

THE GOODSYARD

Environmental Statement Addendum Volume 2

September 2019 – Chapter 13 of 21

ballymore.



CHAPTER 13: NOISE AND VIBRATION

13.1 INTRODUCTION

13.1.1	This Chapter reviews the potential impacts of the Revised Scheme with respect to noise and vibration.
13.1.2	<p>The Planning Policy Documents that have technical standards and guidance that that have now been updated or revised since the 2015 ES are as follows:</p> <ul style="list-style-type: none">• The National Planning Policy Framework;• The London Plan – Spatial Development Strategy for Greater London;• London Borough of Tower Hamlets Local Plan 2031 (Draft);• London Borough of Hackney – Development Management Local Plan 2033 (Draft);• London Borough of Hackney – Hackney A Place for Everyone – Proposed Submission Local Plan; and• Planning & Noise Professional Practice Guidance on Planning & Noise New Residential Development.
13.1.3	There are no changes to baseline noise and vibration conditions since the previous submission. However, a further noise and vibration survey has been undertaken to understand the current conditions. This survey will be used to consider the likely effects arising from noise and vibration to the scheme. Further details of the baseline survey are included in Volume 4, Appendix I – Noise and Vibration .
13.1.4	With regards to construction noise and vibration, it is likely that there are changes that affect the location of impacts. Detailed construction activities are currently not available and therefore technical judgement was used for the required plant activities on-times and locations of activities.
13.1.5	With regards to construction off-site traffic and operational traffic there are no significant design changes which are expected to change the assessment.
13.1.6	The operational noise impact from mechanical plant is expected not to change the outcome of the assessment as embedded mitigation will reduce any effects encountered.

13.2 SCOPE OF ASSESSMENT

13.2.1	This chapter assesses the likely significant effects of the Revised Scheme in terms of noise and vibration and is supported by Volume 4, Appendix I: Noise and Vibration
13.2.2	The chapter describes: the assessment methodology; the baseline conditions currently existing at the Site and in the surrounding area; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; the likely residual effects after these measures have been employed; and the cumulative effects associated with the Revised Scheme in combination with other developments within 1 km of the Site.
13.2.3	Type 1 cumulative effects ‘intra-project effects’ which are the combined effects of individual topic impacts on a particular sensitive receptor are considered in Volume 2, Chapter 18: Effect Interactions .
13.2.4	<p>The two types of cumulative effects considered in this assessment are:</p> <ul style="list-style-type: none">• type 1, intra-project effects which are the combined effects of individual topic impacts on a particular sensitive receptor; and• type 2, inter-project effects which are the combined effects of two or more development projects, which may, on an individual basis not be significant but, cumulatively, might have a significant effect alongside the Revised Scheme
13.2.5	Cumulative effects during both the construction and operational phases of the Revised Scheme will be assessed in this Chapter. Cumulative effects will also be addressed in a discrete section in this ES Addendum Chapter.

¹ Control of Pollution Act. (1974).

² Department for Communities and Local Government. (2012, Last updated February 2019). National Planning Policy Framework (NPPF).

13.3 KEY LEGISLATION, POLICY AND GUIDANCE CONSIDERATIONS

13.3.1	<p>The noise and vibration assessment has been undertaken within the context of relevant planning policies, guidance documents and legislative instruments. These are summarised below.</p> <p>Legislation and Regulation</p> <p>Control of Pollution Act 1974</p>
13.3.2	The Control of Pollution Act 1974 ¹ (CoPA) requires that ‘Best Practicable Means’ (as defined in section 72 or CoPA) are adopted to control construction noise on any given site.
13.3.3	CoPA makes reference to BS5228 as best practicable means. Section 61 sets out the process for application to the local authority for prior consent to carry out works.
	<p>Planning Policy</p> <p>The National Planning Policy Framework (2019)</p>
13.3.4	The National Planning Policy Framework ² (NPPF) sets out the Government’s planning policies for England and how these should be applied.
13.3.5	Planning policies and decisions should contribute to and enhance the natural and local environment by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.”
13.3.6	<p>“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:</p> <ul style="list-style-type: none">• a) mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;• b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”
13.3.7	<p>The revised policy introduces the ‘Agent of Change’ whereby the control of noise from existing sources affecting new noise sensitive developments should be considered. Paragraph 182 in the NPPF says:</p> <ul style="list-style-type: none">• “<i>Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.</i>”
	<p>Noise Policy Statement for England</p>
13.3.8	The Noise Policy Statement for England ³ (NPSE) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise.
13.3.9	The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.
13.3.10	The statement sets out the long-term vision of the government’s noise policy, which is to “promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development”.
13.3.11	The guidance promotes the effective management and control of noise, within the context of Government policy on sustainable development and thereby aims to:

³ Defra. (2012). Noise Policy Statement for England.

- avoid significant adverse impacts on health and quality of life;
 - mitigate and minimise adverse impacts on health and quality of life; and
 - where possible, contribute to the improvements of health and quality of life.
 - The statement uses the concept of noise exposure categories as follows:
 - No Observed Effect Level (NOEL) – the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
 - Lowest Observable Adverse Effect Level (LOAEL) – the level above which adverse effects on health and quality of life can be detected; and
 - Significant Observed Adverse Effect Level (SOAEL) – the level above which significant adverse effects on health and quality of life occur.
- 13.3.12 It is recognised that SOAEL does not have a single objective noise-based level that is applicable to all sources of noise in all situations and therefore the SOAEL is likely to be different for different sources, receptors and at different times of the day.
- 13.3.13 No guidance has been issued at the time of writing to identify the SOAEL and LOAEL for typical noise sources and receptors.

Planning Practice Guidance – Noise

- 13.3.14 The Planning Practice Guidance⁴ (PPG) expands on the use of SOAEL: “if the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.”
- 13.3.15 The PPG also goes on to identify unacceptable noise exposure: “at the highest extreme, noise exposure would cause extension and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.”
- 13.3.16 In addition, PPG refers to further considerations to mitigating noise on residential developments. PPG states that the noise impact may be partially off-set if the residents of those dwellings 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).

Regional & Local Policy

The London Plan – Spatial Development Strategy for Greater London

- 13.3.17 With specific reference to noise, the new London Plan⁵ (2016) contains Policy 7.15: Reducing Noise and Enhancing Soundscapes:
- “Policy 7.15 reducing and managing noise, improving and enhancing the acoustic environment and promoting appropriate soundscapes*
- Strategic*
- A** *The transport, spatial and design policies of this plan will be implemented in order to reduce and manage noise to improve health and quality of life and support the objectives of the Mayor’s Ambient Noise Strategy.*
- Planning decisions*
- B** *Development proposals should seek to manage noise by:*
- a** *avoiding significant adverse noise impacts on health and quality of life as a result of new development;*

⁴ Department for Communities and Local Government. (2014). Planning Practice Guidance – Noise.

⁵ The London Plan, March 2016, GLA

⁶ Draft New London Plan showing Minor Suggested Changes July 2018, GLA

- b** *mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens on existing businesses;*
- c** *improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);*
- d** *separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;*
- e** *where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through then any potential adverse effects should be controlled and mitigated through the application of good acoustic design principles;*
- f** *having particular regard to the impact of aviation noise on noise sensitive development;*
- g** *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.”*

The draft London Plan⁶ updates the policies with respect to noise in the following ways:

- Policy D12 Agent of Change is introduced which places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development.*
- Policy D13 Noise reflects the agent of change principle and expands the methods of separating new noise sensitive development from major noise sources (discussed in paragraph d above) to include distance, screening, layout, orientation, uses and materials.*

Souder City: The Mayor’s London Ambient Noise Strategy

- 13.3.18 The London Ambient Noise Strategy⁷ aims to minimise the adverse impacts of noise on people living, working in and visiting London by using the best available practices and technologies within a sustainable development framework.
- 13.3.19 The Strategy aims to work towards more compact city development, while minimising noise. This requires careful consideration of the adverse impact of noise on, from, within or in proximity to a development.
- London Borough of Tower Hamlets Local Plan**
- 13.3.20 The Managing Development Document ⁸ forms part of the Local Plan of London Borough of Tower Hamlets.
- 13.3.21 Policy DM25 Amenity, Part 1e refers to noise;
- “Development should seek to protect, and where possible improve, the amenity of surrounding existing and future residents and building occupants, as well as the amenity of the surrounding public realm by:*
- e. not creating unacceptable levels of noise, vibration, artificial light, odour, fume or dust pollution during the construction and life of the development.”*

- 13.3.22 This is expanded on in point 25.10;
- “The Council will also seek to limit the impact of existing noise and vibration sources on new development and limit the noise and vibration emissions from new developments. The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. For the purposes of this policy, developers should comply with the current best practice standards (British Standards). Where necessary, Acoustic Reports to demonstrate compliance will be required. In respect of evening and night time uses it is important to remember that while acoustic reports can ensure noise is contained while the venue is operating it does not address noise caused by patrons entering and leaving the premises and patrons smoking outside. Where appropriate the Council will use conditions to control the hours of operation of premises.”*

⁷ Sounder City: The Mayor’s Ambient Noise Strategy, Mayor of London, March 2004

⁸ Managing Development Document, April 2013, Tower Hamlets

13.3.23	<p>Appendix 2 Part 2 of The Managing Development Document also details further noise criteria relevant to residential, commercial and school noise and, amongst others, makes reference to the following guidance standards;</p> <ul style="list-style-type: none"> • Planning Policy Guidance Note: Planning and Noise; • BS8233 - Sound Insulation and Noise Reduction for Buildings; • BS4142 – Method for rating industrial noise affecting mixed residential and industrial areas; and • BS5228 – Code of practice for noise and vibration control on construction and open site.
13.3.24	<p>The Tower Hamlets Draft Local Plan 2031⁹ contains the following policy with respect to noise and vibration.</p> <p><i>“Policy D.ES9: Noise and vibration</i></p> <p><i>Development is required to:</i></p> <ol style="list-style-type: none"> <i>a) use the most appropriate, layout, orientation, design and use of buildings to minimise noise and vibration impacts;</i> <i>b) identify/outline mitigating measures to manage noise and vibration from new development, including during the construction phase;</i> <i>c) separate noise-sensitive development from existing operational noise; and</i> <i>d) provide a noise assessment where noise-generating development or noise-sensitive development is proposed.</i> <p><i>Where new noise-sensitive land uses are proposed in proximity to existing noise-generating uses, such as cultural and entertainment venues, development is required to robustly demonstrate how conflict with existing uses will be avoided, through mitigation measures.</i></p> <p><i>Development is required to demonstrate that the level of noise emitted from any new heating or ventilation plant will be below the background level by at least 10dBA.”</i></p> <p>London Borough of Tower Hamlets – Code of Construction Practice (LBTH COCP)¹⁰</p>
13.3.25	The LBTH COCP contains the agreed policy on construction sites and provides that, except in exceptional circumstances, noisy construction works will only be carried out between 08:00-18:00 Monday to Friday, from 08:00-13:00 on Saturdays and not at all on Sundays, Bank or Public holidays.
13.3.26	Compliance with the LBTH CoCP is usually a condition of development during the planning process. The CoCP states <i>“developers of major projects within LBTH must comply with the CoCP, and must ensure that their contractors and sub-contractors comply with it.”</i>
13.3.27	The LBTH requires the contractor to apply to LBTH for formal consent in accordance with Section 61 of the Control of Pollution Act 1974.
	London Borough of Hackney Local Development Framework Core Strategy¹¹
13.3.28	The LBH Core Strategy references noise in relation to the evening and night-time economy and transportation noise.
13.3.29	<p>Core Strategy Policy 33 mentions:</p> <p><i>“Travel plans will be required for all development over a certain size. To minimise noise and disturbance, operations that require heavy movement of goods should be located close to the higher-level road network as defined by Transport for London.”</i></p> <p>London Borough of Hackney Local Plan – Development Management Local Plan¹²</p>
13.3.30	The LBH Development Management Local Plan (DMLP), which was adopted in July 2015, replaces the saved Unitary Development Plan (UDP) policies EQ40: Noise Control and EQ41: Development close to existing source of noise with DM1: High Quality Design and DM2: Development and Amenity respectively.
13.3.31	<p>Policy DM2 – Development and Amenity refers to noise:</p> <p><i>“Development proposals should be appropriate to their location and should be designed to ensure that they will not result in significant adverse impacts on the amenity of occupiers and neighbours. The individual and cumulative impacts of development proposals on amenity will be considered in considering their acceptability. The consideration of the merits of development proposals will be balanced against the impact on amenity.</i></p>

⁹ Tower Hamlets Local Plan 2031 (Regulation 19), October 2017, LBTH

¹⁰ London Borough of Tower Hamlets – Code of Construction Practice

¹¹ London Borough of Hackney – Local Development Framework Core Strategy (November 2010)

	<p><i>Amenity considerations include the impacts of developments on: Vibration, noise, fumes and odour, and other forms of pollution;</i></p> <p><i>Residential development should be well designed and not lead to substandard layouts, unit sizes, room sizes and awkward room shapes and private amenity space.”</i></p>
13.3.32	<p>Policy DM3 – Promoting Health and Well-Being refers to the following measures:</p> <p><i>“Development should not have an adverse impact on the environment, such as through air, noise and water pollution, and remediation of contaminated land prior to development must be undertaken.”</i></p>
13.3.33	<p>Policy DM11 – Evening and Night-Time Economy Uses</p> <p><i>The Council will seek planning contributions to mitigate the impact of proposals where necessary, and through the use of local management plans where appropriate. When considering planning applications for night time economy uses the Council will give consideration to the following factors:</i></p> <ol style="list-style-type: none"> <i>i. The potential impact of the development on amenities of adjoining and or adjacent residential accommodation and non-residential uses, such as through noise disturbance, cooking smells and anti-social behaviour, and highway safety; and</i> <i>ii. The cumulative impact of the use considering the number, capacity and location of other night-time economy uses in the adjacent area, particularly for proposals within Shoreditch which is part covered by a Special Policy Area designation and Dalston.</i> <p>London Borough of Hackney– Development Management Local Plan¹³</p>
13.3.34	The new LBH local plan 2033 (LP33) will be the key strategic planning document up to 2033. The consultation for the draft ended in January 2019 and is due to be issued. Once the L33 is adopted it will combine and replace existing plans.
13.3.35	<p>Policy LP2 – Development and Amenity:</p> <p><i>All new development must be appropriate to its location and should be designed to ensure there are no significant adverse impacts on the amenity of occupiers and neighbours. The individual and cumulative impacts of development proposals on amenity will be considered in assessing their acceptability. Consideration of the merits of development proposals will be balanced against the impact on amenity.</i></p> <p><i>Amenity considerations include the impact of development on: Vibration, noise, fumes and odour, and other forms of pollution;</i></p>
13.3.36	<p>Policy LP38 – Evening and Night Time Economy:</p> <ol style="list-style-type: none"> <i>A. New evening and night-time economy uses will be primarily located in the borough's designated centres. The use should be of a size and type that reflects the role and function of the centre.</i> <i>B. Proposals for uses that would result in the diversification of the evening and night time economy will be supported. Only limited expansion of licensed premises will be permitted in Shoreditch and Dalston.</i> <i>C. Proposals for evening and night time economy uses will only be permitted if both of the following criteria are met:</i> <ol style="list-style-type: none"> <i>i. There is no negative impact on the amenity of adjoining or adjacent residential accommodation and non-residential uses, such as through noise disturbance, cooking smells, anti-social behaviour, and highway safety; and</i> <i>ii. There is no negative cumulative impacts resulting from the proposed use in relation to the number, capacity and location of other night-time economy uses in the area.</i>
13.3.37	<p>Policy LP58 – Improving the Environment – Pollution:</p> <p><i>Noise-sensitive development should be located in areas where occupiers will not be exposed to significantly adverse noise levels. Where new noise-sensitive development is proposed in proximity to existing noise-generating uses, the applicant will be required to carry out a noise assessment and demonstrate how adverse effects will be effectively mitigated without harming the continued operation of existing uses.</i></p> <p><i>Development in any location will only be permitted where it can be demonstrated that the noise generated by the development is effectively mitigated to prevent adverse impacts on health and quality of life. The impact of noise generated by the demolition and constructions phases of development must also be minimized.</i></p> <p><i>All residential development proposals shall minimise the potential adverse noise impact on and between dwellings through</i></p>

¹² London Borough of Hackney – Development Management Local Plan (July 2015)

¹³ London Borough of Hackney – Hackney A Place for Everyone – Proposed Submission Local Plan, Full Consultation, Strategic Policy Team, (November 2018)

housing layout, design and materials. New development will only be permitted where the locations of lift and circulation spaces is designed to limit the transmission of sound to noise sensitive areas. They should be adequately separated from major noise sources or designed to mitigate the impact.

