Chapter 8 Noise and Vibration

TOPIC	NOISE AND VIBRATION
AUTHOR	Waterman Infrastructure & Environment Ltd
SUPPORTING APPENDIX	ES Volume 3: Appendix: Noise and Vibration: Annex 1: Glossary of Acoustic Terms; Annex 2: Legislative and Planning Policy; Annex 3: Baseline Noise Survey; Annex 4: Consultation with London Borough of Southwark (LBS); Annex 5: Demolition and Construction Noise Assessment; and Annex 6: Road Traffic Noise Assessment.
KEY CONSIDERATIONS	Noise and vibration resulting from demolition and construction activities has the potential to cause temporary disturbance to surrounding sensitive receptors (SRs), particularly during the course of any below ground excavation and construction works including to future residents, if the work is built in phases. Once the Proposed Development is complete and operational noise associated with new building services plant, changes in road traffic and ancillary servicing areas all have the potential to generate noise, which could affect existing occupants at neighbouring properties and residents of the Proposed Development.
KEY LEGISLATION	• Control of Pollution Act, 1974[1]; and • Environmental Protection Act, 1990, Part III[2].
KEY NATIONAL PLANNING POLICY	• National Planning Policy Framework, 2018[3]; • Planning Practice Guidance, 2014[4]; and • Noise Policy Statement for England, 2012[5]
KEY REGIONAL PLANNING POLICY	• The London Plan: The Spatial Development Strategy for London consolidated with alterations since 2011, March 2016[6]; • The Mayor's Ambient Noise Strategy, 2004[7]; and • The Mayor's Supplementary Planning Guidance – Sustainable Design and Construction, 2014[8]
KEY LOCAL PLANNING POLICY	• London Borough of Southwark, saved Southwark Plan Policies, 2013[9]; • London Borough of Southwark, Core Strategy, 2011[10]; • London Borough of Southwark, New Southwark Plan, 2017[11]; and • London Borough of Southwark, Sustainable Design and Construction SPD, 2009[12].
OTHER RELEVANT STANDARDS & GUIDANCE	Including but not limited to: • London Borough of Southwark Technical Guidance for Noise, 2017[13]; • ProPG: Planning & Noise – New Residential Development[14]; • Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Assessment, 2014[15]; • British Standard (BS) 5228:2009+A1:2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites[16]; • BS 4142:2014 – Methods for Rating and Assessing Industrial and Commercial Sound[17]; • World Health Organisation (WHO) Guidelines for Community Noise, 1999[18]; • BS 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings[19];
	• BS 6472-1:2008 - Guide to Evaluation of Human Exposure to Vibration in Buildings. Part 1: Vibration Sources other than Blasting[20]; • Calculation of Road Traffic Noise (CRTN), 1988[21]; • IEMA - Guidance Note 1 Guidelines for the Environmental Assessment of Road Traffic, 1993[22]; • DMRB Volume 11, Section 3, Part 7 Noise and Vibration, 2011[23]; and • BS 7385-2:1993 - Evaluation and Measurement for Vibration in Buildings[24].
CONSULTATION	The EIA Scoping Opinion is presented in **ES Volume 3 Appendix: EIA Methodology, Annex 2** which confirmed acceptability of the scope and method proposed for the noise and vibration assessment. Direct consultation was also undertaken with the Environmental Protection Manager (EPM) at the LBS to agree specific aspects of the assessment methodology, the details of which are presented in **ES Volume 3: Appendix: Noise and Vibration, Annex 4**.

ASSESSMENT METHODOLOGY

8.1 This section of the chapter sets out the approach to the assessment of likely significant noise and vibration effects. The following staged process has been undertaken:

- Identification of potential existing and future SRs on the site and within the surrounding area;
- Establishment of the baseline noise conditions currently existing at the site and at existing SRs surrounding the site using appropriate noise surveys;
- Assessment of the suitability of the site for residential use in terms of the prevailing baseline noise conditions;
- Assessment of the likely noise and vibration levels generated during the demolition and construction works associated with the Proposed Development;
- Establishment of design criteria for building plant and services associated with the completed and operational Proposed Development;
- Assessment of the likely noise levels from the completed and operational Proposed Development (with reference to relevant and credited guidance as detailed earlier in this chapter and in **ES Volume 3: Appendix: Noise and Vibration, Annex 2**);
- Formulation of proposals for noise mitigation (where appropriate); and
- Assessment of the likely significance of any residual noise and vibration effects.

Defining the Baseline

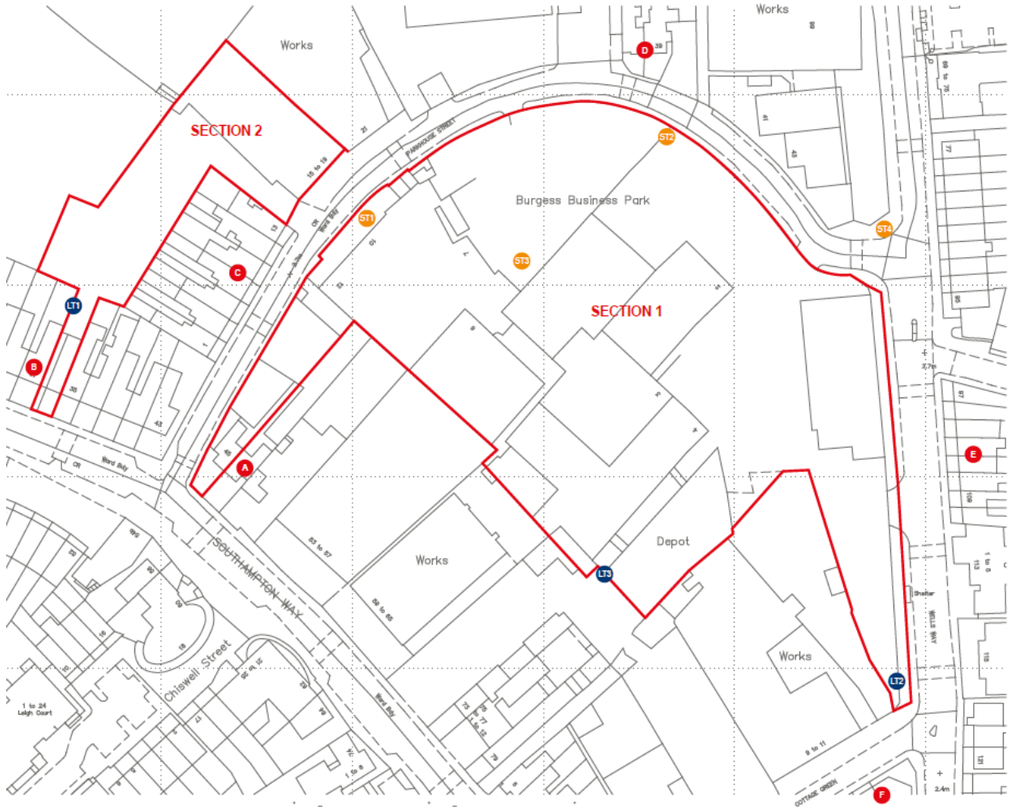
Current Baseline Conditions

8.2 The noise monitoring strategy was agreed prior to the survey in consultation with the LBS as presented in **ES Volume 3: Appendix: Noise and Vibration, Annex 4.**

