CSPAcoustics

NOISE IMPACT ASSESSMENT

54 George Street, Richmond

Prepared for:
Dalesford Estates Ltd

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Document Revision History

Version	Reason	Date/Edits Made By:
1.0	Initial Issue	21/04/21 JT
2.0	Updated floor plans	21/04/21 JT

1.00 Introduction

1.01 CSP Acoustics LLP has been instructed to complete a noise impact assessment (NIA) for a proposed residential development at 54 George Street, Richmond upon Thames. Figure 1 below shows the location of the proposed development and a detailed site layout is provided in Appendix B.

Figure 1: Proposed Residential Development

1.02 The site is located directly off George Street with a side entrance off Brewers Lane, which is a pedestrianised footpath. To the north west, the rear elevation overlooks the rear open-air dining area of The Britannia public house and other residential gardens and houses beyond. To the north east are the rear roof spaces of existing shops along George Street. Further retail and residential housing is located to the south west.

1.03 Planning permission is being sought for the redevelopment of the site to form a 3-storey building with retail remaining on the ground floor and 8 flats in the upper 2 storeys.

1.04 This report considers the impact of existing noise levels on the proposed residential development. The assessment considers noise levels against current national and local guidelines and where appropriate, recommendations are made on mitigation measures necessary to ensure an acceptable noise environment for future residents.

2.00 Assessment Framework and Criteria

Planning Policy

2.01 The National Planning Policy Framework (NPPF), July 2018, sets out the Government's planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 180 of the NPPF states the following:

"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; and
c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

2.02 Guidance on the interpretation of the policy aims contained within the NPPF is contained within National Planning Practice Guidance (NPPG). The NPPG introduces the concept of a noise exposure hierarchy based on likely average response. The guidance contained in the NPPG is summarised in the table below:

Table 1: Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

Table 1: Noise Exposure Hierarchy			
Perception	Examples of Outcomes	Increasing Effect Level	Action
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.03 The NPPF and NPPG reinforce the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three noise policy aims, as follows:

"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."*

2.04 The first aim of the NPSE requires that significant adverse impact should be avoided. The second aim requires that where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement, that: *"... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."*

2.05 The national policy documents do not contain any technical advice on acceptable noise levels. For this we are reliant on the nationally recognised design standards contained within the British Standard (BS) 8233:2014 and Professional Practice Guidance for new residential development, ProPG: Planning & Noise – May 2017.

Standards and Guidance

2.06 **BS 8233:2014:** Guidance on sound insulation and noise reduction for buildings establishes basic criteria for dwellings as follow:

Table 2: BS8233:2014 – "Table 4: Indoor ambient noise levels for dwellings"			
Activity	**Location**	**07:00 to 23:00 (Daytime)**	**23:00 to 07:00 (Night Time)**
Resting	Living Room	35dB, $L_{Aeq,16hrs}$	-
Dining	Dining room/ area	40dB, $L_{Aeq,16hrs}$	-
Sleeping (daytime resting)	Bedroom	35dB, $L_{Aeq,16hrs}$	30dB, $L_{Aeq,8hrs}$

2.07 For regular individual noise events with the potential to cause sleep disturbance such as vehicle pass-bys, it is stated that a guideline value may be set in terms of Single Event Level (SEL) or L_{AFmax}, depending on the character and number of events per night. No further guidance is provided with respect to an appropriate criterion which may be adopted for the assessment of such events. This assessment has therefore drawn upon the guidance detailed within the WHO: Guidelines for community noise document as summarised in the corresponding section below.

2.08 **World Health Organisation (WHO):** From research commissioned to examine community noise the WHO recommends an internal criterion to prevent sleep disturbance of less than 30dB $L_{Aeq,8hr}$ and a maximum level of 45dB L_{Amax} for a limited number of noise events. By assuming a reduction across a slightly open window of 15dB the WHO concluded that external levels should generally not exceed 45dB $L_{Aeq,8hr}$ at 1m from the facade of a dwelling and that regular external event levels should not exceed 60dB L_{Amax}. It should be noted that these are facade values.

2.09 For daytime WHO guidance recommends a maximum exposure level of 35dB $L_{Aeq,16hr}$ for indoor living areas (no L_{Amax} limit specified). By assuming a reduction across a window open for ventilation of 15dB the WHO concluded that external levels in relation to indoor use should not exceed 50dB L_{Aeq} at 1m from the facade of a dwelling.

2.10 For outdoor areas (i.e. balconies), BS 8233:2014 recommends that *"it is desirable that the external noise level does not exceed 50 dB L_{AeqT}, with an upper guideline value of 55 dB L_{AeqT}"* However, the document recognises that that these guideline values are not achievable in all circumstances, and in higher noise areas a compromise might be warranted. In such circumstances, development should be designed to achieve the lowest practicable levels in these external amenity spaces.

2.11 The Planning Practice Guidance on Noise, published on planningportal.gov.uk, gives further consideration relating to mitigating the impact of noise on residential developments and considers that noise may be partially off-set if residents of the dwellings have access to:

- A relatively quiet façade (containing windows to habitable rooms as part of their dwelling;
- A relatively quiet external amenity space for their sole use such as a balcony which is generally considered as desirable.
- A relatively quiet nearby external space for use by a number of residents as part of the amenity of their dwellings, and/or;
- A relatively quiet external, publicly accessible amenity space that is nearby (e.g. within a 5 minute walk)

2.12 **ProPG: Planning and Noise – New Residential Development**: The ProPG professional practice guidance on planning and noise has been jointly produced by the Chartered Institute of Environmental Health (CIEH), Institute of Acoustic (IOA) and Association of Noise Consultants (ANC).

