Chapter 8: Noise and Vibration

NOISE AND VIBRATION	
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SUPPORTING APPENDIX	**ES Volume 3: Appendix: Noise and Vibration:** Annex 1: Glossary; Annex 2: Legislative, Planning Policy Context and Other Relevant Standard and Guidance; Annex 3: Environmental Noise Report; Annex 4: Vibration Survey Report; Annex 5: Construction Plant Assumptions; Annex 6: Detailed Construction Noise Predictions; Annex 7: Traffic Flow Data; and Annex 8: Model images
KEY CONSIDERATIONS	The following are the key acoustic issues which have been assessed: • During the enabling and construction works: - Noise from machinery and the works themselves; - Ground-borne vibration from machinery and the works themselves; and - Change in noise from construction vehicles. • Once the Proposed Development is complete and operational: - The suitability of the Site for residential development; - Change in noise from road traffic; and - Noise from building plant and services.
CONSULTATION	The majority of the comments received from the LBTH through the EIA Scoping process have related to the use of 2016 measurements and the validation survey that was completed in 2020. As demonstrated through the 2020 long-term measurements, the noise conditions experienced on the Site have not changed by a significant magnitude, such that the measurements collected in 2016 can be used and this was agreed as an appropriate approach with the LBTH during the EIA Scoping Process. Additional comments were raised about whether the baseline measurements adequately captured noise from the adjacent Billingsgate Market. During 2016 measurements were taken during a period when the market was operational, with no significant contribution from the market noted. In addition: • The Banana Wall would not be considered a noise sensitive receptor as noise cannot affect land stability. All relevant mitigation to control vibration levels during construction will be presented with a Construction Environmental Management Plan to be agreed with the Council and therefore the Banana Wall is not considered a sensitive receptor for noise and vibration; • Agent of change principles are considered inherently within the assessments as they are predominately based on baseline noise measurements; and • The assessment has been based on representative background noise levels.

ASSESSMENT METHODOLOGY

Outline Application Methodology

8.1 The Applicant is seeking flexibility on how the Site is developed, with the potential for the Development Zones to be developed as commercial/retail, residential or residential-use (hotel/student accommodation).

8.2 The assessments contained within the ES chapter concentrate on the reasonable worst-case potential effects experienced at the receptors surrounding to the Site, while also considering the potential suitability of the Site for future occupants.

8.3 The reasonable worst-case noise and vibration impacts at the existing surrounding receptors will be experienced when a maximum trip generating use (i.e commercial) scheme is adopted, due to the higher predicted road traffic volumes that are associated with this scenario from deliveries and servicing. This assessment has therefore used 'Scenario 3 - the Maximum Transport Generating Scheme' to provide the reasonable worst case scenario. However, a sensitivity test is also undertaken in this ES chapter to compare this reasonable worst case scenario with a lower trip generation scheme, and so the Maximum Population Generating scenario (which brings forward use classes and floorspace more in line with the site suitability assessment) has also been considered (i.e. Scenario 2 as set out in **ES Volume 1, Chapter 2: EIA Methodology)**.

8.4 Residential and residential-use occupants (i.e. hotel, serviced apartments or student accommodation) are typically highly sensitive to noise and vibration. The Indicative Scheme (Scenario 5, as set out in **ES Volume 1, Chapter 2: EIA Methodology)** was used for the site suitability assessments as it includes sufficient details to complete calculations and analysis required to evaluate site suitability and any proposed mitigation measures. However, as the Site could be developed to include residential and residential-use buildings across different Development Plots, it has been necessary to consider the potential noise and vibration receptors that would exist in the maximum residential-use scenario (referred to as Scenario 2 – The Maximum Population Generating Scheme in **ES Volume 1, Chapter 2: EIA Methodology**). The assessments relating to these introduced receptors concentrate on the suitability of the Site for residential uses. When final landscape strategies with confirmed amenity locations are defined during RMA's, these would need to be assessed for site suitability in relation to noise as relevant.

8.5 The enabling and construction works assessments are based on the Indicative Scheme. This scenario was selected as it includes introduced residential-use buildings that will be occupied when construction is taking place on other proposed buildings. The external receptors will experience similar effects irrespective of the design scenario, due to the works involving similar methodologies and equipment.

8.6 The noise emitted from the operational building services plant would need to be controlled to the same levels with either the maximum commercial use (Scenario 3 – The Maximum Transport Generating Scheme **Volume 1, Chapter 2: EIA Methodology**) or maximum residential (Scenario 2 – The Maximum Population Generating Scheme) being pursued (or any variant of the uses in between). As such, the effects, limits and mitigation measures listed within the ES chapter for plant noise are the same for either scenario and whatever is bought forward on-site.

Defining the Baseline

Baseline Conditions

8.7 Extensive environmental noise and vibration surveys were completed in 2016. Due to the age of the surveys, an additional survey was completed in January 2020, with the purpose of establishing whether baseline conditions have changed and to validate previous survey data. The results of both the 2016 and 2020 surveys are provided within **ES Volume 3, Appendix: Noise and Vibration.**

8.8 The results from the surveys have been used to establish the baseline noise and vibration climate at the Site (i.e. from road, light rail, operation of nearby commercial activities) and at key receptor locations surrounding the Site (see section 'Receptors and Sensitivity' of this ES chapter).

8.9 The receptor locations identified are assumed to be representative of other potential receptors further away from the Site; if noise levels are not deemed significant at these receptors, then it is considered receptors located at further distance from the Site will also not be significantly affected. However, where significant effects are identified at the initial receptor locations, then receptors located at further distances from the Site will be included for assessment.

8.10 The survey results are also used to assess the suitability of the Site for residential development and set limiting noise emission criteria for sources associated with the Proposed Development i.e. new building services plant and systems.

8.11 The surveys were completed over periods when the nearby operational Billingsgate Market was operational and therefore noise emissions associated with its operation are inherently included within the dataset. However, as noted during the night time measurements in 2016, noise contributions from the market were less significant than other environmental noise sources present on the Site.

Noise Logging Survey

8.12 Long-term unattended environmental noise surveys were conducted in July 2016 and January 2020.

8.13 The 2016 survey comprised continuous measurements at three positions to determine the existing noise levels across the Site. The 2020 survey comprised of continuous measurements at one position to evaluate whether the noise environment has change significantly since 2016 and to validate previous data results.

8.14 The noise monitoring locations are shown in Figure 8.1, at the following positions in relation to the Site:

- 1 – Overlooking Aspen Way (north boundary),
- 2 – North boundary of North Dock (south east boundary); and
- 3 – Dockland Light Railway (DLR) (west boundary) at a height of 4m for full view of tracks.

8.15 The 2016 measurements were completed at all three positions, with the 2020 verification survey completed at position 2.

8.16 The dominant noise sources identified during the baseline surveys include road traffic, trains (from DLR) and building services plant associated with Canary Wharf buildings.

8.17 A summary of the long-term environmental noise results is provided within the 'Baseline Conditions' section of this ES chapter – refer Table 8.13 to Table 8.17. Full details of the methodology (including the monitoring locations chosen) and results of the 2016 and 2020 environmental noise surveys are presented in **ES Volume 3, Appendix: Noise and Vibration**.

Sample Noise Measurements

8.18 In addition to the long term monitoring, sample noise measurements were carried out on:

- 12th February 2016 (Positions A, B, C and D);
- 15th July 2016 (Positions E, F and G); and
- 30th January 2020 (Positions H, I, J and K) (as shown on Figure 8.1).

8.19 The sample noise measurements on 12th February 2016 were carried out to establish noise levels generally around the Site, including any night time noise emissions associated with the operation of Billingsgate Market (Position C).

8.20 The sample noise measurements on 15th July 2016 were used to establish evening/night time noise levels at receptors where long-term noise monitoring was not possible due to a lack of available secure locations.

8.21 The sample noise measurements completed on 30th January 2020 have been used to validate the 2016 measures completed at similar positions.

8.22 Sample noise measurement details, such as the time of day and duration for which the measurements were undertaken, are provided within the '*Baseline Conditions*' section of this ES chapter – refer Table 8.18 to Table 8.20.

8.23 Measurements were made using a hand-held sound level meter[1] which was calibrated both before and after the measurements, in line with procedures outlined in BS 7445-1:2003[2], with no observable calibration drift.

Sample Vibration Measurements

8.24 Sample vibration measurements were also carried out on 17th July 2016 to assess the baseline vibration levels from the nearby railway line. Further details of this are provided in **ES Volume 3, Appendix: Noise and Vibration**.

8.25 Sample vibration measurement were undertaken on 17th August 2016, with the measurement location is shown in Figure 8.2 as "V1" and "V2".

8.26 Measurements were made using a hand-held DA-20 vibration level meter which was calibrated both before and after the measurements with no observable calibration drift.

8.27 Validation surveys were not completed in 2020, as the sources of potential vibration, DLR and road traffic, remain present and no new sources of vibration introduced. The DLR and roads are operating at similar levels and conditions as those surveyed which has been confirmed by TFL.

[1] *Brüel & Kjær 2250 Sound Level Meter*

[2] *British Standards (BS) 7445-1 Description and measurement of environmental noise – Part 1: Guide to quantities and procedures, December 2003*

Figure 8.1 Noise Measurement Locations (Image Source: Google Earth Pro)

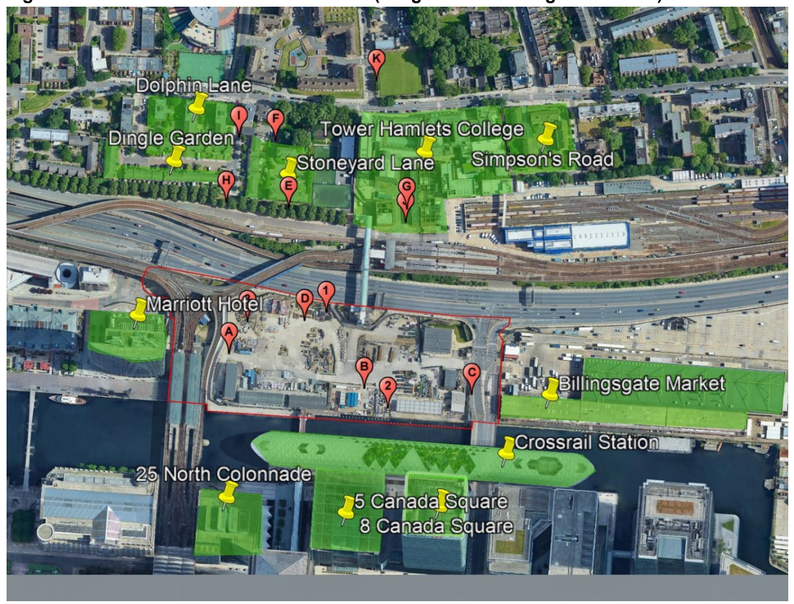


Figure 8.2 Vibration Measurement Locations (Image Source: of Google Earth Pro)

8.28 The baseline measurement data has allowed for a robust and accurate modelling of the current environmental conditions experienced on the Site, which has been principally used to evaluate the suitability of the Site for residential development and establishing of building services plant noise emission limits.

Future Baseline for Opening Year

8.29 It is currently envisaged that the future opening years for the Proposed Development will be 2029.

8.30 Given the identification of key noise sources as a result of the baseline surveys, the scenarios for the future opening year are based on the following:

- An uplift in the traffic road volumes expected in the area relevant for the proposed opening year (further context, see **ES Volume 1, Chapter 7: Transport and Accessibility,** Scenario 2b – 2031 Reference Base Minus);
- No changes to the operation of the DLR, as confirmed by TfL;
- The operation of Billingsgate Market to remain the same as measured in 2016, with planned move to an alternative site not eventuating (worst-case);
- The operation of the Crossrail (Elizabeth Line) does not give rise to vibration on the Site, as tracks are not positioned beneath the Site, and the appropriate vibration/structure borne noise standards are predicted to be achieved in other similarly sensitive properties nearby[3]; and
- Building services noise associated with Canary Wharf buildings and Crossrail station are expected to be maintained at current ambient noise levels recorded through the baseline surveys, with any future additional building services to be controlled within appropriate limits.

Traffic Data

8.31 The following traffic assessment scenarios[4] have been considered in this chapter:

- Future Baseline (Opening Year 2029) Do Nothing[5] ('Scenario 2b – 2031 Reference Base Minus' in **ES Volume 1, Chapter 7: Transport and Accessibility**);
- Future Baseline (Opening Year 2029) Proposed Development – Maximum Transport Generating Scheme ('Scenario 3 – 2031 Future Baseline (Do Something) Maximum Traffic' in **ES Volume 1, Chapter 7: Transport and Accessibility**); and
- Future Baseline (Opening Year 2029) Proposed Development – Maximum Population Generating Scheme [6].

Evolution of the Baseline

8.32 The EIA Regulations (2017 as amended)[7] require that the likely evolution of baseline is considered in the event that the Proposed Development were not to come forward. In other words, how the existing baseline conditions such as background noise levels may naturally involve in the future, taking into account aspects such as the

[3] *Crossrail, Technical Report – Assessment of Noise and Vibration Impacts, Volume 4 of 8, Central Section (1E315-C1E00-00001)*
[4] *Traffic scenario data received from the project Traffic and Transport Consultant. Refer to* ***ES Chapter 7 – Traffic and Transport (Volume 1)*** *for further information*
[5] *Without implementation of Proposed Development*
[6] *With implementation of Proposed Development, assuming full occupation with maximum residential uses, the rest of the total permissible floorspace set out within the Development Specification used in this scenario comprise retail and commercial uses as these produce higher predicted road traffic volumes.*
[7] *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 and The Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2018*

development of the Cumulative Schemes in the surrounding area (a full list of Cumulative Schemes is provided within **ES Volume 1, Chapter 2: EIA Methodology** and **ES Volume 3, Appendix: Introduction and EIA Methodology**) and if any relevant policy designations were to come forward in the absence of the Proposed Development.