[1] The Stationery Office (1974): 'Control of Pollution Act', HMSO, London.
[2] UK Government (1990): 'The Environmental Protection Act', HMSO.
[3] Department of Communities and Local Government (2018): 'National Planning Policy Framework', DCLG, London.
[4] Department for Communities and Local Government (2014): '*National Planning Practice Guidance- Noise (ID 30)*'.
[5] Defra (2010): 'Noise Policy Statement for England'. Defra
[6] Greater London Authority (2016): 'The London Plan Spatial Development Strategy for Greater London consolidated with alterations since 2011', GLA, London.
[7] Greater London Authority (2004): 'Sounder City The Mayor's Ambient Noise Strategy', GLA, London.
[8] Greater London Authority (2014): 'Sustainable Design and Construction – Supplementary Planning Guidance', GLA, London.
[9] London Borough of Southwark (LBS) (2013): 'Saved Southwark Plan policies', LBS, London.
[10] LBS (2011): 'Core Strategy', LBS, London.
[11] LBS (2017); New Southwark Plan, Proposed Submission Version, LBS, London.
[12] LBS (2009): 'Sustainable design and construction – Supplementary planning document', LBS, London.
[13] LBS (2017): 'London Borough of Southwark Technical Guidance for Noise', LBS, London.
[14] ANC, IoA & CIEH (2017): 'Professional Practice Guidance on Planning & Noise – New Residential Development', ANC.
[15] Institute of Environment Management and Assessment (IEMA) (2014): 'Guidelines for Environmental Noise Impact Assessment', IEMA.
[16] British Standard (BS) 5228-1 & -2 (2009) +A1 (2014): 'Code of practice for noise and vibration control on construction and open sites', BSI, Great Britain.
[17] British Standard (BS) 4142 (2014): 'Methods for rating and assessing industrial and commercial sound', BSI, Great Britain.
[18] World Health Organisation (WHO) (1999): 'Guidelines for Community Noise'. WHO, Geneva.
[19] British Standard (BS) 8233 (2014): 'Guidance on sound insulation and noise reduction for buildings', BSI, Great Britain.
[20] British Standard (BS) 6472 (2008): '*Guide to evaluation of human exposure to vibration in buildings*'. BSI, Great Britain.
[21] Department for Transport Welsh Office (1988): 'Calculation of Road Traffic Noise'.
[22] IEMA (1993): 'Guidance Notes No. 1 Guidelines for the Environmental Assessment of Road Traffic', IEMA, London.
[23] Highway Agency (2011): 'Design Manual for Road and Bridges, Volume 11 Environmental Assessment, Section 3, Environmental Assessment Techniques, Part 7 Noise and Vibration.
[24] British Standard (BS) 7385-2 (1993): 'Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration', BSI, Great Britain.

8.3 Long-term noise monitoring was undertaken at three key locations (Figure 8.1) on the site over a typical weekday and weekend period between Wednesday 29th March to Wednesday 5th April 2017. Daytime attended short-term measurements were conducted at ground level to establish the spatial variation in noise across the site and surrounding area to robustly quantify the existing noise climate across the site, whilst also providing a good representation of the noise environment experienced at nearby potential SRs. Individual noise sources at each monitoring location are identified within the baseline conditions section of this chapter.

Figure 8.1 Noise Monitoring Locations



Site Boundary

Long Term Noise Monitoring Location

Short Term Noise Monitoring Location

Noise Sensitive Receptor Location

Sensitive Receptor	Residential Property
SRA	47 Southampton Way
SRB	15 to 42 Southampton Way
SRC	1 to 13 Parkhouse Street
SRD	37 to 39 Parkhouse Street
SRE	77 to 115 Wells Way
SRF	8 to 12 Cottage Green

Impact Assessment

Demolition and Construction

Noise

8.4 The demolition and construction work which is considered most likely to give rise to significant noise effects comprise:

- Enabling and demolition works;
- Excavation and basement works (including piling); and
- Construction of the superstructure.

8.5 To assess the likely significant effects of noise from demolition and construction works on existing and future residential SRs surrounding the site, the 'ABC Method' provided in BS 5228-1 has been used. The 'ABC Method' defines category threshold values which are determined by the time of day and existing monitored ambient noise levels. Noise likely to be generated by demolition and construction activities (known as the 'total noise level') is then compared with the 'threshold value'. If the total noise level exceeds the threshold value, a significant effect is deemed likely to occur.

8.6 Noise threshold levels have been established for the existing and future SRs based upon the monitored noise levels. Noise levels associated with the demolition and construction works were then predicted and assessed against the threshold levels.

8.7 Calculations were carried out in accordance with the methodology prescribed within BS 5228-1. Calculations representing a worst-case scenario over a one-hour period with plant operating at the closest point to the nearest SR and in the absence of mitigation are presented to provide the 'greatest' noise effect that might reasonably be expected. In practice, noise levels would tend to be lower owing to greater separation distances, screening effects and periods of plant inactivity.

8.8 Full details of the predictions and assumptions of the assessment of likely noise associated with the demolition and construction works are contained within **ES Volume 3: Appendix: Noise and Vibration, Annex 5**.

Traffic Noise

8.9 Assessment of noise level changes arising from demolition and construction traffic has been undertaken using the calculation methodology detailed within the CRTN. This involves the use of estimated demolition and construction traffic flow data provided by the Applicant's pre-construction advisor (Bouygues) **(ES Volume 1, Chapter 5: Demolition and Construction)**.

Vibration

8.10 Two aspects of demolition and construction vibration require consideration: the potential for construction vibration to cause disturbance to humans and the potential for vibration to damage buildings.

8.11 There are currently no British Standards that provide a methodology for predicting levels of vibration from construction activities other than BS 5228-2, which relates to percussive, or vibratory, rolling and piling only. However, as stated in BS 5228-2, and as generally accepted, the threshold of vibration perception for humans is typically in the peak particle velocity (PPV) range 0.14 mm/s to 0.3 mm/s at frequencies between 8 Hz and 80 Hz in residential environments. Based on professional judgment and field measurements undertaken by Waterman Infrastructure & Environment Ltd on other projects at developments similar to the Proposed Development and having regard to information contained within BS 5228-2, Table 8.1 details the distance at which certain activities are likely to give rise to 'just perceptible' levels of vibration.

Table 8.1 Perceptible Vibration from Demolition and Construction Activities at Distance

Construction Activity	Distance from activity when vibration may just be perceptible (m)[1]
Heavy Vehicles	5 – 10
Excavation	10 – 15
Concreting	15 – 20
CFA Bored Piling	15 – 20
Rotary Bored Piling	20 – 30

Notes: [1] Distances for perceptibility are dependent on a number of factors and may be greater than indicated. The principal factors are dependent on the radial distance between source and receiver, source energy per blow or per cycle, ground conditions, underlying geology and upon the foundations and construction of the building itself.

8.12 It is a commonly held belief that if vibration can be felt, then damage to property is inevitable; however, vibration levels at least an order of magnitude higher than those for human disturbance are required to cause damage to buildings. A limit of 10 mm/s is typically adopted in-line with the guidance provided in BS 5228-2 when considering the potential for building damage to arise. Whilst mindful of relevant building damage criteria, the vibration assessment concentrates principally upon the potential for human disturbance.

Assumptions

8.13 The BS 5228 calculation methods allow noise levels to be determined for various demolition and construction activities. However, the value of any such predictions is necessarily limited by the number of assumptions that are made regarding the number and type of plant to be utilised, their location and detailed operating arrangements. Some of this information would be clarified as the details of the demolition and construction works are specified and later when resources are actually mobilised on site for the works, but other information such as exactly where the plant operates and for how long would remain uncertain, even after works have commenced.

8.14 As a consequence, the available information (as presented in **ES Volume 1, Chapter 5: Demolition and Construction**) is considered sufficient to perform a demolition and construction phase noise assessment that is suited to this stage of planning, focussing on key activities operating within 5 m of the site boundary, with the aim of identifying whether a significant, albeit temporary, noise effect is likely to arise at the nearest SRs.

Completed Development

Residential Amenity

8.15 Assessment of residential amenity with regard to noise has been undertaken in line with relevant and credited guidance on noise, notably, BS 8233:2014, ProPG and WHO Guidelines (a widely accepted approach). Monitored baseline noise levels have been used to generate contour plots across the site using the software package CadnaA. The monitored and predicted noise levels have been used to assess the site against the BS 8233, ProPG and WHO Guidelines criteria.

Building Services Plant Noise

8.16 BS 4142:2014 provides an assessment and rating method to assess adverse effects from a range of commercial noise sources, including fixed building services plant. The measured or predicted noise level from the source in question, the 'specific noise' level ($L_{Aeq,T}$), immediately outside the dwellings is compared with the 'background noise' level ($L_{A90,T}$). Where the sound contains certain acoustic features at the assessment location (e.g. tones, impulses, intermittency etc.), then a scaled character correction is added to the specific noise level to obtain the 'rating noise' level ($L_{Ar,Tr}$). The significance of effect is dependent on the context, having consideration to pertinent factors such as the sensitivity of the receptor and the level and nature of the sound.