2.13 The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and well-being through the effective management of noise. The ProPG recommends a 2-stage approach; an initial noise risk assessment of the proposed development and where the results indicate that noise requires further consideration a full assessment in the form of an Acoustic Design Statement (ADS) which would include four key elements as follows:

- Element 1 – demonstrating a "Good Acoustic Design Process";
- Element 2 – observing internal "Noise Level Guidelines."
- Element 3 – Undertaking an "External Amenity Area Noise Assessment"
- Element 4 – Consideration of "Other Relevant Issues."

2.14 The advice contained within ProPG is based on the policy objectives contained within the NPPF and the objective noise guidelines within BS 8233:2014. However, the ProPG does not constitute an official government code of practice.

2.15 **London Borough of Richmond Upon Thames Council:** Discussions with the Environmental Health Department were held. Agreement to the processes highlighted above were agreed and they also highlighted that consideration needs to be given to the council's Supplementary Planning Document (SPD) - Development Control for Noise Generating and Noise Sensitive Development.

2.16 The SPD follows the same basic assessment method as highlighted in this section, but it also includes an initial noise risk assessment, which is to be undertaken before any other assessment is completed or mitigation considered. The noise risk assessment can be based on measurement or prediction (or a combination) and should aim to describe noise levels over a "typical worst case" 24 hour day either now or in the foreseeable future. Figure 2 summarises the Stage 1 Initial Site Noise Risk Assessment.

Noise Significance Risk	Noise Significance (without mitigation)	Indicative Noise Levels	Pre-Planning Application Advice
Negligible	No adverse noise effect	L_{Aeq}, 16hr <50dB L_{Aeq}, 8hr < 40dB	Low noise levels indicate that the development site is likely to be acceptable from a noise perspective.
Low	Increasing risk of adverse effect	L_{Aeq}, 16hr 50-63dB L_{Aeq}, 8hr 40-55dB	Noise levels in this region mean that the development site is likely to be acceptable from a noise perspective, provided that good acoustic design is followed and demonstrated in an Acoustic Design Statement which confirms how the adverse impacts of noise will be mitigated and minimised in the completed development.
Medium		L_{Aeq}, 16hr 63-69dB L_{Aeq}, 8hr 55-60dB	As noise levels increase, the site is less likely to be suitable for development from a noise perspective and planning consent is more likely to be refused unless a good acoustic design process is demonstrated in a detailed Acoustic Design Statement which confirms how adverse noise impacts will be mitigated and minimised, and which clearly demonstrates that any significant adverse noise impacts will be avoided in the completed development.
High		L_{Aeq}, 16hr >69dB L_{Aeq}, 8hr >60dB	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The risk of refusal may be reduced by following a good acoustic design process. Applicants are strongly advised to seek expert advice and discuss the proposals in advance with the Local Authority.

Figure 2: Initial Site Noise Risk Assessment

3.00 Noise Survey Methodology

3.01 An environmental noise survey was undertaken between the 19th and 22nd March 2021 to determine the existing noise levels at the site.

3.02 Three noise measurement positions were chosen. One position was located on the façade overlooking George Street. The second position was located from the façade overlooking Brewers Lane. The third position was located at the rear of the site at roof level.

3.03 The measurement locations are shown in Figure 3, the survey results are summarised in the following sections.

3.04 Measurements were made using Norsonic 140 Sound Level Meters; these are Type 1 classified meters that were fitted with a wind shield. The equipment was operated in accordance with British Standard and ISO procedures. The equipment was calibrated both before and after the measurement period using an acoustic calibrator, which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level. Weather conditions over the course of the survey were cool, calm and dry.

