Local Authority and BREEAM Issue Pol 05. It is noted that the following criteria is taken from BREEAM, which is more onerous than the Local Authority criteria.

Details of specific items of plant are not currently known. Therefore, for the purposes of this report, criteria for noise emissions to atmosphere are based on the noise level from the assessed building, as measured at the nearest noise sensitive premises, being 5 dB lower than the background noise throughout the daytime and night-time periods, when assessed in accordance with BS 4142.

3.0 Existing and proposed site details

3.1 Site location

The site is in West Bromwich. To the north, over Edward Street, is Edward Street car park. The southern site boundary is formed by tram lines, with the Lodge Road Tram Stop adjacent to the site. Immediately adjacent to the site, to the west, there is a Masonic Hall and the Change Consortium building. Further to the west, over Lodge Road are established residential areas.

To the east of the site is a mixed residential and commercial area, including the Guru Nanak Gurdwara community buildings.

The surrounding local area is mostly urban in nature, comprising a mixture of residential, commercial (mostly on ground floor levels) and cultural developments.

The following figure shows the site location and surroundings:

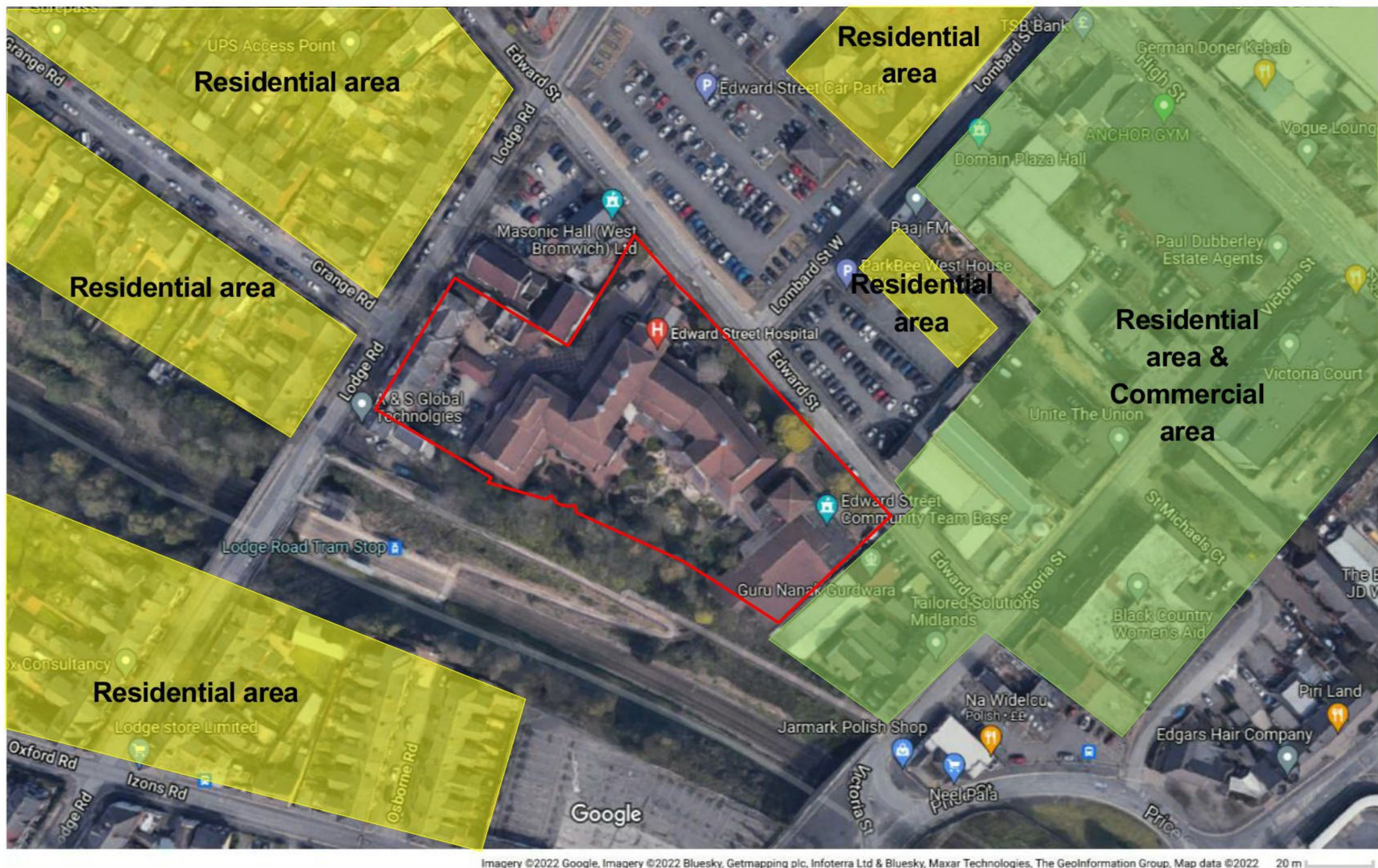


Figure 1 - Site boundary and surroundings

The topography of the site and immediate surrounds is largely flat, with the tram lines set in a cutting.

