
63-65 Upper Chorlton Road Noise Assessment Report



Project: 63-65 Upper Chorlton Road, Whalley Range

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Signature	

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1. Introduction

- 1.1 RS Acoustic Engineering Ltd has been appointed by Terra Nova Developments Ltd to undertake a noise assessment with regard to a proposed residential redevelopment at No.63-65 Upper Chorlton Road, Whalley Range, Manchester, M16.
- 1.2 The proposals are to refurbish the existing detached dwelling and construct a new three storey extension to the rear of the property. The development will provide 12 self-contained apartments in total.
- 1.3 The dominant source of noise at the site is road traffic on Upper Chorlton Road (B5218).
- 1.4 The properties in the immediate surrounding area are predominantly residential dwellings. The neighbouring property to the north is a nursery and the property to the south is split into a number of apartments. There is a Tesco Express to the north west on the opposite side of Upper Chorlton Road.
- 1.5 A noise assessment has been undertaken taking into consideration the guidance contained within British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* and ProPG's *Planning & Noise*. Manchester City Council's planning and noise guidance has also been taken into consideration.
- 1.6 This assessment is based on the results of an environmental noise survey undertaken by RS Acoustic Engineering Ltd. Continuous sound level monitoring was conducted over several days in order to establish the ambient sound pressure levels during the daytime and night-time period.
- 1.7 The measured sound level data has been used to determine the acoustic performance requirements for the building envelope construction and to determine whether it will be suitable to naturally ventilate habitable rooms via opening windows alone.
- 1.8 An assessment of noise ingress through the building envelope with windows open and closed has been undertaken to determine the resulting sound levels.
- 1.9 The guidance given within Approved Document F (Ventilation) and Approved Document O (Overheating) has also been taken into consideration with regard to noise ingress and opening windows.
- 1.10 The survey and assessment was conducted by Mr Ryan Swales (BSc(Hons), MIOA), Principal Acoustic Consultant and Member of the Institute of Acoustics.
- 1.11 The results of the noise survey have been presented, along with the assessment criteria and a discussion of the results with respect to the appropriate guidance and targets.
- 1.12 Recommendations regarding sound insulation, ventilation and noise mitigation are also provided within this report.

2. Assessment Guidance & Acoustic Criteria

Manchester City Council: Planning & Noise Technical Guidance

2.1 With regard to residential developments, Manchester City Council has adopted the following noise criteria:

- Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 10 times).
- Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq} .
- Gardens and terraces (daytime) 55 dB L_{Aeq} .

2.2 These criteria have been adopted for the following reasons:

- BS 8233: 2014 recognises these levels as a good standard for resting/sleeping conditions.
- The WHO document 'Guidelines for Community Noise' recommends an internal L_{Aeq} of 30 dB for optimal sleep conditions (and no more than 35 dB for internal rooms during daytime).
- The performance of acoustic insulation schemes can often be below that specified, according to the quality of installation, materials, noise spectrum and deterioration / wear and tear of building elements. A high design specification introduces a 'safety margin' should building elements not perform as well as expected ('on-site' performance).
- Performance specification for glazing does not usually take into account the detrimental effect of vents on the sound insulation. Even 'acoustic' vents will reduce the performance of the facade insulation, as they will inherently contain a free open area for air exchange.
- There is a general increase in urban noise levels, which can in the future be reasonably accommodated by these standards.
- The standards support the Local Authority corporate objective to prevent ill-health and improve local people's health and well-being.

British Standard 8233:2014: Guidance on sound insulation and noise reduction for buildings

2.3 BS 8233 provides guidance regarding acoustic criteria and noise levels appropriate for various types of space that have different functions.

2.4 With regard to dwellings, appropriate internal ambient sound levels are given for bedrooms, living rooms and dining rooms (habitable rooms). The guidelines take into consideration the effect of internal noise on sleep and also the effect of noise on resting, listening and communicating.

2.5 The internal sound level targets presented in Table 2.1 overleaf have been reproduced directly from Table 4 of the standard.

Table 2.1 - Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	---
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	---
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 2.6 Note 7 of the standard also suggests that in some circumstances it may be appropriate to relax the indoor ambient noise level targets by up to 5 dB:

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

- 2.7 Note 5 also states:

If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

World Health Organisation: Guidelines for community noise (1999)

- 2.8 To help avoid sleep disturbance within bedrooms, this historical guidance document recommends that the night-time internal ambient sound level should not exceed 30 dB $L_{Aeq,T}$ and the maximum sound level should not typically exceed 45 dB $L_{AFmax,T}$.
- 2.9 The corresponding values directly outside of bedroom windows are therefore 45 dB $L_{Aeq,8hour}$ and 60 dB $L_{AFmax,T}$. This is based on the assumption that a partially open window provides approximately 15 dB of sound attenuation (from external noise).
- 2.10 With regard to sleep disturbance and maximum L_{AFmax} sound levels, the study undertaken by Vallet & Vernet (1991) suggests that for good sleep, indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night.

Professional Practice Guidance on Planning & Noise (2017)

- 2.11 Professional Practice Guidance on Planning and Noise (ProPG) has been produced in order to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.
- 2.12 The NPPF encourages improved standards of design. This guidance document encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.
- 2.13 The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transportation sources.

Internal noise level guidelines

- 2.14 The recommended ProPG internal noise level guidelines are presented in Table 2.2. The guidelines reflect and extend current practice contained within BS 8233:2014.