8.33 The likely evolved baseline conditions has been based on a review of the future baseline traffic data, professional judgement on the known changes to nearby rail network (e.g. Crossrail and DLR operations) and assessed qualitatively and will consider a scenario in the absence of the Proposed Development being implemented.

Impact Assessment Methodology

8.34 The extent of the study area for the assessment is defined by the location of the sensitive receptors identified (see section 'Receptors and Sensitivity' of this ES chapter) and review of the traffic data across the network.

8.35 This section presents the methodology used to assess each type of noise and vibration impact, in terms of the relevant standards and guidance, along with the types of data and analyses carried out.

8.36 The assessment considers the following sources of noise and vibration:

- Construction noise - from machinery and the works themselves;
- Construction vibration - ground-borne vibration from machinery and the works themselves;
- Construction traffic – change in noise from construction vehicles;
- Completed Development – change in noise from road traffic;
- Completed Development – suitability of the Site for new residential uses; and
- Completed Development – noise from building plant and services.

Predictions of Changes in Noise

8.37 A 3D computer model of the Site and surrounding areas has been developed using CadnaA software taking into account reflections from the Proposed Development, road geometry and average traffic speed. The results from the model have been used to assess the likely change in ambient noise levels at receptor locations surrounding the Site.

8.38 ES Volume 3, Appendix Nosie and Vibration contains 3D images of the modelled Indicative Scheme, which was modelled as it contains High noise sensitive uses in positions across the Site that are exposed to the notable sources and therefore provides a robust model for the CadnaA software.

Enabling and Construction

On-Site Activities

8.39 Full details of the enabling and construction programme and description of works can be found in **ES Volume 1, Chapter 5: Enabling and Construction Works,** predominantly and is based on the Indicative Scheme**.** As described in the chapter, construction activities will take place during the daytime periods only i.e., Monday to Friday (08:00-18:00) and Saturday (08:00-13:00). Consequentially only daytime impacts have been considered.

8.40 Assessments have been undertaken for the following key construction stages of work: site clear, marine promenade works, excavation/ground works, substructure and superstructure construction. The other key stages identified (envelope, internal fit out, and external landscaping) are not considered to generate levels of noise that would give rise to significant effects and have therefore not been accounted for within the assessments.

8.41 The emphasis of the construction assessment focuses on the noisiest phases of work, which are likely to arise from the use of plant such as excavators with breakers and piling rigs. A 'timeslice' approach has been adopted which has involved reviewing the construction programme (provided in **ES Volume 1, Chapter 5: Enabling and Construction Works**) and identifying when either of the following is present:

- When specific enabling or construction works are being completed that do not occur regularly throughout the programme, e.g, marine promenade works;
- Times when substructure works (due to the use of excavators with breakers and piling rigs) are being completed on each phase;
- Times when simultaneous noisy construction activities are due to take place on different plots, e.g. multiple plots/phases undertaking substructure works; and
- When there is the potential for the introduced residential buildings becoming occupied and noisy construction works are taking place on other plots.

8.42 The 'timeslice' approach is considered robust as it evaluates each proposed noisy construction activity, accounts for the potential for simultaneous construction activities and the occupation of the introduced buildings.

8.43 Noise egress has been calculated based on the methodology outlined in BS 5228-1:2009[8] including reference to noise levels from various items of plant that will be in operation that are included within this standard. The operation of the plant noise levels have been used to determine a representative equivalent continuous sound level (L_{Aeq}) (received at the receptor) associated with each stage of the construction programme.

8.44 Indicative details of plant and equipment associated with the enabling and construction stages are provided in **ES Volume 1, Chapter 5: Enabling and Construction Works** and **ES Volume 3: Appendix, Noise and Vibration**. This information has been used for the construction stage noise assessment.

8.45 The 3D model has been used to predict the noise level during the enabling and construction works for each timeslice, at noise sensitive receptor locations (including external receptors and where appropriate introduced receptors within the Site). Noise levels have been predicted at each of the noise sensitive locations and these levels have been compared with the guidelines highlighted in BS 5228 and London Borough of Tower Hamlets Code for Construction Practice (CoCP[9]), in order to determine the magnitude of impact. This has been

[8] *British Standards (BS) 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites- Part 1:Noise , February 2014*

[9] *London Borough of Tower Hamlets, Code of Construction Practice (CoCP)*

referenced against the sensitivity of each receptor (see section 'Receptors and Sensitivity' of this ES chapter) to determine the scale of effect.

Enabling and Construction Traffic Noise

8.46 The assessment of traffic noise impact is based on the Department for Transport Welsh Office Calculation of Road Traffic Noise 1988 (CRTN)[10] and Volume 11 of the Design Manual for Roads and Bridges (DMRB)[11] using indicative construction traffic data presented in **ES Volume 1, Chapter 5: Enabling and Construction Works**.

8.47 Changes in road traffic noise levels associated with the enabling and construction works have been calculated following the principles detailed within the CRTN, which provide guidance and procedures for how to calculate noise from road traffic.

8.48 The results from the 3D model have been used to assess the likely change in ambient noise levels (from the Baseline condition) at receptors in the area surrounding the Site during the period of enabling and construction works.

8.49 The road links/study area that has been considered include the following:

- Aspen Way;
- Upper Bank Street;
- Hertsmere Road;
- Limehouse Link; and
- West India Dock Road.

Enabling and Construction Vibration

8.50 The assessment of enabling works and construction vibration impacts considers absolute levels (i.e. the actual levels) experienced within adjacent buildings in general accordance with BS 5228-2.

8.51 Vibration levels have been predicted at receptors in the area surrounding the Site using historical data of construction activities and the methodology provided in BS 5228-2.

8.52 Predictions of vibration levels at the receptor locations have been made in terms of the Peak Particle Velocity (PPV) experienced within the working day (for construction site) during piling works, as this construction activity causes the most vibration and is therefore a worst case assessment.

8.53 Specific assessments have not been completed at the listed dock, located within the boundary of the Site, as the vibration controls to limit perceptible vibration elsewhere will result in vibration levels being lower than those where structural damage would usually occur. In addition, all relevant mitigation to control vibration levels during construction will be presented with a CEMP to be agreed with the LBTH.

Assumptions and Limitations

8.54 It is assumed that trade contractors will comply with all relevant legislation for the control of noise and vibration from construction works and that these would form part of any Construction Environmental Management Plan (CEMP), including:

- The Control of Pollution Act (COPA) 1974[12] with particular reference to part III;
- The Environmental Protection Act 1990[13];
- The Control of Noise at Work Regulations 2005[14]; and
- The Health and Safety at Work Act 1974[15].

8.55 It is assumed that trade contractors will comply with all relevant legislation for the control of noise and vibration from construction works and that these would form part of an CEMP, including:

- The adoption of a minimum 2.4m high perimeter site hoarding around the boundary for the Site and each phase of development (refer further details within **ES Volume 1 Chapter 5: Enabling and Construction Works**);
- Construction plant that is compliant with the sound and vibration levels published within BS 5228;
- Stationary construction plant such as concrete crushers, will be positioned behind screens and positioned away from nearby sensitive receptors in order to mitigate where possible;
- The use of hand-held tools when used for a prolonged period will be undertaken behind adequate screens; and
- Mobile plant would be expected to move across the Site/plot equally across the construction period.

8.56 The selected plant and equipment, and the enabling and construction methodology to be implemented when works commence would be subject to the change, based on detailed construction design and information. Therefore, conservative worst-case assumptions have been made with regards to operations and activities, and the associated plant and equipment to be used. As such, the predicted enabling and construction noise and vibration levels represent an upper estimate or worst-case scenario of emissions from the Site during the works.

8.57 The equipment and operating hours assumed for the assessments contained herein are provided in **ES Volume 3, Appendix: Noise and Vibration**.

8.58 For the purposes of this assessment, predictions have been generally made for the construction plant located at ground level to represent the worst-case scenario. Construction works beneath ground level will benefit from greater separating distance to receptors and potentially greater amount of screening.

[10] *Department for Transport Welsh Office (1988) Calculation of Road Traffic Noise (CRTN)*
[11] *Department for Transport Highways Agency Design Manual for Roads and Bridges: Volume 11 Environmental Assessment, August 2008*
[12] *Control of Pollution Act 1974 (COPA)*
[13] *Environmental Protection Act 1990*
[14] *The Control of Noise at Work Regulations 2005*
[15] *The Health and Safety at Work Act 1974*

8.59 Q3 2024 has the estimated highest number of construction traffic generated (taken from **ES Volume 3, Appendix: Enabling and Construction Works**) has been adopted in the assessment of potential increases in construction traffic noise to represent a reasonable worst-case scenario.

Phasing

8.60 The timeslice analysis of the enabling and construction works is based on an Indicative Scheme and therefore could change. Nevertheless, the approach taken, by evaluating different times in the construction programme is considered a reasonable worst-case approach, especially as it considers the introduced receptors who could occupy the buildings towards the end of the construction programme.

8.61 The assessments consider the occupation of the Phase 1 residential buildings prior to the completion of construction works elsewhere on the Site. The assessments also have the potential to be reasonably representative of other eventual scenarios captured within the maximum parameter plans, i.e. where other residential or residential-use buildings could be developed and occupied prior to all construction works being finished.

Completed Development

Building Services (Plant) Noise

8.62 Noise levels from building services plant associated with the completed Proposed Development would need to be controlled to ensure that it would not have an impact on nearby noise sensitive receptors relative to the background sound level. Criteria for the assessment are set in accordance with BS 4142[16].

8.63 The baseline noise levels recorded at locations representative of sensitive receptors surrounding the Proposed Development and at introduced sensitive receptors have been used to set the noise limits for future provision of building services plant.

Operational Traffic Noise

8.64 The assessment of operational traffic noise effects is based on the CRTN and DMRB, using traffic data generated by the Applicant's Transport Consultants. The assessments include the DLR noise contributions, as measured as part of the baseline assessment.

8.65 The traffic data (presented in **ES Volume 3, Appendix: Noise and Vibration, Annex 7**) has been included within a computer model (CadnaA v2020) of the Site and surrounding areas. From the model, road traffic noise contour maps for the Future Baseline (Do Nothing) and Future Baseline (Proposed Development – Maximum Population Generating and Maximum Transport Generating Schemes) have been generated. The contour maps indicate predicted noise levels at 1.5m above ground level, approximately ear height, in the vicinity of the Proposed Development, as shown in Figure 8.13 to Figure 8.17.

8.66 The results from the computer model have been used to predict the change in ambient noise level at the receptors, which forms the basis of assessment on potential impacts caused by increases in operational road traffic due to the Proposed Development.

Site Suitability (Residential Occupation)

Noise Levels

8.67 The assessment of the suitability of the Site for residential occupation consists of the following:

- Noise and vibration measurements completed on-site (detailed in **ES Volume 3, Appendix: Noise and Vibration**);
- Publicly available London City Airport (LCA) contours for future years; and
- Computer modelling of the Proposed Development.

8.68 Results from the noise monitoring are used to assess the suitability for residential development in terms of the LBTH external noise exposure categories contained within Appendix 6 of the Local Plan the (as produced in Table 8.2). It is noted that, irrespective of the category achieved externally, it is anticipated that the ultimate objective is to achieve satisfactory internal noise levels, e.g. those that align with the recommendations provided in BS 8233[17], as presented in Table 8.1.

Table 8.1 Indoor Ambient Noise Level Criteria (BS8233)

Indoor Residential Activity	Location	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Resting	Living room	$L_{Aeq,16hr}$ 35 dB	-
Dining	Dining room	$L_{Aeq,16hr}$ 40 dB	-
Sleeping	Bedroom	$L_{Aeq,16hr}$ 35 dB	$L_{Aeq,8hr}$ 30 dB and L_{AFmax} 45 dB for regularly occurring events

Table 8.2 Local Plan Noise Level Categories for Residential Development

Dominant noise source	Assessment Location	Design Period	LOAEL	LOEAL to SOAEL	SOAEL
Anonymous noise such as general environmental noise, road traffic and rail traffic	Noise at 1 metre from noise sensitive façade/free field	Day	$<L_{Aeq,16}$ 50 dB	$L_{Aeq,16hr}$ 50-69 dB	$>L_{Aeq,16hr}$ 69 dB
		Night	$<L_{Aeq}$ 45 dB	$L_{Aeq,8hr}$ 45 – 60 dB!	$>L_{Aeq,8hr}$ 60 dB
	Outside living space (free-field)	Day	$<L_{Aeq,16hr}$ 50 dB	$L_{Aeq,8hr}$ 50 – 55 dB!	$>L_{Aeq,16hr}$ 55 dB

8.69 An assessment of the noise levels experienced within on-site external residential amenity areas to be provided by the Proposed Development has also been included. The assessment is based on achieving the recommended noise levels contained in BS 8223 which indicates that levels of $L_{Aeq,16hr}$ 55 dB or lower are considered desirable for residential amenity within Urban areas. This aligns to the LBTH Local Plan LOEAL to SOAEL category.

[16] *British Standards (BS) 4142:2014+A1 2019 Method for rating and assessing industrial and commercial sound, June 2019*

[17] *British Standard (BS) 8233:2014 – Guidance on sound insulation and noise reduction for buildings, February 2014.*

Groundborne Vibration

8.70 An assessment of vibration impacts caused by the adjacent railway line has been carried out for the buildings within the Proposed Development. The assessment considers the tactile vibration, through appraising the Vibration Dose Values (VDV) in accordance with BS 6472-1:2008[18], and groundborne noise based on the TfL[19] guidance of L_{AFmax} 40 dB.

