10 Noise and Vibration

10.1 Introduction

10.1.1 This chapter of the ES has been prepared by Mayer Brown Ltd and assesses the potential noise and vibration effects of the Development, including:

- 'direct' effects (e.g. as a result of the construction of the Development); and
- 'indirect' effects (e.g. as a result of changes in traffic patterns on existing roads).

10.1.2 In addition to the noise and vibration effects of the Development on existing receptors neighbouring the Site, this chapter also considers the significance of noise and vibration levels affecting the Site and its 'suitability' for the Development.

10.1.3 The chapter is accompanied by the following figures:

- Figure 10.1: Identified Noise Sensitive Receptors;
- Figure 10.2: Noise Monitoring Positions;
- Figure 10.3: Baseline Noise Model – Daytime;
- Figure 10.4: Baseline Noise Model – Night-time;
- Figure 10.5: Zoning of Glazing;
- Figure 10.6: Operational Noise Model – Daytime;
- Figure 10.7: Operational Noise Mode – Night-time;
- Figure 10.8: External Amenity Area Assessment; and

10.1.4 This chapter is supported by Appendix 10.1: Noise and Vibration Assessment.

Competence

10.1.5 The principal author of this chapter is Paul Gray BSc (Hons), MIOA. Paul is a highly experienced acoustic consultant, with over 29 years' expertise covering all aspects of noise and vibration assessment, including environmental noise and vibration, architectural acoustics, building services acoustics and industrial noise and vibration. Paul is a corporate Member of the Institute of Acoustics.

10.2 Legislation, Planning Policy and Guidance

Legislation Context

- The Control of Pollution Act 1974[1];
- The Environmental Protection Act 1990[2];
- The Building Regulations 2010[3]; and
- Noise Insulation Regulations 1975[4].

Planning Policy Context

National

10.2.1 The following national planning policy is relevant to the Development:

- The National Planning Policy Framework (NPPF)[5] (updated February 2019)[6].

Regional

10.2.2 The following regional planning policy is relevant to the Development:

- The London Plan (2016)[7];
- Draft New London Plan showing minor suggested changes (2018)[8];
- The Mayor's Ambient Noise Strategy, 2004[9] (the 'Mayor's Noise Strategy).

Local

10.2.3 The following local planning policy is relevant to the Development:

- LB Barnet Local Plan – Core Strategy (2012)[10];
- LB Barnet Local Plan – Development Management Policies (2012)[11]; and
- Sustainable Design and Construction Supplementary Planning Document (2016)[12].

Guidance

10.2.4 The following guidance is relevant to the Development:

- Noise Policy Statement for England, 2010[13];
- Planning Practice Guidance (Live Document)[14];
- BS7445-1:2003[15]: Description and measurement of environmental noise. Guide to quantities and procedures, gives guidance on quantities and procedures for description and measurement of noise in community environments;
- BS8233:2014: Sound Insulation and Noise Reduction for Buildings[16];
- BS4142:2014[17]: Methods for Rating and Assessing Industrial and Commercial Sound;
- BS6472:2008[18]: Guide to Evaluation of Human Exposure to Vibration in Buildings: Part 1 - Vibration Sources Other Than Blasting;
- ISO 9613-1:1993[19]: Acoustics -- Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere and Part 2: General method of calculation;
- BS EN 12354-3:2000[20]: Estimation of acoustic performance of buildings from the performance of elements- Part 3: Airborne sound insulation against outdoor sound;
- BS5228-1:2009+A1:2014[21]: Code of practice for noise and vibration control on construction and open sites. Noise;
- BS5228-1:2009+A1:2014[22]: Code of practice for noise and vibration control on construction and open sites. Vibration; and
- BS7385-2:1993[23] Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.

Other Guidance

10.2.5 The assessment has had regard to the following guidance documents:

- Calculation of Railway Noise, 1995[24];
- Calculation of Road Traffic Noise, 1998[25];
- Design Manual for Roads and Bridges, Volume 11 – Environmental Assessment, 2011[26];
- Guidelines for Community Noise, World Health Organisation (WHO), 1999[27]; and
- Night Noise Guidelines for Europe, WHO, 2009[28].

10.3 Assessment Methodology

10.3.1 The following section outlines the methodologies applied to identify and assess the potential noise and vibration impacts and likely effects to result from the Development during demolition and construction, and once the Development is fully complete and operational.

Consultation

10.3.2 As set out in Chapter 2: EIA Methodology, a scoping note was submitted to the GLA, which confirmed topics that would be assessed during the EIA process. The scope and approach for this assessment was informed by an earlier scoping study, subsequent 2016 ES (as amended) and 2017 ES (as amended). LB Barnet and the GLA did not raise any additional potential effects for consideration during the EIA process and therefore the proposed scope was considered to be acceptable for the Development.

10.3.3 Table 10.1 summarises key comments raised by consultees of relevance to this assessment and how the assessment has responded to them.

Table 10.2: Consultation Response Summary

Consultee (Date) and Comment	Response
LB Barnet – Scoping Opinion	
The Report acknowledges that the main potential noise and vibration risk associated with the site relates to the placement of new residents within a site which is currently subject to high noise due to the adjoining major transport infrastructure. Potential Operation impacts and temporary construction noise effects have also been acknowledged as requiring consideration. The Report been assessed by the Local Authority's Environmental Health department who have raised no objection to the proposed noise and assessments for the Environment Statement.	The proposed scope of assessment and assessment methodologies for the EIA were confirmed to be acceptable and form the basis of this Chapter of the ES.
Consultation Response from LB Barnet (13 March 2017)	
Concerns raised about high noise levels from traffic: "As soon as windows on the facades of the M1 and A1 are opened, internal noise levels are likely to be poor. Can windows on the facade of the motorways be fixed close? I also had question about whether the units were single and dual aspect, as potentially air could be brought in from a window furthest from the road."	The scheme includes alternative means of ventilation (MVHR) which will fulfil the statutory whole house and extract ventilation requirements of Approved Document F of the Building Regulations (as amended), and will also provide for mechanical purge ventilation. As such, there is no 'need' for windows to be opened on the noisy elevations of the building, other than as might be instigated at the occupants own choice. The scheme generally provides dual aspect units. However, there are a number of single aspect units. Where possible, these will be located on the internal courtyard side of the scheme. All units will provide the ability to have air brought into the

Consultee (Date) and Comment	Response
	dwellings from the courtyard, i.e. windows furthest from the road.

Study Area and Scope

10.3.4 The principal study area was the Site, in line with scoping discussions with LB Barnet which identified that the main potential noise and vibration risk associated with the Site relates to the placement of new residents in an area currently subject to high noise due to the adjoining major transport infrastructure. The study area for operational effects, e.g. direct and indirect effects of the local road network, aligns with the transport assessment study area (Chapter 7: Traffic and Transport). The study area for the construction assessment includes those areas with the potential to be affected.

10.3.5 In line with scoping discussions with LB Barnet, the principal noise sensitive receptors were identified as the new dwellings that will be created by the Development. Off-site noise sensitive receptors were identified from satellite imagery of the area and observations made during site/area walkovers.

10.3.6 In line with scoping discussions with LB Barnet, potential effects associated with the Development include:

- general environmental noise and vibration effects on the proposed dwellings to be created by the operation of the Development (i.e. traffic, proposed plant);
- direct operational noise effects arising from commercial / community uses within the Development (i.e. due to the operation of building services systems and operational noise associated with proposed building usage);
- indirect operational noise effects (i.e. as a result of changes in traffic flows on existing roads);
- direct noise and vibration effects during the construction phase of the development (i.e. due to noise and vibration from demolition / construction plant and equipment); and
- indirect noise and vibration effects during the construction phase of the development (i.e. as a result of construction noise on neighbouring roads).

Establishing Baseline Conditions

10.3.7 The baseline noise model is based on environmental noise survey work undertaken by Mayer Brown Ltd; topographical survey data for the Site and its environs; traffic survey data provided by Velocity Transport Consultants as set out in the Transport Assessment and general observations made during Site visits.

10.3.8 Existing baseline noise conditions at the Site were established using a combination of automated and manned noise surveys.

10.3.9 Automated noise monitoring was undertaken at the Site to provide detailed information relating to the diurnal fluctuation of noise levels characterising the Site and its environs. Full details of monitoring locations, the survey procedure, equipment used and measurement results are presented in Appendix 10.1.

10.3.10 Additional manned noise measurements were undertaken at the Site in accordance with the 'shortened measurement procedure' of the 'Calculation of Road Traffic Noise', to provide additional information relating to baseline traffic noise levels.

10.3.11 A baseline noise model of the Site and surrounding area was developed using CadnaA® noise modelling software. This software implements calculation methodologies of ISO 9613 for calculation of outdoor sound propagation, the 'Calculation of Road Traffic Noise' (CRTN) and 'Calculation of Railway Noise' (CRN).

10.3.12 The noise model includes noise from the principle noise sources affecting the Site and surrounding area including the M1 motorway, A1 (Watford Way / Barnet By-Pass), Bunn's Lane and other local roads, based on the traffic flow data presented in the Transport Assessment for the Development (Appendix 7.1). The baseline model was validated against the baseline environmental survey work.

Identifying Likely Significant Effects

Demolition and Construction Noise and Vibration

10.3.13 Demolition and construction effects were assessed based on phasing and work stage programming (Appendix 5.1). The construction period is taken to commence in the third quarter of 2019 with completion in the third quarter of 2023.

10.3.14 Noise levels were predicted in line with the methodologies set out in BS 5228-1:2009+A1:2014, as set out in Mayer Brown Limited's 'Noise and Vibration Assessment Report' (Appendix 10.1).