3.2 Proposed site

The proposed scheme includes demolition of part of the existing Edward Street Hospital and the construction of a new two-storey dementia ward that eradicates dormitory accommodation in the two existing older adult mental health wards. The scheme will accommodate 30-beds, in addition to community/staff facilities such as multi-activity rooms, dining, day space and lounges for patients.

In addition, refurbishment is also to be undertaken in areas of the existing hospital adjacent to the new ward.

The proposed bedrooms are not considered to be for long-term patients, and as such are being designed fully in accordance with HTM 08-01. The following figure shows the proposed site layout.

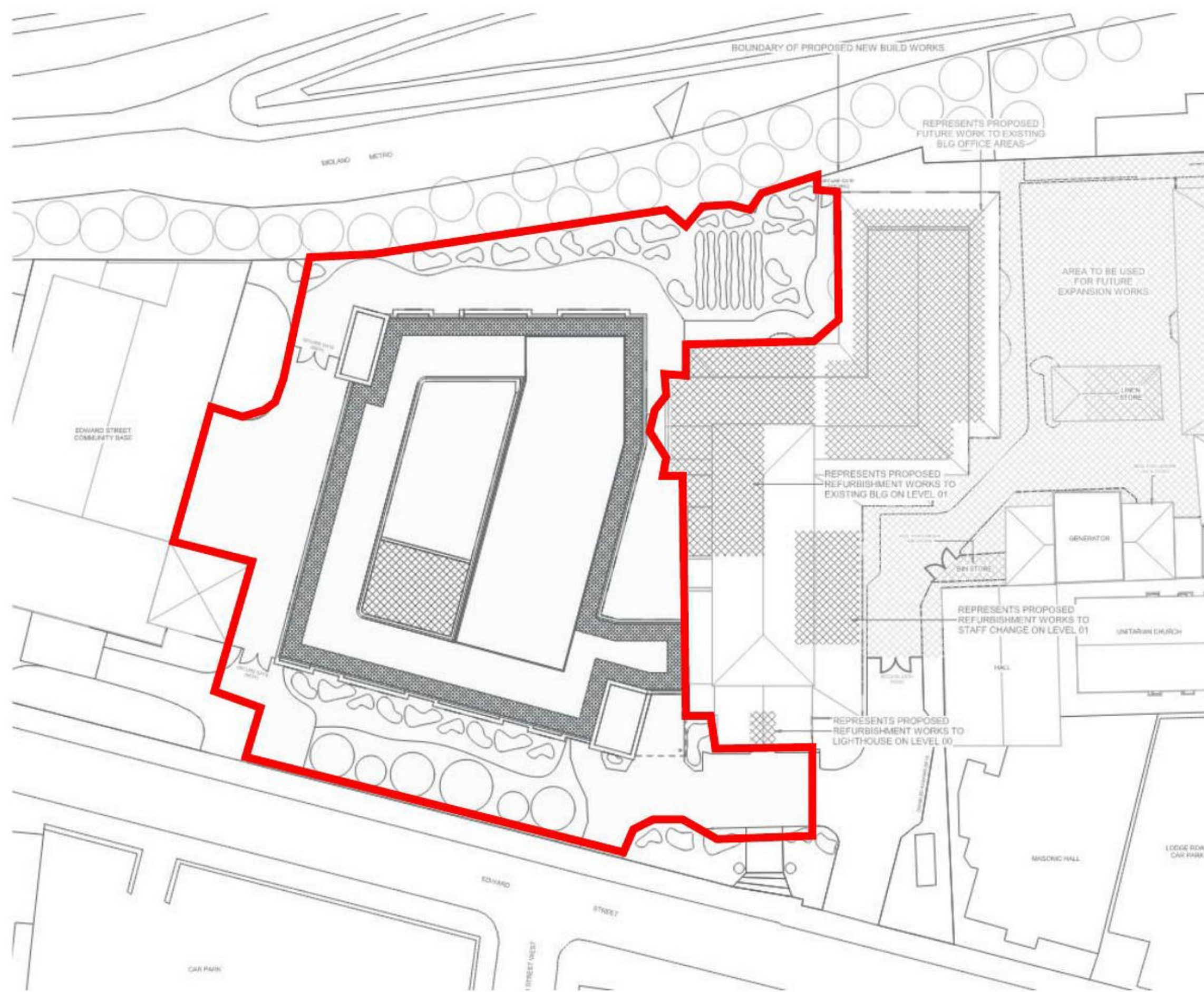


Figure 2 – Site context showing new build works

4.0 Environmental noise

To assess the levels of environmental noise affecting the site, a combination of attended and unattended surveys have been carried out.

During attended noise surveys on site during the daytime, the dominant source of noise was considered to be road traffic on the surrounding roads and trams passing the site. No industrial or commercial noise was audible above the road traffic noise.

