217 High Street, Yiewsley

Noise Impact Assessment

On behalf of **Taylor Wimpey West London**

Project Ref: 46187/3002 | Rev: B | Date: February 2020

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1 Introduction

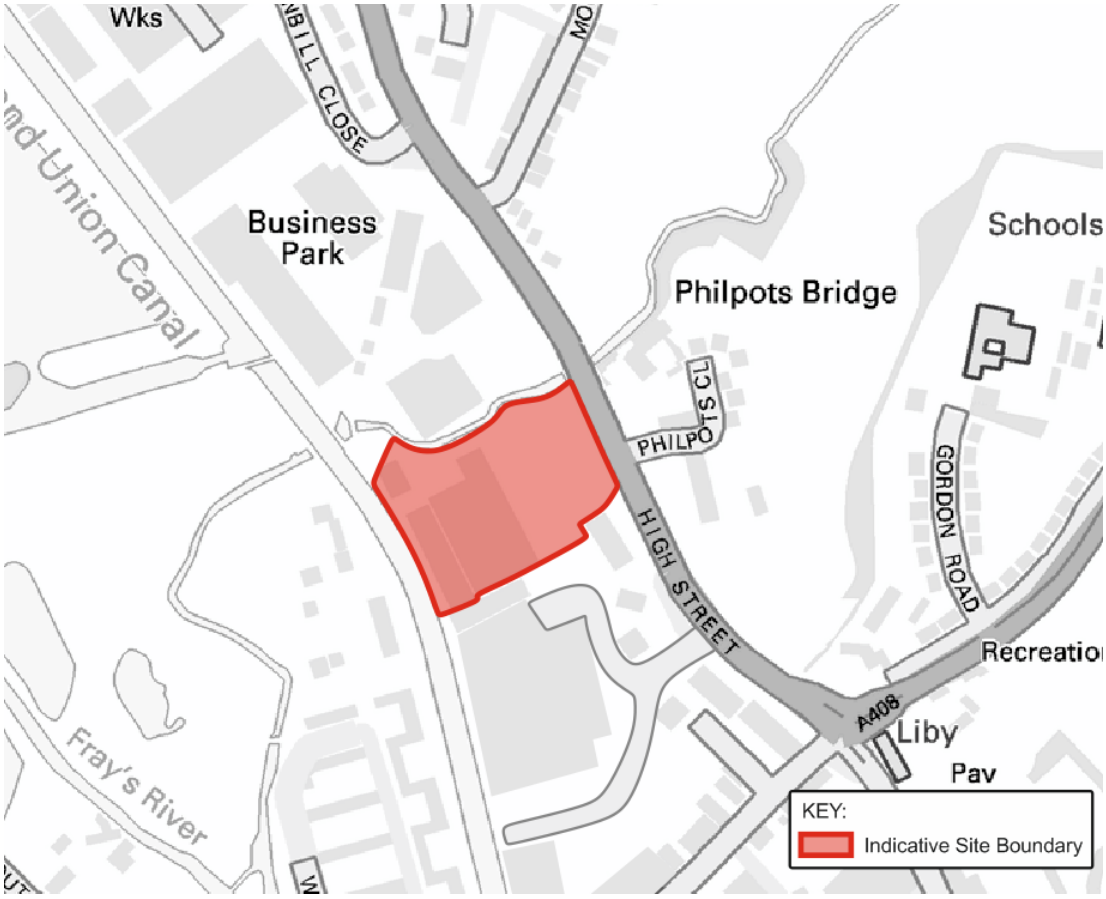
1.1 Background

1.1.1 Stantec UK Ltd. has been commissioned to undertake a noise impact assessment to support a detailed planning application for a proposed mixed-use development at 217 High Street, Yiewsley.

1.2 Site Description and Location

1.2.1 The site is located along High Street, Yiewsley. The site is bound to the west by the Grand Union Canal, the south by existing commercial uses (Tesco and a Shell petrol station), the east by High Street, and the north by further commercial uses (Argos and other units). The indicative site location is shown within Figure 1.

Figure 1: Location Map



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1.2.2 The site is currently designated for commercial use. An MOT centre is situated in the west of the site and fronts the Grand Union Canal. A B&M store is situated in the middle of the site, with the associated car park positioned in the east of the site, adjacent to High Street.

1.2.3 The proposed development comprises the erection of five and six storey buildings to provide a 10,000 ft^2 health facility (Use Class D1) and 235 residential apartments with associated parking, communal podium garden, landscaping, pedestrian and cycle link and external works following the demolition of the existing buildings.

1.3 Scope of Assessment

1.3.1 The purpose of this report is to describe the existing noise climate at the proposed development site in order to provide an assessment of the suitability of the site for its intended residential use in the context of noise, and to provide recommendations in relation to external building fabric requirements and plant noise limits.

1.3.2 Advice and recommendations within this report will need to be integrated, coordinated and ratified with the design by the principal designer and design team to ensure that all other design interfaces, buildability, workmanship and other requirements are considered. Any sketches or drawings provided illustrate acoustic principles only.

1.3.3 An explanation of the terminology used in this report is contained in Appendix A.

2 Legislation, Planning, Guidance and Criteria

2.1 Local Authority Consultation

2.1.1 Consultation with the ASB & Environment Officer (Planning) Monica Mulowozaat the London Borough of Hillingdon was undertaken with regards to the proposed methodology. Monica Mulowozaat agreed with the proposed methodology and noted that the noise assessment should reference BS 8233:2014 and BS 4142:2014 + A1 2019 as appropriate via email on 11 February 2020.

2.2 Local Policy

2.2.1 London Borough of Hillingdon adopted their Local Plan in November 2012.

2.2.2 Strategic Objective SO10 states:

"Improve and protect air and water quality, reduce adverse impacts from noise including the safeguarding of quiet areas and reduce the impacts of contaminated land."

2.2.3 Policy EM8: Land, Water, Air and Noise goes on to state:

"Noise

[…] The Council will seek to ensure that noise sensitive development and noise generating development are only permitted if noise impacts can be adequately controlled and mitigated."

2.2.4 Paragraph 5.72 of the Local Plan Part 2 states:

"Private outdoor amenity space will be required to be well located, well designed and useable for the private enjoyment of the occupier. In assessing the quality of all amenity space in development proposals, whether individual or communal, consideration will be given to the shape and position and whether the layout has regard to matters such as daylight and sunlight, noise, enclosure and privacy."

2.2.5 Paragraph 7.23 of the Local Plan Part 2 goes on to state:

"Health Services

New medical and health service uses are best located in town centres and areas well served by public transport and supported by adequate parking provision. Proposals for 'out of centre' medical and health services in former residential dwellings will be supported provided they do not result in unacceptable noise, traffic and other sources of disturbance to residential areas".

Draft London Plan

2.2.6 The Draft London Plan is currently moving through the process to adoption with the aim of publishing the final plan in February/March 2020. Whilst the current 2016 Plan is still the adopted Development Plan, the Draft London Plan is a material consideration in planning decisions.

2.2.7 Policy D13: Noise states:

"A. In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1. *Avoiding the Agent of Change principle to ensure measures do not add unduly costs and administrative barriers on existing noise-generating uses;*
2. *Reflecting and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development;*
3. *Improving and enhancing the acoustic environmental and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);*

4. *Separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;*
5. *Where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles;*
6. *Promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

B. Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations."

The London Plan (2016)

2.2.8 The London Plan, titled 'The Spatial Development Strategy for London Consolidated with Alterations Since 2011' was published by the Mayor of London in March 2016.

2.2.9 It sets out the spatial development strategy for Greater London and provides an integrated economic, environmental, transport and social framework over a 20-25-year period. There have been a number of alterations to the London Plan since it was adopted in 2011 to ensure that it reflects the most recent Government guidance and legislation. Alterations were formally published in March 2016 to bring the London Plan in line with new housing standards and the Government's approach to car parking policy.

2.2.10 Policy 7.7. 'Location and Design of Tall and Large Buildings' requires that tall and large buildings should not affect their surroundings adversely in terms of noise, amongst other considerations.

2.2.11 Policy 7.15 'Reducing Noise and Enhancing Soundscapes' states that:

"Development proposals should seek to manage noise by:

a) avoiding significant adverse noise impacts on health and quality of life as a result of new development;

b) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens on existing businesses;

c) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);

d) separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;

e) where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through the application of good acoustic design principles;

f) having particular regard to the impact of aviation noise on noise sensitive development;

g) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver."

