

Chapter 9: Noise and Vibration

NOISE AND VIBRATION	
AUTHOR	Sandy Brown Ltd
SUPPORTING APPENDIX	ES Volume 3, Appendix: Noise and Vibration. Annex 1: Glossary; Annex 2: Legislative and Planning Policy Context; Annex 3: Environmental Noise and Vibration surveys; Annex 4: Construction Modelling Assumptions; and Annex 5: Pedestrian Route Noise Assumptions.
KEY CONSIDERATIONS	The following are the key acoustic issues which have been assessed within this ES chapter: - During the demolition 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: - Noise emissions from building services plant and commercial activities; - Change in noise from road traffic; - Noise breakout from the stadium; - Noise along the pedestrian routes to the stadium; and - Suitability of the site for new residential development; and - Noise from building plant and services.
CONSULTATION	An EIA Scoping Report was prepared and submitted formally to the Gravesham Borough Council (GBC) on 11th August 2022 requesting a formal Scoping Opinion from GBC. A copy of the EIA Scoping Report is provided in ES Volume 3, Appendix: EIA Methodology – Annex 1. A formal Scoping Opinion was received on 16th September 2022, as provided in ES Volume 3, Appendix: EIA Methodology – Annex 2. The Scoping Opinion states that noise emissions from nearby industrial uses are to be taken into account (including Tilbury Dock). The assessments included in this ES chapter include appraisal of industrial noise impacts on the likely future residents. This includes noise emissions from atypical high emission events, such as dredging. Furthermore, the assessments presented consider the highest predicted façade noise level on the buildings, rather than concentrating on the lowest levels. Tilbury Freeport, a Tier 1 cumulative scheme, was requested to be included in the assessment, however due to the distance of the scheme from the Proposed Development, and the two schemes not sharing common receptors, it has not been considered relevant to the cumulative impact assessment. The assessment of potential impacts on the Proposed Development caused by other operating elements of Tilbury Freeport has been undertaken, which would adequately cover this cumulative scheme.