4.1 Survey locations

In order to establish the existing noise climate around the site, surveys were carried out at the following locations:

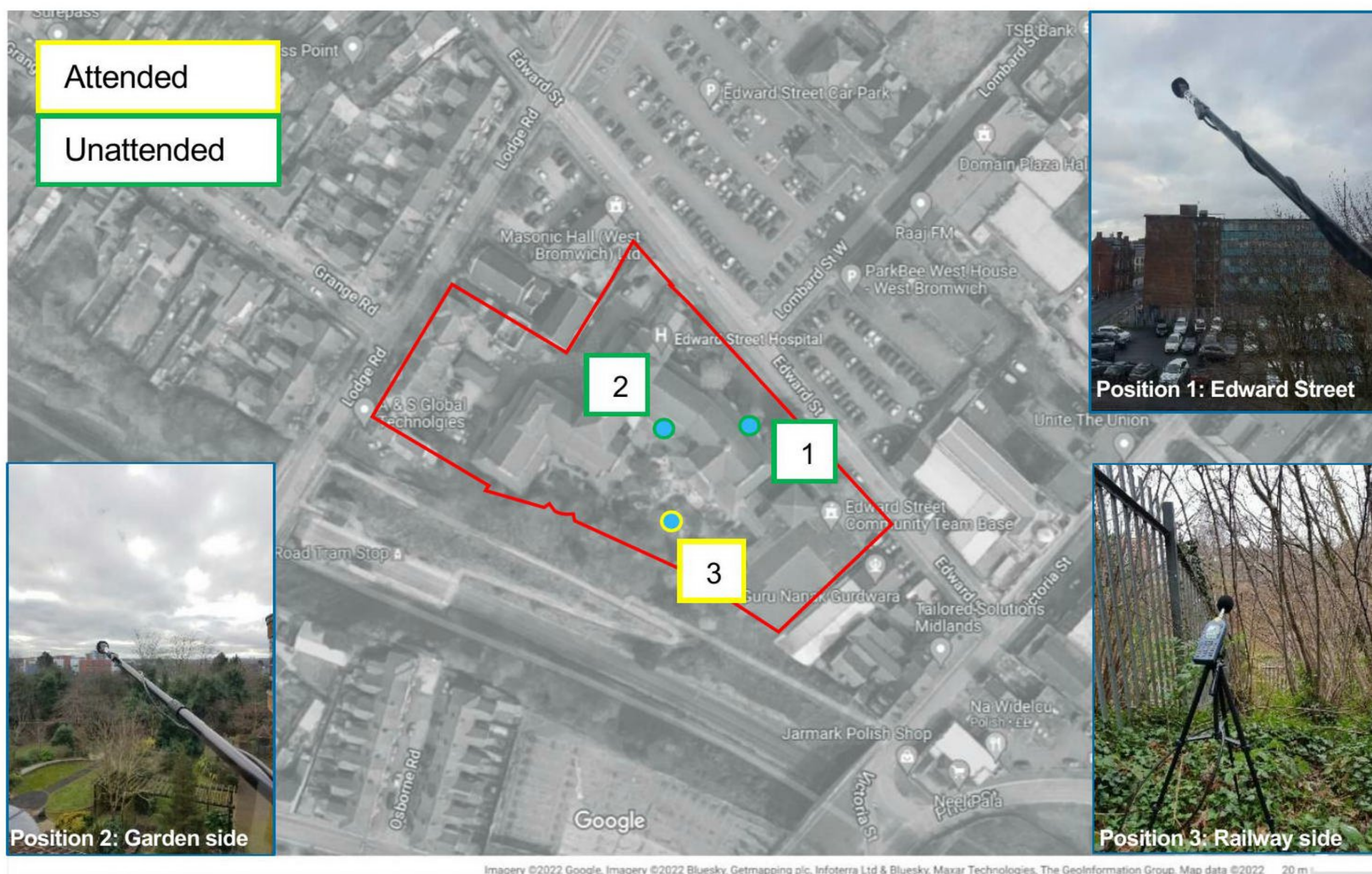


Figure 3 - Indicative survey locations

Unattended sound level meters at Position 1 and Position 2 were mounted on extension poles, in free field conditions at approximately 1 m from the third-floor façade and approximately 9 m above local ground level. The sound level meter at attended Position 3 was mounted on a tripod approximately 1.5 m above the local ground level.

The times and durations of noise surveys are summarised below:

- Position 1 – Representative of the noise impact on the proposed building from Edward Street;
- Position 2 – Representative of the noise impact on the third floor of the proposed building;
- Position 3 – Representative of the noise impact on the proposed building from the tram/railway line.

Position 2, located to the rear of the existing building, was relatively shielded from road traffic noise. Background noise levels measured at Position 2 are to be used in this report as being representative of the background levels at the nearest residential dwellings to the south of the development, off Osborne Road. Due to its shielded location, it is considered to represent a worst-case scenario.

It is also noted that Position 2 measurements have the lowest background during the daytime and night-time and therefore the assessment within this report is based on the worst-case scenario.