London Borough of Hackney – Construction Noise

13.3.38 LBH don’t currently have a Code of Practice for Construction, however the Environmental Health website states the following:

Under the Control of Pollution Act 1974, we can impose requirements as to what times noisy work may be carried out, and the methods of work used. In Hackney these times are:

- Monday to Friday - 8am-6pm
- Saturday - 8am-1pm
- Sundays and Bank Holidays - no working

In certain cases, we may grant permission for work outside these hours, such as emergencies, erecting special cranes or police traffic restrictions.

Technical Standards and Guidance

CIEH, IOA and ANC - ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise New Residential Development, May 2017.

13.3.39 Current Government guidance on planning and noise for new residential developments is found in the National Planning Policy Framework (NPPF). One of the strengths of the NPPF is that it sets clear objectives. However, the IOA, ANC and CIEH feel there is insufficient technical guidance for practitioners and developers on how to deliver the Government’s objectives. Therefore, these professional bodies have jointly produced the ProPG¹⁴ which aims to complement existing Government advice and provides a recommended approach that can be applied proportionately to each development site to encourage good acoustic design.

13.3.40 The ProPG seeks to promote the use of good acoustic design to:

- enable new homes to be built in areas previously considered unsuitable because of noise by appropriate evaluation and careful use of suitable mitigation;
- allow rapid identification of sites where noise is unlikely to be a constraint for new residential developments;
- permit swift recognition of noisy sites that are very unlikely to be suitable for new residential developments; and
- help to reduce the harmful impact of noise on those moving into the properties and the surrounding communities.

13.3.41 ProPG recommends the following:

“Where there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide “whole dwelling ventilation” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position.

“It should also be noted that the internal noise level guidelines are generally not applicable under “purge ventilation” conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).”

“In addition to providing purge ventilation, open windows can also be used to mitigate overheating. Therefore, should the ... scheme ... be assessed with windows closed, but this scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition”

¹⁴ ProPG Planning and Noise: Professional Practice Guidance on Planning & Noise May 2017, ANC, IOA, CIEH

¹⁵ British Standard 7445-1: 1991 Description and measurement of environmental noise, Part 1: Guide to the quantities and procedures, BSI, London.

¹⁶ British Standard 7445-2: 1991 Description and measurement of environmental noise, Part 2: Guide to the acquisition of data pertinent to land use, BSI, London.

¹⁷ British Standard 8233: 2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’, BSI, London.

¹⁸ British Standard 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings, Part 1: Vibration sources other than blasting

¹⁹ British Standard 5228-1: 2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

British Standard 7445

13.3.42 British Standard (BS) 7445-1: 1991¹⁵ has guidance on the acquisition of data for measuring and describing environmental noise.

13.3.43 British Standard (BS) 7445-2: 2003¹⁶ defines parameters, procedures and instrumentation required for noise measurement and analysis.

British Standard 8233

13.3.44 British Standard 8233: 2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’ ¹⁷ provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties. This recently supersedes BS8233:1999 which is withdrawn but referred to in a number of the planning policy documents referenced above.

British Standard 6472

13.3.45 British Standard 6472-1: 2008 ‘Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources other than Blasting’ ¹⁸ presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration) above which comment is likely to occur in residential properties.

British Standard 5228

13.3.46 British Standard 5228: ‘Code of practice for noise and vibration control on construction and open sites’ ^{19,20}, provides a ‘best practice’ guide for noise and vibration control, and includes sound power level (SWL) data for individual plant as well as a calculation method for noise from construction activities. Part 1 relates to noise and part 2 relates to vibration.

British Standard 7385

13.3.47 British Standard 7385: 1993 ‘Evaluation and Measurement for Vibration in Buildings’ ²¹ presents guide values or limits for transient vibration, above which there is a likelihood of cosmetic damage.

British Standard 4142

13.3.48 British Standard 4142: 2014 ‘Methods for rating and assessing industrial and commercial sound’ ²² describes methods to use outdoor sound levels to assess the likely effects of sound of an industrial and/or commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

Calculation of Road Traffic Noise

13.3.49 Department of Transport/Welsh Office Memorandum ‘Calculation of Road Traffic Noise’ ²³ (CRTN) describes procedures for traffic noise calculation and is suitable for environmental assessments of schemes where road traffic noise may have an impact.

Design Manual for Road and Bridges

13.3.50 The Highways Agency ‘Design Manual for Road and Bridges Volume 11 Section 3 Part 7 – Traffic Noise and Vibration’ ²⁴ (DMRB) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration impacts arising from all road projects, including new construction, improvements and maintenance.

²⁰ British Standard 5228-2: 2009 + A2:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration

²¹ British Standard 7385-2: 1993 Evaluation and measurement for vibration in buildings — Part 2: Guide to damage levels from groundborne vibration

²² British Standard 4142: 2014 Methods for rating and assessing industrial and commercial sound’.

²³ Calculation of Road Traffic Noise, Department of Transport Welsh Office, HMSO, 1988

²⁴ Design Manual for Roads and Bridges, Volume 11, Environmental Assessment, Section 3, Environmental Assessment Techniques, Part 7 HA 213/08, Noise and Vibration, The Highways Agency, August 2008

London Underground: Noise and Vibration Asset Design Guidance

13.3.51 The London Underground Guidance Noise and Vibration Asset Design Guidance defines noise and vibration assessment methodologies and criteria that should be used in the design of new operational assets.

Guidelines for Community Noise 1999

13.3.52 The World Health Organisation (WHO) Guidelines for Community Noise (1999)²⁵ sets out guidance on suitable internal and external noise levels in and around residential properties. This document states that, in dwellings, the critical effects of noise are on sleep, annoyance and speech interference. Additional WHO environmental noise guidelines were published in 2018, however the 1999 document is currently considered to be the most relevant guidance given its reference in BS 8233 and ProPG.

ISO 9613

13.3.53 ISO 9613 ‘Attenuation of sound during propagation outdoors – Part 2: A general method of calculation’²⁶ gives general methods of calculating sound propagation outdoors including attenuation due to geometrical divergence (distance); air and ground absorption; screening; reflections and other effects.

IEMA and IOA Guidelines For Noise Impact Assessment 2014

13.3.54 The IEMA and IOA guidelines for noise impact assessment sets good practice standards for scope content and methodology of noise impact assessment. The guidelines present categories of significance relating to the change of basic noise levels.

13.4 CONSULTATION

13.4.1 An email exchange was held on 15th February 2019 with Paul Murphy, Pollution Manager (Noise) at the Environmental Health and Trading Standards from the London Borough of Tower Hamlets. This was to discuss the survey requirements for the assessment, surrounding noise sensitive receptors and assessment methodology. The baseline collection, list of key receptors and assessment methodology presented in this chapter reflect what was discussed.

13.4.2 In January 2014 a Scoping Opinion was issued jointly by the LBTH (Ref: PA/14/107) and LBH (Ref: 2014/0249) on the Proposed Development (see **ES Addendum Volume 4 - Appendix A Scoping**). A review of the Scoping Opinion was requested by the Applicant in March 2019 subject to the Revised Scheme. **Table 13.1** outlines the comments received in the 2014 Scoping Opinion and the 2019 Scoping Opinion Review and where they have been addressed within the documentation.

Table 13.1 LBTH Scoping Opinion Comments and Response

Topic / Section	Summary of Comment	Location within the ES Addendum where comments are addressed
Noise and Vibration	Current and draft Tower Hamlets planning policies which relate to noise from this development should both be considered	Volume 2, Chapter 13, Section 13.3.20 to 13.3.27
	BS8233, BS4142, BS6472-1:2008, BS5228 part 1 and 2: 2009+A1:2015 and agent of change should all be considered together with others that may become apparent during your survey.	Volume 2, Chapter 13, Section 13.3
	Rail noise and vibration and rail night works	Volume 2, Chapter 13, Section 13.5.43 to 13.5.54. No residential properties overlook rail lines so are unlikely to be affected by rail overnight possessions
	Noise from AIR, road, rail, MUGA	Volume 2, Chapter 13, Section 13.6

²⁵ World Health Organisation (1995), WHO Guidelines for Community Noise.

Topic / Section	Summary of Comment	Location within the ES Addendum where comments are addressed
		MUGA has not been assessed as will be removed as part of the scheme.
	Good Acoustic Design. Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design.	Volume 2, Chapter 13, Section 13.8
	You should also consider noise impact on nearby residents from construction and any restrictions on the builders due to the nature of the area and proximity to rail lines.	Volume 2, Chapter 13, Section 13.8

13.4.3 Temple emailed details of the proposed noise survey locations and assessment methodology to Ashraful Haque at the London Borough of Hackney on 15th February 2019 without a response. The survey and assessment methodology has been based on their local plan and following feedback from the 2015 Proposed Development.

13.5 ASSESSMENT METHODOLOGY

Determination of Baseline

13.5.1 To assess the potential noise impact of the Revised Scheme, it is necessary to determine the baseline conditions. The baseline conditions are typically the current (at the time of writing the ES) environmental and socio-economic conditions of the Site and surroundings. For the purposes of this assessment the baseline is taken as the conditions assessed on Site in Spring 2019.

13.5.2 The proposed site is exposed to noise and vibration from the following sources:

- Road traffic noise: A1202 Great Eastern St, A1202 Commercial Street, A10 Shoreditch High Street, A1209 Bethnal Green Road, Sclater Street and Quaker Street.
- Rail noise: the London Overground line passing through Shoreditch High Street Station, National Rail entering and departing Liverpool Street Station, and the London Underground Central Line.
- Groundborne noise and vibration from the existing rail;
- Structure borne noise arising from Shoreditch High Street Station; and
- Commercial and mechanical plant noise from surrounding restaurants, pubs and clubs.

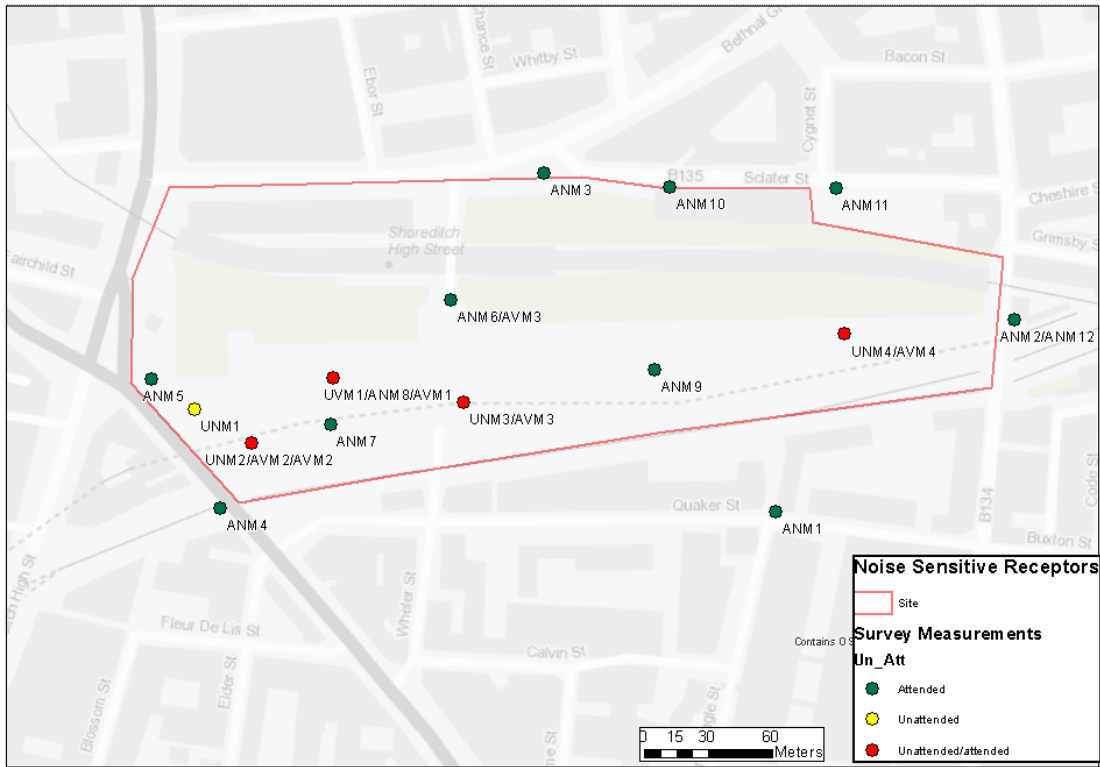
13.5.3 A survey exercise was carried out by Temple with an unattended survey between 25th February to 4th March 2019 and supplemented with additional attended surveys on 25th February 2019 and 10th April 2019.

13.5.4 Four unattended noise-logging meters were installed on the Site as positions representative of different areas of the Revised Scheme. This was supplemented by additional attended measurements on the site and around the site perimeter.

13.5.5 One unattended vibration meter was installed on the central western part of site above the underground rail lines to measure the effect of the trains passing underneath the Revised Scheme. Additionally, attended vibration measurements were carried out on the site to assist in observations of the results.

²⁶ ISO 9613 Attenuation of sound during propagation outdoors – Part 2: A general method of calculation

Figure 13.1 Noise and Vibration Survey Measurement Locations



Significance Criteria

- 13.5.6
- A noise impact is a change in the acoustic environment. This may be through the introduction of a new noise source or a change to an existing source causing change to the noise climate at existing receptors or the introduction of a new noise sensitive development.
- 13.5.7
- The magnitude of the noise impact can depend on the absolute noise level, change in noise level, duration of exposure and the time of day of exposure.
- 13.5.8
- Noise impacts can lead to effects on receptors, such as annoyance or sleep disturbance for residential receptors or disturbance to non-residential receptors.
- 13.5.9
- The significance of noise effect can vary depending on the type of receptor and its sensitivity to noise, such as residential, commercial or hotel uses.
- 13.5.10
- The extent of the potential effects of the Revised Scheme will be assessed using a five-point scale from 'major adverse' to 'major beneficial', a duration scale of short, medium and long term, and a geographic scale of local, district, regional, national and international. A 'major' or 'moderate' effect constitutes a 'significant effect'.
- 13.5.11
- Table 13.2** below details how this relates to the national noise policy effect levels and therefore the action to be taken.