10.3.15 The effect of temporary construction traffic was assessed based on traffic flow projections provided by Velocity Transport Consultants. The significance of effects is assessed on the basis of the short term change in ambient noise levels, in line with the DMRB assessment method.

10.3.16 Vibration effects were assessed on the basis of a scoping assessment in line with the guidance and recommendations of BS 5228-2:2009+A1:2014.

Completed Development

Noise Assessment

10.3.17 The operational noise model is based on the current architectural design of the Development and forecast traffic flows (including committed development) for future years of 2021 and 2026. Since the GLA call in of the planning application, further discussion with the GLA and TfL were undertaken and this approach was agreed, as set out in Chapter 7: Traffic and Transport.

Vibration Assessment

10.3.18 The Midland Mainline railway is located approximately 65m from the proposed build line of the closest residential building. Based on professional opinion, vibration associated with train movements at this distance is considered unlikely to cause vibration that will be of a sufficient magnitude that would be likely to attract adverse comment from the occupants of the proposed flats or present a risk of cosmetic/structural damage to proposed buildings. As such, the assessment of vibration impacts was scoped out of this chapter

Cumulative effects

10.3.19 The effects of the Development in combination with those which are reasonably foreseeable within the identified assessment years, were assessed within this study by the inclusion of the traffic associated with these schemes within the future year scenarios. The details of the schemes included in the cumulative assessment are is set out within Chapter 3: EIA Methodology.

Determining Effect Significance

10.3.20 In order to understand the assessment presented in this chapter, it is useful to highlight the distinction between noise and vibration 'impacts' and 'effects':

- Impact: The introduction of a new sound or vibration into an existing environment; and
- Effect: the noise effect on the receptor subject to an impact. The noise effect is therefore linked to the level of the impact, the sensitivity of the receptor and other key matters such as the existing acoustic environment.

10.3.21 It follows therefore that:

- an impact is a change in the environment;
- an effect is what results from an impact on a receptor; and is dependent on the receptor and its sensitivity; and
- as an effect increases in level, so the effect increases either in terms magnitude (e.g. noise change) or in terms of the number of receptors adversely affected (or both), to a point where either the level of exposure or the number of receptors exposed reach a point where the assessment needs to report the outcome as being significant.

10.3.22 Noise and vibration effects may be either 'adverse' (i.e. resulting from an increase in sound level) or 'beneficial' (i.e. resulting from a decrease in sound level).

10.3.23 Consideration was also given as to whether any effect will be 'temporary' or 'permanent'.

Sensitivity of Receptor

10.3.24 Table 10.3 provides the descriptors of receptor sensitivity used in this assessment.

Table 10.3: Receptor Sensitivity Descriptors

Value (Sensitivity)	Descriptor
High	Residential dwellings (existing and proposed), schools, child care facilities/nurseries, hospitals, places of worship, theatres, auditoria.
Medium	Offices and similar commercial uses, sports facilities (where spectator noise is not a feature of the operational characteristics, hospitality uses (non-residential).
Low	Industrial and working environments characterised by high operational noise levels, sports facilities (where spectator noise is a feature of the operational characteristics), retail uses.

Magnitude of Impact

10.3.25 The magnitude of impact was defined in the assessment as set out in Table 10.4. These terms aligned with the concepts of the 'No Observed Effect Level' (NOEL), 'Lowest Observed Adverse Effect Level' (LOAEL) and 'Significant Observed Adverse Effect Level' (SOAEL) implemented in the NPPF, NPPG, the Noise Policy Statement for England and supporting guidance in the LB Barnet's Sustainable Design and Construction SPD.

Table 10.4: Magnitude of Impact Descriptors

Value	Descriptor	Effect Level*
Negligible	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	Below LOAEL

Value	Descriptor	Effect Level*
Low	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Between LOAEL and SOAEL
Medium	The noise causes a material change in behaviour and / or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Above SOAEL
High	Extensive and regular changes in behaviour and / or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect

*Relative to NPPF, NPPG, NPSE and LB Barnet guidance.

10.3.26 The NPSE highlights that it is not possible to have a single objective noise-based measure that defines noise effect levels. In determining the potential effect level, reference was made to the following objective assessment criteria.

Demolition and Construction Noise

10.3.27 For this type of development, it is suggested that the potential effects of construction noise are most appropriately assessed by reference to fixed noise limits, as promoted in Annex E.2 of BS 5228-1:2009 +A1:2014: 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise'. This states:

"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. […] Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;

75 decibels (dBA) in urban areas near main roads in heavy industrial areas."

10.3.28 Since the Development is located adjacent to main roads, a value of 75 dB $L_{Aeq,12hours}$ was considered to represent the SOAEL for construction noise.

10.3.29 The LOAEL was taken to 55dB $L_{Aeq,12hours}$, being aligned with the upper guideline value for daytime noise level determined WHO guidance for external daytime environmental noise levels of 55 dB $L_{Aeq,16hr}$.

10.3.30 Whilst construction noise will be temporary, the effect of such noise will also be influenced by the duration of the works, i.e. the greater the period of noise exposure, the greater the potential effect on neighbouring receptors. Based on advice given in Annex E of BS 5228-1, additional significance was given to an effect exceeding the SOAEL of 75dB, where such a noise magnitude was predicted to occur on 10 or more days of working in any 15 consecutive days, or for a total of 40 days in any six-month period.

10.3.31 Combining the above magnitude and temporal criteria gives the refined noise effect matrix for construction noise, as set out in Table 10.5.

Table 10.5: Definitions of Magnitude of Impact – Construction Noise

Combined Noise Magnitude and Temporal Criteria	Magnitude of Impact
Daytime noise level less than 55dB $L_{Aeq,T}$	Negligible
Daytime noise level between 55 and 75 dB $L_{Aeq,T}$	Low
Daytime noise level greater than 75 dB $L_{Aeq,T}$ (for a period less than 10 days of working in any 15 consecutive days, or for a total of less than 40 days in any six month period).	Medium
Daytime noise level greater than 75 dB $L_{Aeq,T}$ (for a period more than 10 days of working in any 15 consecutive days, or for a total of more than 40 days in any six month period).	High

Construction Vibration

10.3.32 Two potential effects of construction vibration were assessed – (a) the potential effect of vibration on the structure of neighbouring buildings, and (b) the potential effect of vibration on occupants within those buildings.

10.3.33 With regard to buildings, vibration can potentially cause cosmetic damage and in the extreme, structural damage. Criteria for a 'significant' vibration effect were aligned with guidance for cosmetic damage set out in BS 5228-2. Such criteria should safeguard building from structural damage, whilst vibration below the threshold was defined as negligible since there would be no effect. Adopted values are presented in Table 10.6.

Table 10.6: Vibration Thresholds for Cosmetic Damage to Buildings

Type of Building	Peak Particle Velocity (PPV) in Frequency Range of 4 Hz to 15 Hz	Peak Particle Velocity (PPV) in Frequency Range of 15 Hz and Above
Reinforced or framed structures	50 mm/s at 4 Hz and above	
Industrial and heavy commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz.	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above.

10.3.34 The potential effect of vibration on occupants within buildings was assessed based on the guidance of Annex B of BS 5228-2, as set out in Table 10.7.

Table 10.7: Definitions of Magnitude of Impact – Construction Vibration: Human Comfort

Peak Particle Velocity (PPV)	Impact	Magnitude of Impact
0.14mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible
0.3 mm/s	Vibration might be just perceptible in residential environments	Low
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Medium
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.	High

General Environmental Noise (Noise Sensitive Receptors)

10.3.35 The LOAEL and SOAEL values for general environmental noise were determined from LB Barnet's Sustainable Design and Construction SPD, as set out in Table 10.8.

Table 10.8: Definitions of Magnitude of Impact

Noise source	Assessment Location	LOAEL	SOAEL	Times
General environmental noise, road traffic, rail traffic	Site	50 dB $L_{Aeq,16hr}$	63 dB $L_{Aeq,16hr}$	07:00 to 23:00
	Site	40 dB $L_{Aeq,8hr}$	55 dB $L_{Aeq,8hr}$	23:00 to 07:00

10.3.36 The above definitions were adopted for quantifying general environmental noise effects.

Indoor Ambient Noise Levels (Dwellings)

10.3.37 BS 8233: 2014 'Sound Insulation and Noise Reduction for Buildings' offers the following design guidance in Table 10.9 for indoor ambient noise levels within dwellings.

Table 10.9: BS 8233: 2014 Guidance

Activity	Assessment Location	07:00 to 23:00	23:00 t0 07:00
Resting	Living Room	35dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$

10.3.38 A footnote to the above guidance indicates that where 'development is considered necessary or desirable', the above guideline values can be relaxed by 5dB and 'reasonable' internal conditions still be achieved.

10.3.39 The World Health Organisation's 'Guidelines for Community Noise' recommend that maximum noise levels in bedrooms do not normally exceed a value of 45dB LAmax, for more than 10-15 times per night.

10.3.40 The following definitions of LOAEL and SOAEL in Table 10.10 were adopted for quantifying indoor ambient noise level effects.

Table 10.10: Definitions of Magnitude of Impact – Indoor Ambient Noise Levels (Dwellings)

Noise Source	Assessment Location	LOAEL	SOAEL	Times
General environmental noise, road traffic, rail traffic	Living Room	35dB $L_{Aeq,16hour}$	48dB $L_{Aeq,16hour}$	07:00 – 23:00
	Dining Room / Area	30dB $L_{Aeq,16hour}$	40dB $L_{Aeq,16hour}$	23:00 – 07:00

External Noise Levels – Residential Amenity Spaces

10.3.41 The World Health Organisation's 'Guidelines for Community Noise' state:

'During the daytime, few people are seriously annoyed by activities with L_{Aeq} levels below 55dB; or moderately annoyed with L_{Aeq} levels below 50dB'.