The following table summarises the times and durations of noise surveys:

Position	Period	Date	Start time	End time	Duration
1	Daytime	27 January	10:00	23:00	13 hours
		28 January	07:00	10:00	3 hours
	Night-time	27-28 January	23:00	07:00	8 hours
2	Daytime	27 January	11:00	23:00	12 hours
		28 January	07:00	11:00	4 hours
	Night-time	27-28 January	23:00	07:00	8 hours
3	Daytime	28 January	10:00	12:00	2 hours

Table 4 - Monitoring location, time and duration

4.2 Equipment used in measurements

The instrumentation used during the surveys conforms to BS EN 60651 Type 1 accuracy. External laboratory calibration certificates can be provided upon request. Each sound level meter was fitted with a windshield and was field-calibrated before and after use in accordance with the manufacturer’s instructions; no significant drift in calibration was witnessed. The following table summarises the equipment used.

Item type	Make and model	Serial number	Date calibrated
Sound level meter	Fusion 01dB	10780	01/07/21
Sound level meter	Fusion 01dB	10781	13/09/21
Sound level meter	Norsonic 140	1405753	27/09/21
Calibrator	01dB Calibrator (Rion) NC-74	34851846	01/07/21
Calibrator	Norsonic 1251	33895	27/09/21

Table 5 – Equipment used in survey

4.3 Weather conditions

During the measurement periods, the weather conditions were considered conducive for noise surveys with the following conditions, albeit three hours of measurements have been excluded due to potentially high wind speeds.

Date (2021)	Period	Temperature Range (°C)	Precipitation	Cloud cover	Max wind speeds (m/s)
Thursday 27 January	Daytime (09:00-23:00)	6-11	None	Cloudy	< 5*
	Night-time (23:00-07:00)	1-3	None	Clear	< 5
Friday 28 October	Daytime (07:00-11:00)	5 - 8	None	Cloudy	< 5

*Survey measurements between 12:00 to 15:00 hours of 27 January have been discarded due to high wind speeds.

Table 6 – Weather conditions

4.4 Survey results

The following table summarises the results from noise monitoring. The values shown include the following notations:

- Average noise levels: for short term monitoring, the $L_{Aeq,T}$ values are shown with the time, T, being equivalent to the monitoring duration. For long term measurements, the daytime $L_{Aeq,1hr}$ and night-time $L_{Aeq,15min}$ time periods are recorded;

- Maximum noise levels: for short term monitoring periods, the range between the lowest and the highest measured maximum instantaneous noise levels, L_{AFmax} , is declared. For long-term measurements, the $L_{AFmax,T}$ values are shown with the time, T, being equivalent to the monitoring duration;
- Background noise levels: for short term monitoring, the L_{A90} is declared, with the time period equivalent to the measurement period. For long term monitoring, the typical L_{A90} has been determined using statistical analysis of the results for all measurement periods. The values were taken from the most commonly occurring value within the histogram distribution, or, where there was an equal distribution for a number of data samples, the lowest value was taken. The $L_{A90,T}$ values are shown with the time, T, being equivalent to the monitoring duration.

The following table summarises the measurements at each position to be used in the assessment below.

Position	Period	Average noise level	Range for maximum noise levels	Background noise level
1	Daytime	59 dB $L_{Aeq,1hour}$	73 – 84 dB $L_{AFmax,1hour}$	54 dB $L_{A90,1hour}$
	Night-time	53 dB $L_{Aeq,15mins}$	56 - 84 dB $L_{AFmax,15mins}$	47 dB $L_{A90,15mins}$
2	Daytime	54 dB $L_{Aeq,1hour}$	62 - 78 dB $L_{AFmax,1hour}$	49 dB $L_{A90,1hour}$
	Night-time	53 dB $L_{Aeq,15mins}$	56 - 76 dB $L_{AFmax,15mins}$	48 dB $L_{A90,15mins}$
3	Daytime	55 dB $L_{Aeq,5mins}$	55 - 69 dB $L_{AFmax,5mins}$	52 dB $L_{A90,5mins}$

Table 7 - Summary of measurement results

5.0 External façade elements

This section considers the noise impact from road and rail traffic and identifies mitigation measures to see that an appropriate internal ambient noise level can be achieved within the proposed development.

As noted in Section 2.7 above, the most stringent internal noise level criterion in general spaces throughout the development is 40 dBA $L_{eq,1hr}$ and the following criteria applicable to bedrooms:

- 40 dBA $L_{eq,1hr}$ during daytime periods;
- 35 dBA $L_{eq,1hr}$ during night-time periods;
- 45 dBA $L_{max,f}$ during night-time periods.

Façade attenuation requirements are based on average noise levels measured. The average noise levels are relatively constant, with the highest period reaching 59 dB $L_{Aeq,1hr}$.

To determine appropriate glazing and ventilation sound reduction indices, a number of detailed calculations have been carried out on 'worst-case' elevations, using the following equation from Section G.2.1, BS 8233: 2014:

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{oc}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{tr}}{S} 10^{\frac{-R_{tr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

A copy of the long version equations is documented within Appendix B below.

Based on the predicted average noise levels, it is considered that standard thermal double glazing should provide adequate sound insulation to see the above internal ambient noise level criteria can be achieved. Standard thermal double glazing, such as the following, typically provides up to 25 dB $R_w + C_{tr}$.