2.3 Relevant National Policy

The National Planning Policy Framework (NPPF)

2.3.1 The revised NPPF was published in February 2019. In respect of noise, paragraph 170 states that in relation to conserving and enhancing the natural environment:

"Planning policies and decisions should contribute to and enhance the natural and local environment by…

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of … noise pollution..."

2.3.2 In relation to ground conditions and pollution, paragraph 180 states that:

"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:

- 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 quality of life;
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…"

2.3.3 In relation to the integration of new development with existing premises and community facilities, paragraph 182 states that:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

2.3.4 In relation to facilitating the sustainable use of minerals, paragraphs 204 and 205 advise that:

"Planning policies should…

g) when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction…"

"When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy. In considering proposals for mineral extraction, minerals planning authorities should…

c) ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties;"

2.3.5 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define the *"significant adverse impacts".*

Noise Policy Statement for England

2.3.6 The Noise Policy Statement for England (NPSE) was published in March 2010 and clarifies the underlying principles and aims of existing policy documents that relate to noise. It also sets out the long-term vision of Government noise policy which is: "*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*".

2.3.7 The NPSE states that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and its effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

2.3.8 Paragraphs 2.20 and 2.21 define 'significant averse' and 'adverse' impacts as applied to noise as follows:

"There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

2.3.9 It is necessary to define the LOAEL and SOAEL for the potential source of noise to relate the potential impact to the aims and requirements of the NPSE.

National Planning Practice Guidance

2.3.10 The National Planning Practice Guide (PPG) was launched on 6th March 2014 (latest update – July 2019) and provides additional guidance and interpretation to the Government's strategic policies outlined within the NPPF in a regularly updated, web-based resource.

2.3.11 The PPG provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL and SOAEL.

2.3.12 As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

2.3.13 The LOAEL is described in PPG (Paragraph: 005 Reference ID: 30-005-20190722) as the level above which *"noise starts to cause small changes in behaviour and/or attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise)."*

2.3.14 PPG identifies the SOAEL (Paragraph: 005 Reference ID: 30-005-20190722) as the level above which *"noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused."*

2.4 Other Relevant Guidance

British Standard 8233: 2014 'Guidance on Sound Insulation and noise reduction for buildings'

2.4.1 BS 8233, in relation to this planning application, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.

2.4.2 The guideline values relate to steady external noise without a specific character, previously termed 'anonymous noise'. According to the standard, noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate. Examples of noise with a character may include tonal/intermittent plant noise emissions, music playback, and workshop noise. Examples of external steady noise sources may include environmental noise sources, such as busy road traffic.

2.4.3 The desirable internal ambient noise levels for dwellings are presented in Table 2.1.

Table 2.1: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$
*Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{Amax}, depending on the character and number of events per night. Sporadic noise events could require separate values.			
*Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative source of ventilation that does not compromise the façade insulation or the resulting noise levels.			
*Note 7 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.			

*A selection of the available notes

2.4.4 The standard also provides advice in relation to desirable levels for external noise. It states in paragraph 7.7.3.2 that:

"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 recognized that these guideline values are not achievable in all circumstances where development might be desirable.

In higher noise areas, such as city centre 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."

2.4.5 Paragraph 6.5.2 states:

"Where industrial noise affects residential or mixed residential areas, the methods for rating the noise in BS 4142 should be applied. BS 4142 describes methods for determining, at the outside of a building:

a) noise levels from factories, industrial premises or fixed installations, or sources of an industrial nature in commercial premises; and

b) background noise level."

British Standard 4142+A1: 2019 Methods for Rating and Assessing Industrial and Commercial Sound

2.4.6 BS 4142:2014+A1: 2019 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

2.4.7 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.

2.4.8 The standard should not be used to assess sound from the passage of vehicles on public roads and railway systems; recreational activities; music and other entertainment; shooting grounds; construction and demolition; domestic animals; people; public address systems for speech and other sources falling within the scopes of other standards or guidance. The standard cannot be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels.

2.4.9 The procedure contained in BS 4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur. It is noted that a BS 4142 assessment is reliant on measuring relevant background sound levels.

2.4.10 When considering the appropriateness of the use of the background sound level to assess the rating sound level, Paragraph 8.1 of BS 4142 states:

"Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound."

2.4.11 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:

- Typically, the greater this difference, the greater the magnitude of the impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- 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.

2.4.12 Section 8.5 Introduction of a new noise-sensitive receptor states:

"Measure the background sound at the intended location of any new noise-sensitive receptor(s) in the absence of any specific sound.

NOTE Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognized that the industrial and/or commercial sound forms

a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation."

2.4.13 Based on the above, BS 4142 recommends using other guidance and criteria as an alternative or in addition to BS 4142 to inform assessments in situations where new noise sensitive receptors are proposed in the vicinity of extant industrial or commercial operations.

2.4.14 In order to consider the context, BS 4142 advises that the following factors should be considered:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
  - Façade insulation treatment;
  - Ventilation and/or cooling that will reduce the need to have windows open to provide rapid or purge ventilation; and
  - Acoustic screening.

World Health Organisation, Guidelines for Community Noise, 1999 (WHO)

2.4.15 The World Health Organisation (WHO) Guidelines for Community Noise (1999) also sets out guidance on suitable internal and external noise levels in residential properties. The following internal noise levels are recommended by the WHO:

- 35 dB $L_{Aeq,T}$ in living rooms over a 16 hour day; and
- 30 dB $L_{Aeq,T}$ in bedrooms during the 8 hour night.

2.4.16 With respect to the night-time maximum noise levels, the WHO guidelines state:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night."

Professional Practice Guidance on Planning and Noise, 2017

2.4.17 The Professional Practice Guidance on Planning and Noise (ProPG) provides guidance on a recommended approach to the management of noise within the planning system in England.

2.4.18 The scope of ProPG is limited to new residential development that will be predominantly exposed to airborne noise from transport sources. The guidance is mostly focused on new flats and houses, although there is some relevant content in regard to other types of residential units, such as care homes and residential institutions.

2.4.19 Noise sources other than airborne transport (i.e. industrial, commercial, entertainment, etc.) and ground-borne noise and vibration fall outside of the scope of ProPG.

2.4.20 ProPG recommends that noise levels set out in BS 8233 are used for residential development with an additional criterion of 45 dB $L_{Amax,\ F}$ between the hours of 23:00 – 07:00 stating:

"[…] In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,\ F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events."

2.5 Proposed Assessment Criteria

2.5.1 The levels used as the proposed assessment criteria for transport related noise are detailed in Table 2.2 and Table 2.3. In addition, a night-time maximum noise level criterion has been proposed, based on guidance detailed within BS 8233:2014, ProPG and WHO guidelines.

Table 2.2: LOAEL and SOAEL Noise Levels (Indoor Ambient Noise Levels)

Proposed LOAEL and SOAEL for Indoor Ambient Noise Levels in New Residential Dwellings		
Adverse Effect Level	**Daytime (07:00 hours to 23:00 hours)**	**Night-time (23:00 hours to 07:00 hours)**
LOAEL	35 dB $L_{Aeq,16\ hours}$	30 dB $L_{Aeq,8\ hours}$ 45 dB $L_{Amax,f}$ (no more than 10 times per night)
SOAEL	45 dB $L_{Aeq,16\ hours}$	40 dB $L_{Aeq,8\ hours}$

2.5.2 With respect to extant plant noise intrusion into the development, the following criteria are proposed, based on achieving a level 5dB below the guidelines in BS 8233:2014 with windows shut and trickle ventilators open.

Table 2.3: LOAEL and SOAEL Noise Levels (Indoor Ambient Noise Levels due to Extant Plant Noise)

Proposed LOAEL and SOAEL for Indoor Ambient Noise Levels in New Residential Dwellings		
Adverse Effect Level	**Daytime (07:00 hours to 23:00 hours)**	**Night-time (23:00 hours to 07:00 hours)**
LOAEL	NR 25 $L_{eq,16\ hours}$	NR 20 $L_{eq,8\ hours}$
SOAEL	NR 35 $L_{eq,16\ hours}$	NR 30 $L_{eq,8\ hours}$

2.5.3 Based on guidance detailed within BS 8233:2014, ProPG and WHO guidelines, the proposed LOAEL and SOAEL external noise levels in amenity areas are detailed in Table 2.4.