8.71 The tactile vibration assessment is based on the criterion listed in Table 8.3. It is noted that the first overt sign of an unfavourable reaction to building vibration is adverse comment, whereby occupants express negative responses to the vibration experienced.

Table 8.3 Vibration Dose Value Criteria for Residential Buildings (BS 6472-1)

Time Period	Low probability of adverse comment (m/sec$^{1.75}$)	Adverse comment possible (m/sec$^{1.75}$)	Adverse comment probable (m/sec$^{1.75}$)
07:00-23:00 - 16 hours day	0.2-0.4	0.4-0.8	0.8-1.6
23:00-07:00 - 8 hours day	0.1-0.2	0.2-0.4	0.4-0.8

Assumptions and Limitations

8.72 The prediction of potential completed Proposed Development noise and vibration effects have been based on architectural plans and drawings that illustrate the proposed building massing of the Indicative Scheme, along with baseline measurement data (recorded from the surveys).

8.73 The Indicative Scheme was modelled as it includes sufficient details to complete calculations and analysis required to evaluate the mitigation measures for site suitability.

8.74 The maximum transport generating scheme and maximum population generating scheme traffic flows were also modelled, though the maximum transport generating scheme represents the highest change in traffic volumes and therefore noise levels at the existing receptors surrounding the Site. The changes in ambient noise level assessments assume that the DLR trains will continue to be operate as captured within the baseline data.

8.75 The operation of the retail, offices and public realm will not produce significant levels of noise when in their general operation, e.g. typical retail tenants and no amplified events. This assumption has been necessary, as the future perspective tenants and likely uses are unknown.

8.76 The use of the roof terraces and other shared residential amenity will not incorporate amplified sound and will be used by the occupants of the building. The noise emissions associated with its use will be limited to speaking and therefore have not been considered as a potential significant noise source.

Methodology for Defining Effects

Receptors and Receptor Sensitivity

8.77 Table 8.4 summarises the sensitivity of receptors relevant to this assessment, which is based on a mixture of professional experience, industry standards, and information within the London Borough of Tower Hamlets Local Plan.

Table 8.4 Receptor Sensitivity

Level of Sensitivity	Receptor Categories
High	Residential properties, hotels, student accommodation and hostels
Medium	Hospital, schools and colleges
Low	Markets, offices, residential amenity and retail buildings

Magnitude of Impact

Enabling and Construction - Noise and Vibration

8.78 Significance criteria for assessing the likely effects from enabling and construction plant noise and vibration have been based on the guidance set out in the LBTH's Code for Construction Practice (LBTH's COCP) and BS 5228-1&2:2009 'Code of Practice for Noise and Vibration Control on Construction and Open Sites'[20].

8.79 The magnitude of impact has been set using both sets of guidance. Compliance with the LBTH's COCP requirements would result in a **Low** impact in the assessment of noise and vibration at the nearby residential receptors.

8.80 The enabling and construction noise criteria are presented over the 10 hour daytime period defined in the LBTH's COCP (08:00-18:00). Enabling and construction activity outside these hours will generally not occur due to the likely impact on the environment, unless in the case of an emergency, engineering necessity or for health and safety reasons.

8.81 Magnitude of impact for assessing the impact of enabling and construction plant noise is presented in Table 8.5 . These are external noise levels measured at the facade of the building.

[18] *British Standard (BS) 6472-1:2008 – Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting, June 2008*

[19] *Transport for London (TfL) Guidance Document G1323, Noise and Vibration Assess Design Guidance, April 2012*

[20] *British Standards (BS) 5228-1: and 5228-2:2009 Noise and Vibration Control on Construction and Open Sites Part 1: Code of Practice for Basic Information and Procedures for Noise and Vibration Control*

Table 8.5 Magnitude of Impact – Noise and Vibration - Daytime

Magnitude of Impact	Noise Levels	Vibration Levels
Very Low	Lower than ambient L_{Aeq}, or greater than the ambient L_{Aeq} but less than L_{Aeq} 70 dB.	Peak particle velocity (PPV) less than 0.3 mm/s
Low	Greater than ambient L_{Aeq} and between L_{Aeq} 70-75 dB.	PPV regularly exceeding 0.3 mm/s, but less than 1.0 mm/s.
Medium	Greater than 75 dB L_{Aeq} but for no longer than 10 days in any month.	PPV regularly exceeding 1.0 mm/s, but less than 3.0 mm/s.
High	Greater than 75 dB L_{Aeq} for longer than 10 days in any month.	PPV regularly exceeding 3.0 mm/s.

Operational Building Services Plant Noise

8.82 Criteria for the assessment are set in accordance with BS 4142 and the Institute of Acoustics (IOA) / Institute of Environmental Management and Assessment (IEMA) guidance'[21], as identified in Table 8.6.

Table 8.6 Magnitude of Impact Rating for Assessing Building Services Plant Noise

Magnitude of Impact	Increase in Noise Level (dBA)	Description
Very Low	<1.0	Noise increase is unlikely to be discernible
Low	1.0-2.9	A slight increase in noise levels may be perceived in affected buildings and outdoor recreational areas
Medium	3.0-4.9	Increase in noise levels is likely to be noticeable in affected buildings and outdoor recreational areas
High	>5.0	Increase in noise levels is likely to be clearly perceptible and could have a significant effect on the continued use of a building

Construction and Operational Road Traffic Noise

8.83 The road traffic impact (on nearby noise sensitive receptors) can be categorised as noise associated with changes in road traffic movements on the roads around the Site, as a result of the Proposed Development.

8.84 Significance criteria for assessing the road traffic impacts are presented in Table 8.7. The criteria are based on the IOA / IEMA guidance, and is considered for both the enabling and construction, and when complete and operational.

Table 8.7 Magnitude of Impact Rating for Assessing Increases in Road Traffic Noise

Magnitude of Impact	Increase in Noise Level (dBA)	Category Description / Criteria
Very Low	<1.0	Noise increase is unlikely to be discernible
Low	1.0-2.9	A slight increase in noise levels may be perceived in affected buildings and outdoor recreational areas
Medium	3.0-4.9	Increase in noise levels is likely to be noticeable in affected buildings and outdoor recreational areas
High	>5.0	Increase in noise levels is likely to be clearly perceptible and could have a significant effect on the continued use of a building

Effect Nature

8.85 All noise and vibration effects are considered either Adverse or Negligible. Whilst Beneficial noise effects can occur, this assumes an improvement from the Baseline environment and in practice is unlikely when new development is being introduced to the local environment.

8.86 An 'adverse effect' is considered anything that can cause a change in behaviour, attitude or changes the character of a place in a negative manner.

Effect Scale

8.87 Table 8.8 relates the scale of effects to the sensitivity of the receptor and the magnitude of the impact, based on the IOA / IEMA Guidelines.

Table 8.8 Scale of Effects

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

Effect Duration and Direct and Indirect Effects

8.88 For the purposes of the ES, effects that are generated as a result of the enabling and construction works (i.e. those that last for this set period of time) are classed as 'temporary'; these may be further classified as either 'short term' or 'medium-term' effects depending on the duration of the enabling and construction works that generate the effect in question. Effects that result from the completed and operational Proposed Development are classed as 'permanent' or 'long-term' effects.

8.89 Noise and vibration effects are generally considered to be direct effects.

Categorising Likely Significant Effects

8.90 Table 8.9 categorises the likely scale of effect in context of what would be experienced by the receptors. This is based on the IOA/IEMA guidelines and the Planning Practice Guidelines (PPG)[22].

8.91 Table 8.9 also relates the scale of effect with where adverse effects on health and quality of life can be detected. This follows guidance in the Noise Policy Statement for England (NPSE) [23], which introduces the terms Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL). The LOAEL is the level which adverse effects on health and quality of life can be detected, with the SOAEL the level above which significant adverse effects on health and quality of life occur.

[21] *Institute of Environmental Management and Assessment (IEMA) and Institute of Acoustics (IOA) Guidelines for Noise Impact Assessment, October 2014*

[22] *Department of Communities and Local Government (2018) Planning Practice Guidance*

[23] *Department for Environment, Food and Rural Affairs, Noise Policy Statement for England (NPSE), March 2010*

Table 8.9 Classification of Noise Effects Relative to LOAEL and SOAEL

Scale of Effect (adverse)	Description of Effect	Exceeds SOAEL?	Exceeds LOAEL?	Scale of Effect Significant
Major	Disruptive, causes a material change in behaviour and/or attitude. Potential for sleep disturbance. Quality of life diminished due to change in character of the area.	Yes	Yes	Yes
Moderate	Intrusive, noise can be heard and causes small changes in behaviour and/or attitude. Potential for non-awakening sleep disturbance. Affects the character of an area such that there is a perceived change in the quality of life.	No	Yes	
Minor	Non-intrusive, can be heard but does not cause any change in behaviour or attitude. Can slightly affect the character of an area but not such that there is a perceived change in the quality of life.	No	No	No
Negligible	No discernible effect on the receptor	No	No	

Site Suitability

8.92 The aim of the assessment of site suitability is to consider whether the new development (i.e. to provide residential accommodation) can achieve appropriate internal noise levels within the residential and residential use units for sleeping and relaxing. Categories for site suitability have been developed, relative to increases from BS 8233 internal noise levels, and are set out in Table 8.10.

Table 8.10 Internal Noise (Residential) – Impact Categories

Magnitude of Impact	Internal noise level compared to BS 8233:2014 recommendation (dBA)	Category Description / Criteria
Very Low	<1.0	Complies with Table 8.1 recommended internal noise levels
Low	1.0-5.0	Internal noise limits comply with 'reasonable' standard set out in BS 8233
Medium	6-10	Internal noise limits up to 5 dB higher than 'reasonable' standard set out in BS 8233
High	>10.0	Internal noise limits 10 dB higher than 'reasonable' standard set out in BS 8233

8.93 Categories for site suitability in respect of vibration have also been developed in line with guidance set out within BS 6472:2008. This is presented in Table 8.11.

Table 8.11 Internal Vibration (Residential) – Impact Categories

Magnitude of Impact	Vibration Dose Value (m/sec$^{1.75}$)	Groundborne noise (L_{AFmax} dB)	Category Description / Criteria
Very Low	≤0.2 (16 hour day) ≤0.1 (8 hour night)	<35	Tactile vibration below the 'low probability of adverse comment' range in BS 6472 Groundborne noise below the TFL recommendation
Low	≤0.4 (16 hour day) ≤0.2 (8 hour night)	35-40	Tactile vibration below the 'adverse comment possible' range in BS 6472 Groundborne noise is in line with TfL guidance
Medium	≤0.8 (16 hour day) ≤0.4 (8 hour night)	41-45	Tactile vibration below the 'adverse comment probable' range in BS 6472. Groundborne noise exceeds the TfL guidance
High	>0.8 (16 hour day) >0.4 (8 hour night)	>45	Tactile vibration above the 'adverse comment probably' range in 6472. Groundborne noise exceeds the TfL guidance.

8.94 There are no generally adopted magnitude of impact criteria for noise levels in external amenity spaces. The criteria presented in Table 8.12 are, therefore, applied, which have been derived from BS 8233 and LBTH Local Plan.

8.95 As explained in Table 8.12, the magnitude of impact ratings correspond with the recommendations provided in BS 8233, with compliance with the recommendations resulting in either a Very Low or Low rating.

8.96 The criteria presented in Table 8.12 are intended to be used as part of the assessment of effects to other residential amenity spaces, such as specific areas that are intended to be used for relaxation by the future residents e.g. terraces and other areas specifically designated as external residential amenity.

Table 8.12 Internal Noise (Amenity Spaces) – Impact Categories

Magnitude of Impact	Noise Level (dBA)	Category Description / Criteria
Very Low	≤50	Meets the lower recommended value in BS 8233
Low	51-55	Meets the upper guideline value in BS 8233
Medium	56-60	Noise levels that are just noticeable above the upper guideline value in BS 8233
High	≥61	Would be noticeably above the upper guideline value in BS 8233

BASELINE CONDITIONS

8.97 The noise climate around the Site is mainly affected by road and rail traffic, other sources include building services plant and aircraft.

Long-term Unattended Monitoring

8.98 The representative background sound levels measured at Locations 1, 2 and 3 as shown in Figure 8.1 during the long-term unattended survey are given in Table 8.13.

Table 8.13 Representative Background Noise Levels

Location	Daytime (07:00 – 23:00) $L_{A90,15mins}$ (dB)		Night time (23:00 – 07:00) $L_{A90,15mins}$ (dB)	
	Weekday	Weekend	Weekday	Weekend
1	70	69	62	65
2	55	54	51	51
2 (2020)	57	55	52	52
3	67	-	62	-

8.99 The ambient noise levels measured at Locations 1, 2 and 3, during the long-term unattended surveys are given in Table 8.14 to Table 8.17.