ASSESSMENT METHODOLOGY

Defining the Baseline

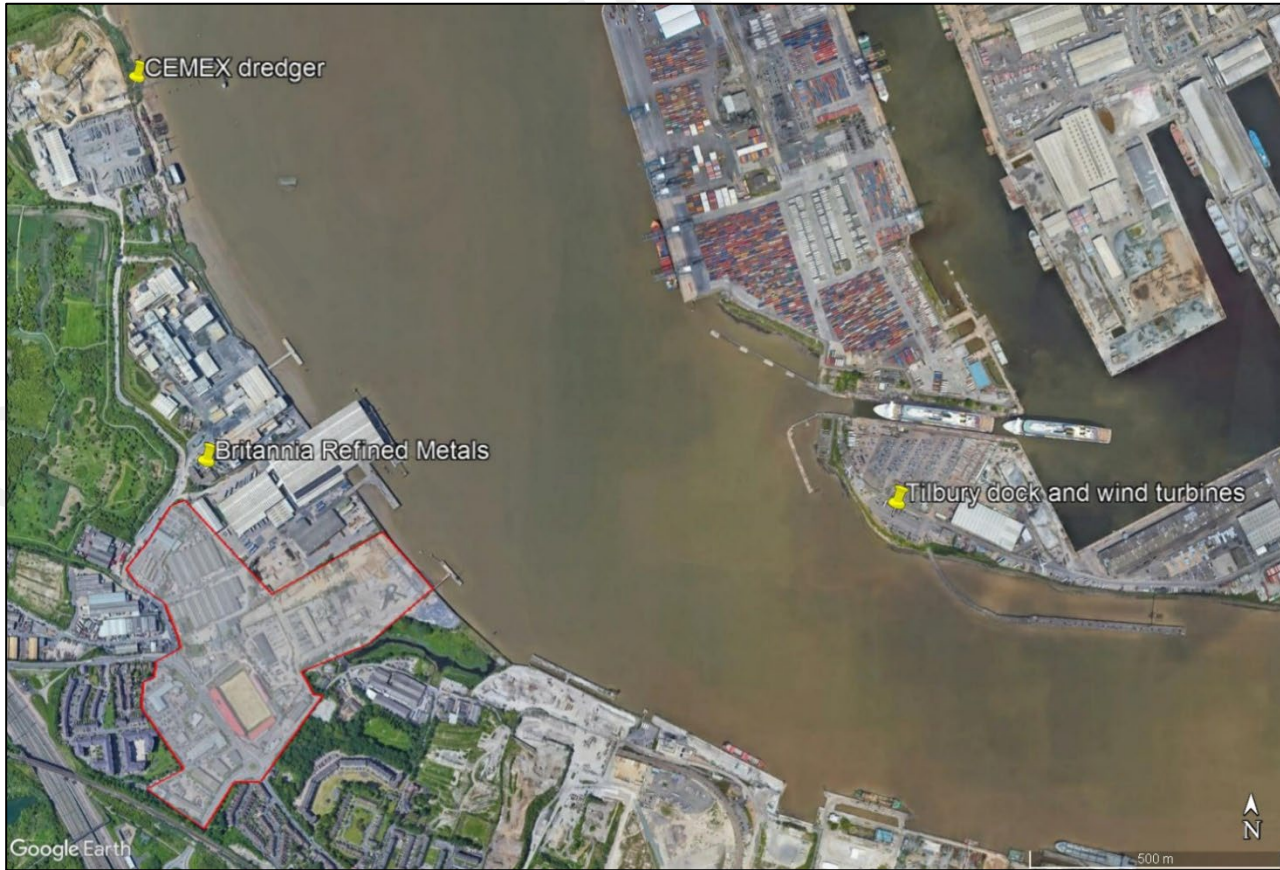
Baseline Conditions

- 9.1
- Environmental noise and vibration surveys were conducted between 7th June 2022 and 22nd June 2022 to assist in establishing the baseline conditions around the site and at key receptor locations surrounding the site (see section ‘Receptors and Receptor Sensitivity’ of this ES chapter).
- 9.2
- The receptor locations 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 a further distance from the site would also not be significantly affected. Where significant effects are identified at the initial receptor locations, then receptors located at further distances from the site will be included for assessment.
- 9.3
- The environmental noise and vibration surveys have been used to define the baseline conditions associated with the Seacon Terminal, the Ebbsfleet United Football Club, the railway and the existing roads. In addition

to the survey results, the baseline conditions have taken into account the following publicly available information, as illustrated in **Figure 9.1**:

- Measurements of noise, including the operation of Britannia Refined Metals, as documented in Planning Application BC080001 for the London Resort scheme (now withdrawn);
- Tilbury Dock and CEMEX dredger operations – taken from Sandy Brown dredger noise survey at Angerstien Aggregates Wharf; and
- The highest Tilbury Dock wind turbine noise emissions as documented in Planning Application 07/01328/TTGFUL (the installation of 3 wind turbines)...

Figure 9.1 Locations of Nearby Industrial Sites¹



- 9.4
- Noise emissions from the proposed future operation of the Thames Clipper Boat to/from Kent have not been included on the basis of the assessment included in Planning Application BC080001 – this use remains proposed only and no further information has been found on this potential use.
- 9.5
- The CEMEX dredging is understood to happen at unspecified times throughout the year and may not have been captured during the environmental noise survey completed on the site.
- 9.6
- Tilbury Dock is dredged up to four times a year, and will therefore, on occasions, inform the baseline condition. Similar to the CEMEX dredging, the environmental noise measurements may not have captured the noise emissions associated with the dredging of Tilbury Dock. The use of existing noise surveys to assess the dredging noise reasonable due to the absence of reliable information.
- 9.7
- The additional environmental noise survey’s presented in paragraph 9.3 captured noise from the wind turbines and dredging. The noise levels measured during these surveys have been included within the assessment.

¹ Image courtesy of Google Earth Pro

- 9.8 The noise emissions from the Tilbury Dock wind turbines depends on the wind speed. During the baseline measurements the wind speeds were not notably high, so noise emissions from the turbines may have been under represented. Accordingly, the highest noise emissions have been included in our assessment.