Table 2.4: Proposed LOAEL and SOAEL Noise Levels (External Noise Levels in Amenity Areas)

Proposed LOAEL and SOAEL for Outdoor Ambient Noise Levels (Free Field) in New Residential Dwelling Amenity Areas	
Effect Level	**Daytime (07:00 hours to 23:00 hours)**
LOAEL	55 $L_{Aeq,16h}$ dB
SOAEL	65 $L_{Aeq,16h}$ dB

2.5.4 In the absence of any specific local authority requirements, we have proposed that plant noise emissions should be no higher than background sound levels in order to protect existing residents' amenity.

3 Survey Methodology

3.1 Procedure

3.1.1 An attended environmental sound survey was undertaken between approximately 18:15 to 20:00 hours on Tuesday 11 February 2020 and 04:00 to 07:00 hours and 08:45 to 12:00 hours on Wednesday 12 February 2020 in order to determine the existing sound climate at locations considered representative of sound levels incident on the future development.

3.1.2 The survey was undertaken over an eight-hour weekday period. Measurements at Location 1 (adjacent to High Street) were made over 15-minute periods. Measurements at Locations 2, and 3 were made over a 1-minute period. In both cases a number of parameters were measured but the L_{Aeq}, L_{A90} and L_{AFMax} sound levels are most relevant to this assessment.

3.1.3 The sound level meters were located on a tripod. The microphones were fitted with the manufacturer's windshield.

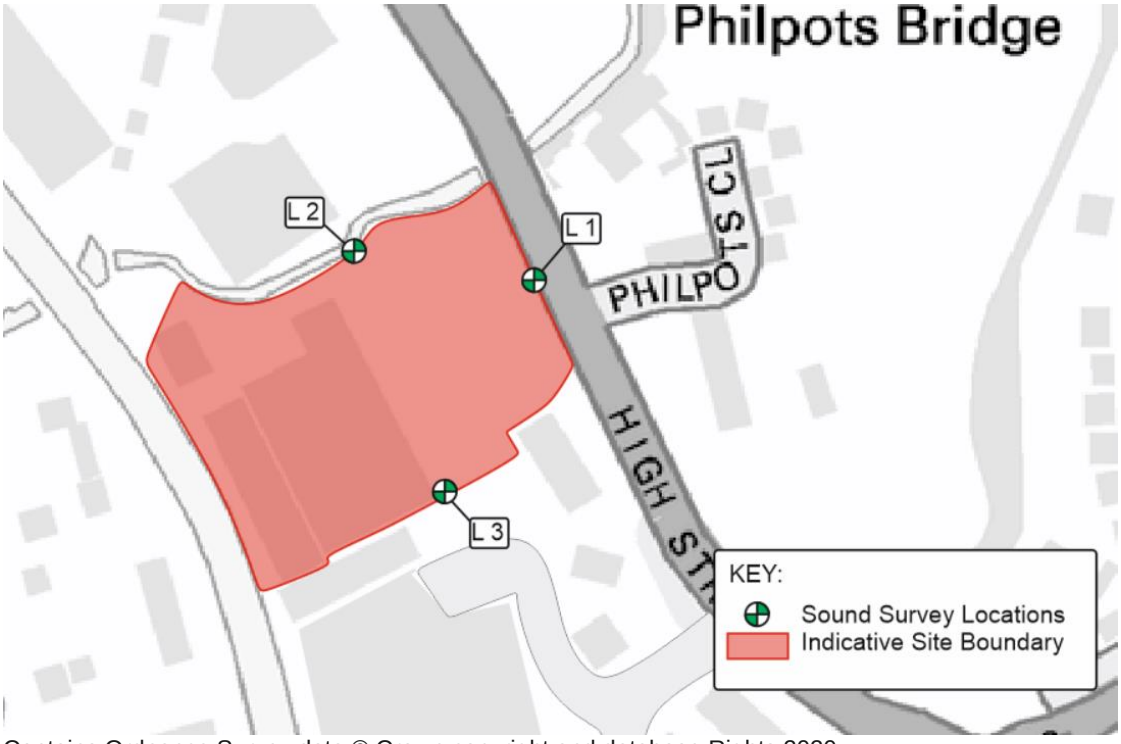
3.1.4 The instrumentation used in the survey (including calibration information) is listed in Appendix B.

3.1.5 Field calibrations were performed before and after the measurements with no significant fluctuations recorded (< 0.5 dB). Calibration certificates are available upon request.

3.2 Measurement Locations

3.2.1 Sound measurements were undertaken at three positions at the site, considered representative of the sound levels incident on the future development. The measurement positions are detailed in Figure 2 and described in Table 3.1.

Figure 2: Environmental Sound Measurement Locations



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Table 3.1: Description of Measurement Locations

Position	Description
L1	The microphone was located along the eastern boundary of the site adjacent to High Street. The microphone was located in a free field position approximately 6 m from the carriageway edge and 1.5 m above ground level.
L2	The microphone was located along the northern boundary of the site adjacent to Cowley Retail Park. The microphone was located in a free field position approximately 55 m from the carriageway edge of High Street and 1.5 m above ground level.
L3	The microphone was located along the southern boundary of the site. The microphone was located in a free field position approximately 30 m from the Tesco rooftop plant area and 1.5 m above ground level.

3.3 Meteorological Conditions

3.3.1 Based on observations and on-site measurements, the meteorological conditions during the survey are detailed in Table 3.2.

Table 3.2: Meteorological Conditions

Description	Meteorological Conditions
	11-12 February 2020
Temperature (°C)	Between approximately 2°C and 8°C
Precipitation (mm)	N/A
Cloud Cover (%)	10 %
Wind Description	Mostly still, with soft, faint breeze
Wind Speed (m/s)	< 2 m/s
Wind Direction	SW

3.3.2 These conditions are therefore considered suitable for obtaining representative sound level measurements.

3.4 Assumptions/Limitations

3.4.1 The engineer noticed nothing unusual in terms of the sound climate at the time of the survey. This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

3.5 Environmental Sound Climate

3.5.1 During the survey it was noted that on-site sound levels at Locations 1 and 2 were dominated by vehicular movements on the surrounding road network, namely High Street. Sound Levels at Location 3 were largely influenced by noise from rooftop plant item serving the adjacent Tesco store.

3.5.2 Plant noise at Location 3 was considered:

- Not to be tonal;
- Not contain significant low frequency content; and
- Was constant and not intermittent.

4 Environmental Sound Survey Results

4.1.1 The full results of the survey are presented in Appendix C**.** A summary of the survey results is detailed in Table 4.1.

Table 4.1: Summary of Measured Environmental Sound Survey Results

Location	Time Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	Typical $L_{Amax,T}$	Typical $L_{A90,T}$
L1	Daytime	70	N/A	60
	Night-time	67	84	57
L2	Daytime	58	N/A	54
	Night-time	55	71	52
L3	Daytime	57	N/A	55
	Night-time	54	62	53

5 Suitability of Site for Residential Development

5.1 Sound Levels in External Amenity Areas

5.1.1 Calculations have been undertaken to determine and assess the likely sound levels in external amenity areas associated with the proposed dwellings. Amenity areas are proposed in the form of a communal garden area located on the second floor (podium), joining blocks B and C of the development along with small individual balconies for all facades on the development. Drawings used within this assessment are detailed in Table 5.1 below, all drawings are courtesy of Assael.

Table 5.1: Assessment Drawings

Drawing Number	Revision Number	Description
HSY-ASA-ZZ-GF-DR-A-200-	R1	Ground Floor Plan
HSY-ASA-ZZ-01-DR-A-201-	R1	First Floor Plan
HSY-ASA-ZZ-02-DR-A-202-	R1	Second Floor Plan
HSY-ASA-ZZ-03-DR-A-203-	R1	Third Floor Plan
HSY-ASA-ZZ-04-DR-A-204-	R1	Fourth Floor Plan
HSY-ASA-ZZ-05-DR-A-205-	R1	Fifth Floor Plan
HSY-ASA-ZZ-RP-DR-A-206-	R1	Roof Plan
HSY-ASA-ZZ-ZZ-DR-A-400-R1	R1	Block A Elevations East and West
HSY-ASA-ZZ-ZZ-DR-A-401-R1	R1	Block A, B, and C Elevations North and South
HSY-ASA-ZZ-ZZ-DR-A-402-R1	R1	Block B and C Elevations East and West
HSY-ASA-BA-ZZ-DR-A-450-R1	R1	Block A elevations East and West
HSY-ASA-BA-ZZ-DR-A-451-R1	R1	Block A Elevations North and South
HSY-ASA-BB-ZZ-DR-A-452-R1	R1	Block B and C Elevations East and West
HSY-ASA-BB-ZZ-DR-A-453-R1	R1	Block B and C Elevations North and South

5.1.2 Figure 3 details the location of the communal podium garden located on the second floor.

Figure 3: Communal Podium Garden Location



Courtesy of Assael, Drawing No. HSY-AA-ALL-02-DR-A-202

5.1.3 Calculations indicate that taking into account screening provided by Block A, noise levels in the communal podium garden area are likely to be around 47 – 49 dB $L_{Aeq,\ 16\ hr}$. This level is below the proposed LOAEL and therefore mitigation measures are unlikely to required.