3.05 Figure 3 below shows the measurement locations used in this assessment:

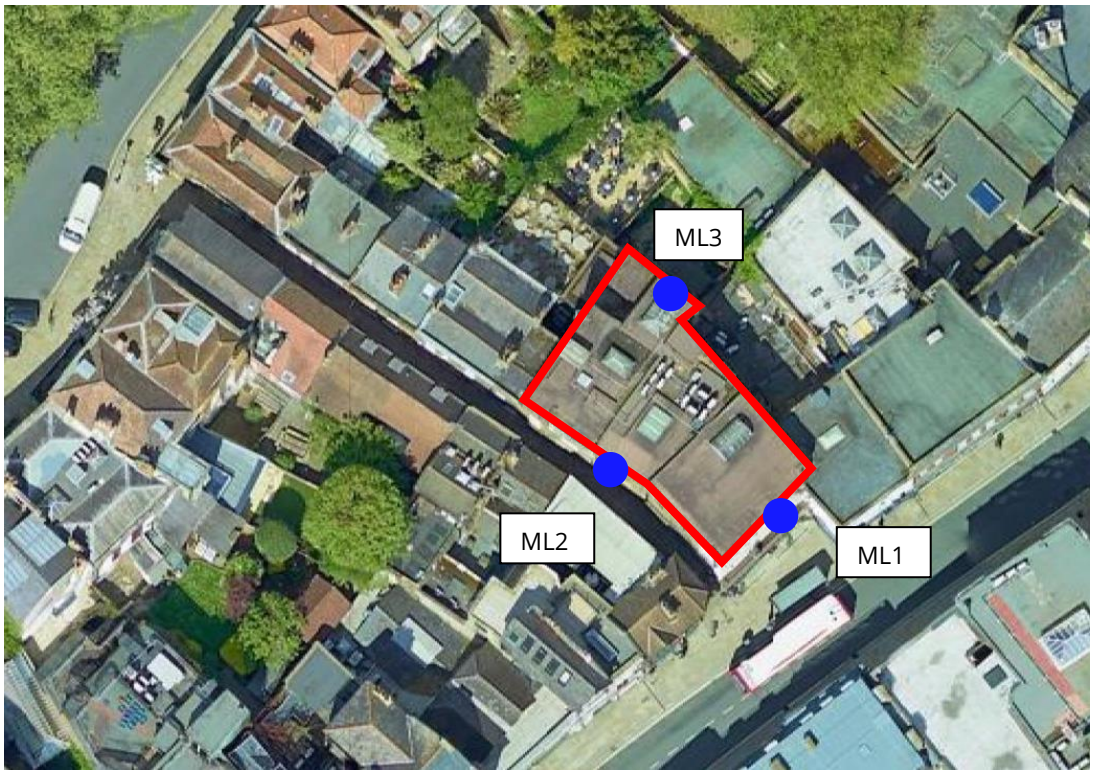

Figure 3: Noise survey locations

3.06 The meter's operating system allows for simultaneous measurement of noise over predetermined time periods, using various measurement parameters. Of interest to this assessment, the L_{eq}, L_{90} and L_{max} noise levels were recorded.

For information purposes it can be noted:

- L_{eq} is the equivalent continuous noise level, which is a method of averaging the varying noise level over the time period into a single figure value. The L_{eq} has the same sound energy as the fluctuating level over that period.
- L_{90} is the noise level exceeded for 90% of the time and is utilised in the assessment of background noise.
- L_{MAX} is the highest level within the measurement period.
- Where there is an 'A' used in the abbreviation above, such as L_{Aeq}, the 'A' stands for A-weighting and is the level corrected sound to represent what is perceived by the typical human ear.

4.00 Noise Survey Results

Location 1 - George Street

4.01 The sound level meter was positioned with the microphone projecting 1m out of a first-floor window. Equipment was operated in accordance with British Standard and ISO procedures. The monitoring equipment was calibrated both before and after the measurement period using an acoustic calibrator. There was no significant shift in the observed calibration level.

4.02 Measured levels are summarised below. These detail the daytime and night-time $L_{Aeq,T}$, L_{A90} and L_{AMax} levels at the measurement location:

Table 3: George Street Survey Results (Façade Level)

Date	Time period	$L_{Aeq,T}$ (dB)	L_{AMax} (dB)	$L_{A90,T}$ (dB)
19th March 2021	Daytime T = 9 hours	68.1	--	56.7
19th/20th March 2021	Night time T = 8 hours	65.4	86.3	43.7
20th March 2021	Daytime T = 16 hours	67.7	--	56.6
20th/21st March 2021	Night time T = 8 hours	60.7	83.1	41.3
21st March 2021	Daytime T = 16 hours	66.7	--	54.4
21st/22nd March 2021	Night time T = 8 hours	61.2	82.3	41.6
22nd March 2021	Daytime T = 5 hours	68.4	--	57.6
Average Levels	**Daytime T = 16 hours**	**67.8**	**--**	**56.3**
	Night time T = 8 hours	**63.0**	**86.3**	**42.2**

4.03 The George Street Elevation overlooks a bus stop, where buses were stopping and running frequently past the site.

Location 2 – Brewers Lane

4.04 The sound level meter was positioned with the microphone projecting 1m out of a first-floor window. Equipment was operated in accordance with British Standard and ISO procedures. The monitoring equipment was calibrated both before and after the measurement period using an acoustic calibrator. There was no significant shift in the observed calibration level.

4.05 Measured levels are summarised below. These detail the daytime and night-time $L_{Aeq,T}$, L_{A90} and L_{AMax} levels at the measurement location:

Table 4: Brewers Lane Survey Results (Façade Level)				
Date	Time period	$L_{Aeq,T}$ (dB)	L_{AMax} (dB)	$L_{A90,T}$ (dB)
19th March 2021	Daytime T = 9 hours	60.3	--	50.3
19th/20th March 2021	Night time T = 8 hours	57.4	80.5	38.5
20th March 2021	Daytime T = 16 hours	61.0	--	51.2
20th/21st March 2021	Night time T = 8 hours	52.4	80.0	38.6
21st March 2021	Daytime T = 16 hours	59.5	--	48.3
21st/22nd March 2021	Night time T = 8 hours	53.0	77.9	37.7
22nd March 2021	Daytime T = 5 hours	60.8	--	51.3
Average Levels	**Daytime T = 16 hours**	**60.4**	**--**	**50.3**
	Night time T = 8 hours	**54.9**	**80.5**	**38.3**

4.06 The Brewers Lane Elevation overlooks a narrow pedestrianised footpath, noise from George Street was able to travel down the path, but lesser noise from pedestrians created the general noise climate here.

Location 3 – Rear Rooftop

4.07 The sound level meter was positioned with the microphone located on a tripod at approximately 1.2m above the flat roof. The position had a clear view of the rear garden areas. Equipment was operated in accordance with British Standard and ISO procedures. The monitoring equipment was calibrated both before and after the measurement period using an acoustic calibrator. There was no significant shift in the observed calibration level.

4.08 Measured levels are summarised below. These detail the daytime and night-time $L_{Aeq,T}$, L_{A90} and L_{AMax} levels at the measurement location:

Table 5: Rooftop Survey Results (Free Field Level)				
Date	Time period	$L_{Aeq,T}$ (dB)	L_{AMax} (dB)	$L_{A90,T}$ (dB)
19th March 2021	Daytime T = 9 hours	51.5	--	47.3
19th/20th March 2021	Night time T = 8 hours	53.3	74.0	40.3
20th March 2021	Daytime T = 16 hours	58.3	--	47.3
20th/21st March 2021	Night time T = 8 hours	48.2	76.3	39.7
21st March 2021	Daytime T = 16 hours	50.6	--	45.6
21st/22nd March 2021	Night time T = 8 hours	47.3	65.7	39.6
22nd March 2021	Daytime T = 5 hours	51.9	--	48.5
Average Levels	**Daytime T = 16 hours**	**54.4**	**--**	**47.2**
	Night time T = 8 hours	**50.4**	**76.3**	**39.9**

4.09 The rooftop location had a softer soundscape but was still controlled by road traffic noise. In the lulls, distant mechanical services plant could be distinguished.