Table 13.2 Significance of Adverse Effect Related to National Noise Policy

Significance of Effect	Increasing Effect level	Action to be taken
Negligible	Noise impact exceeding NOEL, but below LOAEL	No Specific measures
Minor adverse	Noise impact exceeding LOAEL, just below SOAEL	Mitigate and reduce to a minimum
Moderate adverse	Noise impact exceeding SOAEL	Avoid
Major adverse	Unacceptable Adverse Effect	Prevent

Construction Noise

Prediction Methodology

- 13.5.12
- To quantify potential construction noise impact, typical worst-case construction activity noise levels, $L_{Aeq,10hr}$, from the assumed construction activities have been predicted in accordance with BS5228 Part 1 at a point 1 m from the façade of the relevant receptor. Calculations have been based on anticipated construction methods and mechanical plant likely to be used. The predictions will include corrections for facade reflections, angle of view, any appropriate screening and likely percentage on times for the construction plant. Further information regarding the calculations is given in **ES Addendum Volume 4, Appendix I**.

Impact Assessment Thresholds

- 13.5.13
- Construction noise impacts have been assessed using the predicted noise levels in accordance with the evaluation criteria set out in **Table 13.3**. These criteria are based on the 'potential significance based on fixed noise limits' criteria for urban areas in BS5228: Part 1.

Table 13.3 Construction Evaluation Criteria

Description	Impact Category
Daytime noise levels which are less than 75dB $L_{Aeq,10hr}$ but exceed the baseline ambient noise level for total of more than 10 days in any 15-day period, or for a total of days less than or equal to 40 in any 6-month period.	Minor Adverse
Daytime noise levels greater than 75dB $L_{Aeq,10hr}$ for a total of more than 10 days in any 15-day period, or for a total of days less than or equal to 40 in any 6-month period	Moderate Adverse
Daytime noise levels greater than 85dB	Major Adverse

Description	Impact Category
L _{Aeq,10hr} for a total of more than 10 days in any 15-day period, or for a total of days more than 40 in any 6-month period	

- 13.5.14
- The construction noise evaluation criteria shall apply to residential buildings and to occupied non-residential buildings. No night-time works are anticipated during the construction works, therefore, no night-time evaluation criteria has been presented.
- 13.5.15
- The SOAEL is considered to be the level at which the predicted construction noise level exceeds the construction noise evaluation 'Moderate Adverse' criteria. Construction noise levels which fall into the 'minor adverse' criteria are considered to fall in between the SOAEL and the LOAEL.

Construction Vibration

- 13.5.16
- The effect of construction vibration has been assessed from works associated with the Revised Scheme which have the potential to lead to significant levels of vibration at receptors.
- 13.5.17
- Typical vibration levels given in BS5228: Part 2 have been used to predict typical construction vibration levels for these activities at the closest residential receptors to the various works phases (at approximately 20 m).
- 13.5.18
- Predicted vibration levels have been assessed utilising the example vibration criteria contained within BS5228 Part 2 to assess the effect of perceptible vibration on people and BS7385 Part 2 to assess the effect of vibration on buildings.
- 13.5.19
- Table 13.4** below is reproduced from BS5228 part 2. The vibration levels are in terms of Peak Particle Velocity (PPV) at the receptor. The 0.3 mm/s level is considered to be the LOAEL and 1 mm/s level to be the SOAEL.

Table 13.4 Reproduced from BS5228 Part 2 'Guidance on effects of vibration levels'

Vibration Level	Effect
0.14 mm/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.
0.3 mm/s	Vibration might just be perceptible in residential environments.
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.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

- 13.5.20
- Table 13.5** below is reproduced from BS7385 part 2. The levels given represent guide values for the onset of cosmetic damage in buildings.

Table 13.5 Reproduced from BS5228 Part 2 'Guidance on effects of vibration levels'

Type of Building	Peak Component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial type 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
Note 1 Values referred to are at the base of the building Note 2 for unreinforced, at frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.		

Construction Off-Site Traffic Noise

- 13.5.21
- The change in noise associated with increased construction traffic on the surrounding road network has been calculated in accordance with the Calculation for Road Traffic Noise (CRTN). For roads with less than 1000 vehicles per 18 hours the methodology set out in the Noise Advisory Council measurement and prediction guide²⁷ has been used.
- 13.5.22
- The potential impacts as a result of off-site road traffic have been evaluated in accordance with the Design Manual for Roads and Bridges (DMRB) short term traffic noise effect criteria given in **Table 13.6**. The change has been calculated as the difference between the baseline 'do minimum' scenario and the construction phase year 'do something' scenarios, both including growth and committed development traffic. The peak construction phase assessment year is 2027 which includes operational traffic of Phase 1 to 3 and construction traffic during Phase 4.

²⁷ The Noise Advisory Council (1978), A guide to measurement and prediction of the equivalent continuous sound level Leq. HMSO, London.

Table 13.6 DMRB Short-Term Traffic Noise Effect Criteria

Noise Change, L _{A10,18hr} dB	Magnitude of Effect
0	No Change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5+	Major

13.5.23 Using the scale as set out in **Table 13.6** the SOAEL is considered to be equivalent to a 3dB change and the LOAEL a 1dB change. The effect criteria apply to the total road traffic noise change at receptors.

Operational Noise

Mechanical Plant Noise

13.5.24 The operation of noise sources in the development, including building services mechanical plant, has been assessed against BS4142. The assessment is based on the difference between the rating noise level of the specific operational noise source and the measured background noise levels during periods of potential operation. The rating level includes corrections for acoustic character should these be present in the specific operational noise (such as tones or impulsiveness).

13.5.25 **Table 13.7** gives an indication of how the BS4142 assessment may align with the national noise policy effect levels; however, the actual impact will depend on the context the new noise source is introduced into.

Table 13.7 BS4142 Criteria

Difference between Rating Level and Background Level	BS4142 Rating	NPSE effect level
-10dB*	N/A*	NOEL
0dB	Indication of the specific sound source having a low impact	LOAEL
10dB	Likely to be an indication of a significant adverse impact depending on the context	SOAEL

* The difference between rating level and background level of -10dB was removed from BS4142 in the current 2014 revision however; this rating level can still be used as an indication of NOEL.

Operational Off-Site Traffic Noise

13.5.26 The change in noise associated with increased construction traffic on the surrounding road network has been calculated in accordance with CRTN. For roads with less than 1000 vehicles per 18 hours the methodology set out in the Noise Advisory Council measurement and prediction guide has been used.

13.5.27 The potential impacts as a result of off-site road traffic have been evaluated in accordance with DMRB traffic noise effect criteria. The change has been calculated as the difference between the future year 'do minimum' scenario and the future year 'do something' scenario with Phases 1-8 which also accounts for growth and committed development traffic.

13.5.28 Short to medium term effects have been assessed against the short term DMRB criteria given in **Table 13.6**

13.5.29 Long term effects of traffic noise from the development site have been assessed against the long-term DMRB criteria given in **Table 13.8**.

Table 13.8 DMRB Long-Term Traffic Noise Effect Criteria

Noise Change, L _{A10,18hr} dB	Magnitude of Effect
0	No Change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10+	Major

13.5.30 The SOAEL is considered to be equivalent to be a 3dB change for short to medium term effects and a 5dB change for long term effects; the LOAEL is a 1dB and 3dB change respectively. The effect criteria apply to the total road traffic noise change at receptors.

Revised Scheme Site Suitability

13.5.31 The introduction of a noise and vibration sensitive development into areas exposed to noise and vibration requires that a site suitability assessment is completed to assess whether the new sensitive uses would be undermined. The noise and vibration sensitive use within the Revised Scheme includes residential dwellings (Class C3), offices (Class B1) and a hotel (Class C1). Residential uses have sensitive internal and external spaces, others are only sensitive internally.

13.5.32 When operational, the Revised Scheme is likely to be exposed to noise from existing noise sources, including road traffic, rail, commercial and aircraft. It will also potentially be exposed to groundborne noise and vibration from existing noise sources including road traffic and rail.

13.5.33 Heavy road traffic would only be expected to lead to significant vibration levels if it is within 10 m distance from the sensitive receptor and if the roads are in poor condition. The roads surrounding the site are in good condition and are generally greater than this distance from the receptors. Road traffic is therefore not expected to give rise to significant vibration effects due to the propagation distances required to maintain significant levels of vibration at the receptor. No further assessment of vibration exposure from Road traffic on the site has been completed.

13.5.34 Prediction of the exposure of the Revised Scheme to surrounding noise and vibration sources has been based on the baseline noise survey and traffic data as the local noise sources are not expected to change significantly between the baseline survey and the operation of the Revised Scheme in the operational year 2034.

13.5.35 The site suitability assessment involves comparison of predicted noise and vibration levels to various guideline internal and external levels which the Revised Scheme should be designed to meet, detailed below. Where the Revised Scheme meets these guidelines, it is expected that the noise levels experienced by future users will be below the LOAEL and adverse effects will be unlikely to occur.

Groundborne Noise Levels

13.5.36 Exposure to groundborne noise can lead to both activity disturbance and general annoyance. Groundborne noise occurs when, often imperceptible, levels of ground vibration may excite resonances in the structure of a building which then reradiates as a 'rumbling' noise directly into rooms. This effect normally arises from rail systems in tunnels because the receiving building is usually completely screen from the effects of airborne noise.

13.5.37 There are several different methods that are used to predict groundborne noise. One such method is applied to free field vibration measured outside the building. The Kurzweil formula (**Appendix 4, Volume I**) is derived from an empirical approach whereby third octave RMS acceleration is used to predict an L_{Amax,Si}; and this method has been used in this assessment.

13.5.38 There are no UK or international standards for the assessment of groundborne noise inside dwellings, so the predicted groundborne noise levels in the Revised Scheme at residential dwellings have been compared to guideline levels from The London Underground (LU): Noise and Vibration Asset Design Guidance which states the following:

- The noise from sub surface and underground railways should not be considered to be significant if the groundborne noise as measured in a residential dwelling does not give rise to an average maximum noise level exceeding 40dB

- L_{AFmax_i} and
 - In recognition that the sensitivity of people to noise can vary significantly the designers should use reasonable endeavours to meet a more stringent requirement of 35dB L_{AFmax} .
- 13.5.39 Predicted groundborne noise levels in the proposed non-residential aspects of the development have been compared to guideline levels set out in **Table 13.9** which are based on the High Speed (HS2) Phase 1 EIA Scope and Methodology Report (SMR)²⁸. Note that this quotes a slow-weighting on the L_{Amax} but for consistency with the LU guidelines, a fast-weighting has been used and ensures a marginally more stringent approach.
- 13.5.40 The feasibility of the Revised Scheme achieving these guideline groundborne noise levels has been assessed to determine the suitability of the Site for the proposed noise sensitive development.

Table 13.9 Groundborne Noise Criteria for Non-Residential

Type of Receptor	Guideline Internal Noise Level L_{AFmax} , dB
Hotels/Offices	40

Vibration Exposure

- 13.5.41 The assessment of vibration affecting humans in buildings during the day and night is carried out using guidance from BS6472. The vibration dose value (VDV) has been measured during the survey at locations representative of the foundation of the proposed buildings closest to the vibration sources. The VDV takes into account both the level and duration of vibration events whilst taken into consideration whether the vibration is continuous or intermittent. The measured VDV is taken as the worst-case vibration exposure to sensitive buildings in the Revised Scheme.
- 13.5.42 The vibration exposure of the Revised Scheme buildings due to trains is compared to guideline levels in **Table 13.10**

Table 13.10 Reproduced from BS6472 Part 1 'Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings.'

Place and Time	Adverse comment not expected ($ms^{-1.75}$)	Low probability of adverse comment ($ms^{-1.75}$)	Adverse comment possible ($ms^{-1.75}$)	Adverse comment probable ($ms^{-1.75}$)
Residential buildings & hotel & offices 16h day (07:00 – 23:00)	< 0.2	0.2 to 0.4	0.4 to 0.8	> 0.8
Residential buildings & hotel & offices 8h night (23:00 - 07:00)	< 0.1	0.1 to 0.2	0.2 to 0.4	> 0.4

Internal and External Airborne Noise Levels

- 13.5.43 The internal and external airborne noise levels will be used to assess the site suitability. The prediction of the noise levels from the various noise sources at the relevant proposed sensitive receptor is based on the results of the noise survey and noise prediction calculations. The predicted noise levels and survey data are compared with criteria that depend on both the use of the receptor, the time period and the noise source.
- 13.5.44 Predictions of traffic noise exposure incident on the sound sensitive facades of the Revised Scheme have been completed. Predictions of noise propagation and attenuation due to screening have been carried out using CadnaA, a computer based 3D modelling program. The model uses the CRTN and CRN prediction methodology for road traffic noise and railway noise respectively. In addition to the derived road / railway traffic source noise levels used in the predictions, the model also considers the effects of the topographical conditions throughout the area, ground absorption and atmospheric absorption.
- 13.5.45 Predictions have been completed based on the future traffic flows at year 2034 when the site is fully operational. Operational year 2034 is the 'worst case', therefore if the Revised Scheme is suitable in this year, it will also be suitable during operation of Phase 1 in late 2023.

- 13.5.46 From the noise predictions in the model, external to internal noise break in calculations have been undertaken to determine likely internal noise levels with typical façade elements. An indicative $R_w + C_{tr}$ has been calculated to meet the internal noise level criteria using the worst-case predicted $L_{Aeq,T}$ and measured survey data for L_{AFmax} at each building.
- 13.5.47 The following guideline internal ambient noise levels for habitable rooms and Hotel bedrooms, shown in **Table 13.11** are given in BS8233.

Table 13.11 BS8233 Residential Internal Ambient Noise Level Criteria

Activity	Typical Situation	Typical Ambient Day time Noise Level $L_{Aeq,16hrs}$, dB	Typical Ambient Night-time Noise Level $L_{Aeq,8hrs}$, dB
Resting	Living rooms	35	N/A
Dining	Dining rooms	40	N/A
Sleeping (Daytime resting)	Bedrooms	35	30
Resting	Hotel Bedrooms	35	30

- 13.5.48 In locations where regular individual noise events occur (such as scheduled aircraft or passing trains) which can cause sleep disturbance BS8233 recommends that a guideline value be set in terms of SEL or L_{AFmax} depending on the character and number of events per night.
- 13.5.49 The WHO Guidelines of Community Noise recommends that a 'Typical Night Time L_{AFmax} dB' value of 45dB should not be regularly exceeded inside bedrooms during the night-time period to avoid potential sleep disturbance.
- 13.5.50 The suitability of the use of outdoor amenity spaces within the Revised Scheme has been assessed using BS8233 criteria. BS8233 states;
- 13.5.51 "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 50dB $L_{Aeq,T}$ with an upper guideline value of 55dB $L_{Aeq,T}$ 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."
- 13.5.52 "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 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."
- 13.5.53 BS8233 gives a guideline internal noise level design range for an open plan office as 45-50dB $L_{Aeq,T}$, meetings rooms as 35-45dB $L_{Aeq,T}$ and department store 50-55dB $L_{Aeq,T}$.
- 13.5.54 The 'Agent of Change' principle places the responsibility for mitigating the impacts from existing noise-generating activities on the new proposed noise-sensitive development. An assessment has been carried out based on measured data and survey observations.
- 13.5.55 The feasibility of the Revised Scheme achieving these guideline internal and external noise levels has been assessed to determine the suitability of the Site for the proposed noise sensitive residential and non-residential development.

Application of the Development Parameter Range

²⁸ HS2 London to West Midlands:EIA Scope and Methodology Report (Sept 2012), High Speed Two Limited, London.