Balconies

5.1.4 BS 8233 states that for other locations, such as balconies, roof gardens and terraces, the specification of noise limits is not necessarily appropriate.

5.1.5 Calculations indicate that noise levels for balconies fronting on to High Street are likely to be around 65 dB $L_{Aeq,\ 16\ hr}$, which is in-line of the SOAEL. Balconies on other façades overlooking the central podium within the development are unlikely to exceed the LOAEL.

5.1.6 BS 8233 states that in high noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Embedded mitigation includes a set back from High Street of 15 m, as well as a landscaped buffer zone. It should also be noted that balconies are not considered primarily for amenity use.

5.1.7 As the majority of balconies have been located on facades which don't overlook the main noise sources, and there is additional community amenity space that achieves the proposed criteria, it is considered that the site is suitable for residential use.

5.2 Internal Sound Levels (External Building Fabric Specification)

5.2.1 An analysis of the proposed external building fabric has been undertaken in order to ascertain the required acoustic performance of the glazing and ventilation elements to achieve the criteria detailed in Section 2.5. Compliance with the acoustic performance specifications detailed herein is likely to ensure that acceptable internal noise levels are achieved.

5.2.2 The external building fabric analysis has assumed the following:

Room Absorption

- It has been assumed the bedrooms and living rooms will be acoustically 'soft' with carpets, curtains and other soft furnishings. For the purposes of the analyses it is assumed the average typical absorption coefficients detailed in Table 5.2.

Table 5.2: Average Absorption Coefficients

Room Type	Average Absorption Coefficient (α) at Octave Band Frequency (Hz)				
	125	250	500	1000	2000
Bedrooms / Living Rooms	0.18	0.25	0.27	0.31	0.32

Proposed External Building Fabric

- Table 5.3 details typical sound reduction indices associated with the proposed external building fabric constructions.

Table 5.3: Typical Sound Reductions of Proposed Building Fabric Constructions

Construction	Minimum Sound Reduction Indices (dB) at Octave Band Centre Frequency (Hz)				
	125	250	500	1000	2000
102.5mm Brick / 50 mm cavity / 200 mm Mineral Wool Insulation / 12.5 mm Cement Particle Board / 100 mm Mineral Wool Insulation / 2 x 12.5 mm Wallboard Plasterboard wall	41	45	45	54	58
100 mm concrete solid (roof)	37	39	45	52	55

Ventilation

- It is understood that the proposed ventilation strategy is comparable to the Approved Document F System 3, Continuous Mechanical Extract (MEV) for the whole development.

5.2.3 Calculations have been based on the worse case bedroom and living room size on each façade, including dual-aspect rooms. In the case of non-dual aspect rooms it is likely that internal noise levels will be below the internal noise criteria levels due to the reduced external wall and glazing area on the building façade.

5.3 Specification and Guidance on Construction

5.3.1 Incident sound levels will vary across the development. Appendix D details the sound reduction performance specification for the glazed elements of the external building fabric for each plot.

5.3.2 The glazing performance specifications apply to the glazing package as a whole inclusive of glazing, louvres, spandrel panels, framing, opening lights, doors, seal etc. The performance of the glazing system will depend on many factors such as the glazing configuration, size of windows panels, quality of framing, quality of sealing etc.

5.3.3 The proposed glazing package should be tested in accordance with BS EN ISO 10140-2:2010 and the quoted minimum sound reduction specifications achieved by the system as a whole, including frames, trickle ventilators etc. as appropriate, and not just the glass.

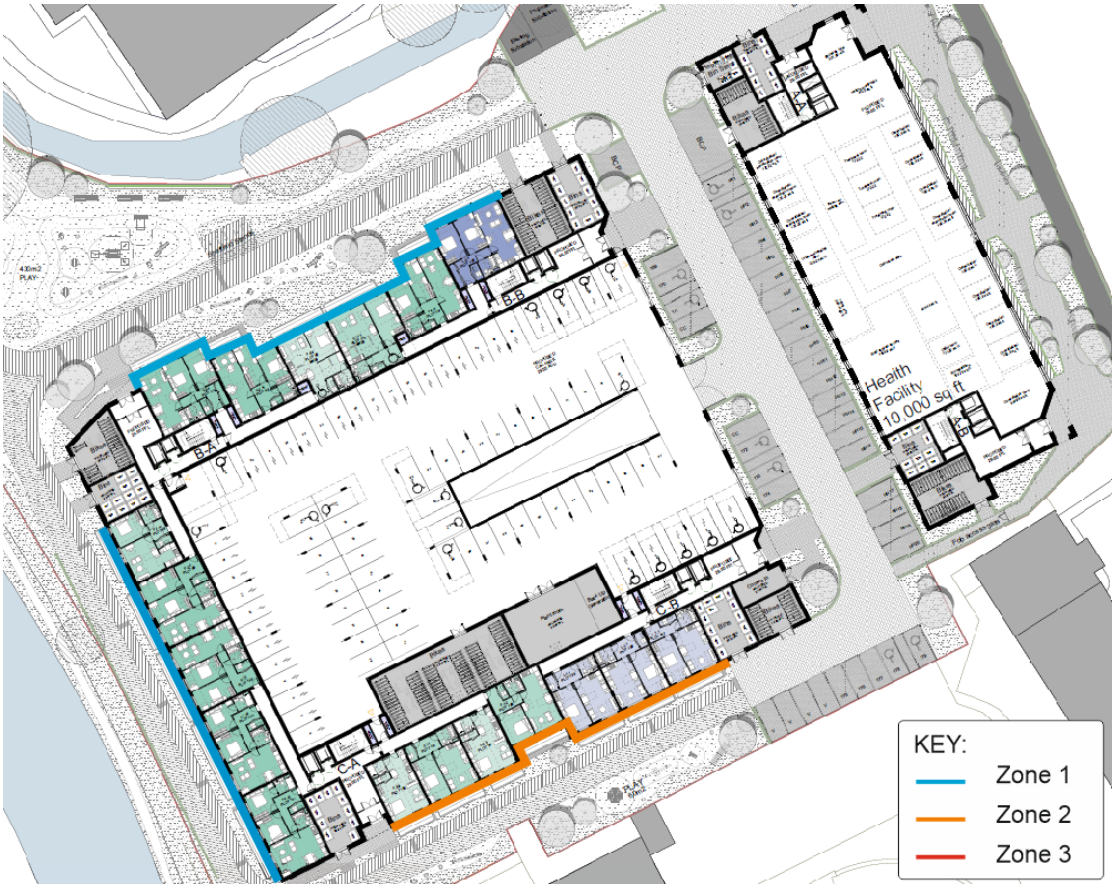
5.3.4 For guidance purposes we would suggest that glazing based around the following configurations is likely to prove commensurate with achieving the sound insulation performance specification detailed within Appendix D.