10.3.42 Guidance in BS 8233: 2014 states:

'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 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.'

10.3.43 The definitions of LOAEL and SOAEL set out in Table 10.11 were adopted for quantifying the effect of noise on outdoor noise level effects.

Table 10.11: Definitions of Magnitude of Impact – External Amenity Areas

Noise Source	Assessment Location	LOAEL	SOAEL	Times
General environmental noise, road traffic, rail traffic	Outdoor Amenity Space	55dB $L_{Aeq,16hour}$	63dB $L_{Aeq,16hour}$	07:00 to 23:00

10.3.44 In addition to considering the magnitude of noise in line with the quantitative values of Table 10.11, the significance of the effect was also assessed taking into account the guidance of paragraph 010 of the NPPF. The assessment will be based on professional judgement to take into account the potential off-set in noise effect that may be indicated if residents have access to:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;

- a relatively quiet external amenity space for their sole use, e.g. a garden or balcony. Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;
- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;
- a relatively quiet, protected, external publicly accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).

10.3.45 The following definitions of LOAEL and SOAEL in Table 10.12 were adopted for quantifying the effect of noise on outdoor noise level effects.

Table 10.12: Definitions of Magnitude of Impact – Outdoor Noise Levels

Noise Source	Assessment Location	LOAEL	SOAEL	Times
Commercial noise or noise of industrial nature (not anonymous	Facade	$L_{Ar,Tr}$ ~ b/g dB	$L_{Ar,Tr}$ ~ b/g +10 dB	Noise source hours of operation
	Habitable Room	Rating level 35 dB $L_{Aeq,1hour}$	Rating level 45 dB $L_{Aeq,1hour}$	07:00 to 23:00
	Habitable Room	Rating level 30 dB $L_{Aeq,15mins}$	Rating Level 40 dB $L_{Aeq,15mins}$	23.00 to 07.00

Entertainment Noise

10.3.46 Whilst there is a general acceptance that entertainment noise has the potential to cause significant noise disturbance to residential neighbours, the question of what constitutes an 'acceptable' level of entertainment noise is a much debated subject amongst acousticians and environmental health practitioners. In the absence of any British or International Standard that offer quantitative advice relating to the determination of 'significant' effects, assessment criteria was aligned with the subjective criteria, set out in Table 10.13.

Table 10.13: Definitions of Magnitude of Impact – Entertainment Noise

Noise source	Assessment location	LOAEL	SOAEL	Times
Entertainment noise from licensed premises	Habitable Room	Inaudible	Audible	Most sensitive

Noise Level Change – Road Traffic

10.3.47 Changes in road traffic noise as a result of additional traffic associated with the complete Development were assessed by considering the increase in traffic flows and factoring in 15 years growth in line with the principles described in CRTN and DMRB.

10.3.48 The criteria for the assessment of traffic noise changes arising from the Development were taken from Table 3.1 (short-term changes) and Table 3.2 (long-term changes) of DMRB and are summarised in Table 10.14.

Table 10.14: Definitions of Magnitude of Impact – Change in Traffic Noise Level

Change in Traffic Noise Level, LA10,18hour dB (Short Term)	Change in Traffic Noise level, LA10,18hour dB (Long Term)	Magnitude of Impact
0	0	No Change
0.1 – 0.9	0.1 – 2.9	Negligible
1 – 2.9	3 – 4.9	Low
3 – 4.9	5 – 9.9	Medium
5+	10+	High

Non-Residential Premises

10.3.49 For non-residential receptors, significant effects were determined by taking into account:

- the type of effect being considered;
- the magnitude of the effect;
- the design of the receptor affected;
- the existing ambient sound and vibration levels in the receptor affected;
- the use and sensitivity of the receptor;
- the frequency and duration over which temporary construction effects may occur; and
- the effectiveness of mitigation through design or other means.

Evaluation of Significance

10.3.50 Table 10.15 demonstrates how the significance of effects were justified against the magnitude of impacts and the sensitivity of the receptor.

Table 10.15: Definitions of Magnitude of Impact – Entertainment Noise

Sensitivity/Value of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible

Evidence Assumptions and Limitations

10.3.51 The potential significance of the effects was assessed by reference to:

- the results of environmental noise survey work to establish existing baseline noise conditions;
- computational acoustic modelling of the baseline noise environment;
- environmental design and management measures (e.g. the massing of buildings, design of external building fabric elements) that will be implemented within the scheme design;
- traffic flow data advised by Velocity Transport Consultants (and resultant increases in noise levels);
- computational acoustic modelling of the completed Development; and

- construction phase work stage programming and plant selection assumptions;

10.3.52 Since noise and vibration decay with distance from a noise/vibration source, any off-Site effects due to the Development will be experienced at the closest noise sensitive receptors to the Site. As such, in order to determine the potential direct noise effects of the Development, it is considered adequate to consider the potential effect on the closest receptor. Notwithstanding this, this chapter also gives consideration to the potential indirect effects that may arise due to changes in noise level associated with changes in vehicle movements on the local road network.

10.4 Baseline Conditions

Sensitive Receptors

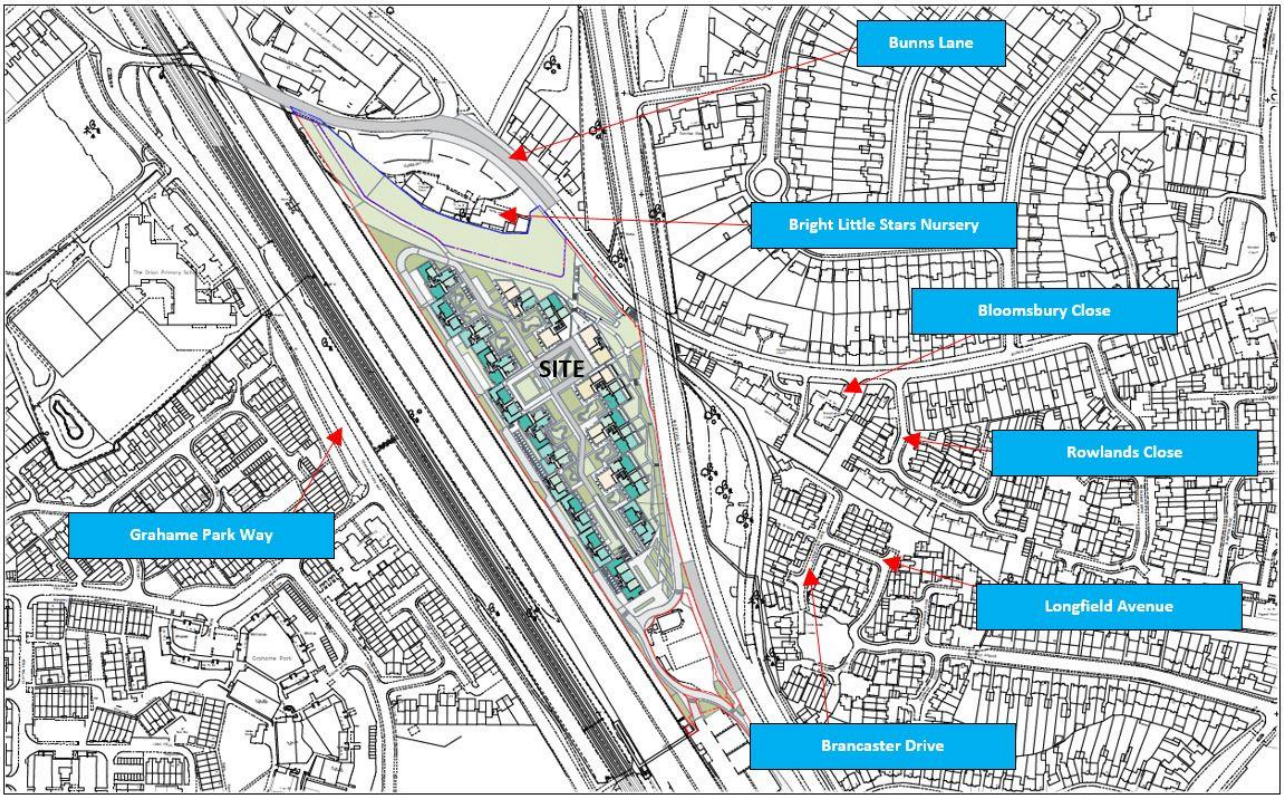
10.4.1 The closest noise and vibration sensitive receptors are set out in Table 10.16.