13.5.56 The scale and location of the outline element of the Revised Scheme has been defined by a maximum development parameter submitted in support of the Application. The assessment of the construction and operational phase effects has therefore been based upon application of the maximum parameter. This will give rise to the largest developable area (for example shortest distance between the Site and external receptors) therefore be a conservative assessment of the likely residual effects. There is no additional assessment of the illustrative development in this case as this would not result in any difference in the assessed effects.

Limitations and Assumptions

Construction Phase

Construction Noise

13.5.57 Detailed methodology for the construction of the Revised Scheme is not available for any phase of the project and would be determined by the appointed contractor. However, an indicative construction programme and a first draft of construction management plan have been provided by SLW (Avison Young) in **ES Addendum Volume 2, Chapter 5: Proposed Development and Construction Overview**.

13.5.58 The construction programme is divided in nine phases and is as follows:

- Phase 1 and 2 are currently envisaged to last for 42 and 13 months respectively, commencing in 2021; Phase 3 for 29 months commencing in 2022; Phase 4 for 37 months commencing in 2025; phase 5 and 6 for 38 and 36 months commencing in 2028; Phase 7 for 31 months commencing in 2030 and lastly, Phase 8 for 28 commencing in 2031.

13.5.59 This phasing has been taken into account in the construction noise and vibration assessment.

13.5.60 Based on the current available works description, it is considered that the noise impact would be greatest during demolition, excavation and substructure activities. These activities will take place at various locations throughout the site (depending on the phase). Expected durations and start dates for these activities are as follows:

- Demolition and excavation works will happen as part of site clearance activity during the eight phases. Phases 1, 4, 6 and 7 have the longest site clearance period ranging from 10 to 41 months. Phase 1 commences in 2021, Phase 4 commences in 2025, Phase 6 commences in 2028 and Phase 7 commences in 2030.
- Piling will happen as part of the substructure activities during the eight phases. Phase 1 and 6 present the longest activity period, approximately 31 and 21 months respectively.

13.5.61 Within **ES Addendum Volume 2, Chapter 5: Proposed Development and Construction Overview** an indicative list of the mechanical plant and equipment likely to be used per construction activity has been included. Noise generating activities during the works could include the following:

- demolition – may include tracked/wheeled 360-degree excavators, breakers and crushers in the vicinity of the existing building being demolished;
- excavation – may include tracked/wheeled 360 degree excavators, dumpers and earth compaction equipment across the Revised Scheme;
- concrete pours and levelling – may involve concrete pumps, mixer trucks and vibrating rollers at building foundations and piling locations;
- substructure (piling) – may involve large diameter bored piling rigs at the building foundations; and
- spoil movements – may involve excavators, tipper lorries and dumpers moving spoil across the Revised Scheme.

13.5.62 Noise impacts from superstructure and envelope works are likely to be lower than the demolition, substructure and excavation works and would be lower still during the fit-out and landscaping stages of works.

13.5.63 The core working hours for Site preparation and construction would be:

- 08:00 – 18:00 hours weekdays; and
- 08:00 – 13:00 hours Saturday.

13.5.64 The core hours are in line with guidance in BS5228; any work outside these hours would be subject to prior agreement, and/or reasonable notice given to LBTH and LBH and their respective Environmental Health Offices. These hours would be strictly adhered to unless or in the event of:

- an emergency demands continuation of works on the ground of safety;
- works are being carried out within the containment of the building envelope; or
- completion of an operation that would otherwise cause greater interference with the environment / general public if

left unfinished.

Construction Vibration

13.5.65 Of the works described above, it is assumed that piling has the potential to lead to significant levels of vibration at receptors.

13.5.66 The effects of vibration from piling on the BT telecommunications tunnel and the LUL Central Line has been addressed within the Bishopsgate Goods Yard: Foundation Design Statement²⁹. This document lists the constraints on piling near these assets and is not considered in this Chapter.

Construction Road Traffic Noise

13.5.67 The assessment year used is assumed to represent the worst-case noise change on the surrounding roads as a result of the Revised Scheme and during the construction phase.

13.5.68 The assessment is based on traffic data provided by the Applicants traffic consultants.

Operational Phase

Operational Noise

13.5.69 Currently there is no detailed information on the proposed noise generating plant to be used on site once operational. LBTH and LBH will require the site to comply with noise limits as set out in their Local Plans. It is assumed that sufficient embedded mitigation is employed so that the limits are complied with.

13.5.70 Commercial operations on the site at the Boxpark and Powerleague will removed as part of the scheme. All measurement positions were screened from these noise generating activities and dominated by other existing sources. It is therefore expected that the overall ambient noise levels at surrounding receptors will not change significantly as a result of the removal of these operations, so no further assessment of this change has been completed.

Operational Road Traffic Noise

13.5.71 The assessment year used is assumed to represent the worst-case noise change on the surrounding roads as a result of the Revised Scheme during the operational phase.

13.5.72 The assessment is based on traffic data provided by the Applicants Transport Consultants.

Operational – Site Suitability

13.5.73 Baseline measurements were undertaken around the perimeter of the site. It was deemed that due to site restraints at the monitoring positions the monitors were screened from the existing road sources. Attended measurements around the site were used to verify the ‘Do Minimum’ 2018 traffic predictions.

13.5.74 Traffic data was supplied by the transport consultants.

13.5.75 Railway source noise levels have been calibrated from the noise levels measured at the nearest survey locations and using information obtained from Real Time Trains³⁰ to obtain an indicative CRN Level. Source term levels within the noise model are shown in **ES Addendum, Volume 4, Appendix I: Noise and Vibration**.

13.5.76 No change in noise level from rail sources is expected and future baseline noise levels are based on current use.

13.5.77 The predicted noise levels from the noise model were compared with the measured levels at all positions to verify the model and produced reasonable agreement.

13.5.78 Currently the site is not located within any of the London City Airport (LCY) Contours for 2016 as per the LCY Noise Action Plan 2018-2023. LCY is currently in the process of expansion and increasing its flights capacity which will be operational by 2023. As part of the City Airport Development Plan (CADP), the Airport has upgraded its existing sound insulation scheme by offering to properties within the 57dB L_{Aeq,16h} noise contour. As it stands the resulting noise impact by the growth of the airport has not been published. Aircraft noise has not been considered significant in comparison to other transportation sources.

²⁹ Bishopsgate Goods Yard (2019), A foundation Design Statement, WSP.

³⁰ SWL Line Ltd. URL: www.realtimetrains.co.uk. Date accessed: 06/03/2019

- 13.5.79 When vibration and groundborne noise passes from one medium to another, a change in level can often occurs as the energy changes from one medium to another. The Transportation Noise Reference Book³¹ summarises transfer functions to be applied when conducting vibration assessments. The assumptions applied in the predictions include a correction for ground to surface foundation, attenuation through floor to floor and floor resonance when going up through the structure. These corrections are shown in **Volume 4, Appendix I: Noise and Vibration**.
- 13.5.80 An attended survey was carried out to assess whether there is any re-radiated noise emanating from the Shoreditch High Street station structure when trains are moving. The observations of the survey indicate that re-radiated noise is not prominent. Survey observations are shown in **Volume 4, Appendix I: Noise and Vibration**.

13.6 BASELINE ASSESSMENT AND IDENTIFICATION OF KEY RECEPTORS

Baseline Conditions

Noise Sensitive Receptors

- 13.6.1 The Revised Scheme is to be constructed in phases as explained in **Chapter 5: Revised Scheme and Construction Overview**, so parts of the Revised Scheme constructed in the early phases are likely to be in use while later stages are under construction. Properties developed during Phase 1-3 are expected to become occupied whilst other phases are completed. Therefore, some buildings will become sensitive receptors as occupants move in whilst construction is still active.
- 13.6.2 The following potential noise sensitive receptors in proximity to the Site have been taken into consideration when assessing the impacts associated with noise and vibration from the construction and operational phases of the Revised Scheme.
- 13.6.3 The existing receptors and type of receptor are presented in **Table 13.12** as follows:

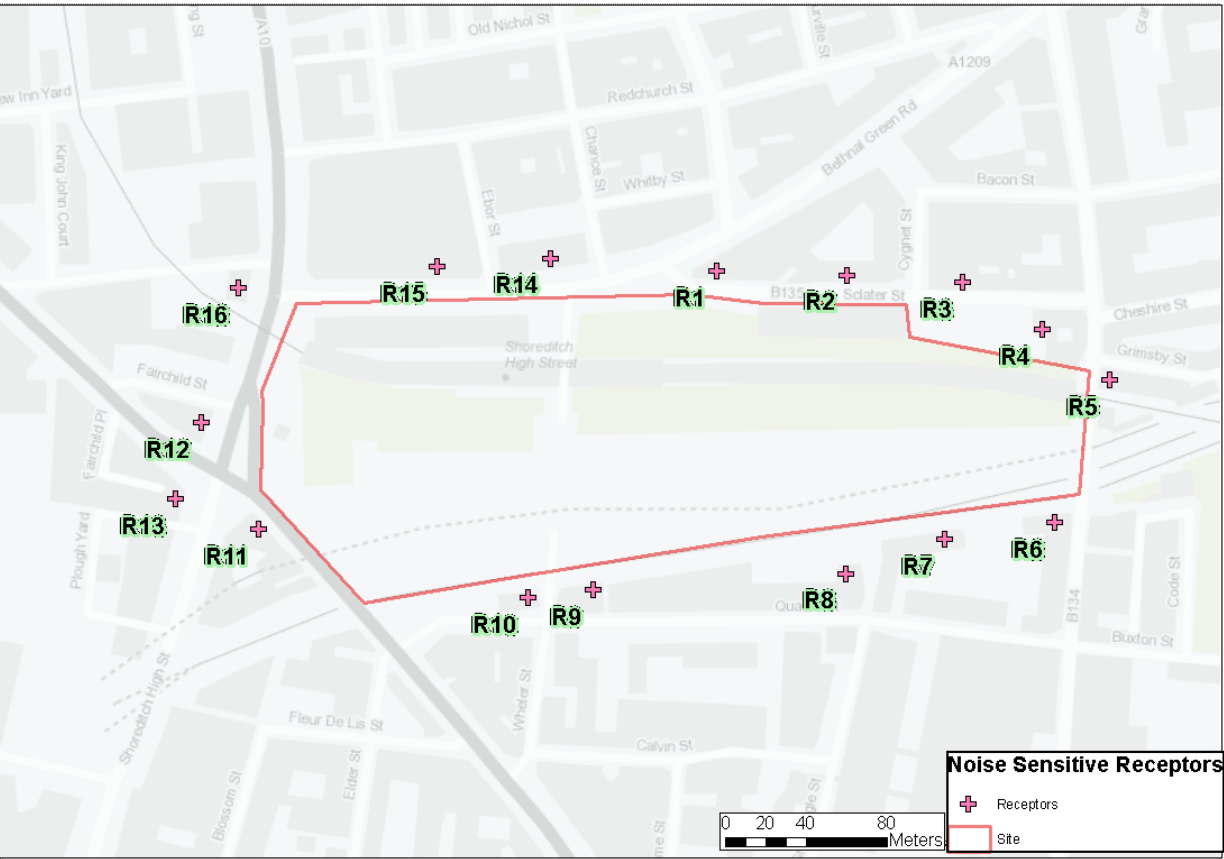
Table 13.12 Existing Noise Sensitive Receptors

Receptor ID	Receptor	Type
R1	1 Sclater Street	Residential Retail Units
R2	2-5 Sclater Street	Residential Restaurants Bar
R3	51 Sclater Street	Residential Cinema
R4	102 Sclater Street	Residential Restaurants
R5	178 Brick Lane	Residential Restaurants
R6	105 Brick Lane	Residential
R7	13 Sheba Place	Residential
R8	56 Quaker Street	Residential
R9	10 Quaker Street	Residential Retail Units
R10	1 Quaker Street	Commercial Unit
R11	169 Commercial Street	Residential
R12	2-4 Great Eastern Street	Residential

Receptor ID	Receptor	Type
R13	1 Great Eastern Street	Residential
R14	13 Bethnal Green Road	Residential Restaurants
R15	56 Shoreditch High Street	Offices
R16	196 Shoreditch High Street	Residential Restaurants

- 13.6.4 **Figure 13.2** below shows the location of the existing sensitive receptors in relation to the site (R1-R14) and the layout of the Revised Scheme.

Figure 13.2 Site Schematic of Existing Noise Sensitive Receptors



- 13.6.5 The noise and vibration sensitive uses within the Revised Scheme includes residential dwellings, offices and a hotel. During the phased operational these will become new noise sensitive receptors on the development.
- Noise and Vibration Survey Results**
- 13.6.6 The existing noise environment across the majority of the site was dominated by transportation sources from the surrounding road and rail lines in the absence of construction noise.
- 13.6.7 Measurement position 1 (UNM1) was exposed to continuous road traffic noise from both Shoreditch High Street and Commercial Street consisting of a mixture of vehicle types. Construction noise from 55B Holywell Lane, which was approximately 200m away, was also clearly audible. Regular rail noise was perceptible although screened and often masked by the construction noise.

³¹ Transportation Noise Reference Book (1987). Butterworths. ISBN 0-408-01446.6

- 13.6.8 Measurement position 2 (UNM2) was exposed to continuous road traffic noise from Shoreditch High Street and Commercial Street; regular rail noise from lines into London Liverpool Street was also clearly audible. Construction noise from both 55B Holywell lane and Silwex House was also prominent at this location as well as occasional aircraft noise.
- 13.6.9 Measurement position 3 (UNM3) was exposed to continuous construction noise form Silwex house approximately 40m away. Regular rail noise from lines into London Liverpool Street to the south was also incident on the site along with traffic noise from Shoreditch High Street and Commercial Street. Other noise sources contributing to a lesser degree were intermittent traffic and pedestrians on Wheler street, occasional aircraft noise and birdsong.
- 13.6.10 Measurement position 4 (UNM4) was exposed to road traffic noise from Bethnal Green Road and Brick Lane. In comparison to the other positions, rail noise from both lines to the north and south was also audible but to a lesser extent. Distant construction noise from Silwex House was also present. Other noise sources included occasional aircraft noise and birdsong.
- 13.6.11 Attended measurement position 1 (ANM1) was exposed to regular, but slow moving, traffic along with contributions from Brick Lane. Other noise sources included pedestrians and construction noise.
- 13.6.12 Attended measurement position 2 (ANM2) was exposed to regular traffic along Brick Lane and regular rail noise from both lines. Wheel screeching was observed from the National Rail line. Other noise sources included aircraft noise, and pedestrians.
- 13.6.13 Attended measurement position 3 (ANM3) was exposed to continuous traffic on Bethnal Green Road and Sclater Street. Other noise sources included pedestrians.
- 13.6.14 Attended measurement position 4 (ANM4) and attended measurement position 5 (ANM5) were dominated by road traffic noise on Commercial Street along with contributions from pedestrians and distance construction noise.
- 13.6.15 The attended measurement position 6 (ANM6) was located central on site. Distant traffic was the prevailing noise source for most of the measurement period along with contributions from a van parking nearby. Re-radiated noise from Overground trains on the Shoreditch High Street station structure was intermittently just audible when leaving/arriving from Shoreditch High Street Station but was not prominent.
- 13.6.16 Additional attended measurements (ANM7-ANM9) were located along Sclater Street. Traffic along Bethnal Green Road and Sclater Street was the prevailing noise source for most of the measurement period. Overground trains were intermittently just audible when leaving/arriving from Shoreditch High Street Station.
- 13.6.17 Evening attended measurements (ANM10-ANM12) were located along Sclater Street and Brick Lane. Traffic along Bethnal Green Road and Sclater Street was the prevailing noise source for most of the measurement period. Entertainment noise from the commercial premises were not prominent but was audible at times during the survey. The results from this are presented in **Volume 4, Appendix I: Noise and Vibration**.
- 13.6.18 Attended vibration measurements (AVM1-AVM4) were located across four locations on site. Vibration was only just perceptible when the trains were audible at AVM1. For the other locations, trains were audible but there was no perceptible vibration.
- 13.6.19 Meteorological conditions were collected at UNM1 during the survey period. Where wind speeds exceeded 5 m/s and precipitation occurred, the survey data was omitted.
- 13.6.20 **Table 13.13** and **Table 13.14** presents a summary of the results from the noise surveys. The noise levels presented are all free field. Full results of the baseline noise survey and information concerning how the results are derived are presented in **Volume 4, Appendix I: Noise and Vibration**.
- 13.6.21 During the survey, aircraft from London City airport formed part of the underlying noise climate; the Site, however, lies outside the 54dB LAeq,16hr noise contours for London City Airport³².