4.10 A summary of measured noise levels are shown in Table 6. It should be noted that the reported $L_{Aeq, T}$ (dB) levels are the logarithmically averaged noise levels. Whereas the $L_{A90, T}$ (dB) levels are arithmetically averaged noise levels. The levels are rounded to the nearest whole number.

Table 6: Noise Survey Results at 54 George Street (free field)					
Measurement Location	Daytime (T = 16 hours)		Night time (T = 8 hours)		
	$L_{Aeq, T}$	$L_{A90,T}$	$L_{Aeq, T}$	L_{Amax}	$L_{A90,T}$
George Street (ML1)	65	53	60	83	39
Brewers Lane (ML2)	57	47	52	78	35
Rear Rooftop (ML3)	54	47	50	76	40

4.11 The equivalent octave band data used within the assessment is provided in Table 7.

Table 7: Octave band data for measured noise levels									
Location		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
George Street	Daytime L_{Leq}	72	65	67	63	63	61	58	59
	Night time L_{Leq}	75	62	63	60	59	58	56	58
Brewers Lane	Daytime L_{Leq}	66	62	60	58	56	53	48	47
	Night time L_{Leq}	62	58	55	53	51	50	49	62
	L_{Lmax}	83	86	81	83	72	68	67	78
Rear of Site	Daytime L_{Leq}	60	58	57	57	54	49	39	33
	Night time L_{Leq}	56	53	53	52	49	44	34	28
	L_{Lmax}	71	64	71	76	71	72	69	58

5.00 Outside Patron Noise Assessment

5.01 The proposed development will have flats that will face towards an open-air dining area which is connected to The Britannia public house. There are two defined areas to the rear area of The Britannia; A first-floor terrace and a ground floor garden. The first-floor terrace has a dining area with approximately 9 tables. It is expected that this area could accommodate 4 covers per table, which equates to 36 people. The ground floor garden equally has approximately 9 tables and could typically accommodate 36 people. Therefore, on a busy night it is expected 72 patrons could be using the outside areas. The image below in Figure 4 shows this outside area and the closest façade of the proposed flats.

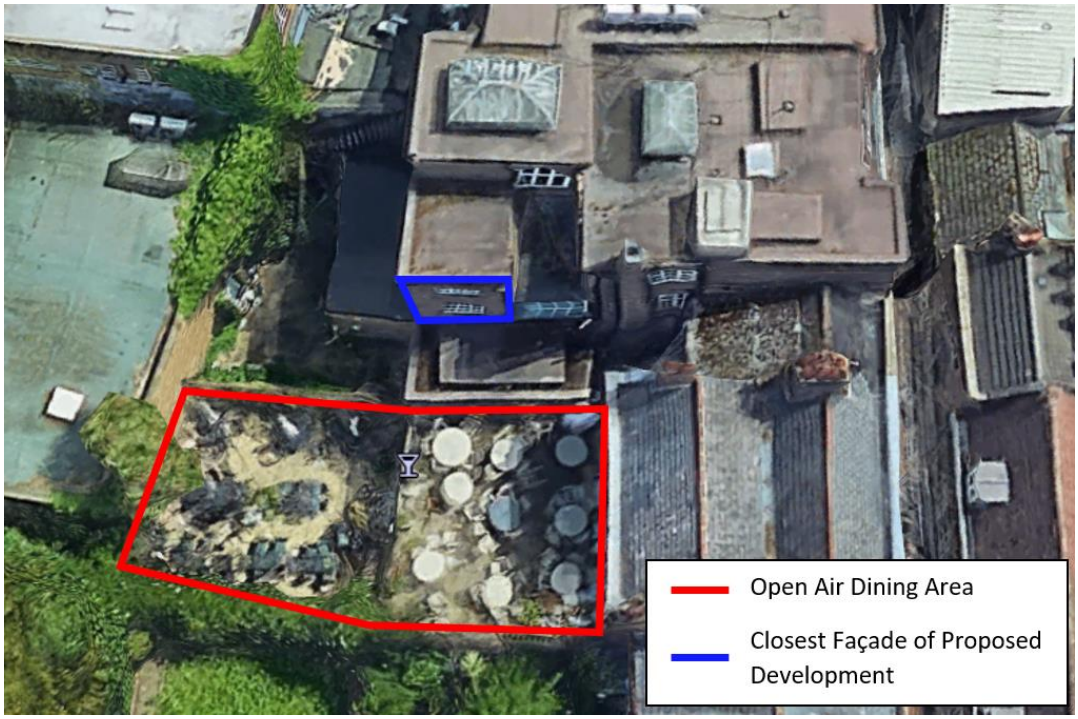

Figure 4: Open Air Dining Area

5.02 We will base the worst-case example on 72 people in total using the outside areas at once. In reality this would probably rarely occur, but for the purpose of this assessment we have made this assumption.

5.03 To quantify potential noise from people with raised voices at the open-air dining area, the sound pressure levels associated with a raised voice, as detailed in ANSI S3.5-1997, is considered as shown below in Table 8.

Table 8: Raised voice effort sound pressure level at 1 m in the free-field								
Description	Linear sound pressure levels (dB) at Single octave band frequency (Hz)							dB(A)
	125	250	500	1k	2k	4k	8k	
Raise voice effort at 1 m	55.5	61.5	65.6	62.3	56.8	51.3	42.6	66.5

5.04 To determine the cumulative effect of multiple people using the open-air dining area, it is necessary to consider how many people at any one time may be speaking.