Table 8.14 Ambient noise levels (Location 1)

Date	Daytime (07:00 – 23:00) $L_{Aeq,16hr}$ (dB)	Night time (23:00 – 07:00) $L_{Aeq,8hr}$ (dB)
21st July 2016	-*	73
22nd July 2016	76	74
23rd July 2016	76	74
24th July 2016	76	74
25th July 2016	76	74
Average	76	74

**Measurements not made over full duration as a result of survey start and end time.*

Table 8.15 Ambient Noise Levels (Location 2 - 2016)

Date	Daytime (07:00 – 23:00) $L_{Aeq,16hr}$ (dB)	Night time (23:00 – 07:00) $L_{Aeq,8hr}$ (dB)
21st July 2016	-*	56
22nd July 2016	61	58
23rd July 2016	57	54
24th July 2016	59	55
25th July 2016	62	55
Average	60	56

**Measurements not made over full duration as a result of survey start and end time*

Table 8.16 Ambient Noise Levels (Location 2 - 2020)

Date	Daytime (07:00 – 23:00) $L_{Aeq,16hr}$ (dB)	Night time (23:00 – 07:00) $L_{Aeq,8hr}$ (dB)
24th January 2020	-*	56
25th January 2020	59	56
26th January 2020	60	57
27th January 2020	62	58
28th January 2020	62	57
29th January 2020	62	57
Average	61	57

**Measurements not made over full duration as a result of survey start and end time*

Table 8.17 Ambient noise Levels (Location 3)

Date	Daytime (07:00 – 23:00) $L_{Aeq,16hr}$ (dB)	Night time (23:00 – 07:00) $L_{Aeq,8hr}$ (dB)
13th July 2016	-*	71
14th July 2016	72	70
Average	72	71

**Measurements not made over full duration as a result of survey start and end time*

Attended Monitoring – 12th February 2016

8.100 The sound pressure levels measured during the attended surveys on 12th February 2016 are presented in Table 8.18.

Table 8.18 Summary of Sample Measurement Results

Position	Start Time (hh:mm)	Measurement duration, T (mm:ss)	Sound Pressure Level		
			$L_{Aeq,T}$ (dB)	$L_{AFmax,T}$ (dB)	$L_{AF90,T}$ (dB)
A	04:25	10:00	60	71	56
	05:00	10:00	60	68	59
	06:05	10:00	63	76	59
	10:25	10:00	65	79	59
	11:30	10:00	64	77	61
	12:30	10:00	65	77	60
B	04:40	10:00	56	63	52
	05:15	10:00	56	63	54
	06:15	10:00	58	68	56
	10:40	10:00	63	83	57
	11:45	10:00	61	75	56
	12:40	10:00	65	77	60
C	04:30	10:00	66	80	60
	05:00	10:00	66	77	59
	06:00	10:00	68	83	61
	10:00	10:00	70	83	64
	11:00	10:00	69	79	65
	12:00	10:00	70	87	64
D	04:45	10:00	79	89	66
	05:15	10:00	81	96	73
	06:15	10:00	82	91	74
	10:10	10:00	81	91	72
	11:15	10:00	80	90	72
	12:15	10:00	80	90	72

Attended Monitoring –15th July 2016

8.101 The sound pressure levels measured during the attended surveys on 15th July 2016 are presented in Table 8.19.

Table 8.19 Summary of Sample Measurement Results

Position	Start Time (hh:mm)	Measurement duration, T (mm:ss)	Sound pressure level		
			$L_{Aeq,T}$ (dB)	$L_{AFmax,T}$ (dB)	$L_{AF90,T}$ (dB)
E	20:19	15:00	65	78	60
	21:11	15:00	64	76	60
	22:04	15:00	64	76	59
F	20:36	15:00	57	74	51
	21:28	15:00	55	71	50
	22:21	15:00	51	63	48
G	20:54	15:00	61	81	55
	21:47	15:00	61	80	55
	22:39	15:00	57	71	52

Attended Monitoring – 30th January 2020

8.102 The sound pressure levels measured during the attended surveys on 30th January 2020 are presented in Table 8.20, with positions shown in Figure 8.1.

Table 8.20 Summary of Sample Measurement Results

Position	Start Time (hh:mm)	Measurement Duration, T (mm:ss)	Sound Pressure Level		
			$L_{Aeq,T}$ (dB)	$L_{AFmax,T}$ (dB)	$L_{AF90,T}$ (dB)
H	20:00	15:00	61	82	49
I	20:20	15:00	58	75	53
J	20:39	15:00	62	80	57
K	20:58	15:00	66	75	63

Baseline Vibration Levels

8.103 As previously noted, the main environmental vibration source near to the Site has been identified as the DLR tracks, which pass above ground to the north and west of the Site.

8.104 The results of the vibration surveys undertaken indicate that the highest daytime re-radiated noise level at a position where the new sensitive receptors are likely to be located is L_{ASmax} 30 dB.

RECEPTORS AND RECEPTOR SENSITIVITY

Existing

8.105 The nearest existing receptors that have the potential to be sensitive to noise and vibration associated with the Proposed Development are listed below and illustrated in Figure 8.3.

- Billingsgate Market – approximately 30m, to the east of the Site;
- Canary Wharf Marriott Hotel/1 West India Quay – approximately 45m to the west of the Site;
- New City College – approximately 75m to the north of the main area of the Site;
- Dingle Gardens, Stoneyard Lane and Dolphin Lane residences – approximately 85m to the north of the main area of the Site;
- Simpson Road residences – approximately 95m to the north east of the Site;
- 5 Canada Square offices – approximately 60m to the south of the Site;
- 8 Canada Square offices – approximately 80m to the south of the Site; and

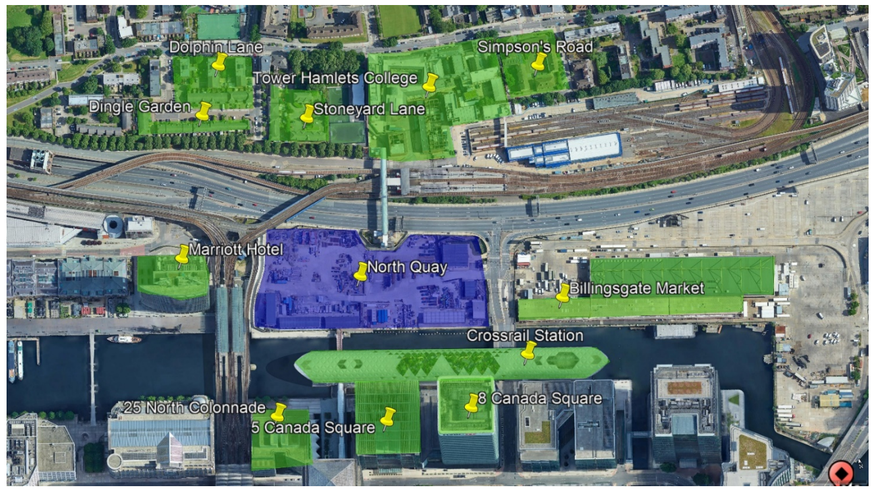
- 25 North Colonnade offices – approximately 80m to the south of the Site.

8.106 The receptors assumed for the assessment are listed (with their sensitivity) in Table 8.21.

Table 8.21 Sensitive Receptor List for Assessment

Receptors	Type	Sensitivity
Crossrail Station	Retail	Low
Billingsgate Market	Market	Low
Canary Wharf Marriott Hotel/1 West India Quay	Hotel/Residential	High
New City College	College	Medium
Dingle Gardens	Residential	High
Stoneyard Lane	Residential	High
Dolphin Lane	Residential	High
Simpson Road	Residential	High
5 Canada Square	Office	Low
8 Canada Square	Office	Low
25 North Colonnade	Office	Low

Figure 8.3 Nearest Existing Receptors



[Image Source: Google Earth Pro]

8.107 Receptors further away from the Site have not needed to be considered, as the traffic flow data indicates no notable change in traffic flows across the network and Negligible ('Not Significant') effects have been assessed at High sensitivity receptors for each assessment i.e. significant effects are geographically limited.

Introduced

8.108 The Proposed Development has the potential to introduce noise sensitive receptors, namely residential or residential-use (i.e. hotel, serviced apartments or student accommodation) across the Site. As such, these locations have been considered when in operation and where appropriate during construction.

8.109 Noise sensitive receptors have the potential to be introduced and could come forward in Development Plots NQ.A1 - NQ.A4, NQ.A5, NQ.D1, NQ.D3 and NQ.D4. The Indicative Scheme which has been used for the assessment of site suitability provides noise sensitive receptors of residential and residential-use in Development Plots NQ.A1, NQ.A4, and NQ.D4, as presented in Table 8.22 and shown in Figure 8.4. In addition, the Indicative Scheme includes locations designated as shared amenity for residential uses. The locations of these are shown in Figure 8.5.

8.110 The OPA allows for the development of residential use at NQ.A2, NQ.A3, NQ.D1, and a mix of uses at plot NQ.D3 and NQ.A5 (potentially residential-use). If these plots were to come forward as noise sensitive (residential or residential-use) then the same or similar design measures as outlined for NQ.A1 - NQ.A4 and NQ.D4 would be appropriate.

8.111 As Plot NQ.D1 is positioned adjacent to Aspen Way with line of sight to the DLR track the measures outlined for NQ.A1 would be expected at this location.

8.112 Plot NQA5 is adjacent to NQA4, and due to its height (6 storeys) is screened from the DLR and Aspen Way by other buildings. If this plot was to be developed with noise sensitive receptors then the measures described at the other identified receptors would be inherently adequate.

8.113 Consequentially, the assessment of the Indicative Scheme is considered adequate for capturing the flexibility being sought in the OPA.

Table 8.22 Sensitive Receptor List for Assessment

Receptors	Type	Sensitivity (as relevant)
NQ.A1	Potential for Residential	High
NQ.A4	Potential for Residential	High
NQ.D4	Potential for Residential-use (Hotel/Serviced Apartments)	High
Residential shared amenity	Potential for Residential amenity	Low

Figure 8.4 Indicative Scheme Introduced Noise Sensitive Receptors

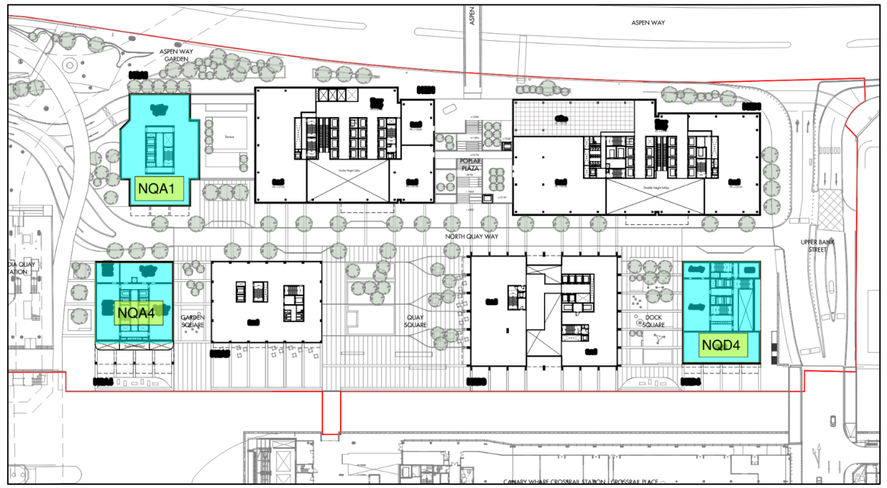
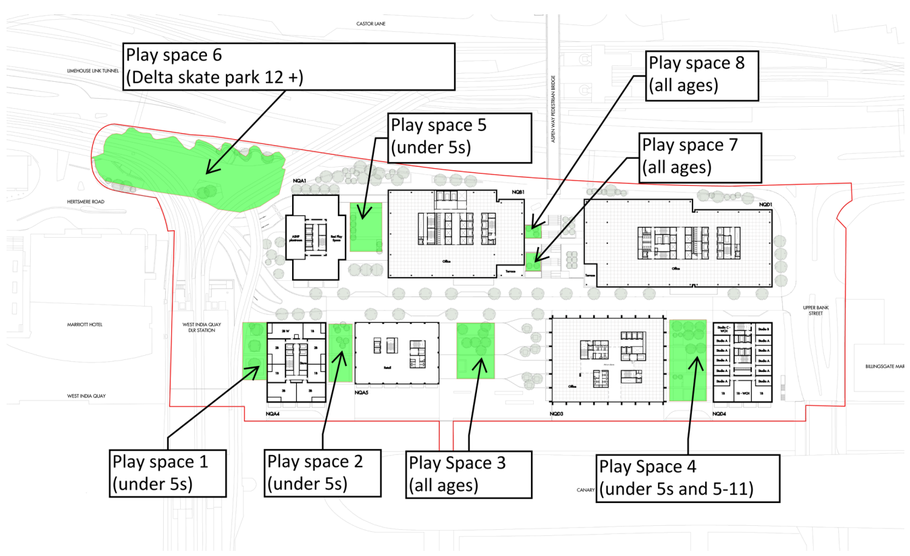


Figure 8.5 Indicative Scheme Shared Amenity Spaces



POTENTIAL EFFECTS

Enabling and Construction

8.114 Full details of the predicted noise levels during the enabling and construction works is presented in **ES Volume 3, Appendix: Noise and Vibration**. The results also present the receptor sensitivity, the magnitude of impact and the resultant scale and nature of noise effect.

8.115 The noise levels presented in this ES chapter are the maximum predicted at each building (receptor) identified from the modelling of the Indicative Scheme. The impacts predicted are pre-mitigation but account for the 2.4m high perimeter site hoarding and construction plant that is compliant with the sound and vibration levels published within BS 5228 (as advised within the '*Methodology - Assumptions and Limitations*' section of this ES chapter).

8.116 The predicted noise levels presented are those calculated at a distance of 1m from the receptor' building facade and also accounts for reflections from the building facade.