- 4 mm pane;
- 16 mm air gap;
- 4 mm pane⁴.

The above sound insulation value for glazing should also apply to any external doors into the building.

It is recommended that the manufacturer of the glazing system confirm that the above minimum attenuation values will be achieved with the windows closed and sealed into the façade.

5.1 Ventilation and control of overheating - bedrooms

It is recommended that any opening in the façade for ventilation provide a sound reduction at least 6 dB over and above the glazing attenuation, i.e. 31 dB $D_{n,e,w} + C_{tr}$.

This only applies to a single unit; if two or more units are required within a specific room, the acoustic rating will need to be adjusted accordingly using the equation $D_{n,e,w} + C_{tr} + 10 \log(N)$, where N is the number of ventilators.

The HTM 08-01 notes that where windows are used for ventilation or control of over-heating, this could potentially reduce privacy. This is of particular importance at ground floor level where people may be passing windows, but also relates to sound flanking between adjacent rooms where both have the windows open, i.e. as illustrated. It is recommended that opening windows be designed to avoid this flanking path.

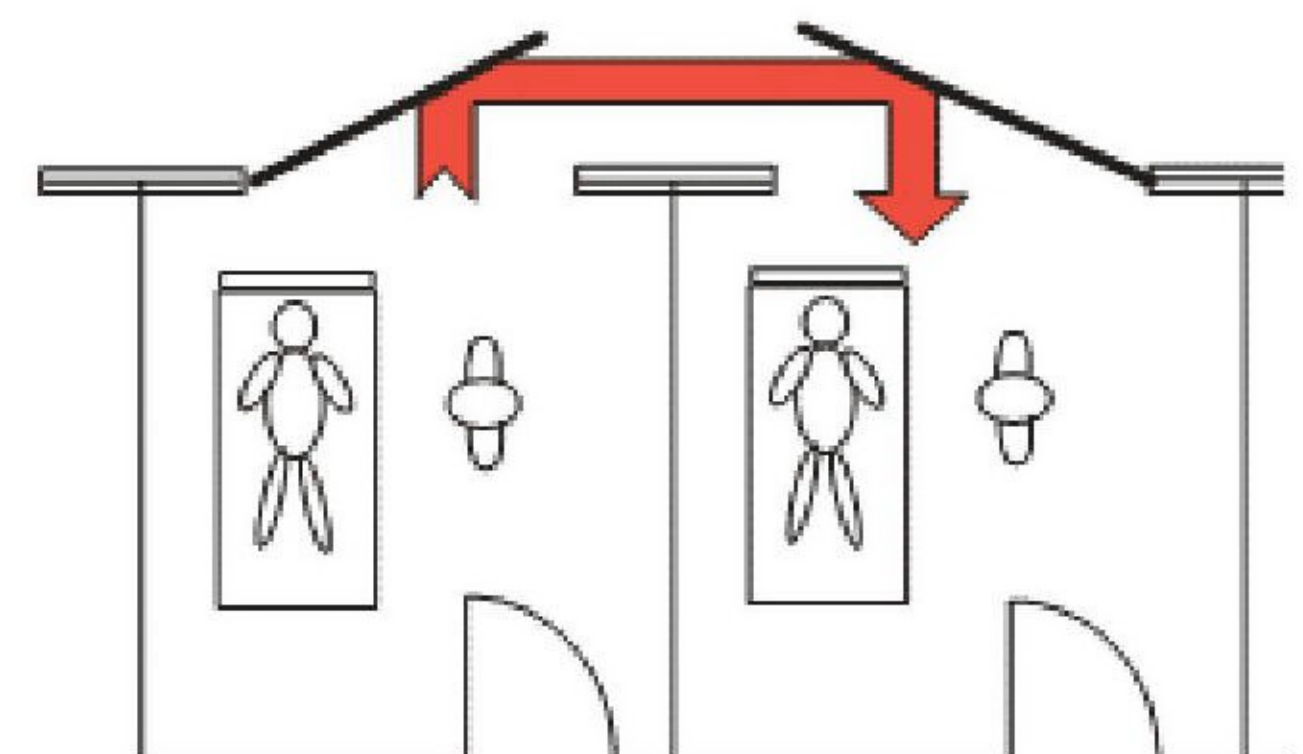


Figure 4 – Potential flanking path to be considered

⁴ Ref. BS EN 12354-3:2000

5.2 Ventilation – community areas

The ventilation strategy for the community spaces (such as Quiet Room, MDT etc.) is a mixed-mode solution comprising mechanical ventilation with peak lopping and openable windows. The impact of external noise levels on these rooms would be considerably lower than for bedrooms, as these are shielded by the existing Edward Hospital building.

5.3 External walls

The proposed external wall construction is as follows:

- 102.5 mm brick;
- 50 mm cavity;
- 110 mm Rockwool insulation;
- 12 mm cement particle board;
- 180 mm SFS packed with Rockwool insulation;
- 18 mm plywood;
- 12.5 mm Knauf Performance Plus;
- 12.5 mm Knauf Performance Plus.