Table 5.4: Glazing Configurations

Façade Zone	Glazing Type / Ventilator Type	Example Glazing Configuration
1	Living Rooms: G1/V1 Bedrooms: G1/V1	Conventional double glazing comprising 4 mm glass / 16 mm cavity / 6 mm glass Non-acoustic Trickle Vents
2	Living Rooms: G2/V2 Bedrooms: G2/V2	Conventional double glazing comprising 10 mm glass / 16 mm cavity / 6 mm glass Acoustic Trickle Vents
3	Living Rooms: G2/V2 Bedrooms: G3/V2	Uprated double glazing comprising 10 mm glass / 16 mm cavity / 6.4 mm laminated glass. Uprated Acoustic Trickle Vents

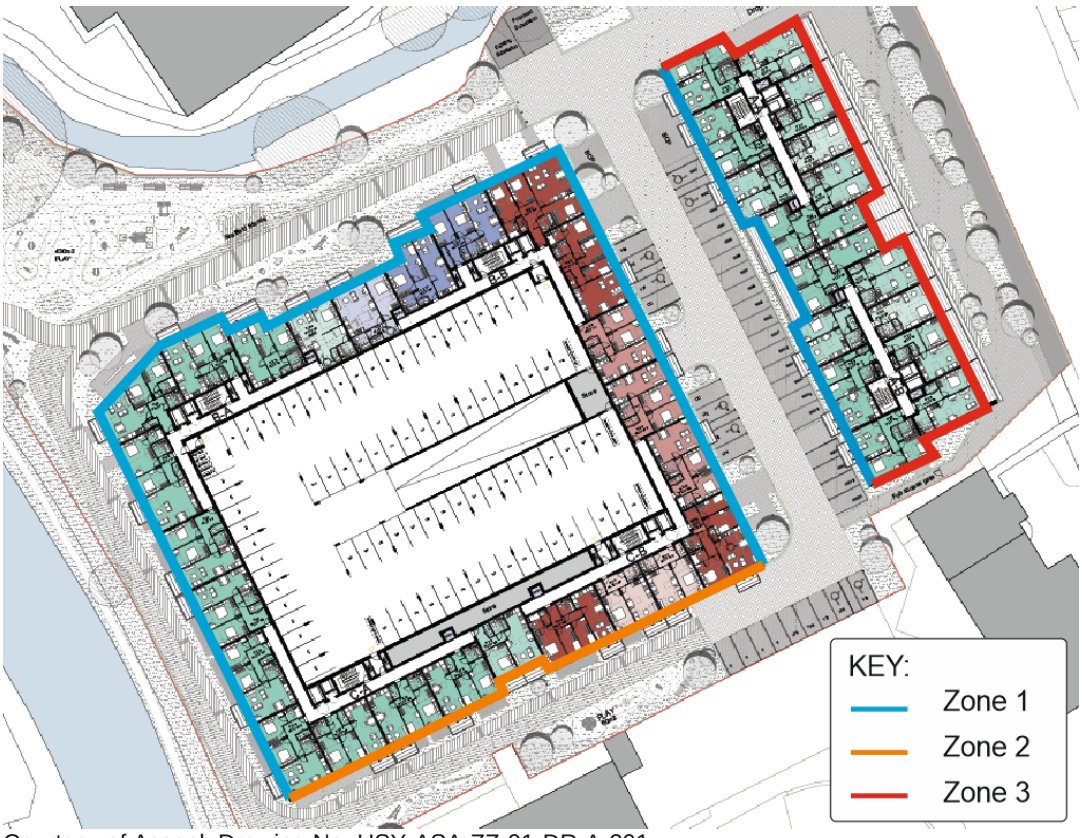
5.3.5 Figures 4 to 7 detail the façade zones.

Figure 4: Ground Floor Façade Zones



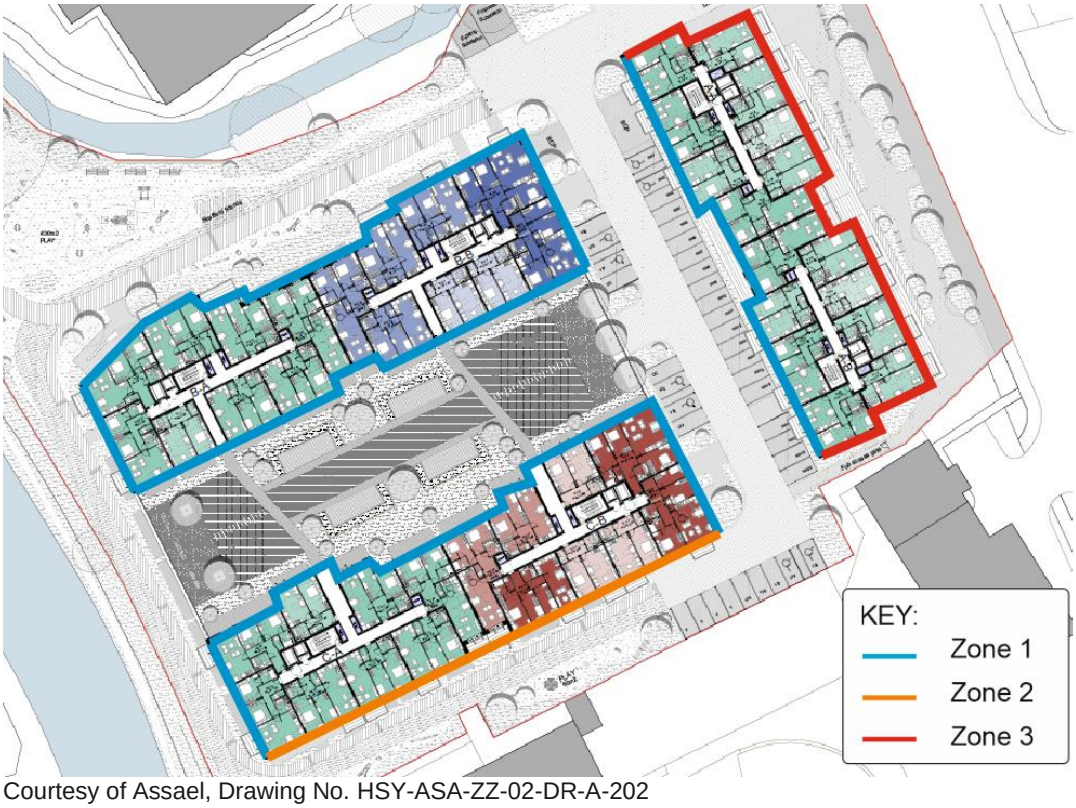
Courtesy of Assael, Drawing No. HSY-ASA-ZZ-GF-DR-A-200

Figure 5: First Floor Façade Zones



Courtesy of Assael, Drawing No. HSY-ASA-ZZ-01-DR-A-201

Figure 6: Floors Two to Four Façade Zones



Courtesy of Assael, Drawing No. HSY-ASA-ZZ-02-DR-A-202

Figure 7: Fifth Floor Façade Zones



Courtesy of Assael, Drawing No. HSY-ASA-ZZ-05-DR-A-205

5.3.6 The guidance construction detailed above is provided for indicative costing purposes only. Selected glazing and ventilation systems should be capable of meeting the performance specifications shown in Appendix D, with laboratory test certificates being made available in support of the quoted performance. Glazing proposals which simply reflect the guidance constructions indicated in this report will not, in isolation, be sufficient evidence that a glazing configuration will meet the performance specification.

5.4 Internal Sound Levels (Extant Plant Noise Break-in)

5.4.1 The dwellings anticipated to be exposed to plant noise generated by equipment on the Tesco roof, to the south of the site are those on the top floor levels of the proposed development on the south façade.

5.4.2 Based on the results of the environmental sound survey and calculations, internal sound levels due to plant noise are anticipated to be approximately NR 24 within the worst-case living rooms and NR 20 within the worst-case bedrooms.

5.4.3 The calculated internal sound level is below the LOAEL with windows shut and trickle ventilators open and should therefore be considered acceptable.

6 Plant Noise Emission Limits

6.1 Proposed Plant Noise Emission Limits

6.1.1 Based on the results of the environmental sound surveys and the proposed requirements in Section 2, the following plant noise emission limit are proposed. The proposed plant noise emission limits should be achieved at 1 m from the nearest existing noise sensitive receptor.

Table 6.1: Proposed Plant Noise Emission Limits

Measurement Location	Time Period	Proposed Plant Noise Emission Limit ($L_{Ar,Tr}$ dB)
L1	Daytime (07:00 – 23:00 hours)	60
	Night-time (23:00 – 07:00 hours)	57
L2	Daytime (07:00 – 23:00 hours)	54
	Night-time (23:00 – 07:00 hours)	52
L3	Daytime (07:00 – 23:00 hours)	55
	Night-time (23:00 – 07:00 hours)	53

7 Conclusions

7.1.1 Stantec has been commissioned to undertake a noise impact assessment to support a full planning application for a proposed mixed-use development at 217 High Street, Yiewsley.