5.05 Research into the Lombard effect for groups of people [Jens Holger Rindel, "Acoustical capacity as a means of noise control in eating establishments", Joint Baltic-Nordic Acoustic Meeting, BNAM 2012, Odense, Denmark, 2012] has suggested using a typical group size of 3.5 people for every speaker.

5.06 Therefore, on the assumption of up to 72 people using the drinking area at any one time this would equate to an average of 20.6 people speaking at the same time, 10.3 per outside space. On this basis a sound power is calculated according to:

$$L_{w,\,1\ person} = L_p + 20*\log_{10}(1m) + 11, \text{ and } L_{w\ 10.3\ speakers} = L_{w,\,1\ person} + 10*\log_{10}(10.3)$$

Table 9: Calculated sound powers for raised voices									
Description	Group size	Linear sound power levels (dB) at Single octave band frequency (Hz)							dBA
		125	250	500	1k	2k	4k	8k	
Raised voice effort L_w	1 person	66.5	72.5	76.6	73.3	67.8	62.3	53.6	77.5
	10.3 people	76.6	82.6	86.7	83.4	77.9	72.4	63.7	87.7

5.07 The calculations associated with the patron noise at the nearest façade of the proposed development are shown in Table 10 below.

Table 10: Calculated noise levels from the open-air seating area with 72 people		
Description	First Floor Terrace (36 people)	Ground Floor Garden (36 people)
Source Patron Noise (Lw)	88 dBA	88 dBA
Distance correction	-14 (at 6m)	-19 (at 9m)
External amenity level (Lp)	63 dBA	58 dBA
Combined Total (free field)	**64 dBA**	

6.00 Existing Mechanical Service Plant

6.01 It was noted during an earlier application from the EHO about their concern of a/c equipment on the adjoining lower roof. This has been identified and is shown below in Figure 5.

Figure 5: Plant on Neighbouring Lower Roof

6.02 The picture shows three condenser units and two rain hoods. One of these hoods was being used to enable pipework to enter the building and was sealed with expandable foam. The other hood is considered to be a ventilation outlet. Due to its size, it is only considered to be a small extractor fan rather than commercial extract. Therefore, it will not likely create a perceptible level of noise when compared to the condenser units themselves.

6.03 The condenser units have been identified as Daikin units. The exact models were not distinguishable, but very similar models (if not the same) have been identified. The assessment is based on 2x Daikin RXS71 units and 1x Daikin RXS50 unit.

6.04 The proposed development will have windows overlooking the flat roof where these units are sited. The closest window has been estimated to be approximately 3 metres from the units. Table 11 shows the estimated noise levels from the three a/c units.

Table 11: Calculated noise levels from the a/c units on the neighbouring lower roof	
Description	**Noise Level**
Daikin RXS71 (Lw)	66 dBA per unit
Daikin RXS50 (Lw)	62 dBA per unit
Combined total of 3 units (Lw)	69.8 dBA
Distance to nearest receiver	3 metres
External level (Lp) (free field)	**52.3 dBA**

6.05 This level is based on the units running at full duty, which is only likely to occur during the day. It is not expected they will operate at full duty through the night.

7.00 Stage 1 - Initial Site Noise Risk Assessment

7.01 The first item to assess is the initial site noise risk assessment. Tables 6, 10 and 11 provide the estimated noise levels impacting upon the site. The table below compares these to the criteria from Figure 2.

Table 12: Calculated Site Noise Risk Assessment				
Façade Location	**Noise source**	**Time Period**	**Noise Level**	**Noise Significance Risk**
George Street	Road traffic and pedestrian	Day	65	Medium
		Night	60	Medium
Brewers Lane	Road traffic and pedestrian	Day	57	Low
		Night	52	Low
Rear of Site	Environment	Day	54	Low
		Night	50	Low
	Open Air Dining Area	Day	64	Medium
	Neighbouring a/c units	Day	52	Low
		Night	<52	Low

7.02 The initial site noise risk assessment defines the noise significance risk of 'Low' and 'Medium' as follows:

- 'Low' – "*Noise levels in this region mean that the development site is likely to be acceptable from a noise perspective, provided that good acoustic design is followed and demonstrated in an Acoustic Design Statement which confirms how the adverse impacts of noise will be mitigated and minimised in the completed development.*"

- 'Medium' – "*As noise levels increase, the site is less likely to be suitable for development from a noise perspective and planning consent is more likely to be refused unless a good acoustic design process is demonstrated in a detailed Acoustic Design Statement which confirms how adverse noise impacts will be mitigated and minimised, and which clearly demonstrates that any significant adverse noise impacts will be avoided in the completed development.*"

7.03 Based on this assessment, the table shows that noise from George Street and patron noise from the neighbouring open air dining area need to be fully addressed. The low-level risks will also be considered in this report.

8.00 Noise Assessment - Acoustic Design Statement

8.01 Generally, there is a hierarchy of noise control that should be considered in all cases, and the layout should demonstrate that the following logical process, which would represent good design, has been followed as far as possible:

- Maximise the spatial separation of noise source(s) and receptor(s);
- Using existing topography and existing structures to screen the proposed development site from significant sources of noise;
- Incorporating noise barriers as part of the scheme to screen the proposed site from significant sources of noise;
- Using the layout of the scheme to reduce noise propagation across the site;
- Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms;
- Using the building envelope to mitigate noise to acceptable levels.