Survey Methodologies

- 9.9 Noise surveys have been undertaken in line with guidance contained in BS 7445:2003² and BS 4142:2014³.
- 9.10 Vibration surveys have been undertaken in line with guidance contained in BS 6472-1⁴. The potential for re-radiated noise resulting from train movements has also been assessed. The re-radiated noise assessment has been based on the Association of Noise Consultants (ANC) guidelines⁵ (2012).

Noise Logging Survey (Unattended)

- 9.11 A continuous noise survey was undertaken at four positions to determine the existing noise levels across the site. The long-term unattended noise monitoring locations are shown in **Figure 9.1**, denoted by 'N1' to 'N4'. Measurements were conducted between 7th June 2022 and 22nd June 2022. The dominant noise sources identified during the baseline surveys included road traffic, trains passing through Ebbsfleet International Train Station and Northfleet Train Station, plant associated with the adjacent commercial buildings, and industrial related processes, i.e., HGV movements.
- 9.12 A summary of the long-term environmental noise monitoring results is provided within the 'Baseline Conditions' section of this ES chapter. Full details of the methodology and results of the environmental noise surveys are presented **ES Volume 3, Appendix: Noise and Vibration - Annex 3**.

Noise Logging Survey (Attended)

- 9.13 A short term noise survey was undertaken at one position to determine the existing noise levels across the site. The attended, short-term, noise monitoring location is shown in **Figure 9.1**, denoted by 'N5'. The measurements were conducted on 15 June 2022. The dominant noise source identified at the measurement position was road traffic on Grove Road and industrial related processes, i.e., HGV movements.
- 9.14 Vibration Survey
- 9.15 The vibration surveys were carried out at the site on 15th June 2022 and 22nd June 2022. Vibration measurements were obtained to assess baseline vibration levels. The vibration measurement positions are shown in **Figure 9.2**, denoted by 'V1' and 'V2'.

Evolution of the Baseline

- 9.16 The EIA Regulations^[1] require that the likely evolution of baseline is considered in the event that the Proposed Development were not to come forward. In other words, the likely effect on the existing baseline conditions if the Cumulative Schemes and any relevant site designations, as listed in **ES Volume 1, Chapter 2: EIA Methodology**, were to come forward in the absence of the Proposed Development.
- 9.17 Potential changes to the existing road traffic flows and the nearby commercial/industrial uses are considered to have the biggest potential to affect the future baseline at the site and the surrounding receptors. 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 country, which have been considered in the assessment road traffic noise increases.
- 9.18 The potential changes in commercial/industrial noise relate directly to changes in the operation of the businesses, which are not always quantifiable. The baseline conditions used in the assessments assume no changes in their operation, i.e., no increase in noise emissions. This would represent a reasonable worst-case for assessing the Proposed Development noise impacts at existing receptors, where a lower baseline would result in a higher magnitude of difference. However, this may under-represent the baseline conditions when assessing site suitability, which is partly addressed by taking into account events that may not have been measured during the surveys.

Figure 9.2 Noise Monitoring Locations⁶ (N1 – N4 = Long Term Measurement Locations, N5 = Short Term Measurement Locations, V1 and V2 = Vibration measurements)



- 9.19 Nevertheless, it is noted that a notable change in ambient noise level requires a substantial increase in either road traffic or commercial/industrial activity (e.g., a 3 dB increase requires a 100% increase in noise level). Given the current road traffic flows, it is expected that baseline noise levels determined by transportation sources will remain broadly the same, without the Proposed Development coming forward. The industrial/commercial noise levels may increase beyond 3 dB, though this less easily quantifiable and unlikely given the site is allocated for development, which includes residential.
- 9.20 The existing baseline conditions capture the current operation at Seacon Terminal. However, as noted above, the baseline could evolve to include additional activities, though there is no publicly available information that indicates that any changes may be forthcoming.
- 9.21 The extension of the Thames Clipper route to Kent is proposed (but not in place yet), therefore the environmental noise measurements will not have captured noise emissions from the proposed Thames Clipper route.
- 9.22 Furthermore, the other current industrial and commercial uses within the Proposed Development could intensify their operations and result in higher noise levels around the site. This is considered unlikely due to the nature of the uses currently on the site.
- 9.23 Given the above, the evolved baseline would be expected to remain broadly the same as those assessed, though with potential small to no increases in road traffic flows and industrial uses broadly remaining the same or intensifying their operation marginally, i.e. less than 100%.