Table 10.16: Receptor Sensitivity

Receptor	Sensitivity / Value of Receptor
The proposed residential dwellings within the Development	High
Residential properties in Dove Close and fronting Bunns Lane to the north	High
'Bright Little Stars Nursery' on Bunns Lane to the north (childcare nursery)	High
Residential properties fronting Grahame Park Way to the west	High
Residential properties in Brancaster Drive, Longfield Avenue, Rowlands Close and Bloomsbury Close to the east.	High
Other existing residential properties fronting other roads in the vicinity of the Site which may be subject to changes in traffic flows associated with the Development and the cumulative effect of such traffic changes due to other committed development in the area.	High

10.4.2 These locations of these receptors are shown in Figure 10.1.

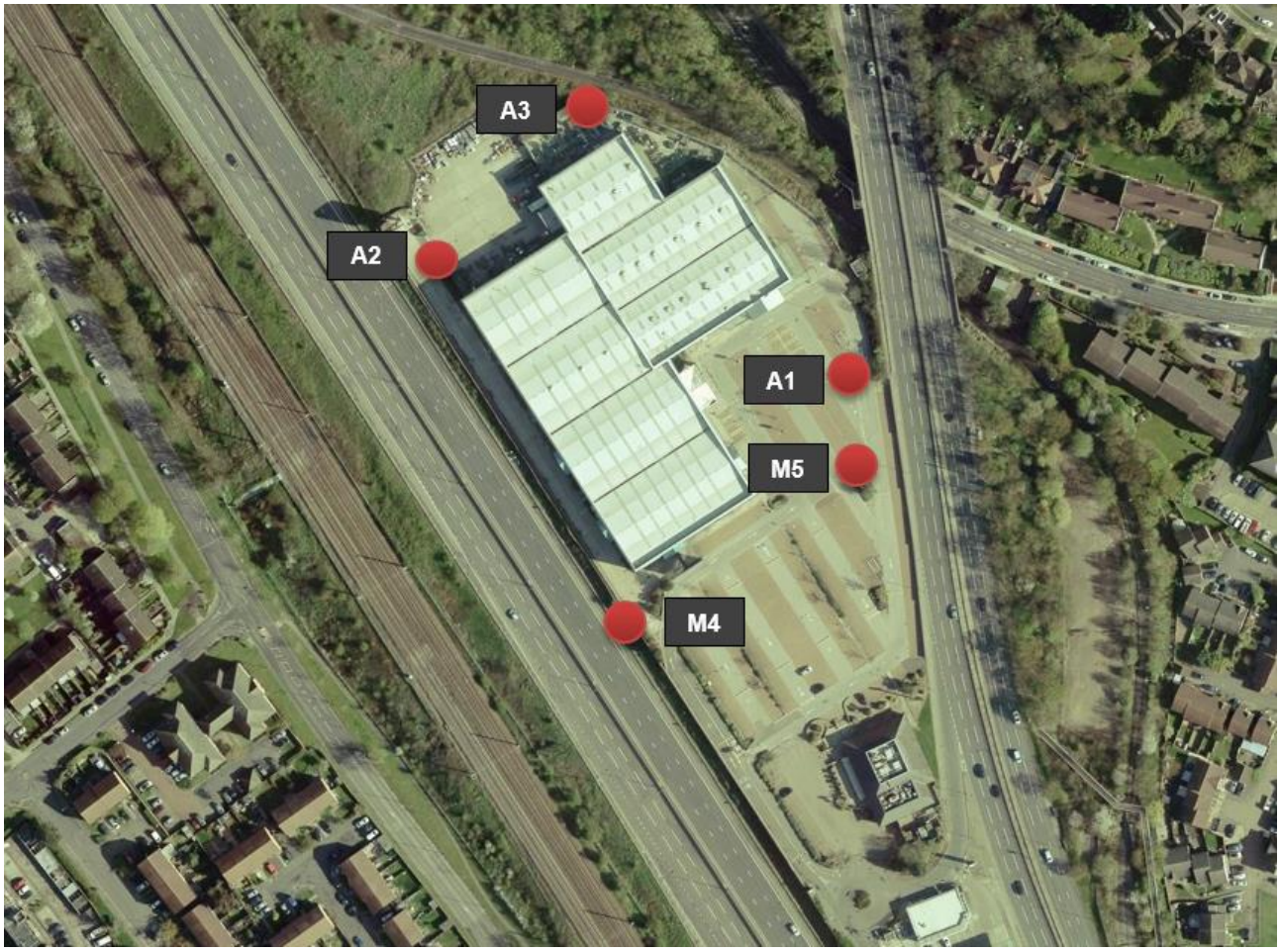
Figure 10.1: Identified Noise Sensitive Receptors



Baseline Noise Surveys

10.4.3 The approximate location of noise monitoring positions is shown in Figure 10.2.

Figure 10.2: Noise Monitoring Locations



10.4.4 Noise levels across the Site are dominated by local road traffic. The highest noise levels are experienced on the western side of the site overlooking the M1 motorway. Noise levels at this location are also influenced by railway noise, but the dominant noise source is assessed to be attributable to vehicular road traffic.

10.4.5 Noise levels attenuate naturally over distance and the screening from intervening buildings.

10.4.6 The lowest noise levels are typically measured at the northern boundary of the site, further from neighbouring roads.

Computational Noise Modelling

10.4.7 A baseline noise model of the Site and surrounding area was developed using CadnaA® noise modelling software. The baseline model is shown in Figures 10.3 and 10.4.

Figure 10.3: Baseline Noise Model - Daytime

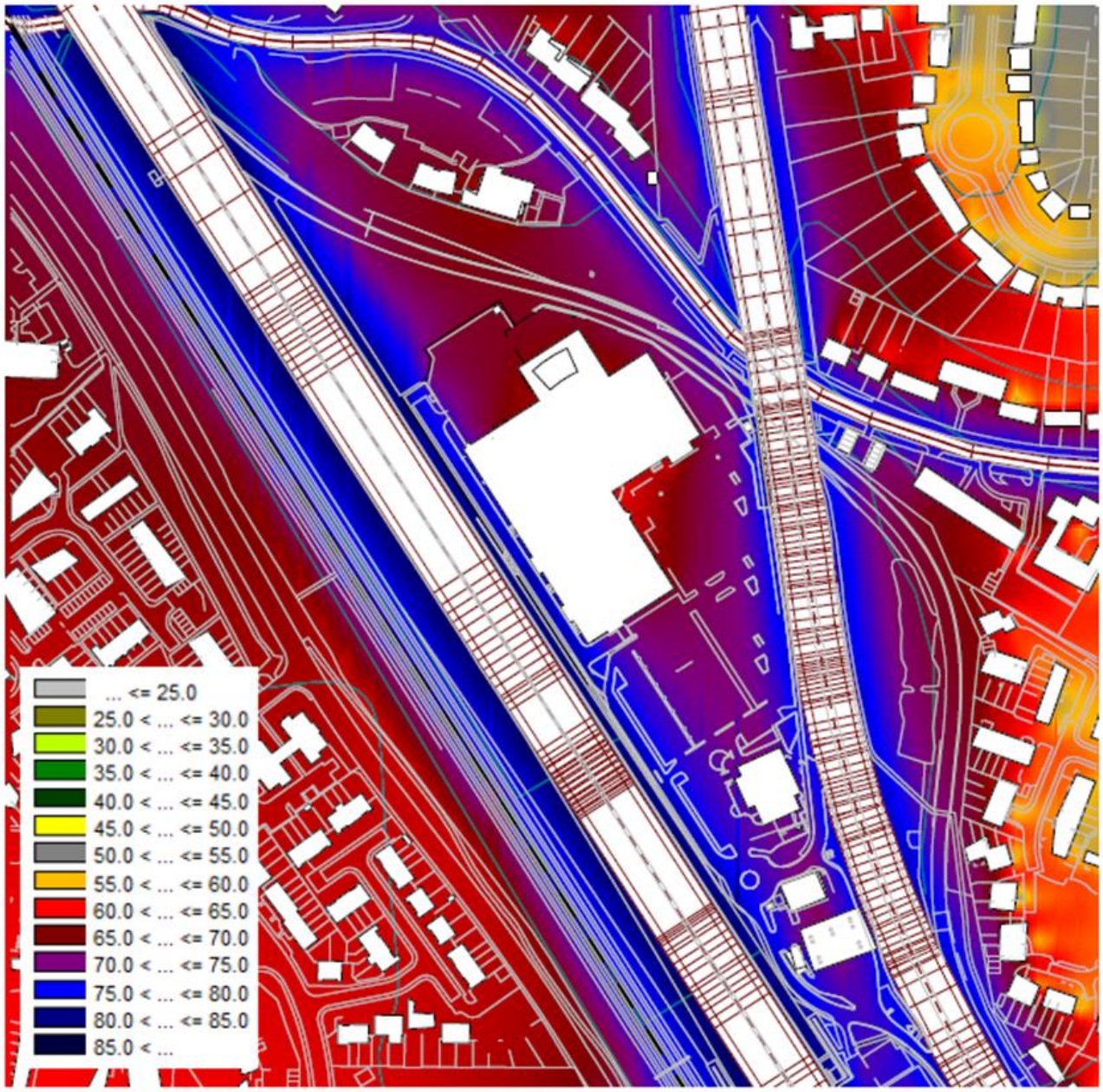
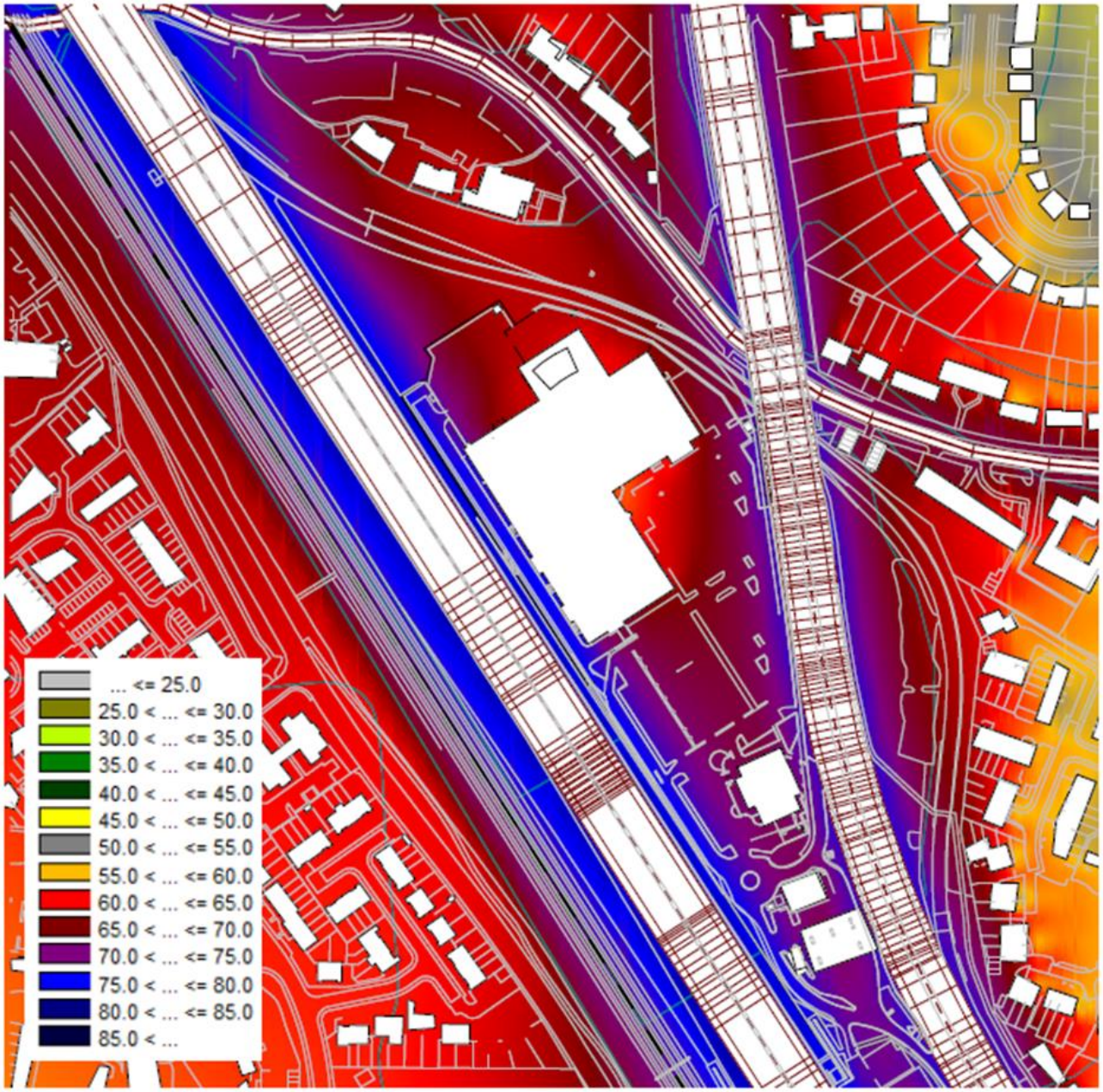