Construction Noise – On-Site Activities

8.117 The timeslices adopted to be modelled are summarised below (refer **ES Volume 1, Chapter 5: Enabling and Construction Works** for construction programme detail):

Table 8.23 Selected Timeslices for Assessment

Timeslice	Timeslice Period Selected	Description of Key Activities at Timeslice Selected
1	Q1 2022	Phase 1 basement works and marine promenade
2	Q1 2023	Phase 1 substructure and superstructure, and Phase 2 basement works
3	Q3 2023	Phase 1 superstructure and Phase 2 substructure
4	Q2 2024	Phase 1 superstructure, Phase 2 substructure and Phase 3 basement works
5	Q4 2024	Phase 1 superstructure, Phase 2 superstructure and substructure and Phase 4 basement works
6	Q3 2025	Phases 1, 2 and 3 superstructure, and Phase 4 substructure
7	Q4 2026	Phases 2, 3 and 4 superstructure

8.118 Table 8.24 presents a summary of the results and the likely effects for each receptor, with images from the modelling provided in Figure 8.6 to Figure 8.12.

8.119 It is noted that NQD4 will only be occupied after all external works on the remaining phases are completed, so NQD4 is not included as an assessment receptor during construction.

Table 8.24 Predicted Enabling and Construction Noise Levels

Receptor	Sensitivity	Timeslice 1	Timeslice 2	Timeslice 3	Timeslice 4	Timeslice 5	Timeslice 6	Timeslice 7
Existing Receptors								
Crossrail Station	Low	Minor Adverse	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Billingsgate Market	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
8 Canada Square	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
5 Canada Square	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
25 North Colonnade	Low	Minor Adverse	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Canary Wharf Marriott Hotel/1 West India Quay	High	**Major Adverse**	**Major Adverse**	Negligible	Negligible	Negligible	Negligible	Negligible
Dingle Gardens	High	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dolphin Lane	High	Negligible	Minor Adverse	Negligible	Negligible	Negligible	Negligible	Negligible
Stoneyard Lane	High	Negligible	Minor Adverse	Negligible	Negligible	Negligible	Negligible	Negligible
New City College	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Simpson's Road	High	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Introduced Receptors								
NQ.A1	High	N/A	N/A	N/A	N/A	N/A	N/A	Minor Adverse
NQ.A4	High	N/A	N/A	N/A	N/A	N/A	N/A	Minor Adverse

Figure 8.6 Timeslice 1 – Q1 2022 – Enabling and Construction Noise Level ($L_{Aeq,10h}$ dB)

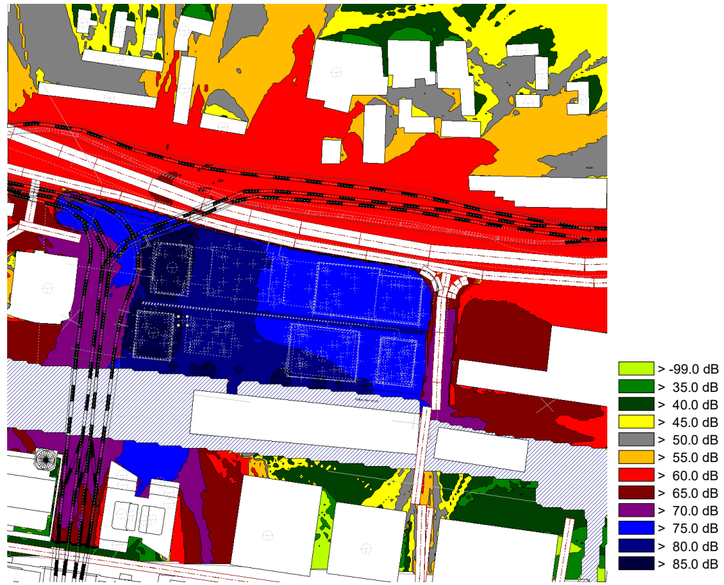


Figure 8.7 Timeslice 2 Q1 2023 - Enabling and Construction Noise Level ($L_{Aeq,10h}$ dB)

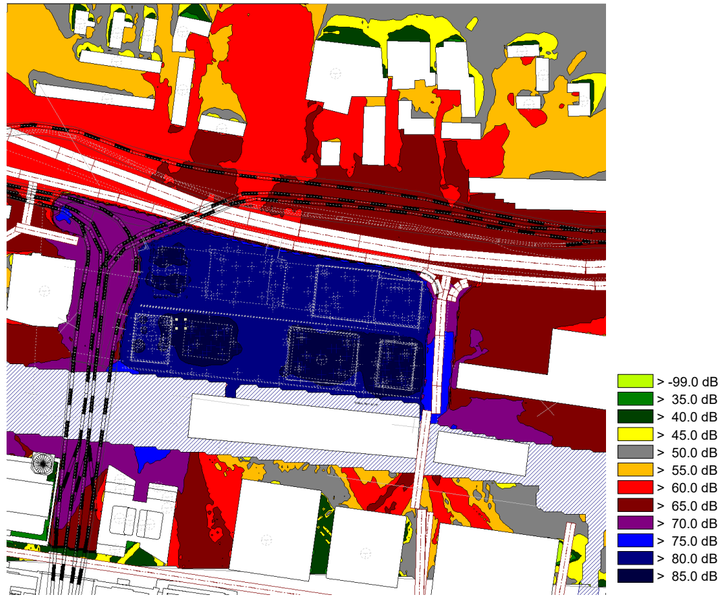


Figure 8.8 Timeslice 3 Q3 2023 - Enabling and Construction Noise Level ($L_{Aeq,10h}$ dB)

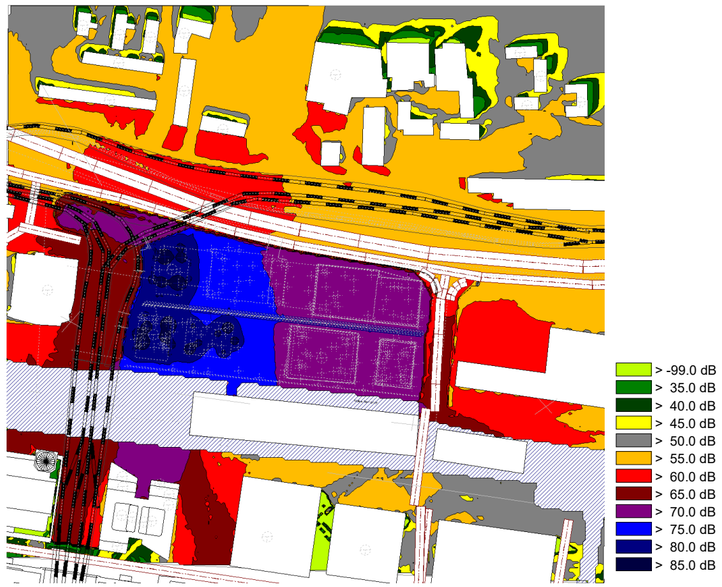


Figure 8.9 Timeslice 4 Q2 2024 - Enabling and Construction Noise Level ($L_{Aeq,10h}$ dB)

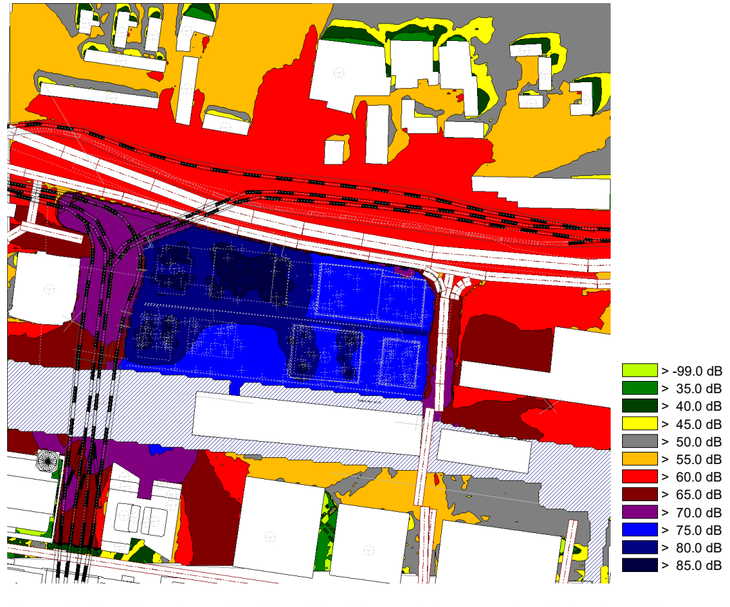


Figure 8.10 Timeslice 5 Q4 2024 - Enabling and Construction Noise Level ($L_{Aeq,10h}$ dB)

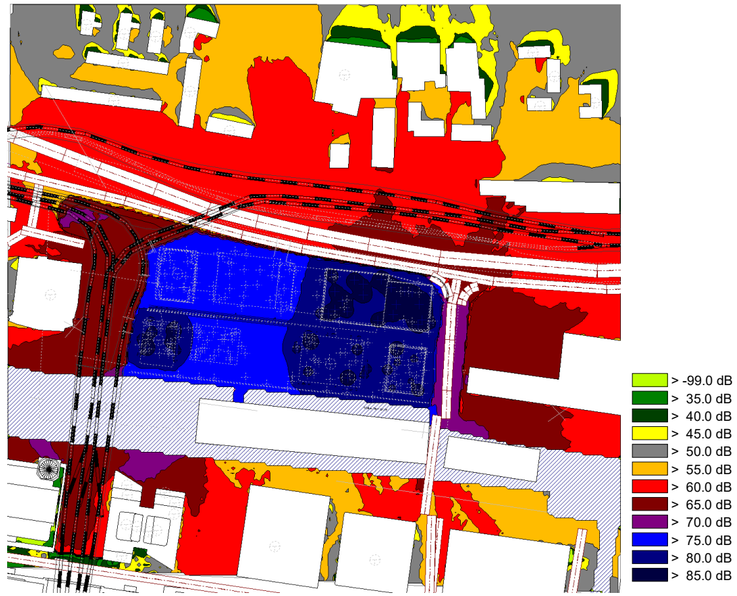


Figure 8.11 Timeslice 6 Q3 2025 - Enabling and Construction Noise Level ($L_{Aeq,10h}$ dB)

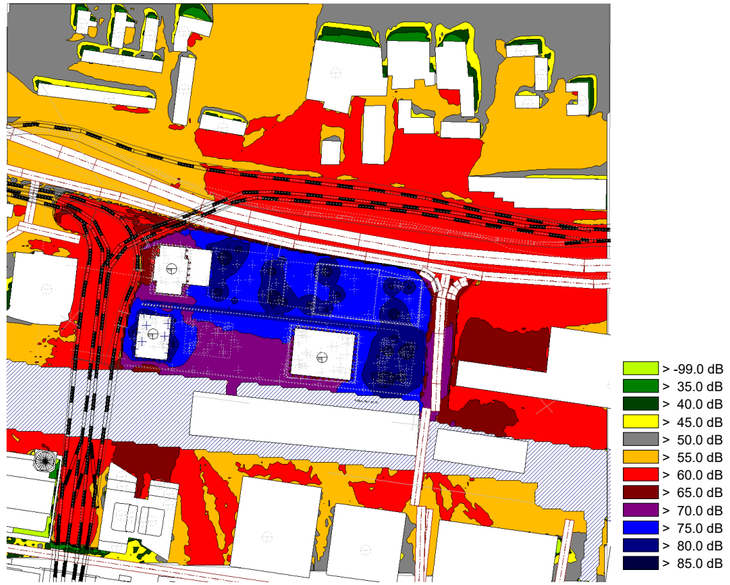
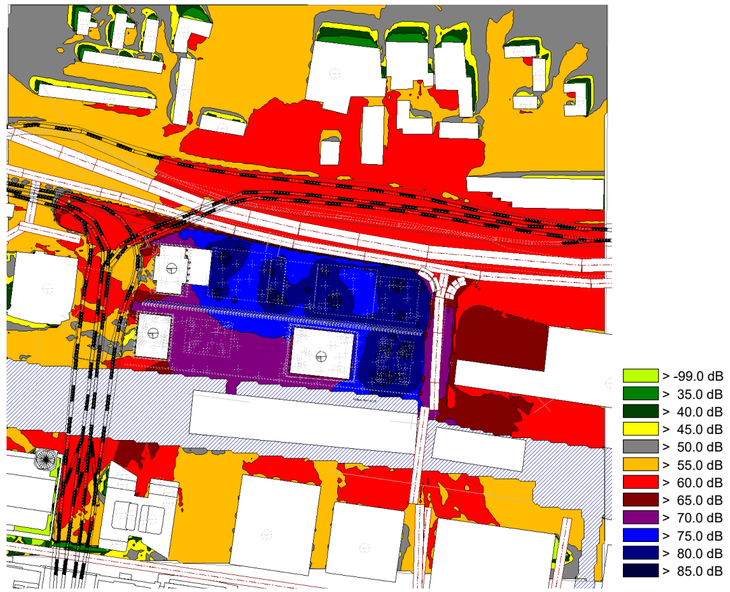


Figure 8.12 Timeslice 7 Q4 2026 - Enabling and Construction Noise Level ($L_{Aeq,10h}$ dB)



8.120 The results presented in Table 8.24 indicate that only the Canary Wharf Marriott Hotel/1 West India Quay will likely experience noise nuisance (unmitigated) during the enabling and construction works (timeslices 1 and 2) that has the potential to be significant (High impact on a high sensitive receptor resulting in **Major Adverse** effects (significant)). It is noted that a reduction of 3dB is required for a Minor Adverse effect (not significant), an achievable reduction with appropriate management.

8.121 The remaining receptors are not expected to experience significant noise nuisance effects with a majority of effects being Negligible (not significant) with one Low impact on Dolphin Lane and Stoneyard Lane (high sensitive receptor) during timeslice 2 resulting in a **Minor Adverse** effect (Not Significant) and a High impact on 25 North Colonnade (low sensitive receptor) during timeslice 1 resulting in a **Minor Adverse** effect (Not Significant).