8.17 Based on the baseline noise monitoring data detailed in **ES Volume 3: Appendix: Noise and Vibration, Annex 3** and in accordance with advice from the LBS, maximum plant emission levels have been set in controlling fixed building services plant to an acceptable level. Noise limits apply at a position 1 m from the façade of the nearest SRs and include the total contribution of noise from all plant items associated with the Proposed Development that may run during any particular period.

8.18 Due to there being limited specification information for the fixed plant required to serve the Proposed Development at this stage of planning, it is not possible to undertake predictions to determine whether appropriate standards might be met, so instead appropriate plant noise emission limits have been set.

Noise from Non-Residential Uses and Servicing

8.19 Specific details of the end users of the non-residential elements of the Proposed Development, such as the proposed retail (i.e. cafe, shop, gym, microbrewery), creative offices, offices, and creative workshops and associated operational times of the Proposed Development are not known at this stage and would be dependent on the future tenants. The likely significant noise effects arising from these uses are normally assessed by calculating the change in ambient noise levels from those currently experienced in the vicinity of relevant SRs due to break-out noise and external activities that may affect future residents within the Proposed Development. Where specific detail is not known, as is the case with the Proposed Development, a qualitative assessment has been undertaken of noise sources associated with the non-residential elements of the Proposed Development based on a worst-case scenario where a particularly noisy use is situated adjacent to a particularly sensitive use (such as residential).

8.20 In the absence of guidelines for assessing noise generated by servicing (e.g. deliveries and refuse collection), the likely noise effects have been assessed qualitatively based on professional judgment.

Road Traffic Noise

8.21 The changes in noise levels attributable to changes in operational road traffic flows and volumes resulting from the Proposed Development have been calculated using traffic data provided by the Applicant's transport consultant, Peter Brett Associates (refer to **ES Volume 3: Appendix: Noise and Vibration, Annex 6**). Traffic flow data was provided for the 'With' and 'Without' Proposed Development scenarios for a future year (2021) of the completion and operation of the Proposed Development and included traffic associated with cumulative schemes (refer to **ES Volume 1, Chapter 2: EIA Methodology**).

8.22 Basic Noise Levels (BNLs) were calculated for the road links covered by the Transport Assessment (TA) (shown in **ES Volume 3: Appendix: Noise and Vibration, Annex 6**). The calculations used the 18-hr Average Annual Weekday Traffic (AAWT) flow, % HGV composition and average vehicle speed for each road link. The BNLs were calculated at positions 10 m from the road using the guidance provided in CRTN. The likely effects of changes in road traffic noise were evaluated by consideration of the estimated changes in $L_{A10,18hour}$ road traffic noise level on the local highway network as a result of the operation of the completed Proposed Development for the future year 2021.

Defining Significance

Receptor Sensitivity

8.23 In terms of human response to noise and vibration a receptor may have **high**, **medium** or **low** sensitivity to changes brought on by the Proposed Development dependent on the likely activities that take place at the receptor. The SRs surrounding the site are all residential in nature (Table 8.9 and Figure 8.1) where occupants may be resting and will be susceptible to changes in the noise and vibration climate. Residential SRs are considered to be of **high** sensitivity in the context of this assessment.

Magnitude of Impact

8.24 Magnitudes of noise and vibration impact can be classified as being **very low**, **low**, **medium** or **high** and relate to the resultant scale of the effect (**negligible**, **minor**, **moderate** or **major**). Magnitudes of impact are provided for each component of the assessment in the section below.

Nature and Scale of Effects and Effect Significance Demolition and Construction Effects

Noise and Vibration

8.25 As outlined earlier in this chapter, in order to assess the significance of noise effects from the demolition and construction works on SRs, threshold values have been determined using 'The ABC Method' provided in BS 5228-1 and guidance in Advisory Leaflet 72.

8.26 With regards to vibration, predicted vibration levels have been assessed against the criteria for human perception as presented in BS 5228-2.

8.27 In view of the above, the criteria in Table 8.2 have been adopted to provide transparency in the definition of the nature and scale (and so significance) of the identified effects. Full details are provided in **ES Volume 3: Appendix: Noise and Vibration, Annex 5.** Significant effects are considered material to the planning decision making process. Generally, effects of moderate and major scale are considered significant.

Table 8.2 Magnitude of Impact and Nature and Scale of Effect for Demolition and Construction Noise

Magnitude of Impact	Nature and Scale of Effect	Level Above Threshold Value (dB)	Level of Vibration (mm/s)	Definition
Very Low	Negligible	≤ 2.9	< 0.14	The effect is not of concern
Low	Adverse, Minor	3.0 to 4.9	0.14 to 1	The effect is undesirable but of limited concern
Medium	Adverse, Moderate	5.0 to 9.9	1 to 3	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration
High	Adverse, Major	≥ 10	> 3	The effect gives rise to serious concern and it should be considered unacceptable

Road Traffic Noise

8.28 The criteria for demolition and construction road traffic noise have been derived by considering how changes in noise levels can be categorised based on key benchmarks that relate to human perception of sound. For noise which is very similar in all respects except magnitude, a change or difference of 1 dB is only just perceptible under controlled or laboratory conditions, whilst a change or difference of 3 dB is the minimum perceptible under most normal environmental conditions. A 10 dB change in noise corresponds roughly to a doubling or halving in the loudness of a sound.

8.29 The criteria in Table 8.3 have been adopted for demolition and construction traffic noise. Significant effects are considered material to the planning decision making process. Generally, effects of moderate and major scale (beneficial or adverse) are considered significant.

Table 8.3 Magnitude of Impact and Nature and Scale of Effect for Demolition and Construction Traffic Noise

Magnitude of Impact	Nature and Scale of Effect	Change or Difference in Noise Level (dB)
High	Beneficial, Major	≤ -5
Medium	Beneficial, Moderate	-4.9 to -3.0
Low	Beneficial, Minor	-2.9 to -1.0
Very Low	Negligible	-0.9 to 0.9
Low	Adverse, Minor	1.0 to 2.9
Medium	Adverse, Moderate	3.0 to 4.9
High	Adverse, Major	≥ 5

Completed Development Effects

Residential Amenity

8.30 Given that the assessment of residential amenity for future residents within the Proposed Development is not an effect assessment itself (i.e. there are no existing residents on the site who would experience a change in ambient noise levels as a result of the Proposed Development, or otherwise), it is not appropriate to attach significance 'criteria' to this particular component of the assessment. Rather, the assessment of residential amenity has been undertaken in line with relevant and credited guidance on noise, notably, BS 8233:2014, ProPG and WHO Guidelines (a widely accepted approach). As previously noted, consideration has also been given to the specific noise criteria set out in LBS' Technical Guidance for Noise.

Building Services Plant Noise

8.31 When assessing the significance of likely effects from fixed plant and building service noise on SRs, the criteria presented in Table 8.4 have been used. The criteria are based on the adverse impact criteria, as provided in BS 4142:2014. The criteria also give due regard to LBS' policy requiring a specific noise level (without accounting for any tonal or intermittent characteristics of the noise) from fixed building services plant to be controlled to 10 dB below the existing 'typical minimum' measured background level at a position 1 m from the façade of the nearest noise sensitive properties (i.e. Plant $L_s \leq L_{A90,15min} - 10$ dB). Additionally, any rating corrected plant noise level (accounting for any tonal or intermittent characteristics of the noise), following the procedures in BS 4142, must not exceed the existing 'typical minimum' measured background level (i.e. Plant $L_{Ar,Tr} \leq L_{A90,15min}$). These criteria apply to the total contribution of noise from all plant items associated with the proposed plant scheme that may run during any particular period.

8.32 Significant effects are considered material to the planning decision making process. Generally, effects of moderate and major scale are considered significant.