7.1.2 An attended environmental sound survey was undertaken between approximately 18:15 to 20:00 hours on Tuesday 11 February 2020 and 04:00 to 07:00 hours and 08:45 to 12:00 hours on Wednesday 12 February 2020 in order to determine the existing sound climate at locations considered representative of sound levels incident on the future development.

7.1.3 Calculations indicate that with embedded mitigation measures in place, the LOAEL is unlikely to be exceeded in the communal podium garden.

7.1.4 Based on the results of the external building fabric assessment, internal ambient sound levels are likely to meet the proposed LOAEL during daytime and night-time periods with appropriate mitigations measures in place.

7.1.5 With appropriate mitigation measures and suitably worded condition, plant noise levels are unlikely to have an impact on proposed and existing noise sensitive receptors.

7.1.6 In summary, the assessment has demonstrated that, with appropriate mitigation incorporated into the design and building fabric, the site is suitable for residential development in relation to noise impacts.

Appendix A Glossary of Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20□Pa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level. This is the noise level above which adverse effects on health and quality of life can be detected.
Night-time	The period 23:00-07:00 hours.
NOEL	No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
SOAEL	Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of 20□Pa ($20x10^{-6}$ Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the indication of impact, measured as and $L_{Aeq,T}$
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{Ar,T}$.

Appendix B Survey Equipment

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	RION	NL-52	542903	06/02/2019
½" Pre-polarised microphone		UC-59	06480	06/02/2019
Pre-amplifier		NH-25	42931	06/02/2019
Sound Level Meter		NL-52	1043456	13/02/2019
½" Pre-polarised microphone		UC-59	7231	13/02/2019
Pre-amplifier		NH-25	43485	13/02/2019
Sound Calibrator		NC-74	34746691	30/08/2019

Appendix C Survey Data

Location 1 – 11 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
18:15	15:00	70.1	81.6	62.3
18:30	15:00	72	94.1	61.3
18:45	15:00	69.5	79.7	60.8
19:00	15:00	69.6	86	61.8
19:15	15:00	69.8	88.7	61.2
19:30	15:00	68.2	80.5	58
19:45	15:00	69.2	80.9	58.3
20:00	08:12	68.2	85.3	60

Location 1 – 12 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
04:00	15:00	60.7	81.3	50.2
04:15	15:00	61.5	77.8	51.2
04:30	15:00	59.9	78.4	51.8
04:45	15:00	63	79.9	52.8
05:00	15:00	62.6	81.7	52.8
05:15	15:00	64.1	77.9	54.5
05:30	15:00	66.7	84.3	55.2
05:45	15:00	68.3	83.7	56.7
06:00	15:00	68.2	80.4	57.9
06:15	15:00	69.5	88.3	58.1
06:30	15:00	69.6	86.2	58.2
07:00	01:10	71.6	90.6	60.9
08:45	15:00	70.9	80	62.8
09:00	15:00	70.8	85	63.1
09:15	15:00	70	81.5	62.3
09:30	15:00	69.6	81.6	60.8
09:45	15:00	70.7	92.9	60.9
10:00	15:00	69.6	80.4	59.4
10:15	15:00	69.6	81.4	59.9
10:30	15:00	69.4	84.5	61
10:45	15:00	69	78.5	59.4
11:00	15:00	69.1	82	60.2

Location 1 – 12 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
11:15	15:00	69.2	80.4	59.2
11:30	15:00	69.3	81.9	60
11:45	15:00	69.1	79	59.4

Location 2 – 11 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
18:44	01:00	58	63.3	54.9
18:45	01:00	57.4	62	54.2
18:46	01:00	57.6	63.1	53.2
18:47	01:00	58.1	62.3	56
18:48	01:00	57.6	61.5	55.4
18:49	01:00	58.6	64.7	55.7
18:50	01:00	57.1	61.4	54.2
18:51	01:00	55.6	61.9	52.7
18:52	01:00	59	63.7	55.7
18:53	01:00	57.5	63.9	54.8
18:54	01:00	57	61.4	54.5
18:55	01:00	57.9	65	54
18:56	01:00	57.6	62.1	53.8
18:57	01:00	56.8	62.3	53.7
18:58	01:00	58.1	66.5	53.9
18:59	01:00	58.7	70.2	53.3
19:00	01:00	57.9	62.3	55.5
19:26	01:00	57.3	70.8	54.1
19:27	01:00	57.3	62.3	54.8
19:28	01:00	56.6	61.1	53.7
19:29	01:00	57.4	67.9	54.9
19:30	01:00	57.5	65.4	55.3
19:31	01:00	55.4	63.2	52.7
19:32	01:00	56.6	61	54.6
19:33	01:00	57.2	62.5	54.3
19:34	01:00	56.2	68	53.3
19:35	01:00	56.2	63.9	54.2
19:36	01:00	56.7	62.8	54
19:37	01:00	57.3	61.5	54
19:38	01:00	55.9	61.8	52.6
19:39	01:00	56	65.6	50.8

Location 2 – 11 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
19:40	01:00	56	63.6	52.1
19:41	01:00	57	63.2	51.6
19:42	01:00	57.7	61.9	54.6
19:43	01:00	56	63.7	51.4
20:10	01:00	55.8	63.3	51.9
20:11	01:00	57.4	63.6	51.8
20:12	01:00	55.4	60.8	52.6
20:13	01:00	54	59.7	50.4
20:14	01:00	57.2	64.5	53.1
20:15	01:00	56.8	61.6	53.7
20:16	01:00	56.3	63.2	53
20:17	01:00	55.4	61.1	51.9
20:18	01:00	56.2	63.3	52.6
20:19	01:00	57	65.6	53.7
20:20	01:00	59	63	56.1

Location 2 – 12 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
04:31	01:00	50.9	57.8	46.8
04:32	01:00	51.1	56.3	48.6
04:33	01:00	50.5	50.3	48.3
04:34	01:00	48.1	55.5	47.2
04:35	01:00	49.5	60.1	48.1
04:36	01:00	52.1	53.5	48.9
04:37	01:00	48.6	55.5	47.5
04:38	01:00	50.8	59.3	48
04:39	01:00	51.5	55.9	48.5
04:40	01:00	49.8	56	48.3
04:41	01:00	50.9	56.7	49.1
04:42	01:00	50.9	59.6	48.6
04:43	01:00	52.2	56.4	49.4
04:44	01:00	50.8	56.8	49.2
04:45	01:00	51	55.8	49.3
04:46	01:00	51	60.7	48.4
04:47	01:00	53.1	58.6	48.5
04:48	01:00	50.2	59.5	48.2
04:49	01:00	51.6	61.2	48.9

Location 2 – 12 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
04:50	01:00	55.2	60.1	50.3
04:51	01:00	53.5	54.1	49.7
04:52	01:00	50	60.1	49
04:53	01:00	52.6	55.3	49
04:54	01:00	50.2	57.6	48.6
04:55	01:00	52.9	62.9	49.6
04:56	01:00	52.3	60.5	48.7
04:57	01:00	50.1	59.8	47.9
04:58	01:00	53.7	57.5	49.1
04:59	01:00	50.5	57.3	48.3
05:00	01:00	51.1	57.8	47.7
05:33	01:00	55.1	66.4	52.6
05:34	01:00	55.1	62.8	51.7
05:35	01:00	54.8	59.2	52.3
05:36	01:00	55.6	60.1	53.3
05:37	01:00	59.8	70.8	53.2
05:38	01:00	54.9	64.3	52.9
05:39	01:00	55.9	61.8	52.3
05:40	01:00	54.7	62.3	51
05:41	01:00	54.9	60.2	52.6
05:42	01:00	57.3	61.8	54.6
05:43	01:00	55.7	62.3	52.4
05:44	01:00	55	60.8	52
05:45	01:00	55.1	61.5	52
05:46	01:00	59	67.8	53.8
05:47	01:00	55	60.7	52.7
05:48	01:00	54.9	59.1	53.5
05:49	01:00	57.6	64.4	52.8
05:50	01:00	56.6	62.2	53.6
05:51	01:00	56	61.8	53.9
05:52	01:00	57.6	62.9	55.4
05:53	01:00	57.6	62.4	53.9
05:54	01:00	57.4	66.5	54.5
05:55	01:00	56.8	63.1	53.8
05:56	01:00	56.4	62.7	53.1
05:57	01:00	57.9	65.1	52.6
05:58	01:00	56.5	60.4	52.1
05:59	01:00	56.9	62.8	53.7