8.122 The introduced receptors are not expected to experience significant noise nuisance effects when they are occupied, with a Low impact (high sensitivity receptors) in timeslice 7 resulting in a **Minor Adverse** effect (Not Significant).

8.123 Timeslice 7 represents the worst-case/highest predicted noise construction noise levels at the introduced receptors, as after this period the noisy construction activities reduce.

8.124 In practice, there is potential for the construction phasing to be altered, so that high noise sensitivity receptors are introduced on-site and residential property occupied prior to Q4 2026. In this instance, there would inherently be less construction activity taking place (as a Phase/building would be completed), and therefore potentially less noisy works to consider. However, the analysis at Canary Wharf Marriott Hotel/1 West India Quay indicates that there is potential for Major Adverse effects (Significant) if noisy works are completed close to the occupied buildings when no mitigation is adopted.

8.125 All reasonable steps should be taken to mitigate and minimise the effects through adopting of Best Practicable Means (BPM). Noise mitigation measures and noise management plan covering BPM are to be put into place to ensure that noise is minimised at all times. Noise mitigation measures representing BMP (as defined in Section 72 of the CoPA) are described in the 'Mitigation Measures, Monitoring and Residual Effects' section.

8.126 It should be noted that enabling and construction noise predictions (at selected timeslices) are based on worst case months that are assumed to represent high periods of construction activity over the course of a working day, with all plant being operational at all areas of all worksites during each period assessed. In reality, it is likely that the worst-case noise levels would be for limited periods of time when plant are operational, and are also likely to vary in the level of noise when in use.

Construction Traffic

8.127 The enabling and construction traffic programme for the Proposed Development (refer **ES Volume 1, Chapter 5: Enabling and Construction Works** for construction programme detail) shows a peak of 400 vehicle movements per day (during Q3 2024) entering and leaving the Site. Based on the change in traffic flow the overall effect on changes to A-weighted 16-hour noise levels would be less than 1.0 dB.

8.128 On this basis, the magnitude of impact would be very low and the likely effect to all receptors (high to low sensitivity (including those located along the road network)) is assessed to be **Negligible** (not significant).

Construction Vibration

8.129 BS 5228 indicates that construction activities (particularly piling) generally only cause vibration impacts when they are located less than 20 m from sensitive locations. The magnitude of impact depends on the type of piling, ground conditions and receptor distance.

8.130 Whilst it is not possible to accurately estimate the levels of vibration with any certainty from the likely construction works (it is dependent on the specific type of piling (such as continuous flight auger), ground conditions and the distance to the receptor), it is proposed that limits are placed on the vibration sensitive buildings (receptors such as Canary Wharf Marriott Hotel/1 West India Quay that is 50 m from the Site boundary) and therefore vibration levels will need to be monitored during construction. The LBTH COCP states that vibration levels should not exceed 1.0 mm/s PPV at residential properties and 3.0 mm/s ppv at commercial properties, during construction.

8.131 Annex C and D of BS 5228-2:2009 provide summaries of case histories of vibration measured during piling operations. Data from works carried out in East London indicate that peak particle velocities of between 0.05 to 0.23 mm/s at 20 m from a site have been recorded during auger boring of 1.05 m diameter piles, with soil conditions described as 'fill / dense ballast / clay'. During the removal of pile casings PPV's (at 25 Hz) of between 0.8 to 1.5 mm/s at 30 m and 25 m from piling locations have been recorded in the same general area. These historical data suggests that vibration levels are unlikely to affect any buildings outside of the Site, and that at reasonable distances from the Site the vibration levels would be expected to be substantially lower than the criteria stated above.

8.132 These historic data provide an indication of the likely low potential vibration effects of the Site construction activities in the immediate surroundings of the Site, although they will be appropriately monitored and confirmed by on-site monitoring during construction of the Proposed Development. The likely magnitude of impact is very low at nearby residential (high sensitivity) and commercial (low sensitivity) receptors and a significance of effect has been assessed to be **Negligible** (not significant) at all receptors.

Completed Development

Operational Road traffic

8.133 A computer model of the Site and surrounding roads has been developed using CadnaA software. The computer model takes into account road geometry, gradients and average traffic speed and accounts for the existing noise from surrounding train lines and road traffic.

8.134 Road traffic noise contour maps for the Future Baseline (Opening Year 2029) Do Nothing scenario and Future Baseline (Opening Year 2029) Proposed Development (maximum transport generating and maximum population generating) have been generated. These take into account the 2031 18 hour AADT road traffic data, percentage of heavy vehicles and average assumed speed of the vehicles. The contour maps indicate predicted noise levels at 1.5m above ground level, approximately ear height, in the vicinity of the Proposed Development.

8.135 Figure 8.13 presents future baseline modelling results, with Figure 8.14 and Figure 8.15 illustrating the modelled results for the maximum population generating and maximum transport generating schemes respectively. The difference in ambient noise level between future baseline and maximum transport generating scheme (highest predicted traffic flows) is shown in Figure 8.16. The difference in ambient noise level between future baseline and maximum population generating scheme is shown in Figure 8.17.

Figure 8.13 2029 Future Baseline Ambient Noise Levels ($L_{Aeq,16h}$ dB)

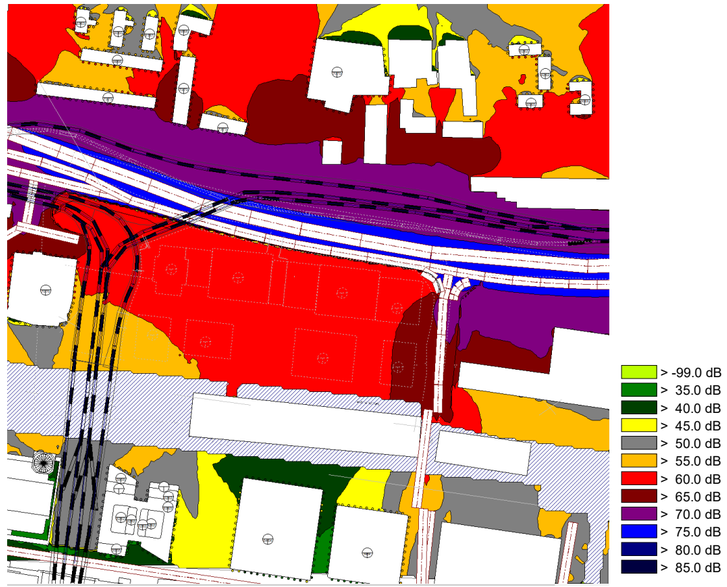


Figure 8.14 2029 "Maximum Population" Ambient Noise Levels ($L_{Aeq,16hr}$ dB)

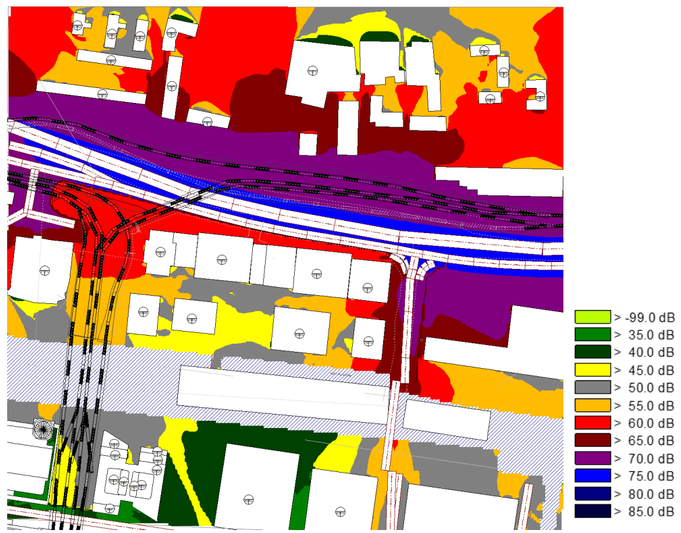


Figure 8.15 2029 "Maximum Transport Generating" Ambient Noise Levels ($L_{Aeq,16hr}$ dB)

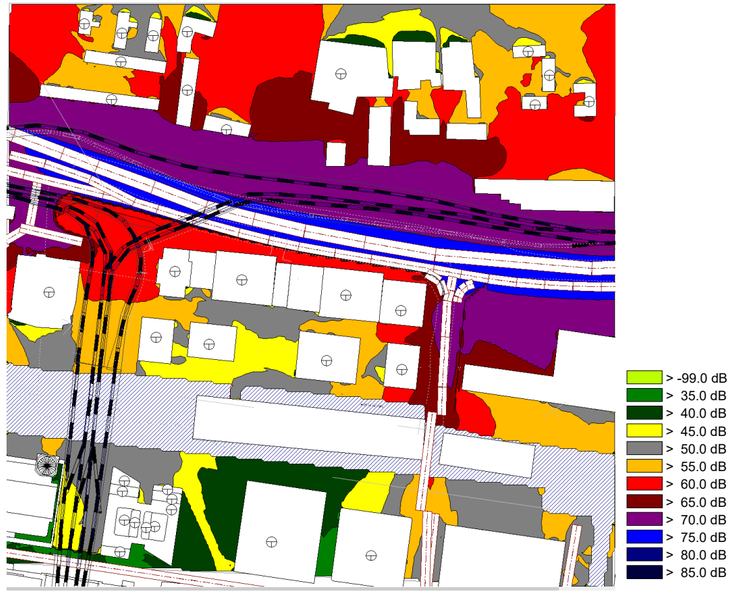


Figure 8.16 Difference in Ambient Noise Levels ($L_{Aeq,16h}$ dB) with Maximum Transport Generating (Light Green = Reduced Noise Level)

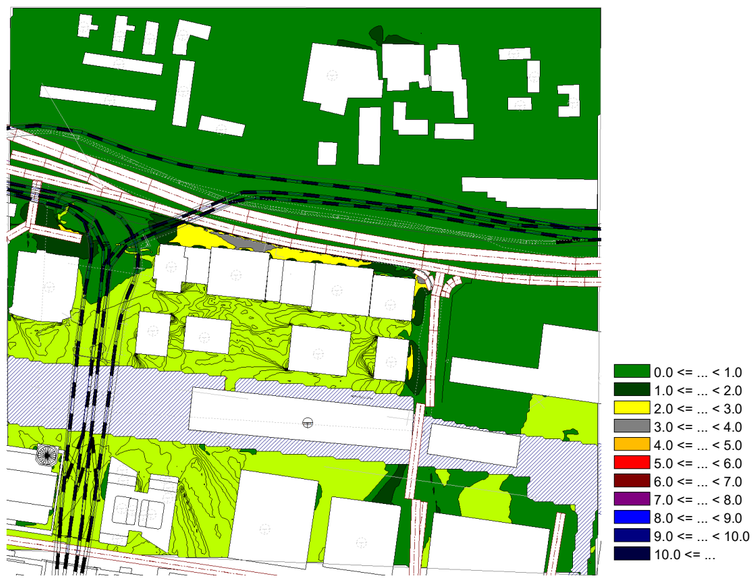
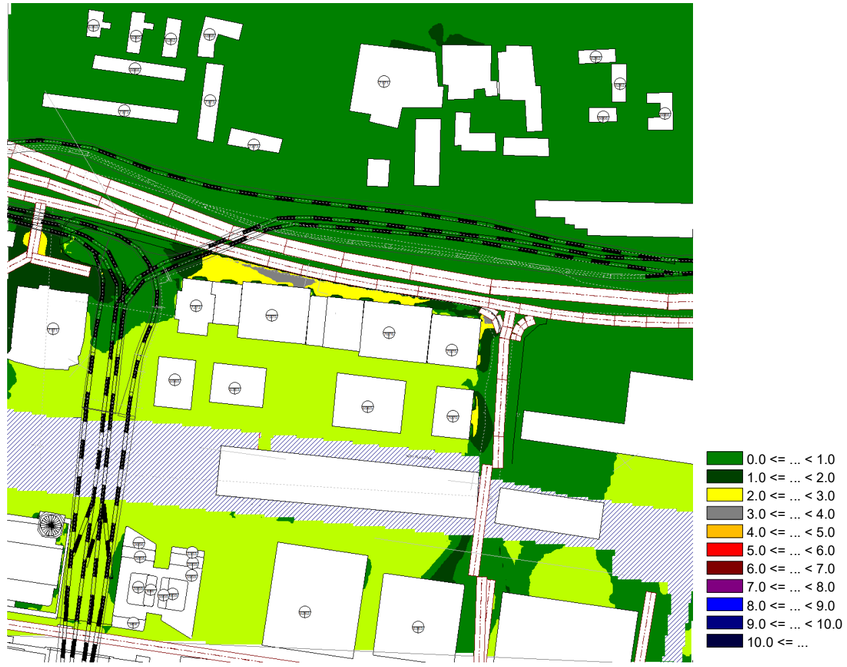


Figure 8.17 Difference in Ambient Noise Levels ($L_{Aeq,16h}$ dB) with Maximum Population (Light Green = Reduced Noise Level)



8.136 The 16-hour noise levels detailed in Table 8.25 are the highest change in noise level predicted between the 2029 "with" and "without" development scenarios for each receptor. The predictions presented are those completed using the "maximum transport generating" journeys, as they are higher than the "maximum population generating" and so provide a reasonable worst case assessment.