The above construction will significantly exceed the sound reduction of the glazing and any ventilation openings, and is therefore considered suitable for the control of noise from external sources.

5.4 Roof construction

It is understood that the roof construction will be similar to the following inverted roof build-up:

- Pavers;
- Vapour permeable membrane;
- 300 mm IKO Permateg hot melt membrane roof insulation;
- 75 mm screed;
- 275 mm concrete slab;
- Knauf MF ceiling: insulation, 18 mm plywood, 2 x 12.5 mm layer Wallboard.

The above construction is considered suitable for the control of noise from external sources.

6.0 Noise emission to atmosphere

At the time of writing, specific details of building services plant are unknown. As the design progresses, a full assessment of noise emissions to atmosphere from building services plant will need to be made.

As noted above, the criteria set out in BREEAM Issue Pol 05 is more onerous than that supplied by SMBC, and therefore criteria from BREEAM is to be used. Providing the design and installation of plant and equipment achieves the noise emissions below, it should be a demonstration that both the credit in Pol 05 of BREEAM and the Local Authority criteria have been achieved.

For the purposes of this report therefore, criteria for noise emissions to atmosphere are based on the rating level of new items of building services plant, not exceeding 5 dB lower than the background noise through the daytime and night-time periods.

The 'rating level', $L_{Ar,Tr}$, is defined in BS 4142: 2014 as the 'specific sound level plus any adjustment for the characteristic features of the sound'.

It is considered that measurements at Position 2 are the most representative of noise levels at the nearest existing residential premises to the site (within 800 m distance from the site). Noise sensitive receptors are highlighted in Figure 1.

The table below therefore summarises the proposed rating levels not to be exceeded.

Period	Lowest background noise level dB L_{A90}	Rating noise level not to be exceeded dB $L_{Ar,Tr}$
07:00 to 23:00 hours	49	44
23:00 to 07:00 hours	48	43

Table 8 – Rating noise level for services plants not to be exceeded

The rating noise level includes any correction that must be applied for the particular acoustic characteristics of services plant noise (e.g. noise that is tonal, impulsive, or will otherwise attract attention).

The above limit applies to all new items of services plant associated with the development, running simultaneously at the appropriate design duty.

In addition to the above, HTM 08-01 also notes that noise from plant should not exceed the existing daytime background noise level or 50 dB L_{A90} (whichever is higher) within open external areas within the development site.

6.1 Demonstration of compliance

Evidence will be required to demonstrate that the above noise emission limits from building services plant have been met for the BREEAM credit to be awarded.

There are usually two separate means of confirming compliance, as follows:

- By repeating noise surveys at the site following completion of the project. This would require mechanical services plant to be commissioned and for tests with and without the plant running, for a comparison to be made;
- Alternatively, once the plant selections have been made, calculations can be carried out to determine the likely noise levels incident on the nearby noise sensitive premises, taking into account distance and any other attenuation.

7.0 Conclusion

Cundall has been commissioned to carry out an assessment of the potential noise impact on the proposed Edward Street hospital development, in West Bromwich.

The assessment has examined the following:

- The potential impact that noise from surrounding sources may have on the proposed development; and
- The potential impact of noise from the proposed development on existing receptors in the area.

Attenuation performance values have been identified for glazing and ventilation elements within the proposed building façades. Suggested acoustic solutions that could meet these requirements have been provided.

Noise emission limits have been given for fixed items of building services plant and equipment. The plant noise limits apply to the cumulative noise level of all new items of plant operating simultaneously under 'normal' conditions and including any additional penalties that may apply for plant noise that has specific characteristics (intermittency, tonality, etc).

7.1 BREEAM assessment

7.1.1 Hea 05 Acoustic Performance

It is considered that if the minimum glazing and ventilation attenuation requirements, as discussed above, are achieved, the internal ambient noise level criteria required by BREEAM Issue Hea 05 for the second credit, relating to internal indoor ambient noise levels, should be achieved.

7.1.2 Pollution 05 Reduction of noise pollution

The report documents a noise emission limit for any new items of building services plant not to be exceeded. This is based on the rating level not exceeding 5 dB below the background noise level at the nearest noise sensitive receptors.

It is considered that if all externally mounted plant is designed and installed to meet this limit, this credit should be achieved.

Appendix A – Acoustics Strategy Drawings

Copies of the Acoustics Strategy Drawings are provided on the following two pages.