Location 2 – 12 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
06:00	01:00	56.2	60.1	54.3
06:01	01:00	57.1	63.6	53.8
06:02	01:00	56.4	61.8	53.9
09:19	01:00	57.6	70.9	54.5
09:20	01:00	57.9	61.8	55.1
09:21	01:00	59.9	68.1	56.8
09:22	01:00	58.7	63.8	55.3
09:23	01:00	58.3	63.3	55.8
09:24	01:00	57.8	63	53
09:25	01:00	57.4	73	52.1
09:26	01:00	57.2	66.4	53.4
09:27	01:00	57.2	61.8	54.6
09:28	01:00	57.9	62.1	54.9
09:29	01:00	59.8	68.1	57.3
09:30	01:00	60	68.9	56.8
09:31	01:00	59.2	70.9	55.8
09:32	01:00	60.1	67.9	56.3
09:33	01:00	57.4	64.5	54.3
09:34	01:00	56.9	63.7	53.8
09:35	01:00	57.5	68	53.8
09:36	01:00	63.6	69.9	59.9
09:37	01:00	62.6	72.1	60.4
09:38	01:00	62.3	70.3	59.2
09:39	01:00	59.5	63	55.2
09:40	01:00	58.8	65.6	55.3
09:41	01:00	56.1	63.9	52.3
09:42	01:00	56.4	70.5	53
09:43	01:00	58.2	77.4	53
09:44	01:00	58.3	70.4	53.8
09:45	01:00	56.4	64.5	52
09:46	01:00	57	60.8	53.3
09:47	01:00	58.5	66.3	54.5
09:48	01:00	57.6	73.8	53.3
09:49	01:00	62.6	72.9	51.9
09:50	01:00	59.2	66.5	56.3
09:51	01:00	62.6	77.6	55.7
09:52	01:00	57.7	66.4	53.8
10:31	01:00	56.4	68.5	53.5

Location 2 – 12 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
10:32	01:00	58	72.1	49.9
10:33	01:00	57.6	63.2	54.8
10:34	01:00	56.7	67.2	54.3
10:35	01:00	56.7	63.8	53
10:36	01:00	60.9	67.3	55
10:37	01:00	56	59.2	53.7
10:38	01:00	55.4	61	52.9
10:39	01:00	54.9	60.5	51
10:40	01:00	56.4	61.3	52.7
10:41	01:00	56.3	64	51.2
10:42	01:00	57	60.8	53.7
10:43	01:00	57.9	63.2	54.8
10:44	01:00	56.5	61.6	52.4
10:45	01:00	56.2	68.3	51.9
10:46	01:00	57.7	63.9	54.6
10:47	01:00	59.2	70.2	53.1
10:48	01:00	55.8	59.3	54
10:49	01:00	55.1	60.4	50.4
10:50	01:00	56.2	61.8	52.9
10:51	01:00	56.1	68.4	52.9
10:52	01:00	56.9	61.1	54.7
10:53	01:00	56.8	59.7	53.5
10:54	01:00	58.3	73.5	54.8
10:55	01:00	62	71.5	53.6
10:56	01:00	60.3	72.3	58.6
10:57	01:00	57.9	61.8	56.8
10:58	01:00	62.4	73.8	58.5
10:59	01:00	57.3	63.1	53.5
11:00	01:00	57.1	68.4	53.5
11:01	01:00	56.1	69.4	52.3
11:02	01:00	56	67	53.3
11:36	01:00	57.3	68.5	54.7
11:37	01:00	57.9	72.1	53.3
11:38	01:00	56.6	63.2	51.7
11:39	01:00	57.6	67.2	53.4
11:40	01:00	56.5	63.8	53.7
11:41	01:00	58.7	67.3	54.5
11:42	01:00	58.1	59.2	55.4

Location 2 – 12 February 2020				
Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
11:43	01:00	58.8	61	54.6
11:44	01:00	56	60.5	52.4
11:45	01:00	55.5	61.3	53
11:46	01:00	54.9	64	52.6
11:47	01:00	55.8	60.8	52.6
11:48	01:00	56	63.2	52.1
11:49	01:00	55.9	61.6	51.9
11:50	01:00	57.6	68.3	52.4
11:51	01:00	56.3	63.9	52.1
11:52	01:00	56.6	70.2	52.4
11:53	01:00	56.3	59.3	52.6
11:54	01:00	55.5	60.4	51.5
11:55	01:00	54.9	61.8	50.9
11:56	01:00	57.2	68.4	53.8
11:57	01:00	56	61.1	52.8
12:00	01:00	57.6	59.7	55.1
12:01	01:00	56.2	73.5	52.6

Location	Date	Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
				$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
L3	11/02/2020	18:21	01:00	56.9	64.4	55.5
		18:22	01:00	57	63.5	55.7
		18:23	01:00	56.7	68	55.3
		18:24	01:00	56.2	58.6	55.1
		18:25	01:00	55.2	57.1	54.6
		18:26	01:00	56.6	59.2	55.6
		18:27	01:00	57.8	70.4	56.6
		18:28	01:00	56.5	68.1	53
		18:29	01:00	55.1	58.4	53.5
		18:30	01:00	54.5	57.3	53.1
		18:31	01:00	56.8	59	55.4
		18:32	01:00	56.7	62.7	55.7
		18:33	01:00	57.6	64.4	55.6
		18:34	01:00	56.3	60.3	55.2
		18:35	01:00	56.9	61.7	55.2
		18:36	01:00	59.7	71.4	55.6
		19:05	01:00	57.3	74.7	55.2
		19:06	01:00	58.6	65.9	56.3
		19:07	01:00	56.8	63.6	55
		19:08	01:00	56.4	59.5	55.2
		19:09	01:00	56.8	59.6	55.8
		19:10	01:00	56.6	61.4	55.3
		19:11	01:00	56.1	58.6	54.5
		19:12	01:00	56.6	63.5	55.3
		19:13	01:00	56.2	62.9	55.2
		19:14	01:00	56.9	59.5	55.8
		19:15	01:00	55.4	59.8	53
		19:16	01:00	56.2	59.6	55.1
		19:17	01:00	56.4	64.5	55.2
		19:18	01:00	57.1	63.5	55.3
		19:19	01:00	54.5	64.1	51.4
		19:20	01:00	53.9	57.7	52.1
		19:21	01:00	53.9	58.3	50.6
		19:48	01:00	58	73.6	55.6
		19:49	01:00	58.2	72.4	55.1
		19:50	01:00	56.4	60.1	55
		19:51	01:00	56.9	60.5	55.2
		19:52	01:00	56.3	58.6	54.9
		19:53	01:00	56.5	59.8	54.8

Location	Date	Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
				$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
		19:54	01:00	56.8	61.9	55.3
		19:55	01:00	58.1	72.7	55.8
		19:56	01:00	57	61.6	54.7
		19:57	01:00	56.7	59.8	54.9
		19:58	01:00	56.6	59.7	55.1
		19:59	01:00	56.2	58.8	54.9
		20:00	01:00	56.7	63.3	55.1
		20:01	01:00	56.4	60.9	54.8
		20:02	01:00	55.9	58.2	54.5
		20:03	01:00	56.2	66.7	54.7
	12/02/2020	03:57	01:00	54.5	54.5	53.2
		03:58	01:00	53.8	55.3	53.1
		03:59	01:00	54	55.5	53.3
		04:00	01:00	54.2	58.1	53.3
		04:01	01:00	53.8	59.2	53.2
		04:02	01:00	54.5	59.1	53.2
		04:03	01:00	54	56.3	53.3
		04:04	01:00	54.2	56.3	53.4
		04:05	01:00	54.6	59	53
		04:06	01:00	51.6	56.1	49.6
		04:07	01:00	50.2	60.4	48.7
		04:08	01:00	53.8	55.8	52.5
		04:09	01:00	55	61.2	53.4
		04:10	01:00	54.7	61.1	53.1
		04:11	01:00	54.9	58.6	53.6
		04:12	01:00	54.3	57.4	53.4
		04:13	01:00	53.9	55.3	53.3
		04:14	01:00	54.7	58.5	53.8
		04:15	01:00	55.2	59.6	53.7
		04:16	01:00	54.3	58.6	53.3
		04:17	01:00	54.3	56.1	53.6
		04:18	01:00	54.4	59.2	53.2
		04:19	01:00	53.4	55.6	52.1
		04:20	01:00	50.7	54	49.5
		04:21	01:00	49.4	52.4	48.1
		04:22	01:00	53.1	55.2	51.7
		04:23	01:00	54.5	57.1	53.4
		04:24	01:00	54.4	57.3	53.6
		04:25	01:00	54.6	57.2	53.5