Table 8.4 Magnitude of Impact and Nature and Scale of Effect for Building Services Plant Noise

Magnitude of Impact	Nature and Scale of Effect	Difference between Specific Plant Level and Background Levels (dB)
Very Low	Negligible	≤ -10
Low	Adverse, Minor	> -10 to ≤ 3
Medium	Adverse, Moderate	> 3 to ≤ 5
High	Adverse, Major	> 5

Non-Residential Uses and Servicing Noise

8.33 In the absence of guidelines for assessing the effects of non-residential use and servicing noise upon SRs, the significance criteria in Table 8.5 have been used. Significant effects are considered material to the planning decision making process. Generally, effects of moderate and major scale are considered significant.

Table 8.5 Magnitude of Impact and Nature and Scale of Effect for Non-Residential and Servicing Noise

Magnitude of Impact	Nature and Scale of Effect	Level Above Threshold Value (dB)
Very Low	Negligible	< 3
Low	Adverse, Minor	≥ 3 to < 5
Medium	Adverse, Moderate	≥ 5 to < 10
High	Adverse, Major	≥ 10

Road Traffic Noise

8.34 Existing SRs are currently exposed to a certain level of road traffic noise. In assessment terms, it is therefore the difference in noise level as a result of the Proposed Development that is important.

8.35 The DMRB provides significance criteria for changes in operational road traffic noise levels which are reproduced in Table 8.6 and which have been used in this assessment.

8.36 DMRB states that 'a change in road traffic noise of 1 dB $L_{A10,18h}$ in the short term (e.g. when a development is completed and in use) is the smallest that is considered perceptible'. It is generally accepted by acoustic practitioners that subjectively an increase of 3 dB in environmental noise is just noticeable, whereas a 10 dB change in noise corresponding roughly to a doubling or halving in the loudness of a sound.

8.37 Significant effects are considered material to the planning decision making process. Generally, effects of moderate and major scale (beneficial or adverse) are considered significant.

Table 8.6 Magnitude of Impact and Nature and Scale of Effect for Road Traffic Noise

Magnitude of Impact	Nature and Scale of Effect	Change or Difference in Noise Level (dB)
High	Beneficial, Major	< -5
Medium	Beneficial, Moderate	≥ -5 to < -3
Low	Beneficial, Minor	≥ -3 to < -1
Very Low	Negligible	≥ -1 to < 1
Low	Adverse, Minor	≥ 1 to < 3
Medium	Adverse, Moderate	≥ 3 to < 5
High	Adverse, Major	≥ 5

BASELINE CONDITIONS

Current Baseline Conditions

Baseline Noise Monitoring

8.38 Continuous long term (LT) noise monitoring was carried out at three key locations (LT1 to LT3) described in Table 8.7 and illustrated on the site plan in Figure 8.1.

Table 8.7 Noise Monitoring Locations

Monitoring Location	Description	Observations and Predominant Noise Sources
LT1	Free-field measurement taken on the south-western boundary of the smaller Site section. Microphone located 3 m above ground level (AGL).	Noise climate dominated by local, onsite noise from vehicle maintenance. Road traffic noise and distant aircraft noise also contribute to the noise climate at this location, to some extent.
LT2	Free-field measurement taken on the eastern boundary of the larger section of the Site. Facing Wells Way. Microphone located 1.5 m AGL.	Road traffic noise from Wells Way dominates the noise climate at this location with regular buses passing by and stopping at the nearby bus stop. Occasional passing pedestrians and distant aircraft also contribute.
LT3	Façade measurement taken at the south-western boundary of the larger section of the Site. Overlooking BCM Scaffolding. Microphone located 4 m AGL.	Noise from activities on the BCM Scaffolding site dominates the noise climate at this location, with noisy deliveries and regular manoeuvring of scaffold poles and supporting timber. Distant aircraft and road noise on the surrounding road network also contribute to the noise climate, to some extent.

8.39 The sound level meters were set-up to record over consecutive 5-minute periods the L_{eq}, L_{90}, L_{10}, and L_{max} noise indices. The indices roughly translated describe in turn the average, background, road traffic, and maximum noise levels.

8.40 A summary of the measured daytime (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00) noise levels for the survey periods are tabulated in Table 8.8.

Table 8.8 Summary of Unattended (Long Term) Baseline Noise Measurements

Monitoring Location (Figure 8.1)	Period (Duration)	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,15min}$ dB		$L_{AFmax,5min}$ dB	
		Ave[1]	Ave[2]	Range	Ave[2]	Range	90th %ile[3]
LT1	Day (12 hr)	60	60	41 – 59	48	58 – 103	80
	Eve (4 hr)	55	57	38 – 58	45	51 – 91	72
	Night (8 hr)	51	47	31 – 50	40	38 – 86	69
LT2	Day (12 hr)	65	67	44 – 59	53	67 – 104	85
	Eve (4 hr)	63	66	43 – 65	51	66 – 97	82
	Night (8 hr)	58	59	28 – 54	40	50 – 97	78
LT3	Day (12 hr)	74	69	45 – 61	52	62 – 100	94
	Eve (4 hr)	52	54	39 – 47	42	45 – 76	71
	Night (8 hr)	50	45	32 – 47	37	42 – 80	70

Notes: [1] Logarithmic average over the day/evening/night survey periods; [2]Arithmetic average over the day/evening/night survey periods; [3]The 90th percentile L_{AFmax} value has been used in the assessment and is considered representative of typical L_{AFmax} levels experienced. All figures rounded to nearest whole decibel.

8.41 Further details on the instrumentation used for the noise measurements, the survey period, weather conditions and baseline results can be found in **ES Volume 3: Appendix: Noise and Vibration, Annex 3**.

Future Baseline Conditions / Do Nothing Scenario

8.42 Without the Proposed Development in place, the future baseline noise and vibration conditions could remain as found in the baseline surveys, notwithstanding likely future changes in road traffic noise based on future (2021) road traffic flows (as a result of the cumulative schemes, refer to **ES Volume 1, Chapter 2: EIA Methodology** for further details) provided by the Applicant's transport consultant, Peter Brett Associates.

RECEPTORS AND RECEPTOR SENSITIVITY

Existing

8.43 The area surrounding the site is mixed use in nature, comprising commercial, industrial and residential premises. The closest SRs to the site boundary are detailed in Table 8.9 and illustrated in Figure 8.1.

Table 8.9 Existing Sensitive Receptors

Receptor	Type of Receptor (Sensitivity)	Description / Name	Approximate Distance to Site Boundary (m)[1]
SRA	Residential (High)	47 Southampton Way	Adjacent to the south-eastern boundary of Section 1
SRB	Residential (High)	15 to 42 Southampton Way	Adjacent to the southern boundary of Section 2
SRC	Residential (High)	1 to 13 Parkhouse Street	Adjacent to the south-eastern boundary of Section 2
SRD	Residential (High)	37 to 39 Parkhouse Street	13 m from the northern boundary of Section 1
SRE	Residential (High)	77 to 115 Wells Way	16 m from the eastern boundary of Section 1
SRF	Residential (High)	8 to 12 Cottage Green	12 m from the southern boundary of Section 1

Note: [1] Sections 1 and 2 of the Site are shown on Figure 8.1.

8.44 Where a number of SRs are located close to each other, the nearest SR to the site has been chosen to represent the immediate area.

Introduced

8.45 SRs introduced as part of the Proposed Development include residential uses, which would be of high sensitivity to noise and vibration and leisure, offices, creative offices, retail and creative workshop uses, which would be of low to medium sensitivity, dependant on the specific occupants, to noise and vibration based on guidance provided in BS 8233:2014.

8.46 Completion and occupation of the Proposed Development on Section 2 (Figure 8.1) may overlap with the demolition and construction of the Proposed Development on Section 1 (Figure 8.1) of the site. The closest façade of the Proposed Development on Section 2 to the site boundary of Section 1 is approximately 10 m away. The potential effects of these overlapping demolition and construction works are considered within the 'Potential Effects' section of this chapter. For ease of referencing, this potential future SR will be labelled as SRG.