Based on:	Architects Drg No: RB0002-GDAC-V1-00-DR-A-1020	Rev	P04
Structural Drg No.		Rev	
Survey Drg No.		Rev	
Other Drg No.		Rev	
Other Drg No.		Rev	

THIS DRAWING MAY INDICATE ELEMENTS RELATED TO FIRE SYSTEMS. THESE ARE INDICATIVE ONLY AND FINAL NUMBER, POSITIONING AND PERFORMANCE MUST BE ESTABLISHED AS PART OF THE CDP WORKS TO MAINTAIN THE INTENT OF THE DESIGN FIRE STRATEGY

NOTES:

Partitions

- █ D_{nT,w} 37 dB [≥ R_w 44 dB]
- █ D_{nT,w} 42 dB [≥ R_w 49 dB]
- █ D_{nT,w} 47 dB [≥ R_w 54 dB]
- █ D_{nT,w} 50 dB [≥ R_w 57 dB]
- █ No acoustic requirements

Doors

- R_w 35 dB doorset
- No acoustic requirements

Room Criteria:

- 35 Maximum internal ambient noise level, dB L_{Aeq,T}
- 30 Maximum services noise level, NR

Other:

- ☁ Cundall annotations
- ~ Movable partitions 55 dB R_w

Absorption

- Class C absorption or better, covering at least 80% of the area of the floor

P2	08/02/2022	Stage 3 Issue	IF	TN	MRE
P1	28/01/2022	First Issue	IF	ME	TN
Issue	Date	Description	By	Chkd	Verfd

Project
DORMITORY ERADICATION - EDWARD STREET HOSPITAL

Client
INTEGRATED HEALTHCARE PROJECTS

Title
ACOUSTICS STRATEGY DRAWING - GROUND FLOOR

Drawing Status
S3 - ISSUED FOR REVIEW & COMMENT

Project No. 1030333 Scale NTS

CUNDALL

4th Floor, 15 Colmore Row
Birmingham,
B3 2BH
Tel: +44 (0)121 262 2720

Website: www.cundall.com

Drawing No.
RB0002-CDLL-V2-00-DR-O-4501

Partitions surrounding the plant room have been based on a reverberant noise level within the plant room of no greater than 80 dBA.

Internal ambient noise levels for Single Bedrooms and Accessible Bedrooms:
40 dB L_{Aeq,1hr} Daytime
35 dB L_{Aeq,1hr} Night time
45 dB L_{Amax,f} Night time

Based on:
 Architects Drg No: RB0002-GDAC-V1-00-DR-A-1020 Rev P04
 Structural Drg No. Rev
 Survey Drg No. Rev
 Other Drg No. Rev
 Other Drg No. Rev

THIS DRAWING MAY INDICATE ELEMENTS RELATED TO FIRE SYSTEMS. THESE ARE INDICATIVE ONLY AND FINAL NUMBER, POSITIONING AND PERFORMANCE MUST BE ESTABLISHED AS PART OF THE CDP WORKS TO MAINTAIN THE INTENT OF THE DESIGN FIRE STRATEGY

NOTES:

Partitions

- D_{nT,w} 37 dB [$\geq R_w$ 44 dB]
- D_{nT,w} 42 dB [$\geq R_w$ 49 dB]
- D_{nT,w} 47 dB [$\geq R_w$ 54 dB]
- D_{nT,w} 50 dB [$\geq R_w$ 57 dB]
- No acoustic requirements

Doors

- R_w 35 dB doorset
- No acoustic requirements

Room Criteria:

- 35 Maximum internal ambient noise level, dB L_{Aeq,T}
- 30 Maximum services noise level, NR

Other:

- ~ Cundall annotations
- ~ Moveable partitions 55 dB R_w

Absorption

- Class C absorption or better, covering at least 80% of the area of the floor

P2	08/02/2022	Stage 3 Issue	IF	TN	MRE
P1	28/01/2022	First Issue	IF	ME	TN
Issue	Date	Description	By	Chkd	Verfd

Project
DORMITORY ERADICATION - EDWARD STREET HOSPITAL

Client
INTEGRATED HEALTHCARE PROJECTS

Title
ACOUSTICS STRATEGY DRAWING - FIRST FLOOR

Drawing Status
S3 - ISSUED FOR REVIEW & COMMENT

Project No. 1030333 Scale NTS

CUNDALL

4th Floor, 15 Colmore Row
 Birmingham, B3 2BH
 Tel: +44 (0)121 262 2720

Website: www.cundall.com

Drawing No.
RB0002-CDLL-V2-01-DR-O-4502

Partitions surrounding the plant room have been based on a reverberant noise level within the plant room of no greater than 80 dBA.

Internal ambient noise levels for Single Bedrooms and Accessible Bedrooms:
 40 dB L_{Aeq,1hr} Daytime
 35 dB L_{Aeq,1hr} Night time
 45 dB L_{Amax,f} Night time

Appendix B – BS 8233 calculations

Copies of the BS 8233 calculations are provided on the following two pages.

Bedroom Edward St - Daytime

PROJECT:	Edward Street Hospital
JOB NO:	1030333
DATE:	04/02/2022
CREATED BY:	IF
CHECKED BY:	TN

Internal L_{Aeq} dB(A) = **32**

Internal L_{Amax} dB(A) = **-**

ROOM DIMENSIONS AND FACADE AREA		
Term	Term Description	Value
S_f	Façade area (incl. window) (m ²)	9.2
S_{wi}	Area of the windows (m ²)	3.2
S_{rr}	Area of the roof/ceiling (m ²)	15.3
S_{ew}	Area of the external wall (m ²)	5.9
x	Room Dimension x (m ²)	3.4
y	Room Dimension y (m ²)	4.5
z	Room Dimension z (m ²)	2.7
V	Room Volume (m ³)	41.3