Table 2.2 - ProPG internal noise level guidelines

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	---
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	---
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$

- 2.15 Where the local planning authority accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment.
- 2.16 In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide “*whole dwelling ventilation*” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position.
- 2.17 It should also be noted that the internal noise level guidelines are generally not applicable under “*purge ventilation*” conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

External noise and amenity areas

- 2.18 The ProPG external amenity area noise assessment reflects and extends the advice contained within BS 8233:2014 and is summarised as follows:
- (i) *If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.*
 - (ii) *The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.*
 - (iii) *These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.*
 - (iv) *Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.*
 - (v) *Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
 - *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*

- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.*

3. Environmental Noise Survey

Survey methodology

- 3.1 Continuous sound level monitoring was conducted over a 63-hour period on the front elevation facing Upper Chorlton Road. The equipment was installed at first floor level (position A).
- 3.2 The front elevation is set-back approximately 13 metres from the carriageway edge.
- 3.3 Measurements were performed from 12:00 hours on Friday 18th through to 02:45 hours on Monday 21st August 2023.
- 3.4 Continuous sound level monitoring was also conducted over a 24-hour period on the rear elevation. The equipment was again installed at first floor level (position B).
- 3.5 Measurements were performed from 11:30 hours on Monday 21st through to 11:30 hours on Tuesday 22nd August 2023.
- 3.6 A measurement interval of 5-minutes was used during the survey and measurements were considered to be subject to sound reflections from the façade (as opposed to free field). One-third octave band and A-weighted broadband sound pressure levels were recorded during the survey.
- 3.7 The site location, surrounding area and survey measurement positions are shown in Figure 3.1 and Figure 3.2. The site plan and floor plans are presented in Appendix A.

Figure 3.1 - Site location and survey measurement positions (source: Google Earth)



Figure 3.2 - Photographs showing survey measurement positions



Survey equipment

- 3.8 The survey was conducted using the following Class-1 specification equipment:
- Brüel & Kjaer 2250-Light data logging sound level meter, microphone type 4189 and pre-amplifier type ZC0032.
 - CEL-120/1 Acoustic calibrator.
- 3.9 Calibration of the sound level meter and microphone used for the measurements are traceable to UKAS accredited laboratories (calibration certificates are available upon request).
- 3.10 The calibration of both sound level meter and microphone was checked using a 1 kHz tone at 94 dB prior to and following the measurements performed. Calibration drift was less than 0.1 dB.

Weather conditions

- 3.11 The weather conditions during the survey were generally dry and fine with a light cloud cover. There was intermittent rainfall on Friday and wind speed measurements taken outside of the building were between 1.1 and 2.2 m/s⁻¹.
- 3.12 The air temperature during the survey ranged between 13°C and 23°C. The overall weather conditions were considered suitable to obtain representative measurements.

Subjective observations of the acoustic environment

- 3.13 The dominant source of noise is road traffic on Upper Chorlton Road. The road is subject to moderate traffic flows during the daytime and night-time period.
- 3.14 Intermittent vehicle movements on Darnley Street and Kings Road also contribute to the prevailing ambient noise climate but are insignificant compared to Upper Chorlton Road.
- 3.15 There is a Tesco Express to the north west on the opposite side of Upper Chorlton Road. Operational noise associated with the premises was generally negligible and was due to vehicle movements accessing/egressing the parking area. Fixed plant is enclosed at the corner of the building and is fully screened from the property.
- 3.16 There was no audible building services plant noise at the front and rear elevation of the property (e.g. from condenser units, commercial extract fans etc).
- 3.17 There is a small nursery to the north east of the property (Early Days Day Nursery). Operational noise associated with the premises was generally negligible and was due to vehicle movements during child drop-off/collection and intermittent play in the rear garden area.

Measured indices

3.18 Although a wide range of statistical sound level data was recorded during the survey, the L_{Aeq} and L_{AFmax} indices are of most interest in this instance:

- $L_{Aeq,T}$ - The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period (commonly used to describe the 'ambient' sound level).
- $L_{AFmax,T}$ - The A-weighted 'maximum' sound pressure level that occurred during a given period, T (commonly used for the assessment of occasional loud noises).

3.19 Sound pressure level measurements are taken with an A-weighting (denoted by a subscript 'A', e.g. L_{Aeq}) to approximate the frequency response of the human ear.

Results summary

3.20 Table 3.1 presents a summary of the continuously measured sound pressure levels at the front elevation. Measured values have been rounded to the nearest whole number.

Table 3.1 - Summary of continuously measured sound pressure levels, front elevation

Date	Period	Duration, T (hours)	$L_{Aeq,T}$ dB	10 th Highest ¹ $L_{AFmax,T}$ dB	15 th Highest ² $L_{AFmax,T}$ dB
Friday 18/08/2023	Daytime (12:00-23:00)	11	66	---	---
	Night-time (23:00-07:00)	8	62	77	76
Saturday 19/08/2023	Daytime (07:00-23:00)	16	65	---	---
	Night-time (23:00-07:00)	8	62	77	76
Sunday 20/08/2023	Daytime (07:00-23:00)	16	65	---	---
	Night-time (23:00-02:45)	3.75	61	74	74
¹ The 10 th highest value from 96 measurement periods ² The 15 th highest value from 96 measurement periods (indoor sound pressure levels should ideally not exceed 45 dB L_{Amax} more than 10-15 times per night).					

3.21 Table 3.2 presents a summary of the continuously measured sound pressure levels at the rear elevation. Measured values have been rounded to the nearest whole number.

Table 3.2 - Summary of continuously measured sound pressure levels, rear elevation

Date	Period	Duration, T (hours)	$L_{Aeq,T}$ dB	10 th Highest ¹ $L_{AFmax,T}$ dB	15 th Highest ² $L_{AFmax,T}$ dB
Monday 21/08/2023 to Tuesday 22/08/2023	Daytime (07:00-23:00)	16	52	---	---
	Night-time (23:00-07:00)	8	45	60	58
¹ The 10 th highest value from 96 measurement periods ² The 15 th highest value from 96 measurement periods (indoor sound pressure levels should ideally not exceed 45 dB L_{Amax} more than 10-15 times per night).					

- 3.22 The daytime ambient L_{Aeq} sound pressures levels are approximately 13 to 14 dB lower on the rear elevation when compared to the front elevation.
- 3.23 The ambient and background sound levels are presented graphically in Figure 3.3 and 3.4. Additional tabulated survey data can be made available upon request.