Table 8.25 Predicted 16-hour Noise Levels at 1m from Receptors

Receptor	Predicted noise level ($L_{Aeq,10hr}$ dB)			Receptor Sensitivity	Magnitude of Impact	Scale and Nature of Effect
	2029 without Proposed Development	2029 with Proposed Development (maximum transport)	Change with Proposed Development			
Crossrail Station	68	68	0	Low	Very Low	Negligible
Billingsgate Market	74	74	0	Low	Very Low	Negligible
8 Canada Square	64	63	<0	Low	Very Low	Negligible
5 Canada Square	64	62	<0	Low	Very Low	Negligible
25 North Colonnade	63	59	<0	Low	Very Low	Negligible
Canary Wharf Marriott Hotel/1 West India Quay	70	71	1	High	Low	Minor Adverse
Dingle Gardens	73	73	0	High	Very Low	Negligible
Dolphin Lane	73	73	0	High	Very Low	Negligible
Stoneyard Lane	73	73	0	High	Very Low	Negligible
New City College	70	71	1	Medium	Low	Negligible
Simpson's Road	66	66	0	High	Very Low	Negligible

8.137 The highest predicted increase in ambient noise levels are at Canary Wharf Marriott Hotel/1 West India Quay (high sensitivity) and New City College (medium sensitivity), where a 1 dB change is expected. This will result in a **Negligible** (not significant) effect at New City College and a **Minor Adverse** (not significant) effect at Canary Wharf Marriott Hotel/1 West India Quay.

8.138 At the remaining receptors, the predictions indicate no increase, or a decrease in ambient noise levels due to the Proposed Development taking place. At the remaining receptors the assessed effects are **Negligible** (not significant).

Building Service Plant Noise

8.139 Based on the baseline background noise levels, the total noise from building services plant will be limited in line with the noise levels detailed in Table 8.26 at a position 1m from all nearby facades.

8.140 Limits have only been determined for the closest residential/high sensitivity receptors on the basis that the control of noise emissions from building services plant at these receptors will inherently result in suitable noise levels at receptors further away.

Table 8.26 Building Services Plant Noise Limits

Receptor	Building Services Noise Limits, 1m from Facade (dB)		Representative Free Field Background Sound Level (dB)		Increase in Background Sound Level	Receptor Sensitivity	Magnitude of Impact	Scale and Nature of Effect and Significance
	Daytime (07:00 to 23:00 hours)	Night-time (23:00 to 07:00 hours)	Daytime (07:00 to 23:00 hours)	Night time (23:00 to 07:00 hours)				
External receptors								
Canary Wharf Marriott Hotel/1 West India Quay	60	55	67	62	<1	High	Very Low	Negligible
Stoneyard Lane	52	46	59	53	<1	High	Very Low	Negligible
Simpson's Road	52	46	59	53	<1	High	Very Low	Negligible
Internal receptors								
NQ.A1	60	55	67	62	<1	High	Very Low	Negligible
NQ.A4 (north and west facades)	62	55	67	62	<1	High	Very Low	Negligible
NQ.A4 (south and east facades)	47	44	54	51	<1	High	Very Low	Negligible
NQ.D4 (all facades)	47	44	54	51	<1	High	Very Low	Negligible

8.141 The building services plant strategy will be developed to ensure that the limits detailed in Table 8.26 are achieved. On this basis a **Negligible** (not significant), effect has been assessed at all receptors.

8.142 If the position of the internal receptors changes, then appropriate limits based on the representative background noise levels would need to be derived according to their location. Nevertheless, the limits presented in Table 8.26 for NQ.A4 south and east facades and NQ.D4 represent the worst-case for the Site (lowest measured representative background noise levels) and therefore if adopted at residential receptors would be also result in a **Negligible** (not significant) effect.

8.143 It is noted that if the windows to the internal receptors are not needed for ventilation or to control overheating then higher building services limits would be acceptable.

Site Suitability

8.144 The Proposed Development is to potentially incorporate residential uses that are sensitive to noise and vibration effects. The suitability of the Site for residential development considers the following:

- The feasibility to achieve appropriate internal noise levels for living rooms and bedrooms;
- The noise levels in external residential amenity areas; and
- Groundborne vibration and structure-borne noise.

8.145 The Indicative Scheme has been used to assess the site suitability, as it contains noise sensitive receptors in worst-case locations (adjacent to road and rail) and as there are sufficient details to complete detailed calculations.

Internal Noise Levels

8.146 The long term noise monitoring results indicate that the Site falls into the LBTH's LOAEL to SOAEL and SOAEL categories, and that mitigation will be necessary. It is noted that, irrespective of the category achieved, it is anticipated that the ultimate objective is to achieve satisfactory internal noise levels, e.g. those that align with the recommendations provided in BS 8233 as per Table 8.1.

8.147 External noise levels have been modelled across the Site and on the Proposed Development buildings. The results from the modelling provided in Table 8.27 present the highest predicted façade sound pressure levels for each façade and the required sound insulation performance (the reduction in noise that the façade needs to provide) so that internal sound pressure levels are no higher than $L_{Aeq,16h}$ 35 dB during the day (in living rooms and bedrooms) and $L_{Aeq,8h}$ 30 dB during the night time (in bedrooms).

Table 8.27 Predicted Sound Pressure Levels and Required Façade Sound Insulation

Block	Facade	Daytime sound pressure level ($L_{Aeq,16h}$ dB)	Night time sound pressure level ($L_{Aeq,8h}$ dB)	Living room overall façade sound insulation requirements ($R'_w + C_{tr}$) to achieve recommended internal noise levels	Bedroom overall façade sound insulation requirements ($R'_w + C_{tr}$) to achieve recommended internal noise levels
NQ.A1	North	70-76	68-74	43	46
	East	68-75	66-73	42	45
	South	65-69	63-67	36	39
	West	69-73	67-71	42	45
NQ.A4	North	65-71	63-69	38	41
	East	60-64	58-61	32	35
	South	60-68	58-66	35	38
	West	65-73	63-71	40	43
NQ.D4	North	65-70	63-68	37	40
	East	64-70	62-68	37	40
	South	58-63	56-61	30	33
	West	59-61	57-58	28	30

8.148 The night time maximum noise levels are determined by individual events, such as DLR wheel screech, emergency vehicle sirens or car horns, that are predominately high frequency in nature. The survey data at the long-term positions indicates that façade noise levels up to L_{AFmax} 96 dB on the west and north facades of NQ.A1 and on the west façade of NQ.A4 could occur. To adequately control night time maximum events the facades must be capable of achieving R'_w 51 dB in the worst case conditions.

8.149 The requirements in Table 8.27 are based on the completed Indicative Scheme and all buildings present. Buildings to the south of the Site benefit (to some extent) from screening being provided by the buildings adjacent Aspen Way and the DLR track. As such, it would be appropriate to revisit the required sound insulation ratings with full details of where buildings will come forward within the Development Zones within RMAs, so that appropriate internal noise conditions are achieved.

8.150 If buildings are brought forward, and are to be occupied for extended periods without other buildings being built, then it will be necessary to evaluate the likely impact that this would have on the façade sound insulation.

8.151 It is noted that the sound insulation requirements are in some instances very high and would require careful consideration. Typically the acoustically weakest element within the façade is the access to the balconies (balcony doors) and glazed sections. Analysis of available products on the market indicates that the highest acoustic performances that can be achieved by these elements are:

- R_w 44 dB and $R_w + C_{tr}$ 41 dB - Lift and slide doors; and
- R_w 51 dB and $R_w + C_{tr}$ 45 dB - Side hung, double rebated heavy frame, acoustic glass openable windows.

8.152 Table 8.27 lists the overall façade sound insulation performances required, i,e. is a combination of the glazing, doors and the building fabric sound insulation performance. The overall requirements can be achieved with appropriate specification of the building fabric, by considering the proportion of glazing/doors to building fabric and mechanical ventilation of the apartments.

8.153 If residential uses are to be adopted in NQ.A1, NQ.A4 and NQ.D4, then it will be necessary to consider appropriate strategies for the control of overheating that do not exclusively rely on opening windows. With appropriate façade design and the implementation of a suitable overheating control strategy, it is possible to address the conflicts associated with occupants controlling internal temperatures that do not result in unsatisfactorily high internal noise levels being achieved. A study on the internal acoustic conditions, ventilation and overheating will be required with the detailed design of the residential buildings at the RMA stage.

8.154 Noise sensitive receptors have the potential to be introduced and could come forward in Development Plots NQ.A1 - NQ.A4, NQ.A5, NQ.D1, NQ.D3 and NQ.D4. The Indicative Scheme which has been used for the assessment of site suitability provides noise sensitive receptors of residential and residential-use in Development Plots NQ.A1, NQ.A4, and NQ.D4. The OPA allows for the development of residential use at NQ.A2, NQ.A3 and NQ.D1, and a mix of uses at plot NQ.D3 and NQ.A5 (potentially residential-use). If these plots were to come forward as noise sensitive (residential or residential-use) then the same or similar design measures as outlined for NQ.A1, NQ.A4 and NQ.D4 would be appropriate.

8.155 On the basis that the highest façade sound insulation requirements can be met the Site is considered suitable for its proposed uses.

Assessment of Outdoor Amenity Areas

8.156 The calculated external noise levels have been assessed with respect to guidance provided in BS 8233, which states that for traditional amenity spaces, such as gardens and patios, it is desirable for noise levels to be within the L_{Aeq} 50-55 dB range. It is recognised within BS 8233 that in high noise areas (e.g. city centres or along

major roads) that the desirable noise level range will not be achieved on balconies and this should not prohibit the development from taking place or the adoption of balconies.

8.157 From the results of the modelling, the calculations indicate the BS 8233 recommended range will not be achieved at the proposed balcony positions. Nevertheless, as part of the Indicative Scheme, other areas designated as residential amenity have been identified, as per Figure 8.5.

8.158 The results from the modelling, with the addition of embedded mitigation designed into the Proposed Development (in the form of barriers) are illustrated in Figure 8.18 and Figure 8.19.

Figure 8.18 Predicted Sound Pressure Levels ($L_{Aeq,16h}$ dB) in shared amenity (1.5 m above ground)

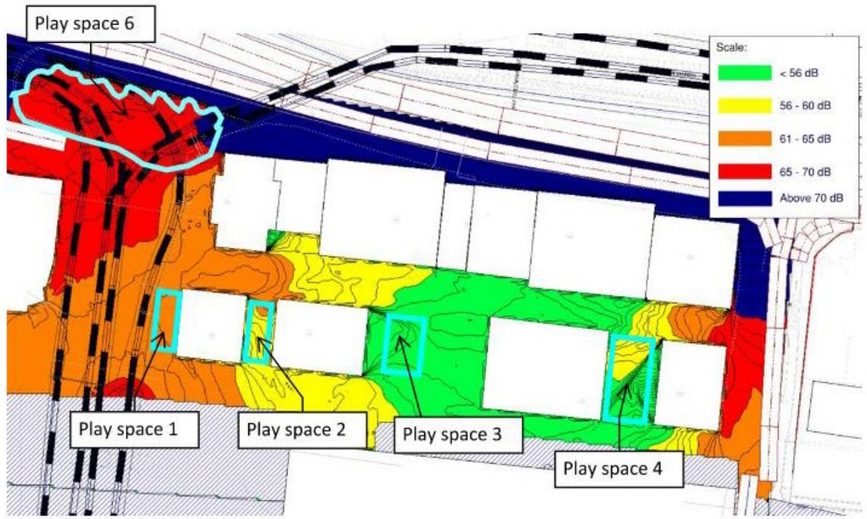


Figure 8.19 Predicted sound pressure level ($L_{Aeq,16h}$ dB) in shared amenity (play space 5)

8.159 The modelling results illustrate the following daytime ambient noise levels can be predominantly achieved in the respective designated play spaces and amenity:

- Play space 1 - L_{Aeq} 61-65 dB;
- Play space 2 - L_{Aeq} 56-60 dB;
- Play space 3 - < L_{Aeq} 56 dB;
- Play space 4 - < L_{Aeq} 56 dB;
- Play space 5 - < L_{Aeq} 56 dB;
- Play space 6 (Delta Skate Park 12+) - L_{Aeq} 65-70 dB;
- Play space 7 - <L_{Aeq} 56 dB; and
- Play space 8 - <L_{Aeq} 56 dB.

8.160 In addition, internal spaces for play and amenity are to be provided, where noise levels would be controlled in line with BS 8233 recommendations by virtue of the sound insulation provided by the façade.

8.161 Strategies to reduce noise levels in amenity spaces are to be implemented as part of any residential scheme's detailed design (at the RMA stage), so that all future residents have access to areas where suitable conditions are achieved. The Indicative Scheme introduces locations within the Proposed Development where the upper

limit in BS 8233 for traditional gardens and terraces are expected to be achieved. The areas where the upper limit in BS 8233 are achieved will incorporate designated play spaces, though also extend beyond these areas.

8.162 Not all areas that are designated as play spaces within the Indicative Scheme will meet the recommendations in BS 8233. This is considered acceptable within the overall context of the Site, due to the type of spaces proposed (e.g. skate park would be able to function satisfactorily with elevated noise levels) and the availability of locations where the recommendations will be achieved.

8.163 The Indicative Scheme indicates that it is possible for the Proposed Development to meet the upper external noise level recommendation in BS 8233 for traditional gardens and terraces, and as such the ability to provide suitable residential amenity. On this basis the Proposed Development is considered to be suitable for its proposed uses.

Groundborne Vibration and Structure-borne Noise

8.164 Measurements of groundborne vibration have been completed (please refer to **ES Volume 3, Appendix: Noise and Vibration**) and analysis indicates that the TfL recommended groundborne noise criterion for residential developments will be achieved across the Site without mitigation. Consequentially, the Proposed Development is considered to be suitable for its proposed uses.

MITIGATION MEASURES, MONITORING AND RESIDUAL EFFECTS

Enabling and Construction Mitigation

Noise Effects from Construction Activities

8.165 Relatively small decreases in construction noise (3dB) are required to comply with LBTH's CoCP limits. Reductions of this magnitude are achievable with appropriate management of construction activities and consideration to noise.