Room =	Living Room
L_{Aeq} Criteria =	35 dB(A)

DISTANCE ATTENUATION CALCULATION	
Apply Distance Correction:	No
Type of distance correction:	Line Source
Distance from source to microphone:	3
Distance from source to receiver:	15
Distance attenuation applied:	N/A

FREE FIELD LEVEL AT 1m FROM NOISE SENSITIVE FACADE							
Term Description	Octave Band Centre Frequency						Broadband dB(A)
	125	250	500	1k	2k	4k	dB(A)
Free Field L_{eq} measured	59.3	55.7	54.6	57.5	52.6	42.5	60.1
Distance Attenuation :	0	0	0	0	0	0	
Resultant Free-Field L_{eq}	59	56	55	58	53	43	60.1
Free Field $L_{F,max}$ measured	81.06	78.92	83.22	80.64	80.88	79.95	87.1
Distance Attenuation :	0	0	0	0	0	0	
Resultant Free-Field $L_{F,max}$	81.1	78.9	83.2	80.6	80.9	79.9	87.1

SOUND REDUCTION PROPERTIES OF EXTERNAL BUILDING FABRIC								
Facade Element	Product / Material	Octave Band Centre Frequency						Single Figure
		125	250	500	1k	2k	4k	$R_w / D_{n,e,w}$
Trickle vent ($D_{n,e}$)		35	36	37	32	36	39	35
Window (R_{wi})	4 / 6 to 20 mm / 4	21	17	25	35	37	31	25
External wall (R_{ew})	Brick and Block External Wall	31	27	35	45	47	41	35
Roof/ceiling (R_{rr})	BS 8233:2014 Given Values	31	27	35	45	47	41	35

0 No. Of Trickle Vents

CALCULATED INTERNAL L_{Aeq} AND $L_{AF,max}$ Levels							
Term Description	Octave Band Centre Frequency						Broadband dB(A)
	125	250	500	1k	2k	4k	dB(A)
Calculated L_{Aeq} in the receiver room	21	29	26	22	16	12	31.6
Calculated $L_{AF,max}$ in the receiver room	40	49	52	42	41	46	55.0

Bedroom Edward St - Night-time

PROJECT:	Edward Street Hospital
JOB NO:	1030333
DATE:	04/02/2022
CREATED BY:	IF
CHECKED BY:	TN

Internal L_{Aeq} dB(A) = **27**

Internal L_{Amax} dB(A) = **36**

ROOM DIMENSIONS AND FACADE AREA		
Term	Term Description	Value
S_f	Façade area (incl. window) (m ²)	9.2
S_{wi}	Area of the windows (m ²)	3.2
S_{rr}	Area of the roof/ceiling (m ²)	15.3
S_{ew}	Area of the external wall (m ²)	5.9
x	Room Dimension x (m ²)	3.4
y	Room Dimension y (m ²)	4.5
z	Room Dimension z (m ²)	2.7
V	Room Volume (m ³)	41.3

Room =	Bedroom
L_{Aeq} Criteria =	30 dB(A)

DISTANCE ATTENUATION CALCULATION	
Apply Distance Correction:	No
Type of distance correction:	Line Source
Distance from source to microphone:	3
Distance from source to receiver:	15
Distance attenuation applied:	N/A

FREE FIELD LEVEL AT 1m FROM NOISE SENSITIVE FACADE							
Term Description	Octave Band Centre Frequency						Broadband dB(A)
	125	250	500	1k	2k	4k	dB(A)
Free Field L_{eq} measured	57.4	51.3	48.3	49.4	43.8	33.5	52.7
Distance Attenuation :	0	0	0	0	0	0	
Resultant Free-Field L_{eq}	57	51	48	49	44	34	52.7
Free Field $L_{F,max}$ measured	65.4	63.3	61.3	63.8	60	51.7	66.9
Distance Attenuation :	0	0	0	0	0	0	
Resultant Free-Field $L_{F,max}$	65.4	63.3	61.3	63.8	60.0	51.7	66.9

SOUND REDUCTION PROPERTIES OF EXTERNAL BUILDING FABRIC								
Facade Element	Product / Material	Octave Band Centre Frequency						Single Figure
		125	250	500	1k	2k	4k	$R_w / D_{n,e,w}$
Trickle vent ($D_{n,e}$)		35	36	37	32	36	39	35
Window (R_{wi})	4 / 6 to 20 mm / 4	21	17	25	35	37	31	25
External wall (R_{ew})	Brick and Block External Wall	31	27	35	45	47	41	35
Roof/ceiling (R_{rr})	BS 8233:2014 Given Values	31	27	35	45	47	41	35

0

No. Of Trickle Vents

CALCULATED INTERNAL L_{Aeq} AND $L_{AF,max}$ Levels							
Term Description	Octave Band Centre Frequency						Broadband dB(A)
	125	250	500	1k	2k	4k	dB(A)
Calculated L_{Aeq} in the receiver room	19	24	19	13	7	3	26.8
Calculated $L_{AF,max}$ in the receiver room	25	34	30	25	20	18	36.1