Figure 3.3 - Graph showing results of continuous sound level monitoring, front elevation

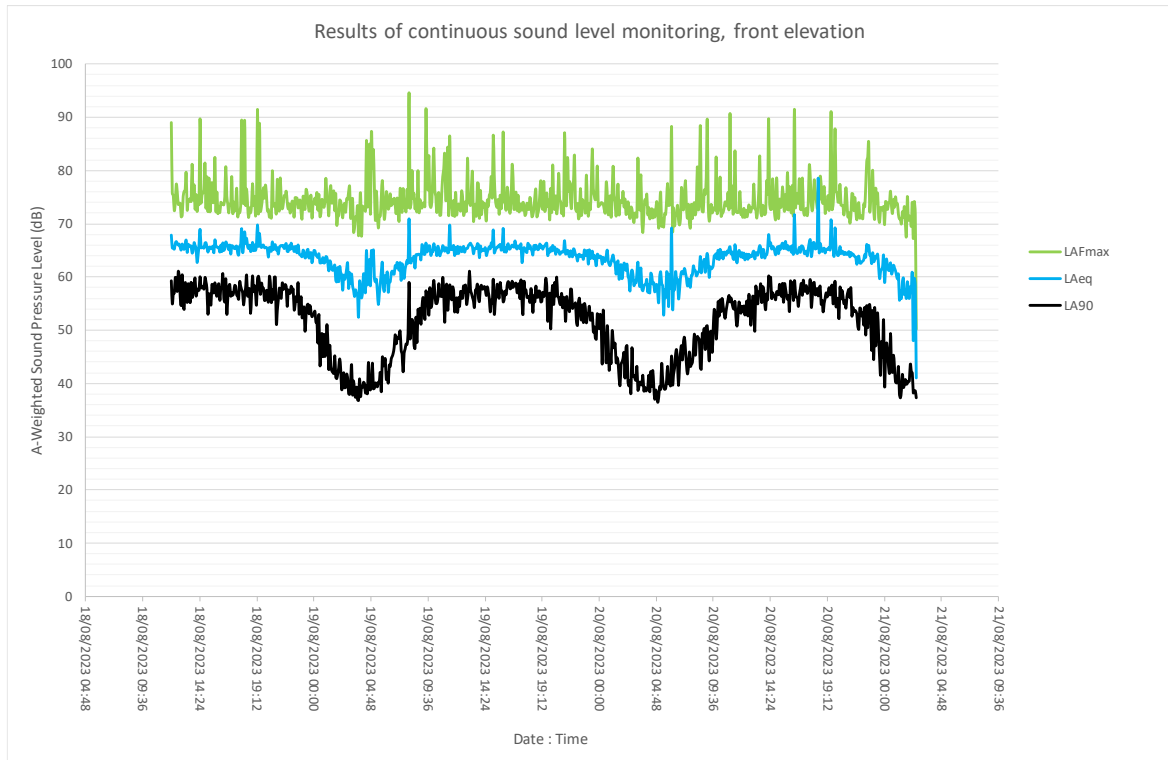
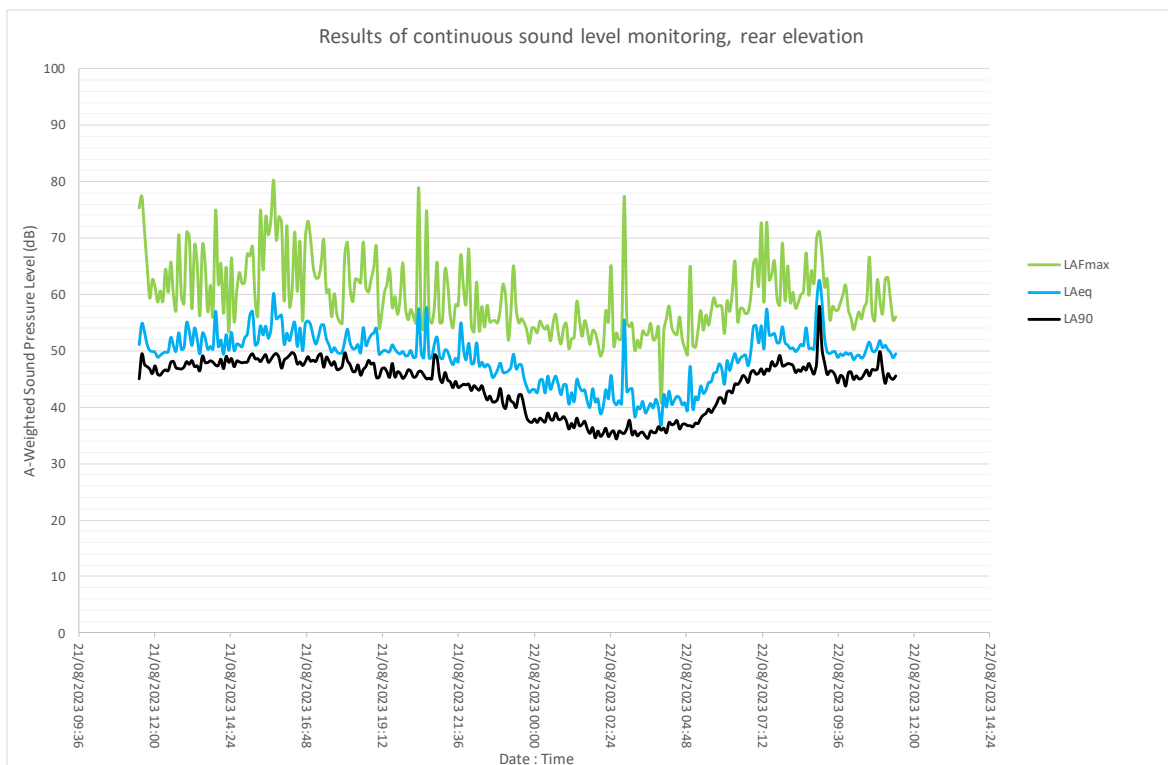


Figure 3.4 - Graph showing results of continuous sound level monitoring, rear elevation