8.47 Whilst not an effect assessment, the suitability of the site for residential uses has been assessed in the 'Potential Effects' section of this chapter and, where appropriate, mitigation proposed in the 'Mitigation and Residual Effects' section of this chapter.

POTENTIAL EFFECTS

Demolition and Construction

Noise

8.48 The calculated 'worst-case' construction noise predictions in dB $L_{Aeq,1hr}$ for the principal demolition and construction works at the nearest affected SRs are presented in Table 8.10. Full details of the demolition and construction noise assessment are provided within **ES Volume 3: Appendix: Noise and Vibration, Annex 5.**

Table 8.10 Summary of Predicted Construction Noise Levels and Resultant Effects

Receptor	Assessment Parameter	Development Stage		
		Enabling and Demolition Works	Excavation and Basement Works	Construction Works
SRA, SRB and SRC	Predicted Noise Level	99	95	94
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.
SRD	Predicted Noise Level	88	84	83
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.
SRE	Predicted Noise Level	87	83	81
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.
SRF	Predicted Noise Level	89	85	83
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.
SRG (potential future SR)	Predicted Noise Level	90	86	84
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.	Adverse, Major, Short-Term, Local.

Notes: Where demolition and construction noise effects are defined as 'Short-Term, Local', the effect is expected to last for the duration of use of specific plant items associated with the development stage and only where those plant items are used within 5 m of the Site boundary closest to the SR. It is unlikely that noise levels would be as high as those presented at each SR other than for a very short period.

8.49 The highest noise levels tend to originate from plant associated with demolition activities, breaking activities and piling. During the fit-out, construction noise would be significantly lower. In practice, demolition and construction noise levels would tend to be lower owing to greater separation distances and screening effects. Noise would also tend to reduce over a full working day owing to periods of inactivity. The potential effect of demolition and construction noise generated by the Proposed Development is considered to be **short-term, local and of major adverse at all SRs**. Effects that are major are significant effects and require mitigating.

Vibration

8.50 During the demolition and construction works, vibration effects could arise at premises neighbouring the Proposed Development where vibration generating activities (specifically breaking up of concrete slabs during demolition and piling, with levels dependant on the piling method used) are carried out within approximately 15 m of SRs.

8.51 SRE is located further than 15 m from the site boundary and would therefore experience a **negligible** effect (not significant) in relation to human perception as a result of vibration generated during the demolition and construction works.

8.52 Given the proximity of SRA, SRB and SRC to the site boundary (adjacent) and in the absence of mitigation, there would be the potential for some **short-term, major adverse effects** (which would be significant) to arise at these locations when considering human perception.

8.53 At SRD, SRF and SRG (13 m, 12 m and 10 m from the site boundary respectively) there would be the potential for **short-term, minor adverse effects** (not significant) when considering human perception.

8.54 Effects relating to building damage are, however, likely to be **negligible** (not significant) at all SRs, given that vibration levels would need to be several orders of magnitude higher than those shown to cause damage to buildings.

Road Traffic Noise

8.55 Construction traffic flow data show that there is anticipated to be a peak in construction vehicle movements of 100 two-way vehicle movements spread over the working day in 2019 (i.e. 50 vehicles in and 50 vehicles out, refer to **ES Volume 1, ES Chapter 5: Demolition and Construction**).

8.56 Comparison of the peak construction vehicle movements against the baseline traffic flows along the construction route reveals construction traffic accounts for less than 2.6% as a proportion of predicted 2019 traffic flows on Parkhouse Street. This equates to an increase in demolition and construction related traffic noise of less than 0.6 dB, which is not large enough to cause any discernible effect. As such, the likely effect of demolition and construction road traffic noise on existing and future SRs is concluded to be **negligible** and not significant.

Completed Development

Residential Amenity

Residential Amenity (Internal) – Noise

8.57 A 3-dimensional CadnaA noise model has been developed taking account of the key prevailing noise sources affecting the site. The modelled Proposed Development façade noise levels (Figures 8.2 to 8.7 which are presented at the end of this chapter) indicate that there would be the potential for the worst affected residential façades, namely the façades orientated onto the BCM scaffolding yard to the south-west, to be exposed to noise levels of up to 73 dB $L_{Aeq,T}$ during the scaffold yard's operational hours in the daytime. At night the noise levels would reduce to 50 dB $L_{Aeq,T}$ and 70 dB $L_{AFmax,90th\%ile}$ at these façades. Façades overlooking Wells Way and Parkhouse Street to the east and north-west, would be exposed to noise levels of up to 65 dB $L_{Aeq,T}$ during the daytime and 58 dB $L_{Aeq,T}$ and 78 $L_{AFmax,90th\%ile}$ during the night-time period.

8.58 Given that elevated noise levels are experienced for facades of the proposed buildings, mitigation measures are required to ensure appropriate internal noise levels are achieved. Mitigation measures are discussed later in this chapter.

Residential Amenity (External) – Noise

8.59 The Proposed Development comprises external amenity spaces in the form of private residential balconies on residential façades, and play spaces and external amenity areas on residential podiums and roof terraces.

8.60 Based on the CadnaA noise model (refer to Figures 8.2 to 8.7 which are presented at the end of this chapter), ambient daytime noise levels at balconies of the Proposed Development are predicted to range between 40 and 72 dB $L_{Aeq,T}$. Balconies on the façades most proximate and with line of site to the BCM scaffold yard are

predicted to exceed the WHO Guidelines' upper daytime outdoor sound level from steady, continuous noise of 55 dB $L_{Aeq,T}$ by up to 17 dB.

8.61 The noise model shows noise levels of between 50 and 54 dB $L_{Aeq,T}$ at the roof terraces of the Proposed Development during the daytime. These levels are below the upper daytime sound level of 55 dB and the roof terraces would therefore be suitable for residential amenity. Due to shielding provided by buildings of the Proposed Development, the proposed play and residential amenity spaces at podium level would be exposed to noise levels of 40 to 41 dB $L_{Aeq,T}$ allowing a high level of amenity for residents using these spaces.

8.62 In considering application of the 55dB $L_{Aeq,T}$ criterion for outdoor living spaces, it is important to take account of the feasibility of achieving such a level.

8.63 Guidance provided in BS 8233 states:

"For traditional external areas that are used for amenity space, such as gardens or 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."

8.64 It goes on to say that:

"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

8.65 Attainment of the outdoor criterion for living spaces is unobtainable at proposed balconies proximate to the dominant noise sources given the site's urban location adjoining the strategic road network and light industrial uses where higher external noise levels are inescapable and outside of the control of the Proposed Development. Levels, however, are considered acceptable when accounting for the convenience and desirability of living in the area and there are many proposed balconies, podium areas and roof terraces where levels will be below 55 dB $L_{Aeq,T}$ and a suitable level of amenity is achieved.

8.66 In line with relevant and credited guidance, the design intent is to achieve the lowest practicable levels in external amenity spaces. Mitigation measures for exposed areas are discussed later in this chapter.

Building Services Plant Noise

8.67 Any items of fixed plant associated with the operation of the Proposed Development would have the potential to generate noise. At this stage in the design, specific details of the plant associated with the Proposed Development are not yet known. Consequently, suitable limits to which plant should adhere have been set based on the LBS's own criteria.

8.68 Table 8.11 sets out the plant noise limits for the Proposed Development in line with credited guidance and the requirements of the LBS. The minimum background noise level ($L_{A90,15min}$) was used at each location.

Table 8.11 Building Services Plant Noise Emission Limits

Receptor	Minimum Background Noise Level (dB $L_{A90,15min}$)	Specific plant noise limit at 1 m from SR façade (dB L_{As})1	Rating plant noise limit at 1 m from SR façade (dB $L_{Ar,Tr}$)[1]
SRA, SRB, SRC and SRD	31	30	35
SRE and SRF	28		

Note: [1] BS 4142:2014 and the LBS Technical Guidance for Noise both recognise that it's method of assessment may not be suitable when background and rating noise levels are both very low. Background noise levels below about 30 dB(A) and rating levels below about 35 dB(A) are considered to be very low. In such circumstances, it is recommended that a maximum plant noise limit of 30 dB L_{As} and 35 dB $L_{Ar,Tr}$ is set where the prevailing background noise levels minus 10 dB are below 30 dB. Such a limiting criterion falls well below credited absolute noise level amenity standards that are based on scientifically derived health-based guideline values to prevent harmful effects of noise (e.g. on rest/sleep with windows open), whilst importantly ensuring unreasonable restrictions on development and/or undue costs on business are not borne where residual noise levels cannot be cost effectively or practically prevented. For these reasons, where background noise level minus 10 dB is less than 30 dB(A), a specific limit of 30 dB L_{As} has been adopted. Where the background noise level is less than 35 dB(A), a rated limit of 35 dB $L_{Ar,Tr}$ has been adopted.