8.02 The advice in ProPG acknowledges that where noise-sensitive developments are proposed in noisy locations there is a limit to the extent to which good acoustic design can be achieved and that it may not always be possible to achieve acoustic standards with windows open or accepting that noise levels in parts of the outdoor amenity areas may not be optimal. In such cases suitable living conditions, in line with the guidance in BS 8233:2014, can still be achieved by using the building envelope to control noise levels.

8.03 The development site is a refurbishment of an existing building and is constrained within its own site boundary. In terms of noise, the location of the site restricts the opportunities to reduce the impact of noise through the use of noise barriers, and layout of the scheme.

Stage 2 - Internal Design Noise Levels

8.04 It is expected that design noise limits contained in BS8233:2014 (as repeated in para. 2.06) are achieved internally. The assessment is based on occupants having the ability to open windows for ventilation. A partially open window typically reduces external noise by 15 dB. By taking this into account the internal noise levels would be as follows:

Table 13: Calculated Site Noise Risk Assessment				
Façade Location	**Noise source**	**Time Period**	**Internal Noise Level**	**BS8233 Criteria**
George Street	Road traffic and pedestrian	Day	53	35
		Night	48	30
Brewers Lane	Road traffic and pedestrian	Day	45	35
		Night	40	30
Rear of Site	Environment	Day	42	35
		Night	38	30
	Open Air Dining Area	Day	52	35
	Neighbouring a/c units	Day	40	35
		Night	<40	30

8.05 It can be seen that the external noise levels associated with the surrounding noise sources will exceed the allowable internal noise levels and so it would be necessary to have windows closed to achieve reasonable noise levels in accordance with BS 8233:2014.

8.06 Noise mitigation will be required to ensure that noise levels remain acceptable. As a matter of course, thermal double glazing would be provided to meet the thermal requirements of the Building Regulations and the specification of this can be upgraded to mitigate noise by a sufficient amount to ensure internal noise levels are within the guideline values.

8.07 To enable windows to be closed, alternative means of ventilation shall be provided i.e. acoustic trickle vents, through-wall ventilators.

8.08 This is discussed further in Section 9.0 - Mitigation.

Stage 3 – Design Noise Levels for External Amenity Spaces

8.09 Flats inherently have little or no private outdoor amenity space leading directly from the dwelling. However, as part of the proposal, the developer is looking to include integral covered balcony areas, or wintergardens, for some of the flats at the rear. This external area will provide the occupants of the flats some desirable outdoor amenity space, although this would be affected by noise from the open-air dining area of the adjacent public house The Britannia (when it is in operation).

8.10 It is understood the conditioned operational times of The Britannia's outdoor areas are as follows:

- The upstairs dining area must close by 9.30pm. The doors must be kept closed at 9.30pm, except for fire escape.
- The downstairs beer garden must close and be cleared of patrons by 11.00pm.

This shows that both outdoor areas are daytime only activities and the closest area, the upstairs dining area, closes earlier.

8.11 The external noise level due to the open-air dining area is expected to be approximately 64 dBA. The balcony area / wintergarden will be contained within the internal footprint of the existing building. See below in Figure 6 a snip of the relevant floor plan of the first floor flat 01.

Figure 6: Snip of floor plan showing balcony area

8.12 With the existing windows removed (and enlarged where appropriate, to satisfy daylight requirements) it is expected that the noise level in the balcony areas would reduce by approximately 5 dB due to the screening effect offered by the remaining façade. This would reduce the level down to 59 dBA.

8.13 WHO guidance states that serious annoyance may occur if the $L_{Aeq,16h}$ in outdoor amenity areas is greater than 55dB or moderate annoyance may occur if the noise levels is greater than 50dB. BS 8233 recognises that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$, which would be acceptable in noisier environments".* BS 8233 then states "*it is also recognised that these guideline values are not achievable in all circumstances where development may be desirable".*

8.14 It is recommended that openable windows are fitted to the façade openings, effectively creating a wintergarden. Then it can be left up to the discretion of the occupant to control the amount of noise ingress into the balcony area. With a partially open window, the noise level would drop to 49 dBA inside the balcony area, with further attenuation possible if fully closed. It can also be fully opened as the typical noise level at the rear (without noise from The Britannia) has be estimated to be approximately 49 dBA (54 – 5 = 49) from the general environment.

9.00 Mitigation

9.01 Noise mitigation will be required to lessen the impact of external noise. Due to the limitations at the proposed development, the only practical mitigation approach would be to close windows to ensure that internal noise levels comply with BS8233 criteria.

9.02 The mitigation advice is based on the proposed site layout as seen in Appendix B. Should this layout change significantly it may need to be reassessed.

9.03 The influence of the existing noise environment on the proposed development site has been determined using the assessed daytime and night time average noise levels set out in the various sections above. The noise levels are considered for each façade in turn. The L_{Amax} levels are typically the controlling factor at night, and these will be considered in terms of noise impact to bedrooms.

9.04 Levels of sound insulation performance required have been determined using the method set in Appendix G of BS8233:2014. This method determines internal noise levels likely to arise within a room using the façade incident noise level and the composite sound insulation performance of the building envelope.

9.05 The required sound insulation performance for windows and ventilators for the proposed flats, based on external noise sources, are provided in Table 14. These show the worst-case noise levels impacting upon the façade listed.