UNM3	52	48	72	70	49	43
UNM4	57	54	78	74	47	44

* due to influences from construction noise, the lowest measured background noise level was used.

Table 13.13 Summary of Noise Survey Results

Monitoring Position	Ambient Noise Level LAeq,T dB		Typical Maximum noise level LAFmax,15mins dB		Typical Background noise level LA90,15mins dB	
	Day	Night	Day	Night	Day*	Night
	07:00 – 23:00	23:00 – 07:00	07:00 – 23:00	23:00 – 07:00	07:00 – 23:00	23:00 – 07:00
UNM1	63	61	84	79	56	51
UNM2	60	58	77	73	51	46

³² London City Airport Noise Action Plan 2013-2016; DEFRA strategic noise maps 2011

Table 13.14 Summary of Attended Noise Survey Results

Monitoring Position	L _{Aeq,15mins} dB	L _{A90,15mins} dB	L _{A10,15mins} dB	L _{AFmax,15mins} dB
ANM1	65	56	67	86
ANM2	66	55	70	87
ANM3	68	59	69	95
ANM4	71	63	73	101
ANM5	75	66	77	105
ANM6	56	51	58	67
ANM7	59	53	62	72
ANM8	56	53	58	69
ANM9	59	55	62	71

- 13.6.22 Day and night-time vibration levels were measured on the site from the unattended monitors. The worst-case measured 16-hour and 8-hour vibration dose values are provided below:
 - daytime: worst-case z-axis 0.04 m/s^{1.75} VDV; and
 - night-time: worst-case z-axis 0.03 m/s^{1.75} VDV.
- 13.6.23 The worst-case measured 10-second third-octave RMS acceleration levels during the survey period are presented in **Volume 4, Appendix I: Noise and Vibration.**
- 13.6.24 Data was obtained from Real Time Trains to confirm the number of train pass-bys during the survey (including both passenger and freight trains) during the day (06:00 – 24:00) and night (00:00 – 06:00) from the different rail lines adjacent to the Site. Real Time Trains obtains the data from Network Rail and Transport for London. According to Real Time Trains, on the 27th February from 06:00 until 28th February 05:59 there were:
 - 346 trains that departed/arrived into Liverpool Street during the daytime of which 8 were freight;
 - 38 trains that departed/arrived into Liverpool Street during the night-time of which 1 was freight;
 - 571 trains that passed through Shoreditch High Street Station during the daytime; and
 - 8 trains that passed through Shoreditch High Street Station during the night-time.
- 13.6.25 Full results of the baseline vibration survey and information concerning how the results are derived are presented in **Volume 4, Appendix I: Noise and Vibration.**

13.7 IDENTIFICATION AND DESCRIPTION OF CHANGES LIKELY TO GENERATE EFFECT

Construction Phase

- 13.7.1 The construction and operation of the Revised Scheme is staggered. Residential and non-residential buildings within the Revised Scheme will be occupied progressively. Phase 3 will be completed in 2025 and building 10B (10 storey residential) will become the closest receptors to Phase 4 which will finish in 2028. Building 8A will become the closest receptors while Phase 6 is being built from 2028 to 2030. Building 1, 5, 8A-8C and 10B will be the closest receptors while Phase 7 is under construction between 2030 and 2032.

- 13.7.2 During the construction phases of the Revised Scheme, simultaneous construction of blocks close-by to residential receptors could potentially generate noise impact, particularly when noisy activities coincide. These construction noise impacts can lead to temporary direct, reversible effects in the form of annoyance, speech interference and disturbance and are confined to the local scale (i.e. surrounding buildings).
- 13.7.3 During the construction phases of the Revised Scheme, where piling operations are in close proximity to receptors, vibration impacts may arise. This impact can lead to temporary direct, reversible effects in the form of annoyance from perceptible vibration of short to medium duration and are confined to the local scale (i.e. surrounding buildings). In more extreme cases, it can also lead to direct and permanent effects in the form of building damage (cosmetic and structural) which would be confined to the local scale (i.e. surrounding buildings).
- 13.7.4 During construction, construction phase road traffic could potentially generate additional noise impacts at noise sensitive receptors surrounding the Site. These impacts can lead to temporary effects in the form of annoyance and disturbance of short to medium duration and are generally confined to the local scale (i.e. surrounding roads).

Operational Phase

- 13.7.5 During the operation of the site, noise from the operation of the Revised Scheme (including mechanical plant and equipment associated with residential and commercial) could potentially generate noise impacts. This can lead to direct effects in the form of annoyance and disturbance of long-term duration and are confined to the local scale (i.e. surrounding receptors).
- 13.7.6 During the operation of the site, a change in road traffic due to the Revised Scheme could potentially generate noise impact. This can lead to direct and temporary effects in the form of annoyance and disturbance of short to medium duration, then potentially lead to effects of long-term duration and are generally confined to the local scale (i.e. surrounding roads) but has the potential to effect on the district scale (i.e. roads further afield).

13.8 ASSESSMENT OF LIKELY SIGNIFICANT EFFECT

Construction Phase

Embedded Mitigation Measures

Construction Noise and Vibration

- 13.8.1 Impacts during the noisiest periods should be considered and addressed in terms of “Best Practicable Means” and controlled and managed through the Section 61 process of the Control of Pollution Act 1974.
- 13.8.2 BS5228 does not state criteria for acceptable levels of construction noise, therefore the preferred approach is to reduce noise levels where possible, but with due regard to practicability. Sometimes a greater noise level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.
- 13.8.3 A Code of Construction Practice (CoCP) will be implemented by the contractor during construction which will act as the means for delivering the mitigation described below. General construction noise and vibration mitigation measures include the following:
 - unnecessary revving of engines should be avoided, and equipment switched off when not in use;
 - internal haul routes should be kept well maintained;
 - drop heights of materials should be minimised;
 - plant and vehicles should be sequentially started up rather than all together;
 - as far as reasonably practicable, sources of significant noise should be enclosed;
 - plant should always be used in accordance with manufacturers’ instructions;
 - care should be taken to site equipment away from noise-sensitive areas;
 - where possible, loading and unloading should also be carried out away from such areas; and
 - regular and effective maintenance by trained personnel should be undertaken to keep plant and equipment working to manufacturers specifications.
- 13.8.4 Screening such as noise barriers (in the form of site hoarding) will be used as appropriate.
- 13.8.5 A risk assessment identifying the probability of vibration from piling and Site excavation activities should also be carried out prior to commencement of construction activities, to determine the need for periodic or continuous vibration monitoring. The contractor should use techniques least likely to cause vibration or impact damage to the surrounding properties.

Construction off-site traffic noise

13.8.6 A construction logistic traffic management plan will be implemented to manage vehicle routing, access to site, on site management and vehicle movements and working hours.

Anticipated Effects

Construction Noise

- 13.8.7 The nearest existing noise sensitive receivers around the Revised Scheme are residential properties along Sclater St (R1-R4), Brick Lane (R5-R6), Sheba Place (R7), Quaker St (R8-R9), Commercial St (R11), Great Eastern St (R12–R13), Bethnal Green Road (R14) and Shoreditch High Street (R16). The noise sensitive properties are typically 15 m to 50 m from the Revised Scheme.
- 13.8.8 The new residential and commercial properties in the different buildings, stated in **13.7.1**, are located approximately 10 to 15 m from the nearest relevant construction area. Predicted noise levels in **Table 13.15** below for all the relevant buildings are applicable for site clearance (demolition and excavation), enabling works, foundations and substructure, superstructure, cladding and apartment fit out.
- 13.8.9 Predictions of noise levels associated with construction activities listed in the indicative construction programme and **ES Addendum, Volume 2, Chapter 5: Revised Scheme and Construction Overview** have been undertaken at distances representative of the closest receptors from the construction activity at 10m, 15m, 25m and 25m.
- 13.8.10 **Table 13.15** presents the predicted $L_{Aeq,10hr}$ levels for a working day at varying distances for each activity and gives the expected duration in months per phase.

Table 13.15 Worst Case $L_{Aeq,10hr}$ at Varying Distances during Construction Phase 1 to 8

Activity	Construction noise level at various distances between site and receptor, $L_{Aeq,10hr}$ (dBA)				Activity duration (months)							
	10m	15m	25m	50m	P1	P2	P3	P4	P5	P6	P7	P8
Site clearance	77	73	69	63	10	5	8	10	3	10	41	5
Enabling Works	75	72	67	61	1	1	1	2	1	1	2	1
Foundations (CFA piling) and Sub-structure	80	76	72	66	31	6	18	14	6	21	9	16
Super-structure	76	73	68	62	13	4	24	14	10	8	24	16
Cladding	68	65	60	54	28	1	24	16	14	17	26	4
Internal Fit-out	67	64	59	43	12	3	8	8	3	4	7	10

- 13.8.11 Noise levels relate only to isolated activities and do not consider other activities that may be working simultaneously across the Revised Scheme. Where worst case activities work in unison, this may result in marginally higher noise levels at receptors, but this situation is considered unlikely.
- 13.8.12 Based on **Table 13.15** the assessment indicates that there is a potential for short term moderate adverse effects at existing residential properties located approximately 15 m from the Revised Scheme during the foundations and substructure phase. Receptors located along Sclater Street (R1-R4), Brick Lane (R5), Quaker Street (R9-R10) Commercial Street (R11) are within this range.
- 13.8.13 There is a potential for short term minor adverse effects at existing residential properties located between 15 m and 25 m from the Revised Scheme during the site clearance, enabling works, foundations and substructure and super-structure phases. Receptors located along Quaker Street (R6-R7), Commercial Street (R11) and Bethnal green Road (R14-R15) are within this range.

- 13.8.14 Buildings are expected to be occupied whilst foundations and superstructure works are undertaken during other phases. The worst-case distance of 10 m distance between an occupied building and the potential work-sites applies to all the buildings, therefore, there is a potential for short term minor to moderate adverse effects.
- 13.8.15 It should be noted that the calculation methodology used assumes that no screening or other forms of attenuation are provided (except site hoarding), and worst-case distances have been used for all work activities. Using a phased approach to the construction programme, activity specific noise mitigation measures and assuming a more realistic separation distance from source to receiver (i.e. not immediately adjacent to receptors from the edge of the Revised Scheme), and the addition of Best Practicable Means as set out in BS5228, the typical construction noise levels can be significantly reduced.

Construction Vibration

- 13.8.16 According to the provided CMP, displacement piling techniques, such as continuous flight augured (CFA) piles, will be used. Indicative vibration levels for these piling methods (sourced from BS5228) are presented in **Table 13.16** below.

Table 13.16 BS5228 Construction Vibration Levels

BS5228 reference	Ground Conditions	Distance (m)	PPV, mm/s ¹
Table D.6 (rotary bored piling) - Augering 1050mm dia - ref. 101	Fill/dense ballast/ London clay	20	0.05
Table D.6 (rotary bored piling) - Augering 900mm dia - ref. 102	Fill/wet sand/liaas clay	9	0.20
Table D.6 (rotary bored piling) - Augering 350mm dia - ref. 103	Fill clay	10	0.38
Table D.6 (rotary bored piling) - Augering 350mm dia - ref. 103	Fill clay	20	0.30
Table D.6 (rotary bored piling) - Augering 500mm dia - ref. 104	Fill/sand/clay	10	0.40
Table D.6 (rotary bored piling) - Augering 500mm dia - ref. 104	Fill/sand/clay	15	0.10

- 13.8.17 The BS5228 data indicates that typical vibration levels from bored piling are unlikely to be perceptible in residential environments at distances greater than 20 m. The impact from piling depends on the type of piling, ground conditions, and receptor distance.
- 13.8.18 The minimum activity-existing receptor distance for piling is approximately 10-15 m. The assessment indicates that there is a potential for short term minor adverse effects at the nearest residential properties located along Sclater Street (R1-R4), Brick Lane (R5), Quaker Street (R6), Commercial Street (R11) and Bethnal Green Road (R14-R15). According to the indicative construction programme and the proposed timeframe for construction activities, there is a potential for short term **minor adverse** effects at occupied buildings within the Revised Scheme.

Construction off-site traffic noise

- 13.8.19 **Table 13.17** presents the predicted change in noise level associated with increased construction traffic on the surrounding road network during construction phase year 2027. Details of the calculations are presented in **Volume 4, Appendix I: Noise and Vibration**.

Table 13.17 Peak 2027 Construction Road Traffic Noise Assessment

Road	Predicted Change in Traffic Noise Level, $L_{A10,18hr}$ dB	Short Term Impact Level
Great Eastern Street	0.1	Negligible
A10 (Shoreditch High Street) north-west of Site	0.1	Negligible
A1209 (Bethnal Green Road)	0.2	Negligible
B135 (Sclater Street)	0.6	Negligible
B134 (Brick Lane)	0.2	Negligible
Wheler Street	0.8	Negligible
A1202 (Commercial Street)	0.1	Negligible

Road	Predicted Change in Traffic Noise Level, L _{A10,18hr} dB	Short Term Impact Level
A10 (Shoreditch High Street) south-west of Site	0.0	No Change
A10 (Shoreditch High Street) west of Site	0.1	Negligible
Bethnal Green Road east of Sclater Street	0.2	Negligible
Brick Lane (north)	0.2	Negligible
Brick Lane (south)	0.2	Negligible

13.8.20 The assessment shows that changes in road traffic noise due to the Revised Scheme during construction phase year 2027 is likely to be negligible.

Anticipated Effects of Applying the Development Parameter

13.8.21 The assessment of the construction phase effects has been based upon application of the maximum development parameter. This will give rise to the largest developable area and therefore be a conservative assessment of the likely residual effects.

13.8.22 Minimum parameters for the outline component of the Revised Scheme would result in some building façade locations being further away from noise sources than they would be for maximum building area parameters. Consequently, noise levels incident on building facades may be lower than presented in the outline component site suitability section. However, it is considered that differences in noise levels that are incident on building façades are likely to be marginal.