8.69 Based on the noise emission limits in Table 8.11 for new building plant being achieved (and potentially being controlled by a standard planning condition), noise generated from new building plant would have a **negligible** effect on all SRs. Negligible effects are not significant.

Noise from Non-Residential Uses

8.70 Operation of the proposed non-residential uses may generate noise. Consideration would need to be given to noise break-out prior to occupation and operation to ensure that the amenity of surrounding uses (including external amenity spaces) and existing and future SRs is protected.

8.71 Noise break-out effects from any of the non-residential uses should, however, be **negligible** (not significant) provided adequate sound insulation is afforded by the building fabric and that any outdoor spaces are appropriately managed, and it is on this basis that the assessment has been made. Suitable sound insulation is assumed to be inherent in the building design for the purpose of this assessment.

Servicing Noise

8.72 At this stage in the design of the Proposed Development, details regarding the final tenants and associated servicing and delivery areas are not known. The number of delivery vehicles associated with non-residential uses would be largely dependent upon the final occupants which has not yet been determined. It is considered that standard controls, secured through planning conditions relating to hours of delivery and screening of service yards would be inherent in the scheme design and therefore, noise effects associated with servicing and deliveries on existing and future SRs would likely be **negligible** and not significant.

Road Traffic Noise

8.73 Based upon traffic data provided by the Applicant's transport consultant (Peter Brett Associates), the likely change in road traffic noise on the road network due to traffic generated by the completed and operational Proposed Development is presented in Table 8.12. Full details of the road traffic noise assessment are provided within **ES Volume 3: Appendix: Noise and Vibration, Annex 6**.

Table 8.12 Differences in the Road Traffic Basic Noise Level (BNL), dB $L_{A10,18hr}$

Road Link	2021 - Without Development (Base)	2021 - With Development (Base + Development)	Difference in dB $L_{A10,18hr}$ BNL (Base + Development) - (Base)
Wells Way (North)	69.0	69.0	0.0
Parkhouse Street	64.6	64.1	-0.4
Southampton Way (West)	68.4	68.3	-0.1
Southampton Way (Mid)	67.2	67.0	-0.1
Southampton Way (East)	67.1	67.1	0.0
Wells Way (South)	67.5	67.4	-0.1

8.74 Analysis of the traffic data for the surrounding roads indicates that when comparing the 'Without Development' situation and the 'With Development' situation for the completed Proposed Development year (assumed to be 2021), there would be no increase in road traffic noise levels and in fact there would be a decrease on four of

the six road links considered. The other two road links experience no change. This is largely due to a significant reduction in car-parking onsite. The greatest decrease in noise levels (-0.4 dB) is predicted to occur on Parkhouse Street. With reference to the magnitude of impact and the nature and scale of effect presented in Table 8.6, the Proposed Development's effects on road traffic noise will be **negligible** (not significant) at all SRs (both existing and introduced).

MITIGATION AND RESIDUAL EFFECTS

Demolition and Construction

8.75 The construction Environmental Management Plan (EMP) (refer to **ES Volume 1, ES Chapter 5: Demolition and Construction**) will have regard to appropriate legislation, guidance and measures to minimise demolition and construction noise and vibration.

8.76 Best Practicable Means (BPM) as defined in Section 72 of the Control of Pollution Act 1974 will be employed to keep the level of noise and vibration generated on site as low as reasonably practicable. Measures to be considered in implementing best practicable means will be consistent with recommendations of British Standard (BS) 5228-1:2009+A1:2014[25][26] and will include but not be limited to:

- Careful programming to ensure activities which may generate significant noise are planned well in advance and SRs are notified of the works;
- Identification and use of low noise techniques. For example, equipment that breaks concrete by munching or similar, rather than by percussion. Where construction plant which is known to generate significant levels of noise then it is to be used sparingly and the construction activity is closely monitored to minimise noise levels;
- All plant brought on to site should comply with the relevant EC/UK noise limits applicable to that equipment or should be no noisier than would be expected based on the noise levels quoted in BS 5228. Plant should be properly maintained and operated in accordance with manufacturers' recommendations;
- Where feasible, all stationary plant should be located so that the noise at all occupied SRs is minimised and, if practicable, every item of static plant when in operation should be sound attenuated using methods based on the guidance and advice given in BS 5228 (e.g. local screening);
- Items of plant on the site operating intermittently should be shut down in the intervening periods between use;
- Adoption of a noise monitoring regime and the establishment of noise Action Levels in consultation with LBS, above which consideration would be given to the use of alternative techniques and/or other means of controlling noise levels;
- If appropriate, agreement with the LBS through a Section 61 Application (under the of the Control of Pollution Act 1974) on the details of the work to be carried out, the time of the works and details of any measures to reduce the noise from the works;
- Use of hoarding to the required height and density appropriate to the noise sensitivity of the site; and
- Implementation of a Construction and Logistics Plan (CLP) to pre-plan and manage traffic associated with the works to minimise disturbance to SRs. The CLP would include aspects such as operation of a 'Just in Time' policy for the delivery and supply of materials for the work to minimise the disruption to the local community.

Noise

8.77 Accounting for the mitigation measures outlined above, noise levels at SRs assessed would be reduced by 10 dB and vibration PPV levels would also be reduced thereby mitigating the potential significant adverse effects.

8.78 Due to the potential high noise levels generated during the enabling and demolition phase, it is assumed that additional mitigation measures would be implemented to afford at least 15 dB attenuation. This may include reduction in on-times, changes to the method of working and plant substitution. Further to this, when all works are undertaken within the vicinity of SRA, SRB and SRC, it is assumed that the additional mitigation set out above would be employed as necessary (reduction in on-time, method of working, plant substitution) to afford additional attenuation to the unmitigated predicted levels.

8.79 The mitigated demolition and construction noise levels and the associated nature and scale of the residual effects for the SRs assessed are presented in Table 8.13. Full details of the demolition and construction noise assessment are provided within **ES Volume 3: Appendix: Noise and Vibration, Annex 5**.

8.80 The construction noise levels were predicted on the basis that all on-site plant activities operate simultaneously within 5 m from the site boundary closest to each SR – a situation which in practice is seldom (if ever) likely to occur, but is a worst-case basis of assessment. By adopting all the mitigation measures described above, it is anticipated that all demolition and construction activities can be undertaken whilst minimising disturbance to those living and working nearby. Following the implementation of mitigation measures, **moderate adverse, short-term, local effects** would be experienced at SRA, SRB, SRC, SRD and SRG; these residual effects are significant, although temporary in duration. Residual effects that are **negligible or minor adverse, short-term and local** would be experienced at SRE and SRF; these effects are not significant.

Vibration

8.81 With regards to the potential effects of demolition and construction generated vibration on nearby existing SRs or introduced SRs as part of the Proposed Development (should any areas of new residential provision become occupied before the construction works are completed), agreed vibration limits would be set to ensure compliance with national standards and, hence, minimise the risk of complaints or building damage. These limits would be controlled through the implementation of a site-specific EMP.

8.82 With the implementation of mitigation measures, demolition and construction vibration levels are anticipated to be reduced to a level commensurate with a **negligible** effect (not significant) both in relation to human perception and building damage.

Road Traffic Noise

8.83 With regard to traffic management during the demolition and construction works, all traffic logistics would be agreed with the LBS. Such measures will be set out within a CLP and EMP.