Location	Date	Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
				$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
		04:26	01:00	54.6	57.5	53.5
		04:27	01:00	54.6	57.2	53.8
		05:04	01:00	54.4	57.3	53.5
		05:05	01:00	54.4	57.2	53.6
		05:06	01:00	54.6	58.2	53.5
		05:07	01:00	54.4	56.3	53.8
		05:08	01:00	55.6	59.7	54
		05:09	01:00	55.6	59.2	54
		05:10	01:00	54.9	59.7	53.8
		05:11	01:00	51.9	55.8	50.1
		05:12	01:00	52.8	58.9	48.8
		05:13	01:00	51.2	58	48.7
		05:14	01:00	53.6	57.4	50.4
		05:15	01:00	54.2	57.2	52
		05:16	01:00	51.1	55.2	49.3
		05:17	01:00	51.9	55.8	49.5
		05:18	01:00	55.4	58.9	54.2
		05:19	01:00	55.3	58.5	53.8
		05:20	01:00	55.7	60	54.4
		05:21	01:00	54.5	56.3	53.9
		05:22	01:00	55.3	60.1	53.9
		05:23	01:00	54.7	56.6	54
		05:24	01:00	54.9	57.9	54
		05:25	01:00	54.9	57.3	54.1
		05:26	01:00	56.5	59.7	55.4
		05:27	01:00	55.3	62.1	54.3
		05:28	01:00	53.4	56.2	51.2
		05:29	01:00	53.7	58.3	51
		08:44	01:00	56.5	62.2	54.3
		08:45	01:00	57	60.3	55.3
		08:46	01:00	56.9	60.9	54.8
		08:47	01:00	56.6	59.7	55
		08:48	01:00	56.6	60.5	55.2
		08:49	01:00	56	59.4	54.7
		08:50	01:00	56.5	63.5	55
		08:51	01:00	57.4	61.6	55.4
		08:52	01:00	54.1	58.5	51.7
		08:53	01:00	54.5	57.1	52.4
		08:54	01:00	56.1	58.6	52.2

Location	Date	Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
				$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
		08:55	01:00	56.1	61	54.6
		08:56	01:00	56.4	60.1	55
		08:57	01:00	56.6	61.8	55.2
		08:58	01:00	57.7	73.9	55.7
		08:59	01:00	58.2	68.1	56.6
		09:00	01:00	54.8	58	51.9
		09:01	01:00	56.2	70.5	52.7
		09:02	01:00	56.9	62.1	55.6
		09:03	01:00	56.1	64.3	54.7
		09:04	01:00	56.7	67.7	55.4
		09:05	01:00	56.2	63.3	55
		09:06	01:00	55.6	57	55
		09:07	01:00	60.4	79.2	55.2
		09:08	01:00	58.4	76	55.3
		09:09	01:00	56	63.5	55
		09:10	01:00	56.9	71.6	55.2
		09:11	01:00	56.7	69	55.3
		09:12	01:00	60.3	81.7	55.5
		09:13	01:00	57.7	64.3	55.9
		09:14	01:00	56	65.1	54.6
		09:15	01:00	55.6	61.9	54.6
		09:57	01:00	56.9	66.6	55.6
		09:58	01:00	55.8	64.6	52.9
		09:59	01:00	53.6	62.5	51
		10:00	01:00	56.5	64.3	52.9
		10:01	01:00	56.6	64.8	55.4
		10:02	01:00	57.8	63.6	56.3
		10:03	01:00	57.6	62.3	55.5
		10:04	01:00	56.8	66.2	54.9
		10:05	01:00	56	60.2	55.1
		10:06	01:00	56	61.7	54.8
		10:07	01:00	55.7	58.6	54.8
		10:08	01:00	56.9	64.7	55.2
		10:09	01:00	59	75.5	55.3
		10:10	01:00	56.8	66.6	54.9
		10:11	01:00	56.6	64.8	54.8
		10:12	01:00	56.5	65.2	55
		10:13	01:00	56.1	64.3	55
		10:14	01:00	55.5	58	54.6

Location	Date	Measurement Start	Measurement Period, T	Measured Sound Level (dB)		
				$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$
		10:15	01:00	56.5	61.2	55.1
		10:16	01:00	55.9	64.3	54.5
		10:17	01:00	56.1	61.6	55.2
		10:18	01:00	56.5	62.6	55.4
		10:19	01:00	56.6	63.4	55.4
		10:20	01:00	56	63.2	54.5
		10:21	01:00	55.8	58.9	55
		10:22	01:00	55.6	59.8	54.6
		10:23	01:00	56.5	60.4	55.3
		10:24	01:00	55.6	57.9	54.8
		10:25	01:00	55.6	58.5	54.6
		10:26	01:00	55.7	60.4	54.8
		10:27	01:00	56.1	61.9	54.7
		11:07	01:00	58.2	72.2	55
		11:08	01:00	55.8	59.2	54.9
		11:09	01:00	55.3	57	54.5
		11:10	01:00	55.3	59.7	54.6
		11:11	01:00	55.8	59.6	54.8
		11:12	01:00	55.4	59.2	54.6
		11:13	01:00	55.2	57.2	54.4
		11:14	01:00	56.3	65.3	55.3
		11:15	01:00	56.6	65.2	55.2
		11:16	01:00	55.5	58	54.7
		11:17	01:00	55.6	57.4	54.7
		11:18	01:00	55.4	57.1	54.6
		11:19	01:00	55.2	65.1	54.3
		11:20	01:00	56.6	67.9	55.3
		11:21	01:00	55.9	65.3	54.8
		11:22	01:00	55.7	64.1	54.7
		11:23	01:00	55.4	57.9	54.5
		11:24	01:00	55.9	58.4	54.6
		11:25	01:00	55.6	61.8	54.6
		11:26	01:00	57.3	65.2	55.5
		11:27	01:00	57.1	64	55.6
		11:28	01:00	56.1	60.8	55
		11:29	01:00	56.1	59.7	55.3
		11:30	01:00	55.8	69.3	54.6
		11:31	01:00	55.4	59.5	54.4
		11:32	01:00	55.6	68.2	54.4

Appendix D External Building Fabric Acoustic Specification

D.1 Glazing Sound Insulation Performance

D.1.1 The complete cladding system shall achieve the following minimum sound reduction indices when tested in accordance with BS EN ISO 10140-2:2010.

Glazing Type	Minimum Recommended Sound Reduction Indices (dB) at Octave Band Frequency (Hz)				
	125	250	500	1k	2k
G1	19	22	25	33	33
G2	25	25	31	34	34
G3	27	29	36	41	42

D.1.2 Fully detailed test reports from independent acoustic test authorities shall be supplied. All test reports shall be in English or, a full English translation.

D.1.3 Test data should include the 1/3 octave band results from 100 Hz to 3150 Hz inclusive, together with the corresponding octave band results from 125 Hz to 4000 Hz inclusive.

D.1.4 The test report shall be provided for test samples which are representative of the complete system for the relevant facades – including frames, joints, seals, spandrel panels and opening lights and trickle vents (as appropriate).

D.2 Trickle Ventilation Sound Insulation Performance

D.2.1 Ventilators shall be tested in accordance with BS EN 10140-2:2010. This will involve testing in 1/3 octaves from at least 100 Hz to 2500 Hz inclusive. These results, together with suitably converted octave band results from 125 Hz to 2000 Hz shall be provided for a ventilator unit which is representative of the proposed ventilator for the relevant façade. The following element normalised level differences shall be achieved:

Façade Zone	$D_{n,e}$ Values (dB) at Octave Band Centre Frequency (Hz) for Single Ventilator				
	125	250	500	1k	2k
V1	31	32	33	35	35
V2	32	35	40	39	51
V3	52	42	40	46	59

D.2.2 It should be noted that the acoustic specification for trickle ventilators is based on a single ventilator. If the number of ventilators in a habitable space is greater than one, then the specification of each ventilator should be adjusted using equation (1).

$$(1)\quad Specification + 10\log\left(\frac{V_{new}}{1}\right)$$

where V_{new} is the total number of ventilators in each habitable room.