4. Assessment & Discussion

Building envelope construction and acoustic performance

- 4.1 The external walls of the existing building are of a traditional double-leaf brickwork construction. The sound insulation performance is expected to be approximately 50 to 60 dB R_w .
- 4.2 The external walls to the new extension are expected to consist of a brickwork/cavity/blockwork construction. The sound insulation performance is expected to be approximately 50 to 60 dB R_w .
- 4.3 The roof and ceiling construction consists of a pitched tiled roof, 100 mm thick insulation (estimated) and plasterboard ceiling. The roof and ceiling combination is expected to provide a sound insulation performance of approximately 40 to 50 dB R_w .
- 4.4 The existing windows are standard thermal double-glazing which appear to consist of 4 mm glass/16 mm cavity/4 mm glass with uPVC frames. The sound insulation performance of the glazing is expected to be approximately 29 to 32 dB R_w .
- 4.5 The glazing and frames are broken in a number of areas and require replacement.
- 4.6 Ventilation is currently provided via opening windows and trickle vents fitted at the top of the window frames.
- 4.7 The glazing, frames and ventilator units are the weakest element with regard to the sound insulation performance of the building envelope.

Noise ingress with windows closed

Front elevation (open-plan living rooms/kitchens)

- 4.8 Table 4.1 presents the noise ingress calculation results for the open-plan living rooms/kitchens on the front elevation facing Upper Chorlton Road. The highest measured daytime sound pressure level has been used in the calculations.
- 4.9 Standard thermal double glazing consisting of 4 mm glass /16 – 20 mm cavity /4 mm glass has been assumed for the calculation. The calculations take into account the sound insulation performance of each building element, surface area and internal room dimensions.
- 4.10 The measured octave-band sound levels and typical reverberation time for a habitable room have also been taken into consideration.

Table 4.1 - Noise ingress calculation results (living room/kitchen-existing)

Title: Upper Chorlton Road (Living/Kitchen-Existing)												
Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
				24.7	24.5	30.5	39.7	42.7	36.1			
L _{in}				38.3	38.5	31.5	24.3	13.3	9.9			
Materials												
4mm glass/16 - 20 mm cavity/4mm glass	6.9			22.0	20.0	26.0	36.0	39.0	31.0		31	(-1,-4)
Double-leaf brickwork wall	22.3			40.0	44.0	45.0	51.0	56.0	60.0		51	(-1,-4)
Tiled roof, insulation, plasterboard ceiling	26.7			28.0	34.0	40.0	45.0	49.0	50.0		44	(-2,-5)
L _{out,s}												
L _{out,2m}	Add Element			63.0	63.0	62.0	64.0	56.0	46.0		66	
L _{out,free field}				60.0	60.0	59.0	61.0	53.0	43.0		63	
Element 1				24.7	24.5	30.5	39.7	42.7	36.1			
Plane façade	ΔL _{fs}	55.8		0.0	0.0	0.0	0.0	0.0	0.0			
Visible	X _{fs}	0.0		24.7	24.5	30.5	39.7	42.7	36.1			36
L _{p,out,2m}				63.0	63.0	62.0	64.0	56.0	46.0		66	
L _{p,in}				38.3	38.5	31.5	24.3	13.3	9.9		33	dBA

- 4.11 The calculation results indicate a daytime internal sound level of approximately 33 dB $L_{Aeq,16hour}$ with standard thermal double glazing.
- 4.12 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will therefore be achieved with windows closed.
- 4.13 The existing double glazing and frames can be retained on the front elevation where required.

Rear elevation (bedrooms)

- 4.14 Table 4.2 and 4.3 present the noise ingress calculation results for the bedrooms on the rear elevation (existing building and new-build extension).
- 4.15 Standard thermal double glazing consisting of 4 mm glass /16 – 20 mm cavity /4 mm glass has been assumed for the calculations. The calculations take into account the sound insulation performance of each building element, surface area and internal room dimensions.

Table 4.2 - Noise ingress calculation results (bedroom-existing)

Title: Upper Chorlton Road (Bedroom-Existing)												
Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
			25.5	26.2	32.1	40.8	44.0	38.0				
L _{in}			34.5	28.8	16.9	6.2	-4.0	-1.0				
Materials												
4mm glass/16 - 20 mm cavity/4mm glass	2.1		22.0	20.0	26.0	36.0	39.0	31.0			31	(-1,-4)
Double-leaf brickwork wall	12.5		40.0	44.0	45.0	51.0	56.0	60.0			51	(-1,-4)
Tiled roof, insulation, plasterboard ceiling	12.9		28.0	34.0	40.0	45.0	49.0	50.0			44	(-2,-5)
L _{out,s}												
L _{out,2m}	Add Element		60.0	55.0	49.0	47.0	40.0	37.0			52	
L _{out,free field}			57.0	52.0	46.0	44.0	37.0	34.0			49	
Element 1			25.5	26.2	32.1	40.8	44.0	38.0				
Plane façade	ΔL _{fs}	27.5	0.0	0.0	0.0	0.0	0.0	0.0				
Visible	X _{fs}	0.0	25.5	26.2	32.1	40.8	44.0	38.0				37
L _{p,out,2m}			60.0	55.0	49.0	47.0	40.0	37.0			52	
L _{p,in}			34.5	28.8	16.9	6.2	-4.0	-1.0			23	dBA

Table 4.3 - Noise ingress calculation results (bedroom-extension)