Figure 10.4: Baseline Noise Model – Night-time



Future Baseline

10.4.8 Future baseline noise levels (without the Development) are likely to be determined by natural traffic flow growth on neighbouring roads and any increased local traffic generation associated with specific committed development in the vicinity of the Site. Based on information contained within the Transport Assessment prepared by Velocity Transport Consultants, baseline noise conditions in 2021 are likely to be around 0.2dB higher than existing baseline conditions, whilst in 2026 baseline values will be in the order of 0.4 higher than current baseline values. A detailed assessment of these increases is presented in the Noise and Vibration Assessment Report (Appendix 10.1).

10.4.9 Assessed in line with DMRB guidance, the long-term change in road traffic noise levels would be assessed to have a negligible impact.

Summary of Receptor Sensitivity

10.4.10 Noise sensitive receptors are summarised in Table 10.16. All identified receptors are considered to have a high sensitivity to noise. Since the impact of any future change in baseline noise levels is

negligible, there will be no change to the future sensitivity of the identified receptors that may influence the noise impact assessment.

10.5 Scheme Design and Management

Demolition and Construction

10.5.1 Noise effects during the construction phase of the Development will be mitigated through the implementation of appropriate management controls as part of a CEMP, including:

- a general need for any contractor to implement the 'best practicable means' for undertaking the works in line with the general guidance of BS5228:2009+A1:2014 (Parts 1 and 2);
- the use of prefabricated materials wherever possible;
- optimising the Site layout to locate noise generating activities as far as possible away from sensitive receptors;
- good housekeeping and management;
- review of plant and activities to ensure noise minimisation measures are in place and operating;
- controlling of Site traffic and setting up of access routes away from sensitive receptors;
- provision of noise monitoring during activities likely to affect sensitive receptors; and
- the use of 'silenced' plant and equipment to be used;
- the provision of screening around those parts of the Site at which activities are likely to generate noise;
- noise generating plant would be located at a low level and as distant as possible from sensitive receptor;
- plant would operate at low speeds, where possible, and incorporate automatic low speed idling;
- all plant would be properly maintained (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
- consideration to be given to temporary screening or enclosures for static noisy plant to reduce noise emissions and plant should be certified to meet any relevant standards;
- early and good public relations with the adjacent tenants and occupants of buildings will also reduce the likelihood of complaints; and
- controlling the opening hours of the Site.

10.5.2 Construction traffic to the Site would also be managed through the CTMP (Appendix 7.1).

Operational Development

10.5.3 The Development includes a number of design and management measures to effectively protect the residential amenity of future occupants in line with industry standard good practice. Particular attention has been paid to the creation of good quality external amenity areas and the selection of appropriate external building fabric elements to control the intrusion of external noise. The following presents a brief commentary of the design measures which are inherent within the Development to assist in delivering these objectives.

10.5.4 The site is arranged with two 'barrier' blocks placed along the M1 and A1 sides of the site. Blocks A, C, E, G, I, J, L, N, O, Q and R lie parallel to M1 and range in height from G+3 to LG+G+14 storeys (the height of the blocks increasing towards the southern end of the Site). Blocks B, D, F, H and K lie

parallel to the A1, with two additional blocks projecting north-west to close the openness of the Site towards Bunns Lane.

10.5.5 The Site is further protected by living 'Green Walls' along the M1 and A1 boundaries of the Site which comprise an acoustic barrier with woodland planting.

10.5.6 The massing and design of the buildings help provide acoustic screening to the central communal amenity spaces at the heart of the Development. Additional communal amenity spaces are proposed at roof level and acoustically screened from neighbouring roads by 2m tall glazed screens.

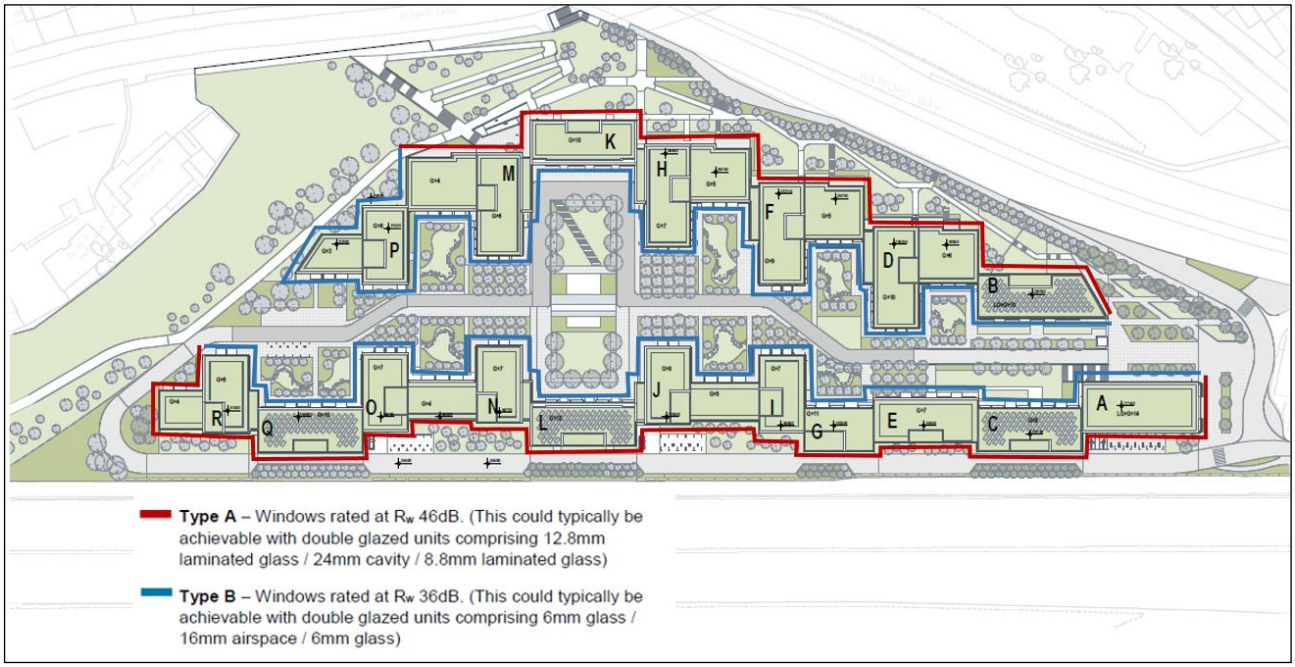
10.5.7 Individual dwellings will also benefit from private amenity spaces (balconies) and noise levels on these will be reduced to the lowest practicable levels. This will be achieved by generally locating balconies on the 'quiet' side of each building (i.e. overlooking the 'internal' courtyard and amenity spaces) to avoid direct noise from the adjoining motorway and dual carriageway. Where balconies are exposed to higher noise levels, it is proposed that these are constructed as winter gardens.

10.5.8 Noise intrusion into the proposed flats will be controlled through the use of a carefully designed sound insulation scheme. This will include:

- The use of concrete and brickwork with an internal metal stud wall lining system to optimise the sound insulation of solid wall elements;
- High performance 'acoustic' glazing; and
- The use of whole house mechanical ventilation systems (MVHR) to provide alternative means of ventilation and thermal control without the need for occupants to open windows.