8.84 With the implementation of mitigation measures the likely residual effect from demolition and construction road traffic noise would remain as **negligible** and not significant.

[25] BSi, (2009); BS 5228-1:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites

[26] BSi, (2014); BS 5228-2:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites

Table 8.13 Summary of Predicted Mitigated Construction Noise Levels and Level of Significance

Receptor	Assessment Parameter	Development Stage		
		Enabling and Demolition Works	Excavation and Basement Works	Construction Works
SRA, SRB and SRC	Predicted Noise Level	<75	<75	<75
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Moderate, Short-Term, Local.	Adverse, Moderate, Short-Term, Local.	Adverse, Moderate, Short-Term, Local.
SRD	Predicted Noise Level	73	74	73
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Moderate, Short-Term, Local.	Adverse, Moderate, Short-Term, Local.	Adverse, Moderate, Short-Term, Local.
SRE	Predicted Noise Level	72	73	71
	Effect Nature, Scale, Duration and Geographic Extent	Negligible	Adverse, Minor, Short-Term, Local.	Negligible
SRF	Predicted Noise Level	74	75	73
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Minor, Short-Term, Local.	Adverse, Minor, Short-Term, Local.	Adverse, Minor, Short-Term, Local.
SRG (potential future SR)	Predicted Noise Level	<75	<75	74
	Effect Nature, Scale, Duration and Geographic Extent	Adverse, Moderate, Short-Term, Local.	Adverse, Moderate, Short-Term, Local.	Adverse, Moderate, Short-Term, Local.

Notes: Where demolition and construction noise effects are defined as 'Short-Term, Local', the effect is expected to last for the duration of use of specific plant items associated with the development stage and only where those plant items are used within 5 m of the Site boundary closest to the SR. It is unlikely that noise levels would be as high as those presented at each SR other than for a very short period.

Completed Development

Residential Amenity - Internal

8.85 The noise monitoring and modelling results show the site to be exposed to high levels of environmental noise at the site's south-western boundary where façades overlook the BCM scaffold yard. With provision of a suitable glazing and ventilation strategy, conditions suitable for residential amenity can be provided. At façades proximate to the BCM scaffold yard, a robust façade/ventilation building design will be necessary to meet relevant and credited indoor design criteria levels.

8.86 The degree of external environmental noise intrusion into internal areas depends on the acoustic performance of all elements of the façade, but it is generally determined by the components providing the least airborne sound resistance, the glazing; especially when residents open windows to provide natural background or rapid ventilation.

8.87 The glazing performance requirements are dependent on the use type, what percentage of the façade is glazed, the frequency composition of noise incident on the façade and the ventilation strategy. Preliminary calculations have been undertaken to determine the indicative sound insulation performance the glazing in the worst affected façades would be required to achieve the internal criteria set out in BS 8233, ProPG and WHO, 1999 (with windows closed). The calculations adopt the detailed methodology set out in BS 8233 and are based on the following assumptions considered to represent an accurate, if slightly conservative, scenario:

- To ensure favorable resting/sleeping conditions are provided for, assessment has been based on determined ambient ($L_{Aeq,16hr}$) daytime and ambient ($L_{Aeq,8hr}$) and maximum (L_{AFmax}) night-time values. The 90th percentile L_{AFmax} level has been used in the night-time assessment for bedrooms and is considered to fairly represent typical L_{AFmax} levels being experienced on the most noise exposed proposed façade of the Proposed Development, for compliance with the WHO Guidelines.
- The internal finishes of a room will affect the reverberant component of the overall noise level, with a degree of soft furnishing (carpet and curtains) considered within the calculations. All walls and ceilings are assumed to be plastered and painted. A reverberation time of 0.5s has been assumed for bedrooms based on BS 8233.
- It has been assumed that solid external wall cladding forming a part of the Proposed Development achieves an acoustic performance of not less than 50 dB R_w.
- The calculated noise levels are based on a glazing area of 50% of residential façades.
- Calculations have been undertaken using an iterative method. Initial calculations were undertaken assuming standard double glazing. Where the internal noise level design criteria were not met, then further calculations were undertaken based on assumptions of higher specification glazing units until the more stringent internal noise level design criteria were met.

8.88 The preliminary assessment results for the worst affected façade are presented in Table 8.14 in terms of the Weighted Sound Reduction Index (R_w+C_{tr}), a single number quantity used to characterise the airborne sound insulation performance of a system or material over the frequency range 100 to 3150 Hz, with C_{tr} adjustment factor (a negative number) used to take into account of the low frequency noise spectrum characteristics from road traffic at the site.

Table 8.14 Indicative Façade Sound Insulation Performance for Residential Glazing Elements

Elevation	Period	Incident Façade Noise Level (dB)[2]	Target Criteria (dB)	Minimum Sound Insulation of Glazing dB (R_w+C_{tr})	Example Glazing Configuration (or equal and approved)
Façades Proximate to the BCM Scaffold Yard	Daytime $L_{Aeq,16hr}$	73	35	≥30	10:12:4 mm thermal double-glazing unit
	Night-time $L_{Aeq,8hr}$	50	30		
	Night-time L_{AFmax}[1]	70	45		
Eastern (*fronting Wells Way*), North and North-Western Façades (*fronting Parkhouse Street*)	Daytime $L_{Aeq,16hr}$	65	35	≥31	6:16:6.8 mm acoustically lined double-glazing unit
	Night-time $L_{Aeq,8hr}$	58	30		
	Night-time L_{AFmax}[1]	78	45		

Notes: [1] 90th Percentile of L_{AFmax} measured data of all days in total. [2] Modelled or calculated incident façade noise level.

8.89 Preliminary break-in calculations indicate that on the most exposed façades of the building overlooking the roads surrounding the site in order to satisfactorily control the ingress of external environmental noise within residential room spaces (with reference to BS 8233:2014, ProPG and WHO, 1999) it will be necessary to provide enhanced double glazing providing in the region of ≥31 dB R_w+C_{tr} sound insulation in combination with acoustically rated passive ventilation.

8.90 Calculations indicate that standard thermal double glazing (e.g. 6/12/4 mm glazing configuration) and acoustically rated passive ventilation should achieve the target design criteria on all remaining residential façades of the Proposed Development, with windows closed.

8.91 During design development and as part of the discharge of noise related design planning conditions, further calculations will be undertaken and used to identify the detailed zoning of window types and attendant acoustic performance specifications in one octave band detail to ensure appropriate control of the frequency content of sound incident upon the different façades of the Proposed Development.

Residential Amenity - External

8.92 The most exposed balconies predicted to exceed the 55 dB $L_{Aeq,16h}$ outdoor external criteria would benefit some reduction in noise level through provision of solid balustrades.

8.93 Podium and roof terrace areas are suitable in terms of noise due to the layout designs proposed and will be used to provide occupants with high quality external amenity space.

Noise from Non-Residential Uses and Servicing

8.94 Provided non-residential building façades together with adjoining walls/floors offer adequate sound insulation and appropriate measures are in place with regards to management of outside and servicing areas, **negligible** residual effects (not significant) are predicted.

Road Traffic Noise

8.95 Road traffic noise effects were assessed as negligible (not significant) without the need for mitigation measures therefore the residual effects would remain as **negligible** (not significant).

Summary

8.96 Table 8.15 provides a summary of the identified mitigation measures committed to, and Table 8.16 provides a tabulated summary of the outcomes of the noise and vibration impact assessment of the Proposed Development.