13.8.23 A reduction in building parameters would result in a reduction in road traffic movements associated with the Revised Scheme. Noise impacts from operational traffic for maximum parameters have been identified as negligible. Consequently, as minimum parameter operational traffic would be lower than maximum parameter operational traffic; operational road traffic noise impacts would be negligible

13.8.24 Overall, it is considered that the difference in the minimum and maximum parameters will not present a significant difference in residual impact, and that overall reducing the development extent to the minimum parameters will present a negligible difference in comparison to the maximum parameters

Operational Phase

Embedded Mitigation Measures

Mechanical Plant Noise

13.8.25 Currently there is no detailed information on the proposed noise generating plant to be used on site once operational. LBTH and LBH will require the site to comply with noise limits as set out in their respective Local Plans. It is assumed that sufficient embedded mitigation is employed so that the limits are complied with

Operational Traffic Noise

13.8.26 There is no embedded mitigation proposed for operational traffic noise.

Anticipated Effects

Mechanical Plant Noise

13.8.27 **Table 13.1818** identifies recommended operation noise limits based on the noise survey results which would comply with the requirements of LBTH and LBH. Due to the potential effects on an elevated background noise level from the construction work the background noise levels used are the lowest measured during the daytime and typical during the night-time.

13.8.28 The operational noise limit is the rating level measured at the receptor as defined in BS4142:2014. The limit applies to the measured or calculated total combined rating noise level from the plant or equipment, associated with the mechanical units, at 1 m from the closest window of the relevant sensitive property during that stated time period. Should the noise from the plant contain any impulsive or tonal characteristics, the rating level should include the appropriate acoustic character correction as specified in BS 4142:2014.

Table 13.18 Recommended Operational Noise Limit Rating Levels

Receptor	Day (07:00 – 23:00)		Night (23:00 – 07:00)	
	Lowest Measured Background noise level	Operational Noise Limit Rating Level dB	Typical Background noise level	Operational Noise Limit Rating Level dB
	L _{A90,15mins} dB		L _{A90,15mins} dB	
Building 4 Dwellings	49	39	43	33
Building 5 Dwellings	50	40	46	36
Building 8A-8C Hotel and Dwellings	53	43	43	33
Building 10A-10C Dwellings	53	43	43	33
Receptors R1-R3 Dwellings	50	40	46	36
Receptors R5-R8 Dwellings	50	40	46	36
Receptors R4, R9, R11 Dwellings	53	43	43	33
Receptors R10, R12, R15 Dwellings	53	43	50	40

13.8.29 All plant to be installed on, or as part of, the development should be subject to the above criteria. However, it must be noted that these limits would be applicable to the worst affected receptors that are closest to the mechanical plant and have a low baseline due to the screening effects of the site. The collective sum of all plant operating under worst case conditions should achieve the above limits. Plant items should be located as far as possible or not overlooking any residential premises. Noise due to mechanical services equipment may need to be controlled by selecting low-noise items of plant, fitting acoustic louvred screens or enclosures, or erecting acoustic screens. An assessment of the proposed mechanical services plant should be undertaken, during the detailed design stage, to demonstrate that the limits proposed in **Table 13.1819** will be achieved.

Operational Road Traffic Noise

13.8.30 **Table 13.1919** presents the predicted change in noise level associated with increased development traffic on the surrounding road network during operational phase year 2033. Details of the calculations are presented in **Volume 4, Appendix I: Noise and Vibration**

Table 13.19 Operational Road Traffic Noise Assessment

Road	Predicted Change in Traffic Noise Level, L _{A10,18hr} dB	Short Term Impact Level	Long Term Impact Level
Great Eastern Street	0.1	Negligible	Negligible
A10 (Shoreditch High Street) North-West of Site	0.1	Negligible	Negligible
A1209 (Bethnal Green Road)	0.3	Negligible	Negligible
B135 (Sclater Street)	0.8	Negligible	Negligible
B134 (Brick Lane)	0.2	Negligible	Negligible
Wheler Street	1.0	Minor	Negligible
A1202 (Commercial Street)	0.2	Negligible	Negligible
A10 (Shoreditch High Street) South-West of Site	0.0	No Change	No Change
A10 (Shoreditch High Street) West of Site	0.1	Negligible	Negligible
Bethnal Green Road east of Sclater Street	0.1	Negligible	Negligible

Road	Predicted Change in Traffic Noise Level, L _{A10,18hr} dB	Short Term Impact Level	Long Term Impact Level
Brick Lane (north)	0.2	Negligible	Negligible
Brick Lane (south)	0.2	Negligible	Negligible

13.8.38 Overall, it is considered that the difference in the minimum and maximum parameters will not present a significant difference in residual impact, and that overall reducing the development extent to the minimum parameters will present a negligible difference in comparison to the maximum parameters

- 13.8.31 On Wheler Street, the predicted change in in traffic noise level is expected to increase by +1dB meaning there is a short-term minor adverse impact but a negligible long-term impact level. The basic noise level of the road in question is predicted to be 55.7dB L_{A10,18hr}. Comparing this noise level to the closest similar attended monitoring position (ANM1) suggest that this change would not be perceptible as the measured level is 65dB L_{Aeq,15mins} so the ambient noise level at receptors is dominated by other surrounding noise sources.
- 13.8.32 The assessment shows that changes in road traffic noise due to the Revised Scheme during operational phase year 2033 are likely to be negligible in the short term and the long term for the rest of the links.

Revised Scheme Site Suitability

Residential and Hotel Uses - Internal Noise Levels

- 13.8.33 Noise from the existing noise sources incident on the Revised Scheme can lead to noise impacts due to elevated internal noise levels in habitable rooms (such as living rooms, bedrooms and hotel rooms). This can lead to effects such as annoyance, speech interference, disturbance and, during the night-time, sleep disturbance for occupants of the Revised Scheme residential and hotel buildings.
- 13.8.34 **Table 13.20** presents a summary of the worst-case noise exposure levels identified for each residential and hotel building. **Figure 13.3** and 4 present the worst-case noise exposure levels on each façade of each building (free field levels presented).

Table 13.20 Summary of Worst-Case Noise Exposure at Residential Dwellings and Hotel

Receptor	Typical Predicted Day, L _{Aeq,16hr} dB	Typical Predicted Night, L _{Aeq,8hr} dB	Typical Measured Night, L _{AFmax,T} dB
Building 4 (Residential)	67	59	74
Building 5 (Residential)	64	56	74
Building 8A (Hotel & Residential)	65	61	70
Building 8B (Hotel)	61	57	70
Building 8C (Hotel)	72	68	74
Building 10A (Residential)	52	46	70
Building 10B (Residential)	58	53	70
Building 10C (Residential)	58	53	74
Existing (Residential)	64	56	74

Anticipated Effects of Applying the Development Parameter

- 13.8.35 The assessment of the operational phase effects has been based upon application of the maximum development parameter. This will give rise to the largest developable area and therefore be a conservative assessment of the likely residual effects.
- 13.8.36 Minimum parameters for the outline component of the Revised Scheme would result in some building façade locations being further away from noise sources than they would be for maximum building area parameters. Consequently, noise levels incident on building facades may be lower than presented in the outline component site suitability section. However, it is considered that differences in noise levels that are incident on building façades are likely to be marginal.
- 13.8.37 A reduction in building parameters would result in a reduction in road traffic movements associated with the Revised Scheme. Noise impacts from operational traffic for maximum parameters have been identified as negligible. Consequently, as minimum parameter operational traffic would be lower than maximum parameter operational traffic; operational road traffic noise impacts would be negligible

Figure 13.3 Noise Model Predictions of Noise Exposure during daytime

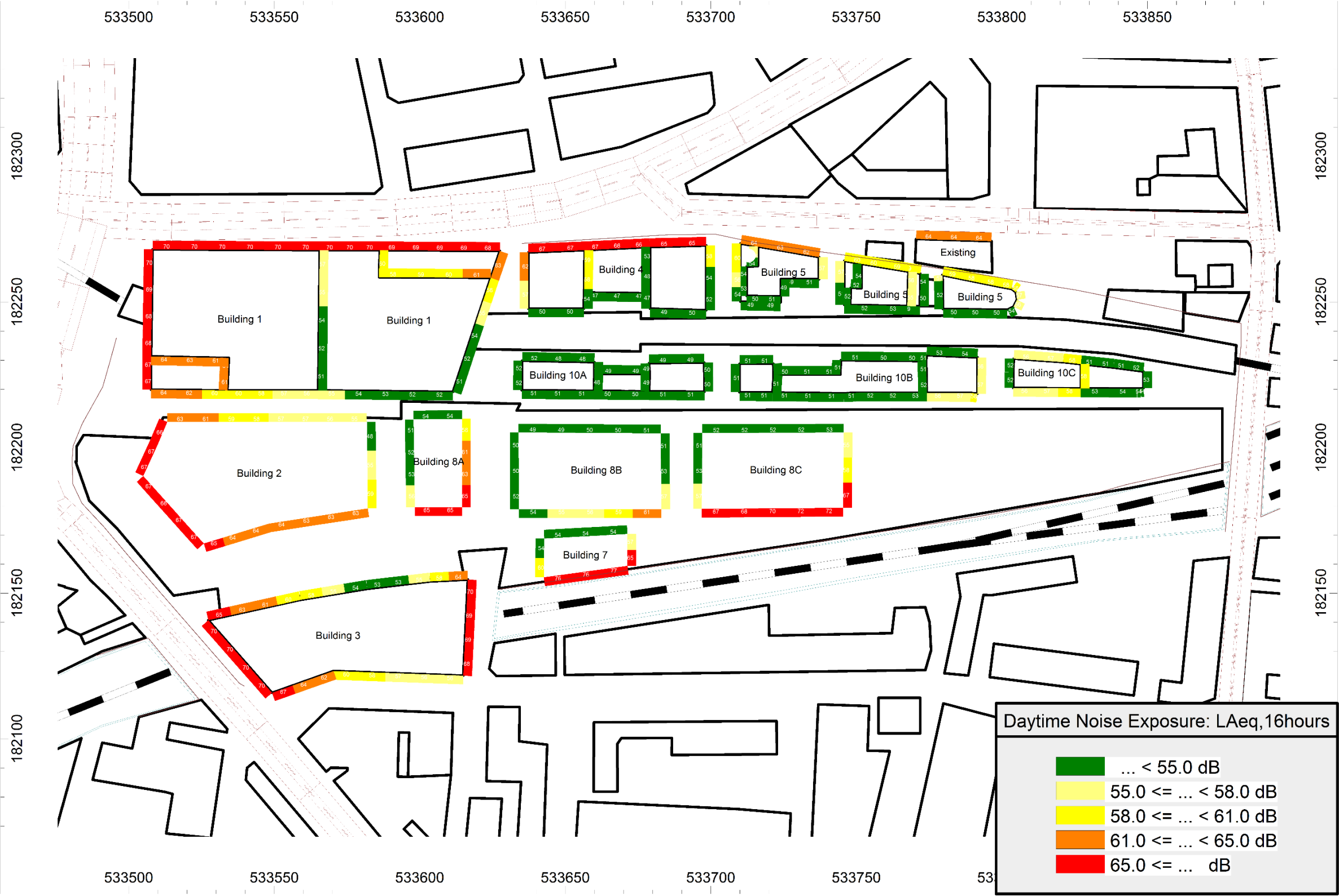
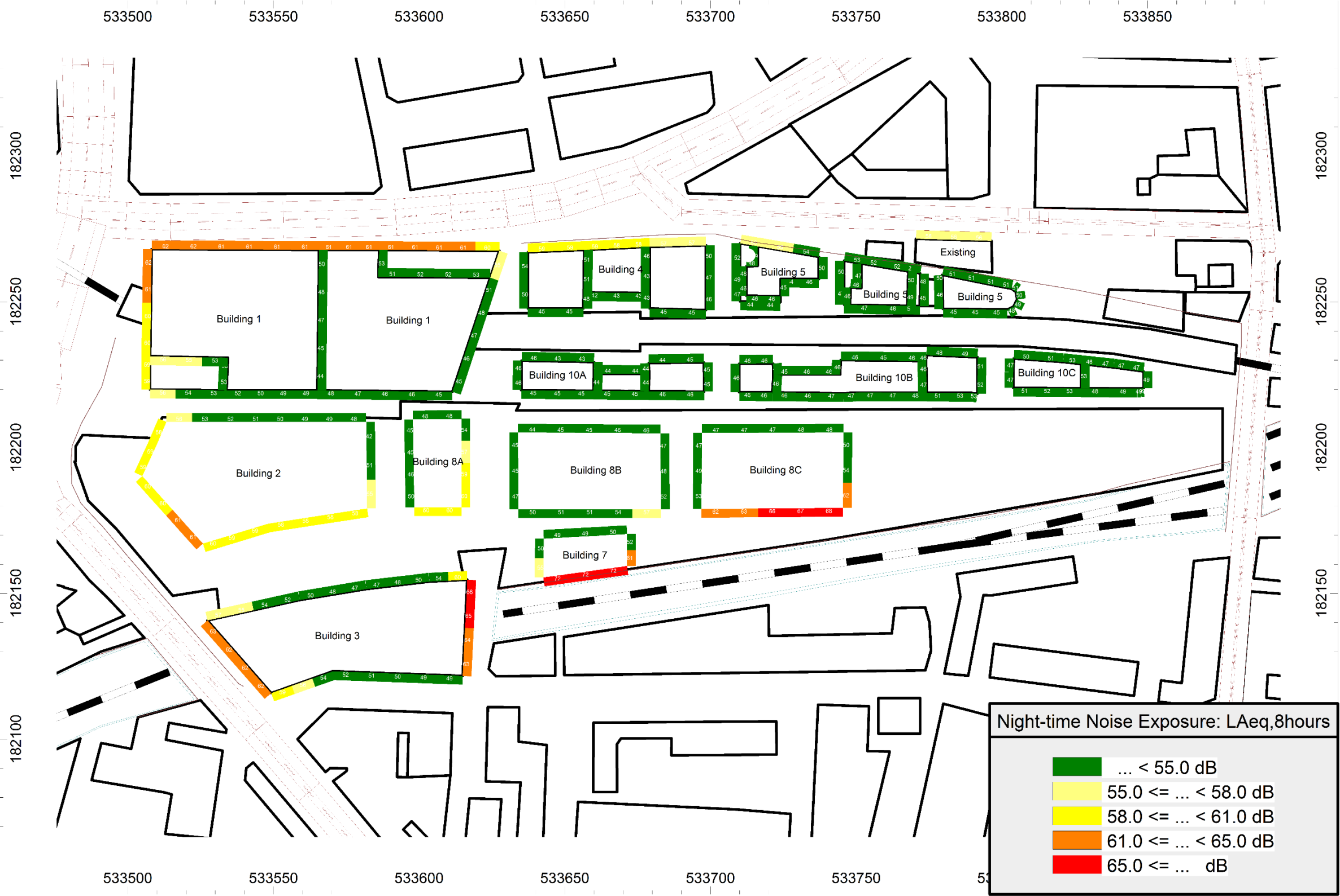


Figure 13.4 Noise Model Predictions of Noise Exposure during night-time



- 13.8.39 The guideline indoor noise levels which would be targeted are 35dB $L_{Aeq,16hr}$ during the day in living rooms and hotel rooms and 30dB $L_{Aeq,8hr}$ and 45dB L_{AFmax} during the night in bedrooms and hotel rooms.
- 13.8.40 Open windows achieve approximately 10-15dB attenuation, so windows would need to be closed to achieve the guideline indoor noise levels in sensitive room on the most exposed facades.
- 13.8.41 External-internal noise break in calculations undertaken for residential and the majority of the hotel units show that the it is feasible to meet the internal noise level criteria outlined in BS8233 at the most exposed facades using high performance thermal double glazing or secondary glazing and high-performance sound insulation for walls. High performance acoustically-rated ventilators or remote ventilation will be required on the loudest facades as a basic means of continuous ventilation and a means of alternative rapid ventilation to openable windows is likely to be needed. At facades exposed to lower noise levels there will be lower performance sound insulation requirements.
- 13.8.42 **Table 13.2121** presents a summary of outline guidance on the required glazing sound insulation to meet the BS8233 level at the various buildings in the Revised Scheme, however this can vary depending on room sizes and types, window sizes and wall construction.