10.5.9 The proposed zoning of glazing is shown in Figure 10.5. Further details of the acoustic design strategy are provided in Appendix 10.1.

Figure 10.5: Zoning of Acoustic Glazing



10.6 Construction Effects

Assessment of Effects

10.6.1 The potential effect of construction phase noise and vibration will principally be influenced by:

- the overall duration of the works;
- the particular selection of plant, equipment and working methods;
- the siting of plant on the Site (i.e. the distance between work activities and noise sensitive receptors);
- the duration of use of individual plant/equipment;
- the topography of the Site and/or any features that may help reduce noise propagation to adjoining receptors; and
- noise sensitive receptors (residential dwellings and a childcare nursery) are located to the north, east and west of Site, all of which have a permanent High sensitivity to noise.

Construction Activity Noise

10.6.2 Initial programming, phasing and work stage information for the Development and is presented in Chapter 5: Demolition and Construction. Based on this information, preliminary assumptions were made in relation to plant selections, based on data published in BS 5228-1:2009+A1:2014. These were used to determine typical construction noise levels for each stage of the works at selected 'worst case' (closest) noise sensitive receptors. Full details of this assessment can be found in Appendix 10.1.

10.6.3 Table 10.17 summarises the predicted noise levels and assessment of significance.

Table 10.17: Preliminary Assessment of Unmitigated Construction Phase Noise Impacts

Receptor	'Worst Case' Construction Stage Noise Level, $L_{Aeq,10hour}$						
	Demolition	Substructure	Superstructure	facade	Fit-Out	Magnitude of Impact	Significance of Effect
Residential properties in Dove Close and fronting Bunns Lane to the north	65	71	65	64	55	Low	Moderate adverse
'Bright Little Stars Nursery' on Bunns Lane to the north (childcare nursery)	68	70	68	67	58	Low	Moderate adverse
Residential properties fronting Grahame Park Way to the west	60	59	55	54	45	Negligible to Low	Negligible to Moderate adverse

10.6.4 It is therefore concluded that the construction noise will be temporary and may have a negligible to moderate adverse effect (depending on the distance between the locations of works and receptor), prior to the implementation of any mitigation.

10.6.5 Assuming the CEMP is in place, as set out under 'Scheme Design and Management', construction noise is assessed to have a direct and temporary effect of negligible to moderate significance and therefore of minor adverse significance.

Construction Vehicle Noise

10.6.6 The ES is accompanied by an CTMP (Appendix 7.1). The CTMP includes an assessment of construction vehicle movements that may be generated during the construction period of the Development.

10.6.7 The greatest number of vehicle movements are expected during the initial enabling, demolition, infrastructure and services phase of the construction programme – most particularly during earthwork operations.

10.6.8 It is understood estimated that enabling, demolition, and construction works will produce approximately 12 HGVs trips per day on average, which equates to a maximum of 2 vehicle trips per hour resulting in 4 HGV movements (inbound and outbound) per hour. It is understood that construction access and egress will take place via the existing slip road of the northbound carriageway of the A1.

10.6.9 Table 10.18 compares the number of existing traffic movements and anticipated peak hour movements.

Table 10.18: Comparison of 2016 Baseline Flows and Construction Traffic Movements

Link Name	Baseline Flows (2018)		Construction Traffic (2018)		% Change	
	All Vehicles	HGV's	All Vehicles	HGV's	All Vehicles	HGV's
A1 (North of Mill Hill Circus)	36,182	1,910	24	24	0.07%	1.26%
A1 (South of Mill Hill Circus)	59,772	2,986	24	24	0.04%	0.80%
A1 (North of Page Street)	37,526	1,862	24	24	0.06%	1.29%

10.6.10 The potential significance of any noise effects arising from temporary construction traffic was assessed on the basis of the short term change in ambient noise levels, in line with the DMRB assessment method.

10.6.11 Table 10.19 summarises the predicted change in noise level and assessment of the significance of the effect.

Table 10.19: Receptor Sensitivity

Link Name	Change on $L_{Aeq,16hour}$ (dB)	Significance
A1 (North of Mill Hill Circus)	<1dB	Negligible

Link Name	Change on $L_{Aeq,16hour}$ (dB)	Significance
A1 (South of Mill Hill Circus)	<1dB	Negligible
A1 (North of Page Street)	<1dB	Negligible

10.6.12 The above assessment concludes that the potential short-term change in road traffic noise levels as a result of construction traffic will be temporary and of negligible significance.

Construction Vibration Effects

10.6.13 Whilst demolition and construction activities have the ability result in potentially significant effects (i.e. cosmetic/structural and/or cause disturbance to building occupants), such effects are normally experienced in relatively close proximity to works and for relatively limited durations. In that regard, guidance in BS 5228-1:2009+A1:2014 suggests that vibration effects will not normally be significant beyond a distance of around 20m from the construction works. The nearest noise sensitive receptors to the Site are beyond this initial scoping distance and, as such, it is expected that the magnitude of any vibration effect will be negligible.

Mitigation and Residual Effects

Construction Activity Noise

10.6.14 Noise effects during the construction phase of the works will be mitigated through the implementation of appropriate management controls as defined by the CEMP. The assessment assumes a worst case, although this also considers the effective implementation of the measures above. The residual effects would therefore be as stated under 'Assessment of Effects'.

Construction Vehicle Noise

10.6.15 Noise associated with construction vehicle traffic is assessed to be of negligible significance only. However, the outline CTMP will be developed and implemented to minimise the general impact of construction traffic, including the detailed routing of traffic, programming vehicle arrivals to spread movements throughout the day, etc., which will assist in minimising potential noise generation. The residual effects would therefore be as stated under 'Assessment of Effects'.

Construction Vibration

10.6.16 Vibration during the construction phase of the works will be mitigated through the implementation of appropriate management controls as defined by the CEMP and assessment indicates that any effect with be temporary and of minor adverse significance. The residual effects would therefore be as stated under 'Assessment of Effects'.

10.7 Completed Development

Assessment of Effects

10.7.1 In order to quantify the potential effects on the Development and environs of the Site, a 3D operational noise model of the Development was used. This was based on the massing of buildings and elevational treatments shown on the architectural design drawings prepared by AFK.

10.7.2 The output of the operational noise model is presented in Appendix 10.1 and extracts are presented in Figures 10.6 and 10.7.