Table 8.15 Summary of Proposed Mitigation Measures

Potential Effects Identified	Proposed Mitigation / Enhancement Measures
Demolition and Construction	
Noise	Adoption of best practicable means mitigation measures as defined within an EMP
Vibration	Adoption of best practicable means mitigation measures as defined within an EMP
Road Traffic Noise	Adoption of a CLP
Completed Development	
Residential Amenity - Internal	Appropriate glazing and ventilation specifications to achieve appropriate noise levels inside residential units with windows closed.
Residential Amenity – External	Solid balustrades on the most exposed residential balconies
Building Services Plant Noise	Careful selection, installation and noise attenuation of plant and equipment to ensure that the specified plant noise emission limits are achieved.
Noise from Non-Residential Uses and Servicing	Appropriate management measures to control outdoor activities and operational / servicing times.
Road Traffic Noise	None required

Table 8.16 Summary of Residual Effects

Receptor (and Sensitivity)	Description of Residual Effect	Classification of Residual Effect*					
		Nature* and Scale**	+ve -ve	D I	P T	R IR	St Mt Lt
Demolition and Construction							
SRA, SRB, SRC, SRD and SRG (high)	Noise	Adverse, Moderate	-ve	D	T	IR	St
SRE (high)	Noise	Negligible to Adverse, Minor	-ve	D	T	IR	St
SRF (high)	Noise	Adverse, Minor	-ve	D	T	IR	St
All SRs	Vibration	Negligible	n/a	D	T	IR	St
All SRs	Road Traffic Noise	Negligible	n/a	D	T	IR	St
Completed Development							
Residential Amenity	Internal	n/a	n/a	n/a	n/a	n/a	n/a
Residential Amenity	External	n/a	n/a	n/a	n/a	n/a	n/a
All SRs	Building Services Plant Noise	Negligible	n/a	D	P	IR	Lt
All SRs	Noise from Non-Residential Uses and Servicing	Negligible	n/a	D	P	IR	Lt
All SRs	Road Traffic Noise	Negligible	n/a	D	P	IR	Lt

Notes:
***Nature = Beneficial or Adverse;
**Scale = Negligible / Minor / Moderate / Major
D = Direct / I = Indirect;
P = Permanent / T = Temporary;
R = Reversible / IR= Irreversible;
St = Short Term / Mt = Medium Term / Lt = Long Term.
n/a = not applicable

LIKELY SIGNIFICANT EFFECTS

8.97 Likely significant residual effects are anticipated in respect of demolition and construction related noise at SRA, SRB, SRC, SRD and SRG. The likely significant residual effects are classified as being a**dverse, direct, temporary (short-term) and irreversible and moderate** in scale. It is not uncommon for significant effects to be identified as a result of demolition and construction related works on sites such as this within a dense urban environment and needs to be expected as a consequence of urban regeneration. As discussed throughout this chapter, noise will be controlled as far as is reasonably practicable through the adoption of best practicable means.

CUMULATIVE EFFECTS ASSESSMENT

Demolition and Construction

8.98 Of the cumulative schemes considered in this assessment, which are set out in **ES Volume 1, Chapter 2: EIA Methodology**, based upon professional judgment, when considering noise and vibration resulting from the actual physical demolition and construction works, only those within 100 m of the site (and assuming that all cumulative schemes would be implemented at the same time as each other and the Proposed Development) would have the potential to result in likely cumulative effects.

8.99 Only four cumulative schemes Ref. 1 (Land at Camberwell Area Housing Office), Ref. 14 21-23 Parkhouse Street, Ref. 16 49-65 Southampton Way and Ref. 17 66 Wells Way and 41 and 43 Parkhouse Street are located within 100 m of the site.

8.100 In the event that these cumulative schemes are constructed concurrently with the Proposed Development, cumulative adverse noise and vibration effects could occur.

8.101 Should works be undertaken concurrently, provided EMPs are implemented at all sites, the likely cumulative effects in relation to construction generated noise and vibration are expected, at worst, to be temporary, local, adverse and moderate adverse (significant).

8.102 In relation to cumulative construction related road traffic noise, each cumulative scheme (as per the Proposed Development) would be required to implement its own CLP including consideration of concurrent construction schemes to minimise the combined effects of construction road traffic. A combined management strategy shared by all developers may also be used, as far as reasonably practicable, to minimise cumulative adverse road traffic noise effects. Consequently, the likely cumulative effects from construction traffic noise are likely to be **negligible** (not significant).

Completed Development

8.103 It is considered that all of the cumulative schemes, with the exception of cumulative schemes Ref. 1, Ref. 14, Ref. 16 and Ref. 17 are too distant from the SRs to cause any significant cumulative effects in terms of noise and vibration with the completed and operational Proposed Development.

8.104 Noise from fixed plant associated with these close by cumulative schemes would be subject to a standard planning condition based upon the guidance provided in BS 4142 and in line with the LBS's requirements. Such a planning condition would limit noise generated by fixed mechanical plant and building services so that it would not increase the existing background noise level. As such, cumulative noise from fixed plant from all cumulative schemes and the Proposed Development would be **negligible** (not significant).

8.105 It is considered that noise associated with non-residential uses and servicing for the close by cumulative schemes would be subject to the same controls as the Proposed Development and as such residual cumulative effects in relation to non-residential uses and servicing noise would be **negligible** (not significant).

8.106 The road traffic data used to establish the likely significant road traffic noise effects of the Proposed Development has already accounted for the cumulative schemes set out in **ES Volume 1, Chapter 2 EIA Methodology**. Therefore, the traffic data presents the results of a comprehensive cumulative road traffic noise assessment and it is considered that the likely cumulative effects of traffic noise from the Proposed Development and the cumulative schemes would be equivalent to the identified residual effects presented in this chapter for the Proposed Development, which were assessed to be **negligible** and so not significant.

DESIGN CHANGES POST EIA

8.107 The noise and vibration impact assessment presented within this chapter of the ES has been based on a design for the Proposed Development issued by HTA (the architects) on 27th October 2017. Following this information release, there was a requirement for further pre-application consultation with the LBS and other consultees on the scheme. This resulted in some design amendments which have been factored into the scheme that has been submitted for planning.

8.108 The design amendments can be summarised as follows:

a) Block K: the addition of a single set back storey;

b) Blocks D, E, G, J and K: the removal of a single storey to reduce height;

c) Blocks F, G, H and I: the first-floor commercial uses switched to residential use;

d) Block B: Moved slightly to the west to facilitate vehicular access to Blocks A and B;

e) Block D rotated to align with the adjacent red line boundary to the south-west to improve the proportions of the central space and increase visibility of the chimney from Parkhouse Street; and

f) A reduction in commercial floorspace across the entire Proposed Development from 6,382 m^2 GIA to 4,062 GIA m^2.

8.109 The design amendments have been reviewed by Waterman Infrastructure & Environment Ltd and are 'non-material' in that they do not have an effect on the conclusions presented within this ES chapter.

8.110 The massing related changes (a-e above) do not alter the bulk and height of the scheme sufficiently to have any bearing on the contour plots for the Proposed Development which have been generated using the software package CadnaA. As such, the layout of the scheme and the bulk / massing and height largely remain consistent with that presented within the CadnaA contour plots. On this basis the results and conclusions drawn with regard to residential amenity, both internal and external and so the site's suitability for redevelopment for the uses proposed remains valid.

8.111 Peter Brett Associates have confirmed that the changes to the amount of commercial floorspace proposed (i.e. the reduction described at f) above) does not have a material impact on the trip generation. The fact that the commercial floorspace quantum has reduced means that the trip generation considered within the road traffic noise assessment presented within this ES chapter considers a worst case (i.e. it assesses a trip generation that is higher than would be for the floorspace proposed).

8.112 Additional design amendments were made in July 2018. These amendments can be summarised as follows:

a) Block A moved westward to follow line of red line boundary;

b) Block B existing structure being retained and refurbished;

c) Block D increased on north-east corner by 1 storey;

d) Block G reduced by 1 storey;

e) Block I reduced by 2 storeys;

f) Block J increased by 1 storey and 1 set-back storey;

g) Block K increased by 1 set-back storey;

h) An increase in commercial floorspace across the entire Proposed Development from 4,062 m^2 GIA to 4,490 GIA m^2.

8.113 The design amendments have been reviewed by Waterman Infrastructure & Environment Ltd and are again 'non-material' in that they do not have an effect on the conclusions presented within this ES chapter. The façade noise mapping has been updated to reflect the massing changes made across the Proposed Development.

8.114 Based on the above, the results presented in this ES chapter are representative of the Proposed Development submitted for planning and as such, the results and conclusions of the noise and vibration impact assessment (as presented within this ES chapter) remain valid irrespective of the design amendments summarised above.