Table 13.21 Summary of Required Glazing Sound Insulation for façades in the Residential and Hotel Uses

Receptor	Room Type	Outline guidance on the required glazing sound insulation to achieve BS8223:2014 & WHO guidelines, $R_w + C_{tr}$, dB	
		Day	Night
Building 4 (Residential)	Living Room	27	-
	Bedroom	32	29
Building 5 (Residential)	Living Room	24	-
	Bedroom	29	29
Building 8A (Residential)	Living	30	
	Bedroom	30	31
Building 8A (Hotel)	Hotel Room	30	25
Building 8B (Hotel)	Hotel Room	27	25
Building 8C (Hotel)	Hotel Room	37	31
Building 10A (Residential)	Living Room	12	-
	Bedroom	17	25
Building 10B (Residential)	Living Room	18	-
	Bedroom	23	25
Building 10C (Residential)	Living Room	18	-
	Bedroom	23	29
Existing (Redevelopment along Sclater Street, (Residential))	Living Room	24	-
	Bedroom	29	29

- 13.8.43 Building 8C may be subject to high noise levels due to the hotel overlooking the rail line. As such, standard double glazing may not be readily achievable for this target. The implementation of high-performance acoustic double glazing (e.g. 6mm/16mm gap/6.8mm) has the potential to meet this performance requirement.
- 13.8.44 Specific calculated assessment of the sound insulation for all elements of the building envelope should be completed based on detailed design proposals to see that the guideline internal noise levels can be met with the proposed design.
- 13.8.45 The survey observations in relation to commercial noise, suggest that whilst the commercial noise is not prominent it is audible.

- 13.8.46 The measured levels along Sclater Street range from 57–64 dB $L_{Aeq,15mins}$ and the predicted levels at facades facing Sclater Street on Buildings 4, 5 and Existing range from 51–59dB $L_{Aeq,8hrs}$ during the night-time. The change in noise level at these receptors from the commercial noise is likely to be audible.
- 13.8.47 The measured levels along Brick Lane range from 65–67 dB $L_{Aeq,15mins}$ and the predicted levels at the façades facing Brick Lane on Buildings 10c range from 47 – 49dB $L_{Aeq,8hrs}$. Building 10C facade has a greater distance separation than the receptors along Sclater Street but it is likely that the change in noise level will still be audible.
- 13.8.48 To protect the dwellings from commercial noise sources and ensuring these businesses can continue to operate within their remits, it is proposed that mechanical ventilation is used as a method of background ventilation for sensitive receptors facing commercial noise at Buildings 4, 5, 10C and the Existing redevelopment. Windows will remain openable, however, the comfort cooling provided by the background ventilation will reduce the reliance on opening windows for purge ventilation.

Residential Uses - External Spaces

- 13.8.49 It is desirable that the external noise level in amenity spaces such as gardens does not exceed 50dB $L_{Aeq,16hr}$, with an upper guideline value of 55dB $L_{Aeq,16hr}$ which would be acceptable in noisier environments.
- 13.8.50 The results of the noise survey indicate existing outdoor noise levels, $L_{Aeq,16hr}$, range between 52dB and 63dB across the Site. However, this is likely due to be elevated due to the existing construction sites surrounding the site. It is likely that the majority of outdoor amenity spaces on the Revised Scheme will be within the upper guideline value based on the noise model results, particularly with the additional screening afforded by the Revised Scheme. **Table 13.15** shows the predicted daytime noise levels in external amenity areas.

Non-Residential Uses - Internal Noise Levels

- 13.8.51 **Table 13.2222** presents a summary of the worst-case noise exposure of the non-residential buildings on the site.

Table 13.22 Summary of Worst-Case Noise Exposure at Non-Residential

Receptor	Typical Predicted Day, $L_{Aeq,16hr}$ dB	Typical Predicted Night, $L_{Aeq,8hr}$ dB
Building 1 (Offices)	71	62
Building 2 (Offices)	67	61
Building 3 (Offices)	70	66
Building 7 (Retail)	77	72

- 13.8.52 The guideline indoor noise levels which would be targeted for open plan offices is 45dB $L_{Aeq,16hr}$ during the day and for meeting rooms requiring privacy 35dB $L_{Aeq,16hr}$.
- 13.8.53 The guideline indoor noise levels which would be targeted for a retail space is 50dB $L_{Aeq,16hr}$ during the day.
- 13.8.54 External-internal noise break in calculations undertaken for non-residential units show that the internal noise level criteria outlined in BS8233 can readily be met even at the noisiest façade with the proposed specification of building elements, including standard double glazing and passive ventilation. It is assumed that the offices will have mechanical ventilation systems and therefore not require openable windows for ventilation.
- 13.8.55 **Table 13.2323** shows a summary of the required sound insulation for non-residential uses.

Table 13.23 Summary of Required Sound Insulation for Non-Residential Uses

Receptor	Room Type	Outline Guidance on the Required glazing sound Insulation to Achieve Design Range of BS 8223:2014, $R_w + C_{tr}$, dB
Building 1	Open Plan Office	26
	Meeting Rooms	36
Building 2	Open Plan Office	22
	Meeting Rooms	32

Receptor	Room Type	Outline Guidance on the Required glazing sound Insulation to Achieve Design Range of BS 8223:2014, $R_W + C_{tr}$, dB
Building 3	Open Plan Office	25
	Meeting Rooms	35
Building 7	Retail	27

Groundborne Noise and Vibration

- 13.8.56
- Groundborne Noise and Vibration arising from the existing sources incident on the Revised Scheme can lead to noise impacts due to elevated internal noise levels in habitable rooms (such as livings rooms, bedrooms and hotel rooms).
- 13.8.57
- The feasibility of the Revised Scheme achieving these guideline levels has been assessed to determine the suitability of the site for the proposed vibration sensitive development.
- 13.8.58
- Based on measurements carried out, the third-octave band RMS acceleration values were obtained to provide an estimation of the groundborne noise level. The highest predicted groundborne noise level was 18dB L_{ASmax} and is therefore below the 35dB L_{AFmax} guideline level for all residential and non-residential uses.
- 13.8.59
- The assessment indicates that the criteria can be met at the proposed ground floors and above without any specific mitigation measures.

Vibration Exposure

- 13.8.60
- Vibration Exposure from the rail sources was measured during an unattended long-term survey to derive the vibration dose value during the daytime and night-time. The levels measured indicate that adverse comments are not expected even when a multiplication factor is applied to account for amplification up the building structure.
- 13.8.61
- The assessment indicates that the criteria can be met for all uses without any specific mitigation measures.

13.1 SCOPE FOR ADDITIONAL MITIGATION MEASURES

Potential Additional Mitigation Measures

Construction Phase

Construction Noise and Vibration

- 13.1.1
- Where minor adverse effects are predicted, further best practicable means measures should be investigated to minimise noise from the construction Site.
- 13.1.2
- Impacts during the noisiest periods should be considered and addressed in terms of “Best Practicable Means” and controlled and managed through the Section 61 process of the Control of Pollution Act 1974.
- 13.1.3
- Prior warning and explanation should be given to residents which are likely to be impacted by vibration from construction activities.
- 13.1.4
- BS5228 does not state criteria for acceptable levels of construction noise, therefore the preferred approach is to reduce noise levels where possible, but with due regard to practicability. Sometimes a greater noise level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.
- 13.1.5
- A risk assessment identifying the probability of vibration from piling and site excavation activities should also be carried out prior to commencement of construction activities, to determine the need for periodic or continuous vibration monitoring. The contractor should use techniques least likely to cause vibration or impact damage to the surrounding properties.

Construction – Off-site Traffic Noise

- 13.1.6
- Provision should be made, wherever possible, to ensure that unloading of vehicles will be carried out on-site rather than on the adjacent roads. All construction traffic entering and leaving the Site should be closely controlled. Vehicles making deliveries or removing spoil from the Site should travel via designated traffic routes previously agreed with local authorities and interested parties. Construction traffic should be controlled by means of a vehicle arrival and departure management plan to achieve an even spread of vehicle movements during the working day. Access and egress for construction vehicles may vary according to the particular stage or phase of the works.

Operational Phase

Operational Mechanical Plant Noise

- 13.1.7
- No additional mitigation measures are proposed for operational mechanical plant noise.

Operational Traffic Noise

- 13.1.8
- No additional mitigation measures are proposed for operational road traffic noise.

Likely Effectiveness of Additional Mitigation Measures

Construction Phase

Construction Noise and Vibration

- 13.1.9
- With the additional mitigation measures listed above minor adverse effects are still likely at the closest residential and non-residentials properties surrounding the site along with the new residential and non-residential receptors on the Revised Scheme; however, they will be minimised as far as is practicable and, in some cases, reduced to negligible effects.
- 13.1.10
- With the additional mitigation measures listed above, effects from construction vibration are likely to be negligible.

Construction Off-site Traffic Noise

- 13.1.11
- No additional mitigation is proposed. The assessment shows that changes in road traffic noise due to the Revised Scheme during construction phases are likely to be negligible.

Operational Phase

Operational Mechanical Plant Noise

- 13.1.12
- No additional mitigation is proposed, the effect of mechanical plant noise is likely to be negligible with embedded mitigation measures.

Operational Traffic Noise

- 13.1.13
- No additional mitigation is proposed. The assessment shows that changes in road traffic noise due to the Revised Scheme during operational phase year 2033 are likely to be negligible.

Figure 13.5 Noise Model Predictions of External Amenity Areas



13.2 RESIDUAL EFFECTS

13.2.1 **Table 13.24** provides a summary of the residual effects resulting from the Revised Scheme after effective implementation of the embedded and additional mitigation measures proposed above.

Table 13.24 Significant Residual Effects

Phase	Resource or Receptor Affected	Residual Effect
Construction	Existing residential and non-residential receptors within 15m of the site perimeter. (R1, R2, R3, R4, R5, R9, R10, R11)	Temporary moderate adverse effect from the Phased Construction during Foundation and Super-Structure.
	Existing residential and non-residential receptors within 15m and 25m of the site perimeter. (R6, R7, R11, R14, R15)	Temporary minor adverse effect from the Phased Construction during Site Clearance, Enabling Works and Foundation and Super-Structure.
	New residential and non-residential receptors within 15m of the nearest construction area within the relevant Phase.	Temporary moderate adverse effect from the Phased Construction during Site Clearance, Enabling Works, Foundation and Super-Structure.
	New residential and non-residential receptors within 15m and 25m of the nearest construction area within the relevant Phase.	Temporary minor adverse effect from the Phased Construction during Site Clearance and Demolition, Enabling Works, Foundation and Super-Structure.
	Surrounding receptors and new receptors occupied as part of the Revised Scheme within 20m of construction activity.	Temporary minor adverse effect from construction vibration.
	Surrounding receptors and receptors occupied as part of the Revised Scheme.	Negligible effect from construction off-site traffic noise
Operation	Surrounding receptors and receptors occupied as part of the Revised Scheme.	Negligible effect from operational mechanical plant
	Surrounding receptors and receptors occupied as part of the Revised Scheme.	Negligible effect from operational traffic noise.

13.3 CUMULATIVE EFFECTS

13.3.1 Cumulative effects are the combined effects of several development schemes (in conjunction with the Revised Scheme) which may, on an individual basis be insignificant but, cumulatively, have a significant effect.

13.3.2 The ES Addendum has given consideration to 'Cumulative 'Effects' for schemes located within (1) km radius from the boundary of the site. **These schemes have been listed in Chapter 3: Methodology Table 3.8.**

Construction Phase

Construction Noise and Vibration

13.3.3 Schemes that are located within approximately 200 m of the identified sensitive receptors can give rise to a potential cumulative noise and vibration impacts should construction works take place simultaneously on all sites.

13.3.4 The following schemes that are in proximity to the Site that may lead to cumulative construction noise impacts at the identified sensitive receptors:

13.3.5 The following nearby committed development schemes are identified as potentially affecting some of the same receptors as the Revised Scheme during construction:

- Land within former Truman's Brewery site, (LPA Ref. PA/12/00090);
- Principal Tower (Principal Place / Bishops Place) (LPA Ref: 2016/2044);
- The Stage (Plough Yard) (LPA Ref: 2015/3453);
- 201-207 Shoreditch High Street (LPA Ref: 2015/2403);
- Silwex House, Quaker street (LPA Ref: PA/16/00392/A1);
- Shoreditch Village (183-187 Shoreditch High Street, bounded by Holywell Lane, New Inn Yard and rail viaduct) (LPA Ref: 2017/0596); and
- 168-178 Shoreditch High Street (LPA Ref: 2015/3316).

13.3.6 Locations of the schemes can be found in **ES Addendum Volume 2, Chapter 3: EIA Methodology – Figure 3.5.**

13.3.7 Compliance with the mitigation measures detailed within this chapter will reduce these effects as far as practicable.

13.3.8 The contractors will liaise with LBTH and LBH in order to establish working guidelines in order to reduce the impacts of cumulative construction works noise.

Construction Off-Site Traffic Noise

13.3.9 Cumulative noise from construction traffic from planned schemes is unlikely to give rise to any additional adverse effects. The contractors will liaise with the LBTH to establish a traffic management plan in order to reduce potential for effects of cumulative construction traffic noise along surrounding roads.

Operational Phase

Operational Mechanical Plant Noise

13.3.10 It is expected that building services noise from the committed developments will be designed to achieve appropriate operational noise limits.

13.3.11 Due to the distances between the committed developments and the nearest receptors, it is considered that the operational noise limits advised in the noise assessments for each scheme would not be exceeded with all developments in operation.

13.3.12 Overall, it is considered that cumulative building services noise would be of negligible significance.

Operational Traffic Noise

13.3.13 The change in noise associated with increased development traffic and committed developments on the surrounding road network has been predicted based on the change between the baseline without committed developments and the 2033 assessment year operational traffic; results are presented in Table **13.19**.

13.3.14 The additional impact of committed developments on road traffic noise compared to the Revised Scheme traffic only is negligible, so there is a negligible cumulative effect.

13.4 QUALITATIVE COMPARISON OF THE 2015 PROPOSED DEVELOPMENT WITH THE 2019 REVISED SCHEME

13.4.1 The Proposed Amendments to the 2015 Proposed Development as a result of the Revised Scheme will not make a material change to the overall Noise and Vibration effects presented in the 2015 ES. **Table 13.25** below shows the difference between the effects. However, an additional assessment has been carried out to assess the 'Agent of Change' principle.

Table 13.25 Comparison of Residual effects between the 2015 Proposed Development and the 2019 Revised Scheme

Phase	Resource or Receptor Affected	Residual Effect (2015 Proposed Development)	Residual Effect (2019 Revised Scheme)
Construction	Existing residential and non-residential receptors within 15m	Major Adverse	Moderate Adverse
	Existing residential and non-residential receptors within 15m and 25m of the site perimeter	Minor Adverse	Minor Adverse
	New residential and non-residential receptors within 15m of the nearest construction area within the relevant Phase	Moderate Adverse	Moderate Adverse
	New residential and non-residential receptors within 15m and 25m of the nearest construction area within the relevant Phase.	Minor Adverse	Minor Adverse
	Surrounding receptors and new receptors occupied as part of the Revised Scheme within 20m of construction activity.	Minor Adverse	Minor Adverse
	Surrounding receptors and receptors occupied as part of the Revised Scheme.	Negligible	Negligible
Operational	Mechanical Plant Noise	Negligible	Negligible
	Operational Traffic Noise	Negligible	Negligible
	Internal and External Noise Levels	Negligible	Negligible
	Groundborne Noise and Vibration	Negligible	Negligible
	Vibration Exposure	Negligible	Negligible

- 13.4.2 Due to the reduction in the scale of construction of Plots 2 (previously A and B) and Plots 5,6 and 10 (previously C, D and E) there has been a corresponding reduction in noise effect on surrounding residential properties from a temporary Major Adverse effect to a temporary Moderate Adverse effect. Otherwise there is no difference in the effects reported between the 2015 Proposed Development and the 2019 Revised Scheme.