Figure 10.6: Operational Noise Model Daytime

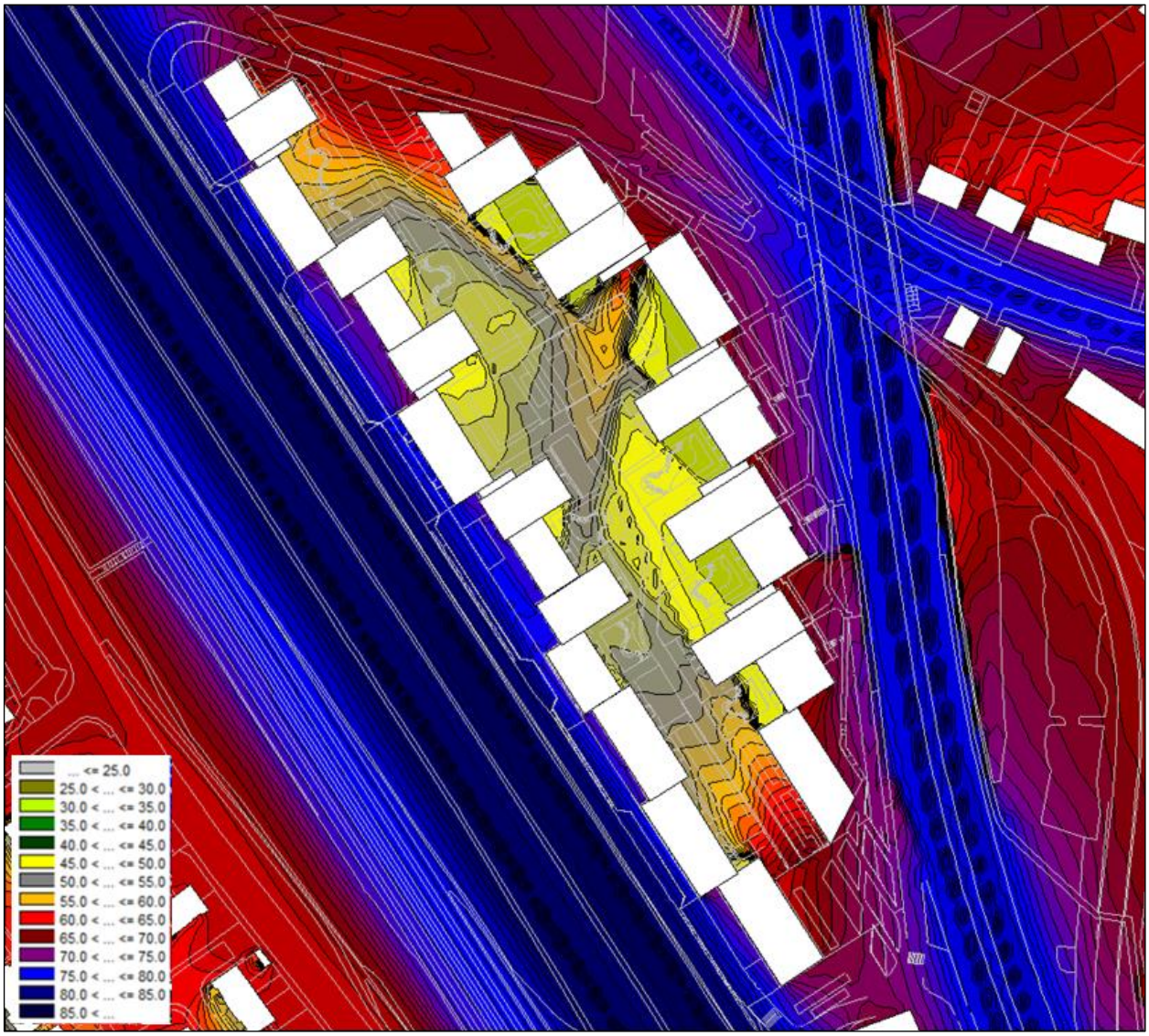
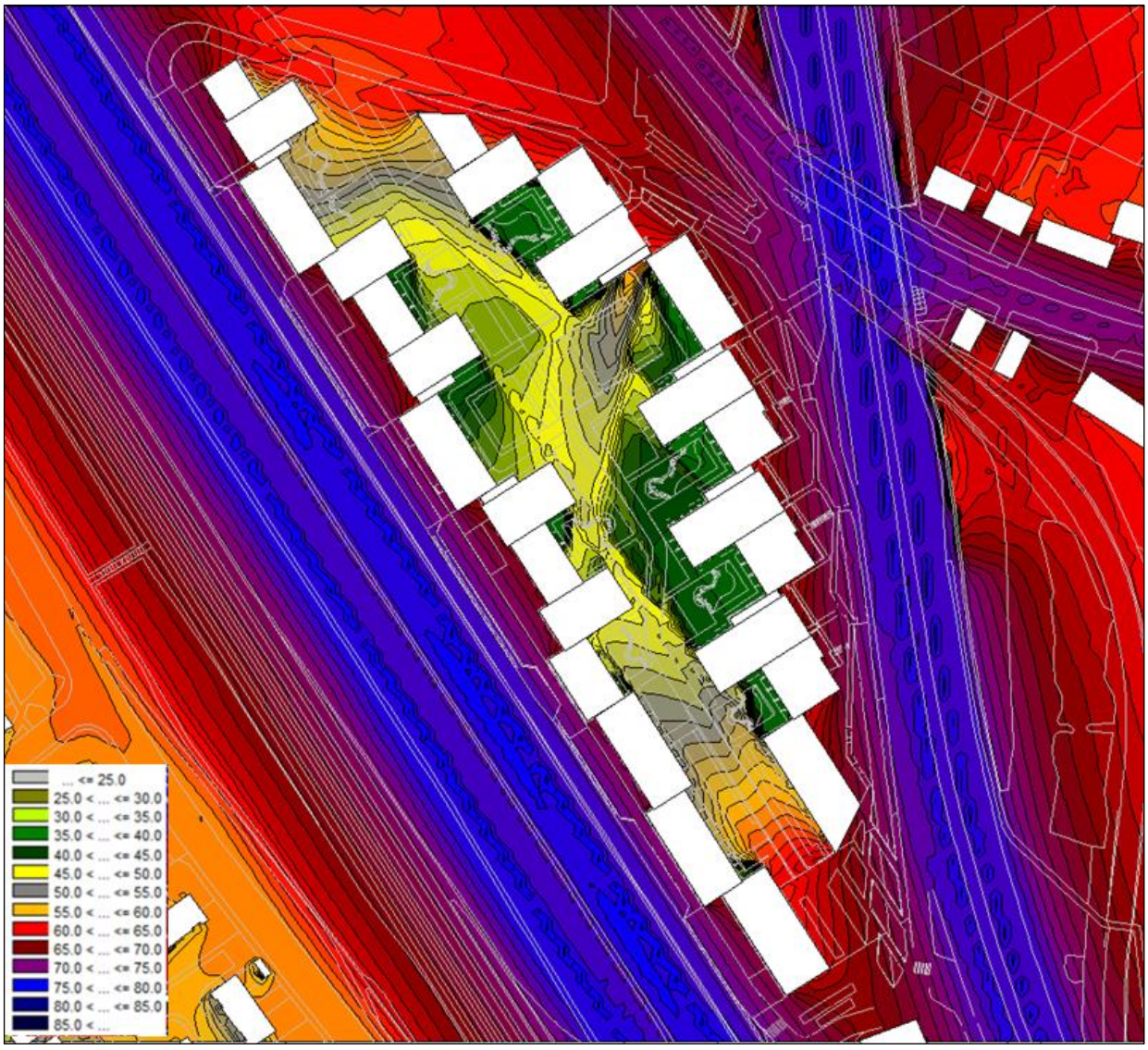


Figure 10.7: Operational Noise Model Night-time



General Environmental Noise

10.7.3 The noise levels outlined in the noise models shown in Figures 10.6 and 10.7 were based on an operational year of 2021 and therefore take account of future traffic growth and committed development in the area.

10.7.4 As identified in Figures 10.6 and 10.7 with the Development in place, noise levels close to the boundaries of the Site exceed the SOAEL inferred from the LPA'as adopted supplementary planning guidance, i.e. noise levels will exceed a daytime sound level of 63 dB $L_{Aeq,16hour}$ and night-time sound level of 55dB $L_{Aeq,8hour}$. Such noise levels would therefore constitute a major adverse effect in terms of the general amenity of the site for residential uses (e.g. provision of external amenity spaces).

10.7.5 Notwithstanding the above, Figures 10.6 and 10.7 also clearly show that the massing of buildings will substantially reduce noise levels and noise levels within the majority of the central courtyard area will be controlled to below the LOAEL (which would constitute a negligible effect). A more detailed explanation regarding the noise levels experienced within dwellings and within the proposed amenity spaces is provided below.

Noise Change at Existing Dwellings

10.7.6 Consideration was given to the potential noise impacts arising from the Development on existing noise sensitive receptors at the site. A comparison of the baseline models (Figures 10.3 and 10.4) and operational models (Figures 10.6 and 10.7) indicates that the Development will generally result in 'no change' in existing traffic noise levels, whilst some properties may experience a sound level reduction of up to 1dB (due to the increased screening offered by the proposed massing of the buildings). Such changes are of negligible significance.

Noise Intrusion into Proposed Dwellings

10.7.7 The sensitivity of future receptors at the Site (the proposed dwellings) is high.

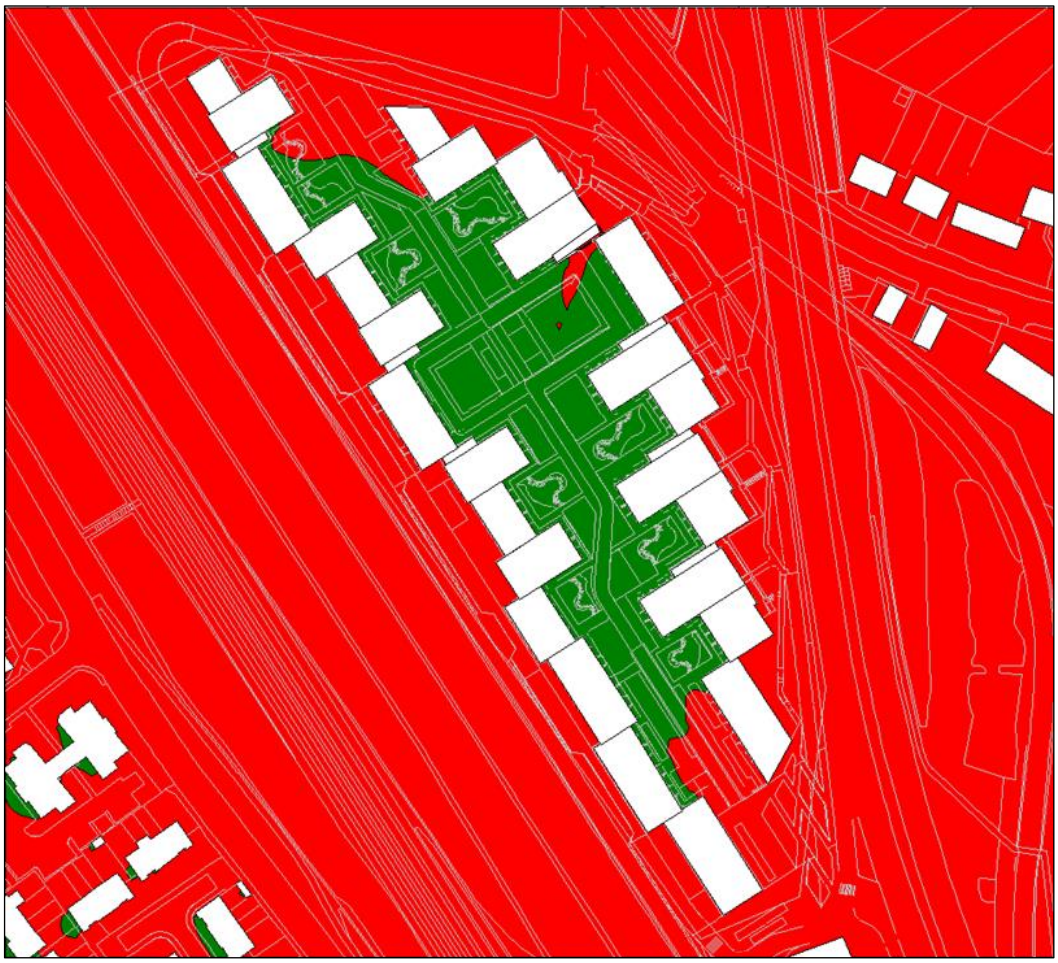
10.7.8 Incident noise levels on the M1 elevation of up to 74 $L_{Aeq,16hour}$ and 65 $L_{Aeq,8hour}$ are predicted, with noise levels incident on the A1 elevation ranging between 70 $L_{Aeq,16hour}$ and 65 $L_{Aeq,8hour}$. However, as set out under 'Scheme Design and Mitigation' external building fabric elements are specified in line with the design guidance of BS 8233: 2014. Noise levels within all of the new properties within the Development would therefore be below the LOAEL, i.e. 35dB $L_{Aeq,16hour}$ in day-time and 30 dB $L_{Aeq,8hour}$ in night-time. This would equate to a negligible magnitude of impact, i.e. noise should be below a level at which there is an observed adverse impact on health or quality of life.