Title: Upper Chorlton Road (Bedroom-Extension)												
Noise Break In (ISO 12354-3)												
Formula/Comment	Single Value		63	125	250	500	1000	2000	4000	8000	Rw	(C,C _{tr})
			24.6	25.3	31.0	39.6	43.1	36.8				
L _{in}			35.4	29.7	18.0	7.4	-3.1	0.2				
Materials												
4mm glass/16 - 20 mm cavity/4mm glass	1.9		22.0	20.0	26.0	36.0	39.0	31.0			31	(-1,-4)
Brickwork / blockwork cavity wall	14.1		40.0	44.0	45.0	51.0	56.0	60.0			51	(-1,-4)
Tiled roof, insulation, plasterboard ceiling	8.1		28.0	34.0	40.0	45.0	49.0	50.0			44	(-2,-5)
L _{out,s}												
L _{out,2m}	Add Element		60.0	55.0	49.0	47.0	40.0	37.0			52	
L _{out,free field}			57.0	52.0	46.0	44.0	37.0	34.0			49	
Element 1			24.6	25.3	31.0	39.6	43.1	36.8				
Plane façade	ΔL _{fs}	24.1	0.0	0.0	0.0	0.0	0.0	0.0				
Visible	X _{fs}	0.0	24.6	25.3	31.0	39.6	43.1	36.8				36
L _{p,out,2m}			60.0	55.0	49.0	47.0	40.0	37.0			52	
L _{p,in}			35.4	29.7	18.0	7.4	-3.1	0.2			24	dBA

- 4.16 The calculation results indicate a daytime internal sound level of approximately 23 to 24 dB $L_{Aeq,16hour}$ with standard thermal double glazing.
- 4.17 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will therefore be easily achieved with windows closed.

4.18 Since the night-time L_{Aeq} sound level is approximately 7 dB lower than the daytime sound level, the night-time sound level target of 30 dB $L_{Aeq,8hour}$ will also be easily achieved.

4.19 With regard to the maximum L_{AFmax} internal sound levels, the recommended target of 45 dB L_{AFmax} will also be achieved within bedrooms for the majority of the night-time period.

- 60 dB $L_{AFmax,5min}$ – 28 dB R_w+C_{tr} = 32 dB $L_{AFmax,5min}$

4.20 This assessment demonstrates that standard thermal double glazing will be sufficient for all habitable rooms and additional noise mitigation such as installing acoustically-laminated double glazing and/or thick heavy panes of glass is unnecessary.

4.21 The existing double glazing and frames can be retained on the rear elevation (assuming the units are in good working order).

Noise ingress with windows open

4.22 The level of sound attenuation through an open window is dependent on the type and size of window, the extent of opening, the angle of sound incidence and the characteristics of the noise source in question.

4.23 It is reasonable to assume a sound attenuation performance of approximately 15 dB for a partially open window. Partially open windows will provide background ventilation only, as opposed to rapid/purge ventilation.

Front elevation (open-plan living rooms)

4.24 Daytime façade sound pressure levels are approximately 65 to 66 dB $L_{Aeq,16hour}$.

4.25 When assessing noise ingress through an open window, it is appropriate to correct the measured sound levels at the façade by approximately -3 dB to give an equivalent free-field sound level.

4.26 The corresponding 'free-field' sound pressure levels are therefore 62 to 63 dB $L_{Aeq,16hour}$ during the daytime.

4.27 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 47 to 48 dB $L_{Aeq,16hour}$ during the daytime.

- 63 dB $L_{Aeq,16hour}$ – 15 dB = 48 dB $L_{Aeq,16hour}$

4.28 The daytime sound level target will therefore be exceeded with windows open.

4.29 BS 8233 states where occupants rely on closed windows to meet the internal noise limits, there needs to be appropriate alternative ventilation that does not compromise the facade sound insulation or resulting internal sound level.

4.30 BS 8233 also provides the following comment with regard to ventilation:

The Building Regulations' supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.

4.31 On this basis, an alternative means of ventilation should be provided to habitable rooms on the front elevation.

4.32 There are trickle vents fitted to the frames of the existing windows which may be retained where appropriate.

4.33 Should new ventilator units be required for the rooms on the front elevation, it is recommended that sound attenuating (acoustically rated) ventilator units are fitted to the frames and/or external masonry wall. Further guidance is provided within Section 5 of this report.

- 4.34 Opening windows are appropriate for providing rapid or purge ventilation (e.g. to remove odour from painting and decorating or from burnt food).

Rear elevation (living rooms and bedrooms)

- 4.35 Daytime façade sound pressure levels are approximately 52 dB $L_{Aeq,16hour}$ and night-time sound pressure levels are approximately 45 dB $L_{Aeq,8hour}$.

- 4.36 The corresponding 'free-field' sound pressure levels are therefore 49 dB $L_{Aeq,16hour}$ during the daytime and 42 dB $L_{Aeq,8hour}$ during the night-time.

- 4.37 On this basis, the internal sound level is expected to be approximately 34 dB $L_{Aeq,16hour}$ during the daytime and approximately 27 dB $L_{Aeq,8hour}$ during the night-time.

- 49 dB $L_{Aeq,16hour}$ – 15 dB = 34 dB $L_{Aeq,16hour}$
- 42 dB $L_{Aeq,8hour}$ – 15 dB = 27 dB $L_{Aeq,8hour}$

- 4.38 The daytime and night-time sound level targets will therefore be achieved with windows open.

- 4.39 The maximum sound level target of 45 dB L_{AFmax} will also be typically achieved during the night-time period.

- 4.40 Since the recommended targets will be achieved with windows open, an alternative method of ventilation is considered unnecessary (e.g. such as acoustic ventilator units).

- 4.41 If required, standard non-acoustic trickle vents can be used to provide background ventilation.

Overheating and opening windows

- 4.42 With regard to noise at night and opening windows, Approved Document O (Overheating) states the following:

In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- a. 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- b. 55 dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).

- 4.43 The predicted internal sound levels are below the noise limits given within Approved Document O which indicates that occupants are likely to open bedroom windows during the night to help cool and remove excess heat from the bedroom.

Ambient sound level in outdoor living areas

- 4.44 With regard to outdoor living areas (gardens), BS 8233 provides the following guidelines:
- For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*
- 4.45 ProPG also states the following with regard to noise levels:
- The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.*
- 4.46 The measured façade sound pressure level at the rear of the property was 52 dB $L_{Aeq,16hour}$ during the daytime period. The equivalent free-field sound pressure level is 49 dB $L_{Aeq,16hour}$.
- 4.47 The daytime ambient sound pressure level within the rear garden area is therefore expected to achieve and even improve on the guideline value of 50 to 55 dB $L_{Aeq,16hour}$ which is considered appropriate for residential amenity space.
- 4.48 It is anticipated that a good acoustic standard will be achieved within the rear garden area and it is highly unlikely that residents will be annoyed by road traffic related noise.
- 4.49 Noise mitigation measures for the rear garden area are unnecessary.