8.166 The assessment of potential construction noise and vibration effects does not include prescriptive measures, as these are not appropriate for this stage of the development. A CEMP (secured by a planning condition) would be employed to mitigate the potential noise and vibration effects on nearby noise sensitive premises, with the primary method for the control of noise and vibration being a Section 61 agreement under the COPA with the LBTH being established.

8.167 A Section 61 agreement under the COPA will contain appropriate noise and vibration limits at the nearby properties depending on their use and ownership. These limits will be continuously monitored and reported. The reports and monitoring will highlight when it is likely that the construction limits will be exceeded, so that construction activities can be effectively altered.

8.168 In addition, a Section 61 agreement also sets out a dispensation and variation procedure under which consent can be applied for to carry out works which it is considered would exceed the agreed noise and vibration limits or must occur at times when such work is otherwise not approved. Such dispensation/variations would be applied for where there are good engineering, safety or practical reasons for undertaking the works at these times. The selected contractor should adopt measures, including site supervision arrangements, to reduce noise and vibration to a minimum in accordance with best practicable means, as defined in Section 72 of the COPA.

8.169 Other key mitigation measures that have been included in **ES Volume 1, Chapter 16: Mitigation and Monitoring Schedule** are summarised below.

8.170 Time management of piling rigs and tracked excavators with breakers. This may take the form of 2 hours on and 2 hours off, or prescribed hours for their use. The application of time management alone could reduce noise levels by 3dB.

8.171 Delivery and removal of heavy plant (including the tower cranes) which may need to be undertaken outside of normal hours because of restrictions imposed by the LBTH or the Metropolitan Police should only be undertaken after prior notification to the Environmental Health Department of the LBTH.

8.172 No plant would be allowed to start or to move on site nor any work commence before 08.00 hours, except in cases of emergency where safety is an issue, or as agreed under the Section 61 agreement.

8.173 A noise protection screen would be erected around hoists to screen them from adjacent buildings.

8.174 Hoists would use, where possible, a Variable Frequency Converter drive system, which leads to a quieter mechanical operation, and all landing gates would be fixed with rubber strips to reduce the noise effect when the gates are shut. In addition, a system would be introduced to work in conjunction with the gate opening, which would prevent the operator allowing the drop down flap to fall open in a manner that can cause significant noise.

8.175 Trade contractors will comply with all legislation relevant to the control of noise and vibration from construction works including:

- The COPA 4 with particular reference to part III;
- The Environmental Protection Act 1990;
- The Control of Noise at Work Regulations 2005 ; and
- The Health and Safety at Work Act 1974.

8.176 All plant brought on to the Site will comply with the relevant EC / UK noise limits applicable to that equipment or no noisier than would be expected based the noise levels quoted in BS 5228. Plant is to be properly maintained and operated in accordance with manufacturer's recommendations. Electrically powered plant is preferred, where practicable, to mechanically powered alternatives.

8.177 Trade contractors would at all times apply the principle of Best Practicable Means as defined in Section 72 of the COPA and carry out all work in such a manner as to reduce any disturbance from noise and vibration to a minimum.

8.178 The timing of building operations is expected to be critical in avoiding noise and vibration nuisance to surrounding areas and premises. The contractor would identify particularly sensitive periods in the works so that the potential problems can be minimised and that early and good public relations with the adjacent tenants and occupants of buildings are maintained.

8.179 The Canary Wharf Estate has been progressively constructed in phases since 1987 and has endeavoured to maintain good relationships with the LBTH and its residents. As part of previous agreements between Canary Wharf and the LBTH, and in order to ensure that any complaints or concerns from local residents and

commercial businesses are dealt with quickly and efficiently, regular meetings are held with the LBTH to discuss any such matters as well as prospective developments and projects.

8.180 This relationship with the LBTH has been found to work successfully in the past in dealing with the management and control of noise from construction sites at the Canary Wharf Estate.

8.181 Provided the above steps are implemented, the likely residual noise effect from construction activities is expected to be **Negligible** (not significant) at all receptors, except Canary Wharf Marriott Hotel / 1 West India Quay where a **Minor Adverse** (not significant) effect is expected.

Vibration Effects from Construction Activities

8.182 With regards to the effects of construction generated vibration on nearby sensitive receptors, vibration limits would be set to ensure compliance with the LBTH COCP and hence, minimise the risk of complaints or building damage. These limits would be controlled through the implementation of the CEMP as set out above, in addition to vibration monitoring.

8.183 Provided the above steps are implemented, the likely residual vibration effect at all receptors from construction activities is expected to be **Negligible** (not significant).

Construction Traffic Noise

8.184 The likely effects of construction traffic noise are considered to be negligible and no mitigation measures are therefore required. Implementation of the relevant measures outlined above as part of the CEMP would nevertheless assist in reducing and controlling traffic noise further during construction. The residual effect would remain **Negligible** (not significant) to all receptors.

Completed Development Mitigation

8.185 Noise effects as a result of the operational Proposed Development due to changes in road traffic flows and building services plant have been identified as not significant. No further mitigation measures have been recommended for road traffic, with the building services plant noise emissions secured through a Planning Condition.

8.186 Any future residential uses within the Proposed Development will need to suitably design the facades and ventilation system so that appropriate internal noise conditions are achieved. The design of the façade and ventilation systems are to be suitable so that overheating is not exclusively controlled through opening windows.

8.187 External amenity or play spaces incorporated within the Proposed Development will need to implement measures that reduce ambient noise levels as much as feasibly possible. These will include barriers between Aspen Way and Play Space 6 (Delta skate park), and barriers on the north and south elevation of Play Space 5 (terrace level).

Residual Effects

8.188 The residual effects resulting from the Proposed Development (based on the worst case scenarios) are summarised in Table 8.28.

8.189 In addition, with the implementation of design and mitigation measures, it is demonstrable that appropriate conditions can be created for residential development upon the Site.

Table 8.28 Residual Effects

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	St Mt Lt
Enabling and Construction							
Canary Wharf Marriott Hotel	Construction noise – on site activities for timeslices 1 and 2	Minor adverse	Not significant	L	D	T	St
	Construction noise – on site activities remaining timeslices	Negligible	Not significant	L	D	T	St
Crossrail Station	Construction noise – on site activities during timeslice 1	Minor adverse	Not significant	L	D	T	St
	Construction noise – on site activities remaining time	Negligible	Not significant	L	D	T	St
All other receptors	Construction noise – on site activities	Negligible	Not significant	L	D	T	St
All receptors	Construction traffic noise	Negligible	Not significant	L	D	T	Mt
All receptors	Construction vibration	Negligible	Not significant	L	D	T	Mt
Completed Proposed Development							
All receptors	Building services noise	Negligible	Not Significant	L	D	P	Lt
Canary Wharf Marriott Hotel	Road traffic increases	Minor adverse	Not significant	L	D	P	Lt
All receptors		Negligible	Not significant	L	D	P	Lt
All receptors		Negligible	Not significant	L	D	P	Lt

Notes:
Residual Effect:
Scale = Negligible / Minor / Moderate / Major. Nature = Beneficial or Adverse.
Geo (Geographic Extent) = Local (L), Borough (B), Regional (R), National (N). D = Direct / I = Indirect. P = Permanent / T = Temporary. St = Short Term / Mt = Medium Term / Lt = Long Term. N/A = not applicable / not assessed

CLIMATE CHANGE

8.190 Climate change has the potential to result in an increase in heat during the hottest months of the year and reduce temperatures during the coldest months of the year. There is therefore potential for an increased demand on heating and cooling systems, both within the Proposed Development itself and for sensitive receptors external to the Site.

8.191 Increased temperatures during the warmer times of the year (i.e. summer) will potentially result in future residents of the potential residential component of the Proposed Development having to rely on either natural ventilation solutions (i.e. attenuated operable louvres or openable windows), or comfort cooling for longer periods of time. The use of natural ventilation solutions would expose the occupants to greater internal noise levels. It will be necessary for the detailed design of the residential buildings to consider the implications of overheating in the design and outline measures that do not exclusively rely on the opening of windows.

8.192 Ventilation and cooling requirements during the summer, and demand for heating during the cooler months, for the commercial elements may require additional or upgraded equipment such as mechanical cooling, which if not appropriately mitigated, would result in greater noise impacts on the surrounding residential receptors. In

this scenario, any building services plant will need to be designed to the same measures that have been outlined in the assessments and therefore the impacts and effects described within the assessments above will remain the same.

ASSESSMENT OF THE FUTURE ENVIRONMENT

Evolution of the Baseline Scenario

8.193 Regarding any likely future changes in road traffic noise in the absence of the Proposed Development (for example, as a result of Cumulative Schemes in the area or forecasts of general changes in road use), this is reflected in the predicted road traffic noise levels for the Future Baseline (Do Nothing) scenario, which has been considered through review of forecast data, as well as professional experience and judgement.

8.194 Potential changes in road traffic flows and the use of the DLR are considered to have the biggest potential to affect the future baseline (noise and vibration levels) at the Site. Potential changes in road traffic, for example, can be derived from either natural population growth and/or new developments and infrastructure within the local and wider area of the borough and London region.

8.195 It is noted that a notable change (3 dB) in ambient noise levels would require the road and/or DLR to operate at double their current levels. Given the current high road traffic flows and use of DLR it is expected that baseline noise levels will remain broadly the same, as changes in the order of 100% are unlikely.

Cumulative Effects Assessment

8.196 This section identifies the effects of the Proposed Development in combination with the effects of other Cumulative Schemes within the surrounding area (those schemes identified in **ES Volume 1, Chapter 2: EIA Methodology**).

Enabling and Construction

8.197 The majority of cumulative schemes are sufficiently far from the Proposed Development and associated receptors that the noise and vibration levels from them will not influence the predictions and outcomes presented herein.

8.198 There are two schemes (one consented and one proposed) that could potentially influence the construction noise levels at the receptors assessed, namely Hertsmere House (committed) and New City College Poplar Campus (proposed with only with an EIA Scoping Application submitted).

8.199 Hertsmere House is approximately 300m to the west of the Site, and 180m to Canary Wharf Marriott Hotel/1 West India Quay, a potentially shared receptor. The enabling works on the Site have been completed, with future works currently on hold. The closest receptors to Hertsmere House are along Hertsmere Road, approximately 25-50m from the Site. It is assumed that the noise and vibration limits prescribed in the LBTH's CoCP have formed the basis for their work and will be applied to the closest receptors. Through meeting these limits at the closest receptors is predicted to result in construction noise levels between $L_{Aeq,10h}$ 58-64 dB at the west façade of the Canary Wharf Marriott Hotel/1 West India Quay and substantially less at the east façade.

8.200 It can be seen that the predicted construction noise levels from Hertsmere House will be sufficiently below those predicted from the Proposed Development that they will not cause an increase or result in changes in the effects presented.

8.201 New City College Poplar Campus is approximately 90-180m to the north of the Proposed Development and potentially has shared receptors at Stoneyard Lane, Dolphin Lane and to a less extent Dingle Gardens, which are 50-120m from New City College.

8.202 There is limited information on the proposals, so accurate predictions on potential impacts or influence on the predictions presented herein cannot be made. Nevertheless, one of the closest receptors to New City College Poplar Campus are receptors along Stoneyard Lane, which are 40-120m from the college buildings. It is therefore expected that the development of New City College Poplar Campus will need to consider construction noise emissions at this receptor.

8.203 The highest predicted sound pressure level during enabling and construction from the Proposed Development at the Stoneyard Lane receptors is $L_{Aeq,10h}$ 70 dB. Assuming that construction noise emissions from the development of the New City College Poplar Campus meets the LBTH's CoCP limits of $L_{Aeq,10h}$ 75 dB could potentially result in an overall construction noise level of L_{Aeq} 76 dB. The overall effect will be either Medium or High and a Moderate or Major Adverse effect.

8.204 The likelihood of this situation eventuating is unknown at this stage, though as the calculations for the Proposed Development have been based on reasonable worst-case assumptions it is likely that lower construction noise levels from the Proposed Development will be achieved, i.e. less than L_{Aeq} 70 dB at Stoneyard Lane. As such, the overall effect is expected to be Low and a **Minor Adverse** (not significant) effect.

Completed Development

8.205 The cumulative schemes considered are inherently included within the calculation of road traffic noise levels and therefore have been included within this assessment. The addition of the surrounding cumulative schemes, due to their distance from the Site, are not expected to increase traffic noise levels by means of discrete reflections from buildings or other structures. Therefore, a **Negligible** (not significant) residual effect would remain.

8.206 The building services plant noise limits for the Proposed Development have been set to achieve a negligible effect. The cumulative schemes will also need to adopt a similar strategy, which will result in no increase in the background noise level at the sensitive receptors and therefore the **Negligible** (not significant) residual effect would remain.

LIKELY SIGNIFICANT EFFECTS

8.207 The assessment indicates that there will be no likely significant effects as a result of the Proposed Development.

COMPARISON AGAINST THE INDICATIVE SCHEME

8.208 The Indicative Scheme has been used to evaluate enabling and construction works and the site suitability.

8.209 The assessment of traffic flows and the potential for increasing ambient noise levels has been completed using "maximum population generating" and "maximum transport generating" traffic volume predictions. The "maximum transport generating" predictions represent the largest increase in traffic flows and as such a reasonable worst-case. The Indicative Scheme traffic flows would be less than those assessed and therefore

the impacts and effects are expected to be the same or less than those presented. In addition, the maximum population generating scheme would have a negligible difference to the predictions presented and would not result in different effects being described.

8.210 The scheme developed has no bearing on the building services plant noise emission limits, with all building services plant within the Proposed Development to be designed so that they cumulatively comply with the noise emission limits presented.