13.5 SUMMARY AND CONCLUSIONS

- 13.5.1 A baseline noise and vibration survey was carried out to determine the existing baseline conditions on site. Four unattended noise-logging meters were installed on the Site as positions representative of different areas of the Revised Scheme. This was supplemented by additional attended measurements on the site and around the site perimeter. One unattended vibration meter was installed on the central western part of site above the underground rail lines to measure the effect of the trains passing underneath the Revised Scheme. Additionally, attended vibration measurements were carried out on the site to assist in observations of the results.
- 13.5.2 The site was exposed to continuous traffic noise from the surrounding roads, rail noise from the London Liverpool Street and Shoreditch High Street, construction noise from 55b Holywell lane and Silwex and occasional aircraft noise. The Site lies outside the 54dB $L_{Aeq,16hr}$ noise contours for London City Airport.
- 13.5.3 The highest ambient $L_{Aeq,16hr}$ level across the site was measured as a free field level of 63dB. The highest ambient $L_{Aeq,8hr}$ level across the site was measured as a free field level of 61dB.
- 13.5.4 A noise impact is a change in the acoustic environment. This may be through the introduction of a new noise source or a change to an existing source causing change to the noise climate at existing receptors or the introduction of a new noise sensitive development. The magnitude of the noise impact can depend on the absolute noise level, change in noise level, duration of exposure and the time of day of exposure.
- 13.5.5 Noise impacts can lead to effects on receptors, such as annoyance or sleep disturbance for residential receptors or disturbance to non-residential receptors. The significance of noise effect can vary depending on the type of receptor and its sensitivity to noise, such as residential, commercial or hotel uses.

- 13.5.6 The extent of the potential effects of the Revised Scheme will be assessed using a five-point scale from 'major adverse' to 'major beneficial', a duration scale of short, medium and long term, and a geographic scale of local, district, regional, national and international. A 'major' or 'moderate' effect constitutes a 'significant effect'.
- 13.5.7 An email exchange was held on 15th February 2019 with Paul Murphy, Pollution Manager (Noise) at the Environmental Health and Trading Standards from the London Borough of Tower Hamlets. Survey requirements for the assessment, surrounding noise sensitive receptors and assessment methodology were discussed.
- 13.5.8 Temple attempted to make contact with Ashraful Haque at the London Borough of Hackney but were unable to get a response. The survey and assessment methodology will be based on their local plan and following feedback from the 2015 Proposed Development.
- 13.5.9 For the construction phase, assessment of Construction noise, construction vibration and off-site road traffic noise change due to construction traffic has been completed.
- 13.5.10 The construction noise assessment involves prediction of construction noise levels based on various assumptions regarding the construction activities, such as plant to be used, on-times, hours of working, location of plant and working methods etc. It is assumed that best practicable means measures are implemented to minimise as far as practicable noise impact from the construction Site. Predicted noise levels are compared to evaluation criteria from BS5228 part 1 to assess whether a significant effect is likely.
- 13.5.11 Noise levels from construction activities are predicted to be higher than existing ambient noise levels at the closest noise sensitive receptors to the works so a temporary minor to moderate adverse effect is likely. Where minor to moderate adverse effects are predicted, further best practicable means measures should be investigated to minimise noise from the construction Site, in which case the effect will be minimised as far as is practicable and, in some cases, reduced to negligible effects.
- 13.5.12 The construction vibration assessment involves prediction of vibration levels from the construction activities which are most likely to generate vibration (such as piling). Data from BS5228 part 2 has been used to predict the likely vibration level at receptors. Predicted vibration levels are compared to evaluation criteria from BS5228 part 2 to assess whether a significant effect is likely.
- 13.5.13 Vibration levels from construction is predicted to be at a level where it might just be perceptible in the closest sensitive receptors, so a temporary minor adverse effect is likely. Prior warning and explanation should be given to residents which are likely to be impacted by vibration from construction activities, in which case effects are likely to be negligible.
- 13.5.14 The assessment of off-site road traffic noise change due to construction traffic involves prediction of future baseline and future road traffic noise levels during construction phases from surrounding road links. The predicted change in noise level is compared to a semantic criterion in DMRB to assess whether a significant effect is likely.
- 13.5.15 On Wheler Street, the predicted change in in traffic noise level is expected to increase by +1dB meaning there is a short-term minor adverse impact but a negligible long-term impact level. The basic noise level of the road in question is predicted to be 55.7dB $L_{A10,18hr}$. Comparing this noise level to the closest similar attended monitoring position (ANM1) suggest that this change would not be perceptible as the measured level is 65dB $L_{Aeq,15mins}$.
- 13.5.16 The assessment shows that changes in road traffic noise due to the Revised Scheme during operational phase year 2033 are likely to be negligible in the short term and the long term for the rest of the links.
- 13.5.17 For the operational phase, assessment of mechanical plant noise and operational traffic noise has been completed. A site suitability assessment has also been completed to assess whether the new noise and vibration sensitive uses would be undermined by noise and vibration exposure from existing sources.
- 13.5.18 Currently there is no detailed information on the proposed noise generating plant to be used on site once operational. LBTH and LBH will require the site to comply with noise limits as set out in their respective Local Plans. It is assumed that sufficient embedded mitigation is employed so that the limits are complied with. No likely significant effects are likely to occur if these limits are complied with.
- 13.5.19 The assessment of road traffic noise change due to operational traffic involves prediction of future baseline and future road traffic noise levels during operation from surrounding road links. The predicted change in noise level is compared to semantic criteria in DMRB to assess whether a significant effect is likely.
- 13.5.20 The assessment shows that changes in road traffic noise due to the Revised Scheme during operation are likely to be negligible over the short and long term.
- 13.5.21 A site suitability assessment has been completed. A noise model has been used to carry out the prediction and calculation of road traffic and rail noise from the surrounding sources.
- 13.5.22 External-internal noise break in calculations undertaken for residential and hotel units show that the internal noise level criteria outlined in BS8233 can readily be met even at the noisiest façade with the proposed specification of building elements, including standard double glazing and passive ventilation. Acoustically-rated ventilators will be required as a basic means of continuous ventilation (this could potentially be acoustic rated trickle vents for example).

- 13.5.23 Specific calculated assessment of the sound insulation for all elements of the building envelope should be completed based on detailed design proposals to see that the guideline internal noise levels can be met with the proposed design.
- 13.5.24 To protect the dwellings from commercial noise sources and ensuring these businesses can continue to operate within their remits, it is proposed that mechanical ventilation is used as a method of background ventilation for sensitive receptors facing commercial noise at Buildings 4, 5 and 10C. Windows will remain openable, however, the comfort cooling provided by the background ventilation will reduce the reliance on opening windows for purge ventilation.
- 13.5.25 The results of the noise survey indicate existing outdoor noise levels, $L_{Aeq,16hr}$, range between 52dB and 63dB across the Site. It is likely that the majority of outdoor amenity spaces on the Revised Scheme will be within the upper guideline value based on the noise model results. The noise model shows that with the additional screening afforded by the Revised Scheme, the majority of the outdoor areas may fall below the 55dB upper guideline value.
- 13.5.26 External-internal noise break in calculations undertaken for non-residential units show that the internal noise level design range outlined in BS8233 can readily be met even at the noisiest façade with the proposed specification of building elements. It is assumed that the offices will have ventilation systems and therefore not require openable windows for ventilation during periods of overheating.
- 13.5.27 Groundborne noise and vibration arising from the existing sources incident on the Revised Scheme can lead to noise impacts due to elevated internal noise levels in habitable rooms (such as living rooms, bedrooms and hotel rooms). Based on measurements carried out, the highest measured acceleration value was obtained to provide an estimation of the Groundborne noise level. The predicted Groundborne noise level shows that the site is below the site suitability for all residential and non-residential uses. The assessment indicates that the criteria can be met at the proposed ground floors and above without any specific mitigation measures.
- 13.5.28 Vibration exposure from the rail sources were measured during an unattended long-term survey to derive the vibration dose value during the daytime and night-time. The levels measured indicate that adverse comments are not expected. The assessment indicates that the criteria can be met for all uses without any specific mitigation measures.
- 13.5.29 Schemes that are located within approximately 200m of the identified sensitive receptors can give rise to a potential cumulative noise and vibration impacts should construction works take place simultaneously on all sites. The contractors will liaise with LBTH and LBH in order to establish working guidelines in order to reduce the impacts of cumulative construction works noise.
- 13.5.30 Cumulative noise from construction traffic from planned schemes is unlikely to give rise to any additional adverse effects. The contractors will liaise with the LBTH to establish a traffic management plan in order to reduce potential for effects of cumulative construction traffic noise along surrounding roads.
- 13.5.31 It is expected that building services noise from the committed developments will be designed to achieve appropriate operational noise limits. Due to the distances between the committed developments and the nearest receptors, it is considered that the operational noise limits advised in the noise assessments for each scheme would not be exceeded with all developments in operation. Overall, it is considered that cumulative building services noise would be of negligible significance.
- 13.5.32 The change in noise associated with increased development traffic and committed developments on the surrounding road network has been predicted based on the change between the baseline without committed developments and the 2033 assessment year operational traffic. The additional impact of committed developments on road traffic noise compared to the Revised Scheme traffic only is negligible, so there is a negligible cumulative effect.

Table 13.26 Summary of Residual Effects

Receptor/ Affected Group	Value or Sensitivity (Significance) of Receptor	Activity or Impact	Embedded Design Mitigation	Magnitude/ Spatial Extent/ Duration/ Likelihood of Occurrence	Significance of effect	Additional Mitigation	Residual Magnitude of Impact	Significance of Residual effect
Construction - Phase 1 to 8								
Existing residential and non-residential receptors within 15m of the site perimeter. (R1, R2, R3, R4, R5, R9, R10, R11)	High	Phase 1 to 8 Construction during Foundations and Substructure Phase.	Screening	Moderate	Moderate adverse	Best Practicable Means measures	Minor	Minor adverse
				Direct				
				Local				
				Temporary				
				Likely				
Existing residential and non-residential receptors within 15m and 25m of the site perimeter. (R6, R7, R11, R14, R15)	High	Phase 1 to 8 Construction during Site Clearance, Foundations and Substructure, Enabling Works	Screening	Minor	Minor adverse	Best Practicable Means measures	Minor	Minor adverse
				Direct				
				Local				
				Temporary				
				Likely				
New residential and non-residential receptors on Revised Scheme within 15m of the nearest construction area within the relevant Phase.	High	Phase 1 to 8 Construction during Site Clearance and Demolition, Enabling Works, Foundation and Super-Structure	Screening	Minor to Moderate	Minor to moderate adverse	Best Practicable Means measures	Minor	Minor adverse
				Direct				
				Local				
				Temporary				
				Likely				
New residential and non-residential receptors on Revised Scheme within 15m and 25m of the nearest construction area within the relevant Phase.	High	Phase 1 to 8 Construction during Site Clearance and Demolition, Enabling Works, Foundation and Super-Structure	Screening	Minor	Minor adverse	Best Practicable Means measures	Minor	Minor adverse
				Direct				
				Local				
				Temporary				
				Likely				
Existing residential and non-residential receptors within 20m of the site perimeter. (R1, R2, R3, R4, R5, R6, R11, R14 and R15)	High	Phase 1 to 8 Construction vibration	Best Practicable Means measures	Minor	Minor adverse	Prior warning and explanation to residents	Minor	Negligible
				Direct				
				Local				
				Temporary				
				Likely				
Existing residential and non-residential receptors located along Construction traffic routes. (R1-R16)	High	Phase 1 to 8 Construction traffic noise	Construction traffic management plan.	Negligible	Negligible	None	Negligible	Negligible
				Indirect				
				Local				
				Temporary				
				Likely				
Operation - 2033								
Existing residential and non-residential receptors (R1-R16). New residential and non-residential receptors on Revised Scheme	High	Operational Mechanical Plant	Plant Noise Limits	Negligible	Negligible	None	Negligible	Negligible
				Direct				
				Local				
				Permanent				
				Likely				

Receptor/ Affected Group	Value or Sensitivity (Significance) of Receptor	Activity or Impact	Embedded Design Mitigation	Magnitude/ Spatial Extent/ Duration/ Likelihood of Occurrence	Significance of effect	Additional Mitigation	Residual Magnitude of Impact	Significance of Residual effect
Existing residential and non-residential receptors (R1-R16). New residential and non-residential receptors on Revised Scheme	High	Operational Traffic Noise	None	Negligible	Negligible	None	Negligible	Negligible
				Direct				
				Local				
				Permanent				
				Likely				
Residential receptors along Wheler Street	High	Operational Traffic Noise	None	Minor	Minor – however due to the high existing baseline noise levels it is unlikely there will be a perceptible change.	None	Negligible	Negligible
				Direct				
				Local				
				Temporary				
				Likely				
New residential and non-residential receptors on Revised Scheme	High	Internal and External Airborne Noise Levels	Design layout and sound insulation	Negligible	Negligible	None	Negligible	Negligible
				Direct				
				Local				
				Permanent				
				Likely				
New residential and non-residential receptors on Revised Scheme	High	Groundborne Noise and Vibration	None	Negligible	Negligible	None	Negligible	Negligible
				Direct				
				Local				
				Permanent				
				Likely				
New residential and non-residential receptors on Revised Scheme	High	Vibration Exposure	None	Negligible	Negligible	None	Negligible	Negligible
				Direct				
				Local				
				Permanent				
				Likely				
Commercial Activities	High	Agent of Change	Mechanical ventilation for facades facing	Minor	Negligible	None	Negligible	Negligible
				Indirect				
				Local				
				Permanent				
				Likely				
Cumulative Effects - Construction								
New residential and non-residential receptors on Revised Scheme	High	Construction Noise	Best Practicable Means measures	Minor	Minor adverse	Investigate BPM measures	Minor	Minor adverse
				Direct				
				Local				
				Temporary				
				Likely				
New residential and non-residential receptors on Revised Scheme	High	Phase 1 to 8 Construction vibration	Best Practicable Means measures	Minor	Minor adverse	Prior warning and explanation to residents	Negligible	Negligible
				Direct				
				Local				
				Temporary				

Receptor/ Affected Group	Value or Sensitivity (Significance) of Receptor	Activity or Impact	Embedded Design Mitigation	Magnitude/ Spatial Extent/ Duration/ Likelihood of Occurrence	Significance of effect	Additional Mitigation	Residual Magnitude of Impact	Significance of Residual effect
				Likely				
Cumulative Effects - Operation								
New residential and non- residential receptors on Revised Scheme	High	Operational Mechanical Plant	Plant Noise Limits	Negligible	Negligible	None	Negligible	Negligible
				Direct				
				Local				
				Permanent				
				Likely				
New residential and non- residential receptors on Revised Scheme	High	Operational Traffic Noise	None	Negligible	Negligible	None	Negligible	Negligible
				Direct				
				Local				
				Permanent				
				Likely				

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