5. Ventilation & Noise Mitigation Options

Acoustically rated ventilator units

- 5.1 Manually controlled trickle ventilators are the most common type of background ventilator and can be located over the window frames, in the frames, just above the glass or directly through the wall.
- 5.2 Sound attenuating (acoustically rated) ventilator units can be installed to habitable rooms, in order to allow background ventilation whilst maintaining a high acoustic performance from the facade.
- 5.3 Where the existing window frames are to be replaced and currently have trickle vents fitted, it is recommended that the replacement ventilator unit provides a sound insulation performance of at least 38 dB $D_{n,e,w}$ in the open position.
- 5.4 With regard to the new extension, standard non-acoustic trickle vents will be suitable for providing background ventilation.
- 5.5 Example manufacturers of acoustically-rated ventilator units include:
 - www.aereco.co.uk/products-and-systems/
 - www.greenwood.co.uk/acoustic
 - <http://brookvent.co.uk/product/airvent-sm-acoustic/>

Mechanically assisted ventilation

- 5.6 A further option with regard to ventilating and cooling habitable rooms whilst achieving a high facade sound insulation would be to use a mechanical ventilation system, such as a heat recovery system (MVHR) or positive input ventilation system (PIV).
- 5.7 Example suppliers of MVHR and PIV systems include:
 - www.nuaire.co.uk/residential/positive-input-ventilation
 - www.envirovent.com/specifier/products/heat-recovery-systems/
 - www.envirovent.com/specifier/products/positive-input-ventilation/
 - www.greenwood.co.uk/range/5/heat-recovery-mvhr.html
- 5.8 Appropriate ventilation rates will depend on the number of bedrooms and the anticipated occupancy rate (refer to Approved Document F for guidance). Such systems can also be supplied with a 'boost' function in order to reduce the need to open windows for purge ventilation.
- 5.9 With a loft mounted motor and control unit, particular attention should be paid to the construction of bedroom ceilings and the mounting of the motor unit in order to minimise the noise transmission into adjacent rooms. It is commonplace for a double-boarded ceiling construction and acoustically enhanced loft-hatch to be used where there is a loft mounted motor/control unit.

Single room heat recovery ventilation units

- 5.10 Heat recovery units are designed to improve indoor air quality and lower the risk of condensation. Single room heat recovery units tend to be more efficient than traditional extract ventilation systems, but are not as complex to install as the centralised packaged units for the whole building.
- 5.11 Example manufacturer's and systems include:
 - [heatSava | Single Room Heat Recovery System | EnviroVent](#)
 - [Wall-Mounted Ventilation System | Mitsubishi Electric](#)

Building Regulations 2010: Approved Document F (Ventilation)

- 5.12 The approved document supports Part F of Schedule 1 to the Building Regulations 2010 and came into effect on 15 June 2022.

Section 1: Ventilation provision

- 5.13 The aim of requirement F1(1) is to protect the health of occupants with the dwelling by providing adequate ventilation. Without adequate ventilation, mould and internal air pollution might become hazardous to health.
- 5.14 The document sets minimum standards for purge ventilation for rapidly diluting indoor air pollutants and extracting water vapour where necessary in habitable rooms in dwellings. For domestic-type buildings, Part O may require a higher standard than the guidance given in this document for purge ventilation to remove excess heat. In this case, the higher of the two standards should be followed.

- 5.15 With regard to noise (from mechanical systems), page 6 of the document states the following:

1.5 Mechanical ventilation systems, including both continuous and intermittent mechanical ventilation, should be designed and installed to minimise noise. This includes doing all of the following.

- a. Correctly sizing and jointing ducts.*
- b. Ensuring that equipment is appropriately and securely fixed, such as using resilient mountings where noise carried by the structure of the building could be a problem.*
- c. Selecting appropriate equipment, including following paragraph 1.6.*

1.6 For mechanical ventilation systems, fan units should be appropriately sized so that fans operating in normal background ventilation mode are not overly noisy. This might require fans to be sized so that they do not operate near maximum capacity when in normal background ventilation mode.

1.7 Account should be taken of outside noise when considering whether openable windows are appropriate for purge ventilation.

Note: Although there is no requirement to undertake noise testing, achieving the levels in the following guidance would ensure good acoustic conditions. The average A-weighted sound pressure level for a ventilator operating under normal conditions and not at boost rates should not exceed both of the following.

- a. 30 dB $L_{Aeq,T}^*$ for noise-sensitive rooms (e.g. bedrooms and living rooms) when a continuous mechanical ventilation system is running on its minimum low rate.*
- b. 45 dB $L_{Aeq,T}^*$ in less noise-sensitive rooms (e.g. kitchens and bathrooms) when a continuous operation system is running at the minimum high rate or an intermittent operation system is running.*

** The noise index $L_{Aeq,T}$ is used in BS 8233, where T is the duration of the measurement. If the noise from the sound source is steady (i.e. fluctuating by up to 3dB), a measuring time of 1 minute will be adequate and the $L_{Aeq, 1 \text{ min}}$ level will be similar to the dB(A) level used elsewhere. If the noise from the sound source fluctuates more than this, a longer measuring time (T) may be required, but the higher portion of the fluctuating level should be considered, and the sound may attract more attention due to the changes in level.*

Note: Methods for measuring the sound power level produced by the fan unit of decentralised extract ventilation, centralised extract ventilation and balanced mechanical ventilation with heat recovery systems are described in BS EN 13141.

5.16 Section 3 of Approved Document F (Replacing windows) states the following:

Existing windows with background ventilators

3.14 - If the existing windows have background ventilators, the replacement windows should include background ventilators. The new background ventilators should comply with both of the following conditions.