10.7.9 On this basis, the significance of noise intrusion into dwellings will be permanent and of negligible significance.

Noise Levels in Proposed Outdoor Amenity Spaces

10.7.10 The sensitivity of future receptors at the Site (the proposed dwellings) is high.

Figure 10.8: External Amenity Area Assessment



10.7.11 Outdoor noise levels within the principal amenity spaces created through the implementation of effective environmental design and management strategies are predicted to be below the LOAEL, i.e. below the WHO/BS 8233 guideline value of 55dB $L_{Aeq,16hour}$. The effect on receptors in these outdoor amenity spaces would therefore be Negligible.

10.7.12 Noise levels in some of the amenity space are predicted to be above WHO/BS8233 guidelines values (LOAEL), but below a value of 63dB $L_{Aeq,16hour}$, which is taken to be the SOAEL. The effects to receptors these outdoor amenity spaces would therefore constitute a minor magnitude of impact.

10.7.13 Balancing the above with NPPG guidance relating to the availability of amenity spaces, it is concluded that the significance of noise levels in external amenity spaces will be permanent and negligible.

Noise in Outdoor Amenity Space – Balconies

10.7.14 In addition to communal amenity areas, all flats will also benefit from private amenity spaces (terraces/balconies).

10.7.15 In order to reduce balcony noise levels to the lowest practicable levels, these are generally to be located on the 'quiet' side of each building (i.e. overlooking the 'internal' courtyard and amenity spaces) to avoid direct noise from the adjoining motorway and dual carriageway. Balconies to external elevations or exposed to higher noise levels have been developed as winter gardens to prevent any significant noise effect.

10.7.16 The proposed balustrades are 'solid' to help provide acoustic screening and the underside of balconies are to be acoustically treated to minimise noise reflections.

Operational Noise from Plant /Machinery

10.7.17 At the time of preparing this chapter, detailed information relating to proposed building services plant is not available. Notwithstanding this, it is proposed that any plant associated with the Development are controlled such that the rating noise level (L_{Ar}) of the plant is at least 5dB(A) lower than the typical background noise (L_{A90}) during the hours of operation of the plant, in line with the Council's adopted SPD. Such a design target will ensure that the magnitude of any effect is Negligible. It is therefore concluded the significance of operational noise levels from plant/machinery should be negligible, for both existing and proposed noise sensitive uses (including proposed dwellings to be created by the Development).

Operational Noise from Commercial Uses

10.7.18 The Development will introduce a number of commercial uses. At the time of preparing this assessment, detailed information relating to likely operational noise levels is not available. The sensitivity of future receptors at the Site (the proposed dwellings) is High. The magnitude of operational noise levels associated with some forms of commercial use is considered to be 'high'. On this basis, it is concluded that commercial uses could be permanent and major adverse, prior to the implementation of mitigation measures.

Noise Effects Resulting from Changes in Traffic Flow

10.7.19 Existing residential properties in the vicinity of the Site have a 'high' sensitivity to noise.

10.7.20 An assessment of the change in traffic noise levels on roads in the vicinity of the Site indicates any change will be negligible, permanent in both the long and short terms.

Mitigation and Residual Effects

10.7.21 The National Planning Policy Framework requires development to 'mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life'.

10.7.22 In order to deliver the above planning goals, noise effects above the SOAEL should be avoided and noise effects between the LOAEL and SOAEL should be mitigated and reduced to a minimum. The 'Assessment of Effects' section above assesses the effects of the Development with the inherent mitigation in place, which includes the Scheme Design and Management controls identified at Section 10.5. Commentary on the need for further mitigation and the residual effects is provided below.

General Environmental Noise

10.7.23 The Development incorporates a number of environmental design and management controls that assist in controlling general environmental noise levels to values below the adopted LOAEL. As such, no additional mitigation is necessary and the residual effects remain as stated above.

Noise Change at Existing Dwellings

10.7.24 Noise changes at existing dwellings as a result of development are assessed to be of negligible significance. As such, no additional mitigation is necessary and the residual effects remain as stated above.

Noise Intrusion into Proposed Dwellings

10.7.25 The Development incorporates environmental design and management controls which will assist in controlling internal noise levels within dwellings to below the adopted LOAEL. As such, no additional mitigation is necessary and the residual effects remain as stated above.

Noise Levels in Proposed Outdoor Amenity Spaces

10.7.26 Noise level across within the principal amenity areas within the Development are generally predicted to be below the LOAEL. As such, no additional mitigation is necessary and the residual effects remain as stated above.

Operational Noise from Plant/Machinery Associated with Commercial Uses

10.7.27 Noise emissions from building services plant installations can be mitigated through the suitable siting of plant and implementation of standard noise control techniques (e.g. use of attenuators, acoustic enclosures, screening), as appropriate. The specific detail of such mitigation can be secured and enforced through the imposition of an appropriate planning condition, for example, by imposing operational noise limits and/or requiring the submission and approval of a noise control scheme demonstrating the adequate attenuation of plant. Assuming plant noise is adequately controlled through planning conditions and detailed design, the residual effects would be negligible.

Operational Noise from Commercial Uses

10.7.28 Noise transfer from commercial uses and adjoining noise sensitive premises and the operational 'break-out' of noise from such uses can be mitigated through the specification of appropriate separating constructions (where uses share a common structure) and specification of external building fabric elements (to control operational noise 'break-out'). The control of noise can also be addressed through appropriate management controls, for example, the operating hours of any licensed premises and will therefore be statutorily controlled through other statutory regulatory regimes (i.e. The Licensing Act 2003).

10.7.29 Notwithstanding this, mitigation to address operational noise from non-residential sources that will form part of the Development can be secured and enforced through an appropriate planning condition, for example, requiring the submission and approval of a sound insulation scheme compatible with operational noise levels for the intended use classes sought. Assuming noise from commercial units is adequately controlled through planning conditions and detailed design, the residual effects would be negligible.

Noise Effects Resulting from Changes in Traffic Flow

10.7.30 Indirect noise effects associated with the proposed use are assessed not to be significant. As such, no mitigation is required and the residual effects remain as stated above.

10.8 Cumulative Effects

10.8.1 Cumulative effects were assessed using information from extant planning permission, planning applications that are yet to be determine, and / or site-specific information from local policy for two cumulative schemes as set out in Chapter 2: EIA Methodology and Appendix 2.8.

10.8.2 Where relevant information is not available – either through the planning application documents or through policy documents, professional judgement was applied to identify the likely effects of the developments identified above.

Building Services / Commercial Noise

10.8.3 Operational noise from the Development (e.g. noise from building services installations and commercial uses) be will be controlled to levels that do not given rise to any significant effect on neighbouring noise sensitive receptors (essentially minimising any risk of 'creep' in existing baseline, background noise levels). Assuming that other developments are controlled in line with industry standard good practice and local planning policy, it is concluded that any cumulative effect of operational noise would be of negligible significance.

Road Traffic Noise

10.8.4 This chapter has used traffic data provided by the transport consultant who has agreed with LB Barnet that the EIA would consider the cumulative effects of committed developments in the locality of the Site. It follows that the operational noise effects intrinsically take account of the effect of cumulative effect of the Development and other committed development. It is concluded that any cumulative effect due to changes in road traffic noise would be of negligible significance.

Table 10.20: Summary of Effects of the Development

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Significance of Effect (pre-mitigation)	Mitigation and Monitoring	Residual Effect
Demolition and Construction						
Construction activity noise	High	Local	Temporary	Negligible to moderate adverse	CEMP (including adoption of 'best practicable means contained in BS 5228-1 and BS 5228-2', non-statutory scheme for compensation)	Temporary, minor to moderate adverse
Construction vehicle noise	High	Local	Temporary	Negligible adverse	CTMP	Temporary, negligible adverse
Construction vibration	High	Local	Temporary	Moderate adverse	CEMP	Temporary, minor adverse
Completed Development						
General environmental noise	High	Local	Permanent	Negligible to moderate adverse	Facade design	Permanent, negligible adverse
Noise intrusion into proposed dwellings	High	Local	Permanent	Negligible adverse	Facade design	Permanent, negligible adverse
Noise levels in proposed outdoor amenity spaces	High	Local	Permanent	Negligible to moderate adverse	Facade design	Permanent, negligible adverse
Operational noise from plant / machinery with	High	Local	Permanent	Negligible adverse	Appropriate plant selection, installation of noise barriers and acoustic attenuators. Means of implementation: through design	Permanent, negligible adverse

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Significance of Effect (pre-mitigation)	Mitigation and Monitoring	Residual Effect
commercial uses						
Operational noise from commercial uses	High	Local	Permanent	Major adverse	Appropriate plant selection, installation of noise barriers and acoustic attenuators. Means of implementation: through design	Permanent, negligible adverse
Indirect operational noise impacts resulting from changes in traffic flow	High	Local	Permanent	Negligible adverse	None required	Permanent, negligible adverse
Cumulative Effects						
Operational noise from plant/machinery and commercial uses	High	Local	Permanent	Negligible adverse	Appropriate plant selection, installation of noise barriers and acoustic attenuators. Means of implementation: through design	Permanent, negligible adverse
Indirect operational noise impacts resulting from changes in traffic flow	High	Local	Permanent	Negligible adverse	None required	Permanent, negligible adverse

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