Table 14: Acoustic performance specification for windows and ventilators

Façade Location	Most Sensitive Room and Time Period	External Noise level dB	Internal Noise		Glazing Type Rw dB	Ventilators D_{new} dB
			$L_{Aeq,T}$	L_{Amax}		
George Street	Living Rooms - Daytime	68 L_{Aeq}	35 dB	--	38	35
Brewers Lane	Bedrooms – Night time	83 L_{Amax}	--	45 dB	43	55
	Living Rooms - Daytime	57 L_{Aeq}	35 dB	--	33	35
Rear – North East	Bedrooms – Night time	78 L_{Amax}	--	45 dB	38	46
Rear – North West (Overlooking Britannia's Terrace)	Bedrooms – Night time	78 L_{Amax}	--	45 dB	38	46
	Living Rooms - Daytime	64 L_{Aeq}	35 dB	--	33	35

9.06 Sound insulation performances summarised for windows and vents in Table 14 are given in terms of single figure performances. It is recommended that where selecting windows and vents, they must also provide the minimum octave band sound insulation performances set out in Table 15.

Table 15: Minimum Sound Insulation performance (R) of windows and vents of the proposed development in dB							
Glazing							
R_W Performance dB	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
43	29	30	34	40	43	48	54
38	22	26	27	34	40	38	46
33	16	20	19	29	38	36	45
Vents							
D_{new} Performance dB	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
55	40	47	46	49	56	66	75
46	31	35	42	41	47	52	60
35	32	32	36	36	35	34	35

9.07 With reference to Table 15, the following construction is typically given with respect to the following details:

- 43dB R_w glazing – can typically be achieved with a double glazing configuration of 12/15/8.8, which is 12mm glazing, 15mm airgap and 8.8mm laminate glazing
- 38dB R_w glazing – can typically be achieved with a double glazing configuration of 6/12/10, which is 6mm glazing, 12mm airgap and 10mm glazing
- 33dB R_w glazing – can typically be achieved with a double glazing configuration of 6/12/6, which is 6mm glazing, 12mm airgap and 6mm glazing
- 55 dB D_{new} Vent – can typically be achieved with a high performance acoustic through wall trickle vent, such as the Greenwood MA3051.
- 46 dB D_{new} Vent – can typically be achieved with a high performance acoustic through wall trickle vent, such as the Greenwood AAB4000.
- 35 dB D_{new} Vent – can typically be achieved with a basic acoustic trickle vent.

9.08 The chosen window and vent supplier must provide a sound insulation test certificate which demonstrates the specified performance shown in Table 15 and 16 can be achieved.

9.09 The required sound insulation performances can typically be achieved by trickle ventilation or through wall ventilators from the following suppliers:

https://www.greenwood.co.uk/acoustic
https://www.titon.com/uk/products/ventilation-systems/
http://www.passivent.com/
https://www.renson.eu/en-gb

10.00 Stage 4 – Assessment of Other Relevant Issues

10.01 The final element of this report is an assessment of other relevant issues, including compliance with relevant national and local policy; the magnitude and extent of compliance with ProPG; likely occupants of the development; unintended adverse consequences resulting from the acoustic design and wider planning objectives.

Compliance with relevant national and local policy

10.02 In terms of noise sensitive development, the main aims of the NPPF is the avoidance of significant adverse effects and the mitigation and reduction of any adverse impacts to a minimum. As discussed in Section 2.0 of this report, the current nationally recommended internal noise levels for dwellings are given in BS 8233:2014 'Guidance on Sound Insulation & Noise Reduction for Buildings.' These guideline values are based on the WHO Guidelines for Community Health. The World Health Organisation guidance is referenced in the NPSE.

10.03 The WHO guideline values are appropriate to what are termed "critical health effects". This means that the limits are at the lowest noise level that would result in any psychological, physiological or sociological effect. They are, as defined by NPSE, set at the Lowest Observed Adverse Effect Level (LOAEL) and therefore exceedance of the guideline values cannot be considered to be Significant adverse effects (SOAEL).

10.04 As shown above, as a result of the proposed mitigation measures, internal noise levels will meet or improve upon the guidelines in BS 8233:2014. It is therefore concluded that internal noise levels will not cause significant adverse impacts to future residents in accordance with the policy aims of the NPPF.

Likely occupant of the development

10.05 With regard to the likely occupants of the development; new residents are likely to choose the site based on its location and close proximity to the town centre, local amenities and open spaces. As such they would reasonably expect a certain level of noise from roads and the active urban environment. Provided compliant internal noise levels can be achieved, the occupants can decide on whether to let the urban noise environment in via open windows or choose to close these for a controlled restful internal ambiance.

Wider Planning Objectives

10.06 The scheme has been designed taking into account the advice from the London Borough of Richmond upon Thames in relation to previous schemes. The evolution of the design of the scheme and the wider planning objectives discussed within the Design Access Statement and other planning documents are to be submitted with the application.

11.00 Conclusion

11.01 CSP Acoustics have been appointed to undertake a noise impact assessment for a proposed residential development at 54 George Street, Richmond upon Thames.

11.02 The scope and approach of the assessment has been agreed in consultation with London Borough of Richmond upon Thames and has been completed considering both local and national planning policy. The assessment has also drawn upon applicable environmental noise guidance documents and British Standards.

11.03 Comprehensive surveys have been carried out at locations representative of the proposed residential flats.

11.04 Taking into account the above and having assessed the main noise impacts onto the development against national standards, it is concluded that mitigation measures can be incorporated into the design to ensure acceptable internal noise levels within the proposed residential development are in line with national and local policy aims.

11.05 The assessment concludes that mitigation will be required to ensure that the internal noise levels meet or are below those stated within BS 8233. Alternative ventilation in the form of acoustic trickle vents and acoustic glazing will provide sufficient mitigation against road traffic noise, patron noise, mechanical services noise plant noise and the general noise environment.