- a. Not be smaller than the background ventilators in the original window.*
- b. Be controllable either automatically or by the occupant.*

If the size of the background ventilators in the existing window is not known, the ventilator sizes in paragraph 3.15 may be applied.

Existing windows without background ventilators

3.15 - Replacing the windows is likely to increase the airtightness of the dwelling. If ventilation is not provided via a mechanical ventilation with heat recovery system, then increasing the airtightness of the building may reduce beneficial ventilation in the building. In these circumstances, it is necessary to ensure that the ventilation provision in the dwelling is no worse than it was before the work was carried out. This may be demonstrated in any of the following ways.

- a. Incorporating background ventilators in the replacement windows equivalent to the following.*
 - i. Habitable rooms – minimum 8000mm² equivalent area.*
 - ii. Kitchen – minimum 8000mm² equivalent area.*
 - iii. Bathroom (with or without a toilet) – minimum 4000mm² equivalent area.*
- b. If the dwelling will have continuous mechanical extract ventilation, installing background ventilators in any replacement windows which are not in wet rooms, with a minimum equivalent area of 4000mm² in each habitable room.*
- c. Other ventilation provisions, if it can be demonstrated to a building control body that they comply with the requirements of paragraph 3.2.*

NOTE: If it is not technically feasible to adopt the minimum equivalent areas set out in paragraph 3.15, the background ventilators should have equivalent areas as close to the minimum value as is feasible.

3.16 - When windows are replaced as part of the work connected with a material change of use, Section 1 of this approved document should be followed in addition to paragraphs 3.14 and 3.15.

6. Conclusion

- 6.1 The building envelope construction will provide sufficient sound insulation from external noise.
- 6.2 Standard thermal double glazing will provide sufficient sound insulation for habitable rooms.
- 6.3 A suitable construction for the new glazing would be 4 mm glass/16 – 20 mm cavity/4 mm glass.
- 6.4 Within the existing building and the new extension, the recommended sound level targets will be achieved during the daytime and night-time period with windows closed.
- 6.5 Where the existing glazing and frames are to be replaced, it is recommended that sound attenuating ventilator units are fitted to the new window frames and/or external wall of habitable rooms on the front elevation.
- 6.6 An alternative method of ventilation is unnecessary for the habitable rooms on the rear elevation or within the new extension, since the daytime and night-time sound level targets will be achieved with windows open. Standard non-acoustic trickle vents could be installed to window frames in order to provide background ventilation where required.
- 6.7 It is anticipated that future occupants will open bedroom windows during the night to help cool and remove excess heat from the room, since the internal noise targets will be achieved.
- 6.8 Noise mitigation measures are unnecessary for the existing rear garden area.

Appendix A

Site plan, floor plans and elevations

Figure A.1 - Existing site plan and floor plans

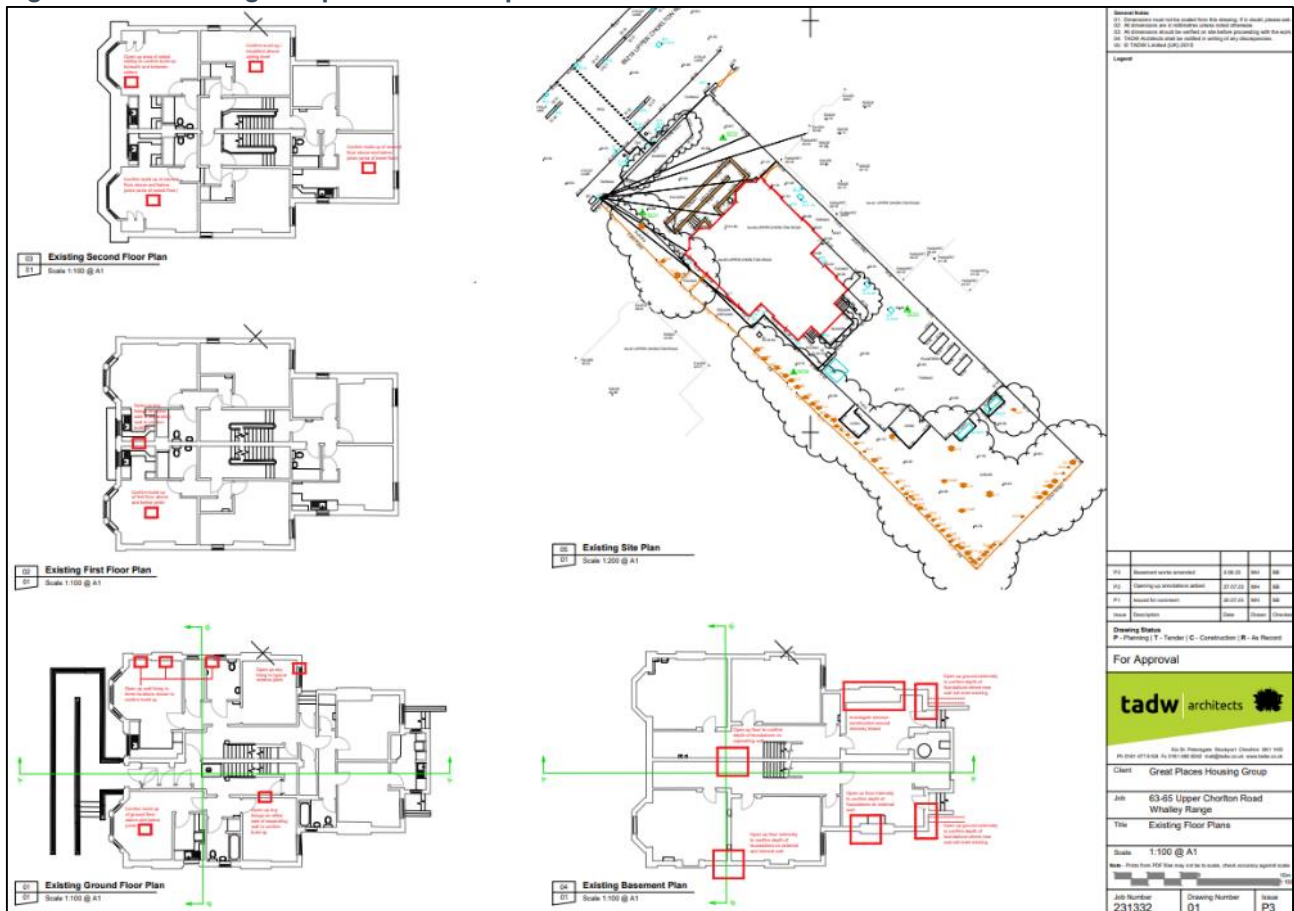


Figure A.2 - Proposed site plan and floor plans

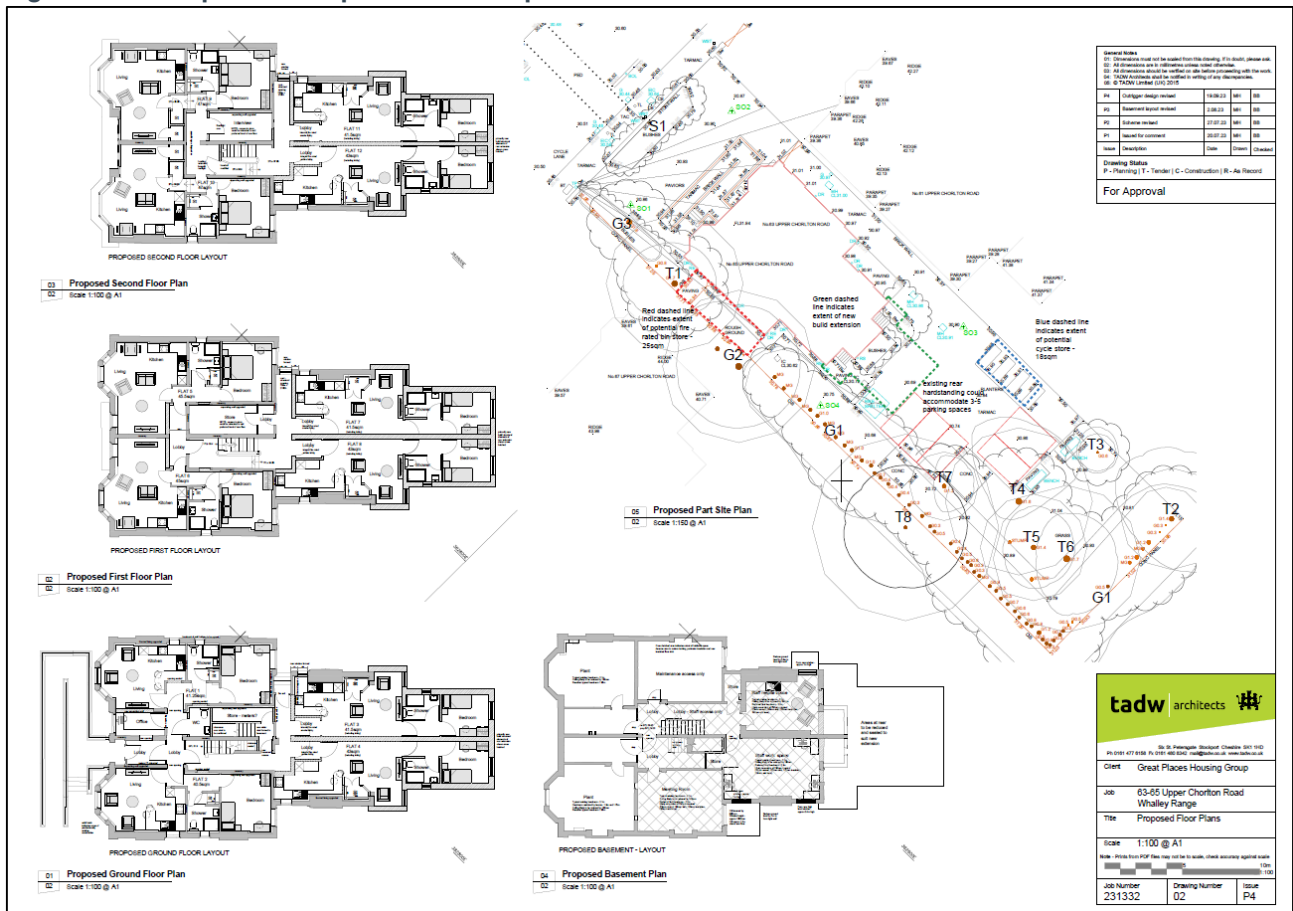


Figure A.3 - Existing and proposed elevations



Appendix B

Assessment terminology

Assessment terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2 \times 10^{-5} \text{Pa}$).
dB(A)	The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc, according to the parameter being measured.
Acoustic environment	Sound from all sources as modified by the environment.
Ambient sound level	The totally encompassing sound in a given situation at a given time; it is usually composed of sound from many sources, near and far.
Equivalent continuous sound level - $L_{Aeq,T}$	The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period (commonly used to describe the 'ambient' sound level).
Maximum sound level - $L_{AFmax,T}$	The A-weighted 'maximum' sound pressure level that occurred during a given period, T (commonly used for the assessment of intermittent loud noises).
Background sound level - $L_{A90,T}$	The sound pressure level that is exceeded for 90% of the measurement time interval, T. $L_{A90,T}$ is often used to describe the 'background' sound level.
Habitable room	Any room used or intended to be used for sleeping, cooking, living or eating purposes (enclosed spaces such as bath or toilet facilities, service rooms, corridors, laundries, hallways, utility rooms or similar spaces are excluded from this definition).
R_w	The weighted sound reduction index expressed in dB. A single number quantity for airborne sound insulation rating.
Free-field level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other significant reflective surfaces. Generally as measured outside and away from buildings (>3.5metres).