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Appendix A: Acoustic Glossary

Term	Description
Acoustic environment	Sound from all sound sources as modified by the environment
Ambient Noise	Totally encompassing sound at a given location, usually composed of sound from many sources near and far
Background Noise	The lowest noise level present in the absence of any identifiable noise sources. This is usually represented by the L_{A90} measurement index.
Break-in	Noise transmission into a structure from outside
Break-out	Noise transmission from inside a structure to the outside
dB (decibel)	Defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	Level of sound across the audible spectrum with a frequency filter to compensate for the varying sensitivity of the human ear to sound at different frequencies at a lower SPL
Façade Level	A sound field determined at a distance of 1m in front of a building façade.
Free-field Level	A sound field measured at a point away from reflective surfaces other than the ground
Frequency (Hz)	Number of cycles of a wave in one second measured in Hertz.
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
$L_{Aeq,T}$	$L_{aeq,T}$ is defined as the equivalent continuous "A"-weighted Sound Pressure Level in dB over a given period of time.
L_{Amax}	Maximum A - weighted sound pressure level recorded over the measurement period. Usually has a time constraint (L_{afmax}, L_{asmax})
Measurement time interval, T	Total time over which measurements are taken
Noise	Unwanted sound.
Noise-sensitive receptors (NSRs)	Any occupied buildings outside the assessment location used as a dwelling (including gardens), place of worship, educational establishment, hospital or similar institution, or any other property likely to be adversely affected by an increase in noise level
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile level $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting "F", which is exceeded for N% of a specified time period
Rating level, $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound

Term	Description
Residual sound level, Lr = $L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T
Sound power level, LWA	Ten times the logarithm to the base 10 of the ratio of the sound power radiated by a sound source to the reference sound power, determined by use of frequency-weighting network "A"
Sound pressure level	Is the Root Mean Squared value of the instantaneous sound level over a period of time expressed in decibels, usually measured with an appropriate frequency weighting
Specific sound level, Ls = $L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r
Specific sound source	The sound source which is being assessed
Third octave band	Octave bands sub-divided into three parts, equal to 23% of the centre frequency

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Appendix B: Proposed Site Layout

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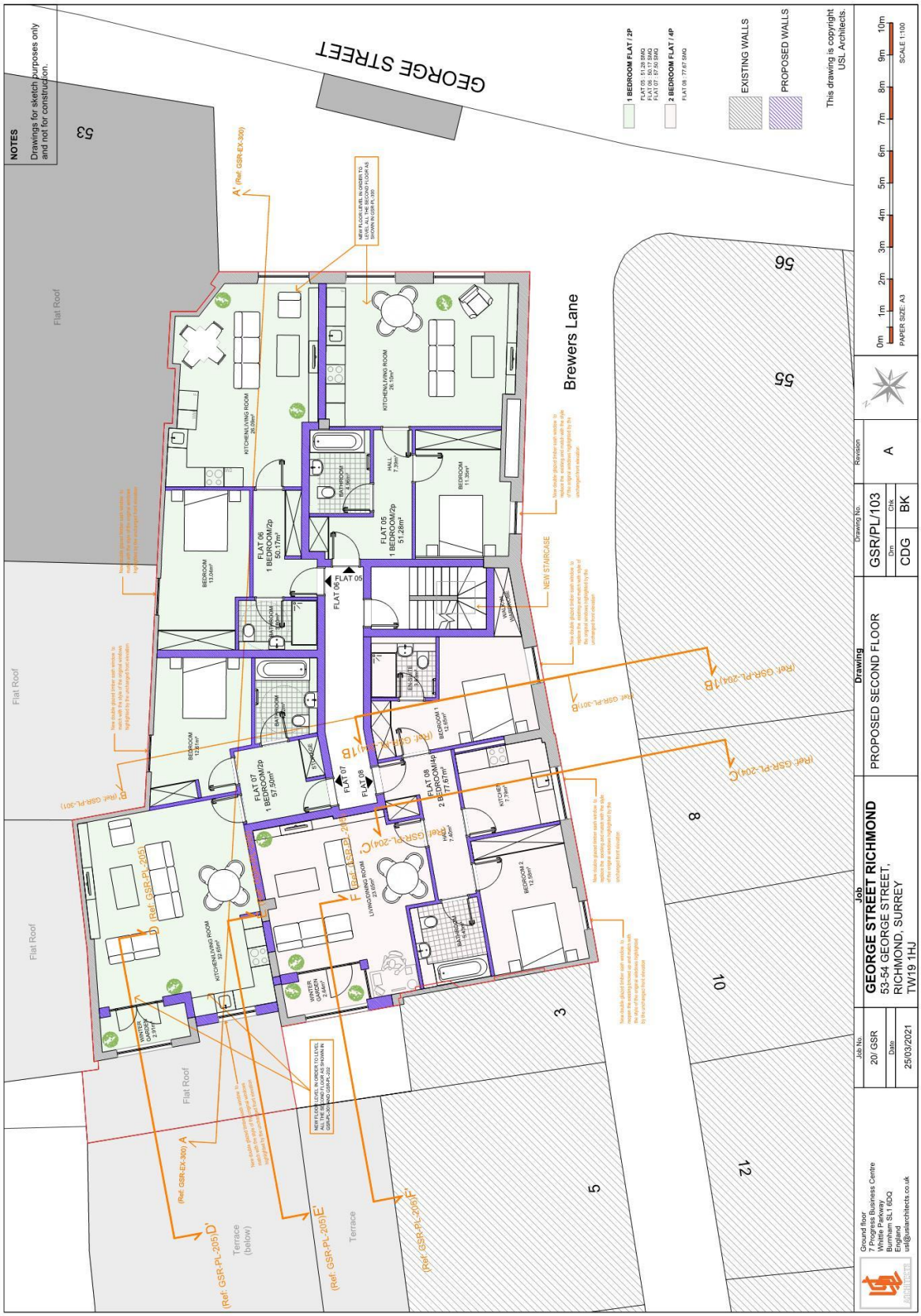

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