² British Standards (BS) 7445:2003 Description and measurement of environmental noise, December 2003

³ British Standards (BS) 4142:2014: +A1:2019 Method for rating and assessing industrial and commercial sound, October 2014

⁴ British Standards (BS) 6472-1:2008 – Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting, June 2008

⁵ Association of Noise Consultants (ANC) guidelines (2012) 'Measurement and assessment of ground-borne noise and vibration', 2nd edition

^[1] Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2020

⁶ Image courtesy of Google Earth Pro

Impact Assessment Methodology

- 9.24** The study area for the assessment is defined by the location of surrounding receptors and the end use of the Proposed Development. Receptors are outlined within the 'Receptors and Receptor Sensitivity' section of this ES chapter.
- 9.25** This section presents the methodology used to assess each type of noise and vibration impact, in terms of the application of relevant standards and guidance, along with the types of data and analysis carried out.
- 9.26** The assessment considers the following types of noise and vibration:
- Construction noise – airborne noise from machinery and the works themselves;
 - Construction vibration – ground-borne vibration from machinery and the works themselves;
 - Construction traffic – noise from construction vehicles;
 - Completed Proposed Development building services noise;
 - Completed Proposed Development road traffic noise;
 - Completed Proposed Development noise from increase in stadium capacity (noise from the stadium and along pedestrian routes); and
 - Site suitability (including industrial impact of noise and vibration from CEMEX, Seacon, and Tilbury Dock).

Phasing

Overview

- 9.27** The Proposed Development will be built and occupied over two phases. The first phase is the largest and will include Plots 1, 2, 3, 4, 5, 6, 7, 8, 15, 16, 17, 18 and 19. Plots 1 and 2 include the Stadium and commercial buildings, with the remaining phases being residential plots. Phase 2 will include residential plots 9, 10, 11, 12, 13 and 14. The Proposed Development phasing and plot layout are illustrated in **ES Volume 1, Chapter 5: Demolition and Construction**.

Demolition and Construction

- 9.28** Full details of the demolition and construction programme can be found in **ES Volume 1, Chapter 5: Demolition and Construction**. 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.
- 9.29** Assessments have been undertaken for the following key construction stages of work: demolition, infrastructure, substructure and superstructure. The other stages identified (envelope, internal fit-out and landscaping and public realm) 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.
- 9.30** 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 and piling rigs, occurring during demolition and substructure works. A 'timeslice' approach has been adopted in order to identify key periods for assessment when the noisiest activities are undertaken (further details of the timeslice approach is described in paragraphs 9.45 to 9.47).
- 9.31** Noise egress has been calculated based on the methodology outlined in BS 5228-1:2009⁷, 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 demolition and construction programme. Indicative details of plant and equipment associated with the demolition and construction stages are provided in **ES Volume 1, Chapter 5: Demolition and Construction** and **ES Volume 3, Noise and Vibration – Annex 4**. This information has been used for the demolition and construction stage noise assessment.

- 9.32** The 3D noise model has been used to predict the noise level during the demolition and construction works for each timeslice, at noise sensitive receptor locations (including external receptors and introduced receptors within the site itself). Predicted 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, in order to determine the magnitude of impact. This has been referenced against the sensitivity of each receptor (see section 'Receptor and Receptor Sensitivity' of this ES Chapter) to determine the scale of effect.

Assumptions and Limitations

Receptors

- 9.33** During Phase 1 works, demolition of the existing receptors in the location of Phase 2 will not have occurred. The existing industrial receptors which lie within the red line of the Proposed Development have not been included within the noise and vibration assessments.

- 9.34** The receptors are not considered

Demolition and Construction

- 9.35** The assessment of demolition and construction vibration effects considers absolute levels experienced within the site's adjacent buildings, in general accordance with BS 5228-2:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration⁸.
- 9.36** Vibration levels have been predicted within each of the nearby sensitive receptors using historical data and the methodology provided in BS 5228-2.
- 9.37** Predictions of vibration levels within the receptors have been made in terms of the Peak Particle Velocity (PPV) experienced within the working day during the piling operations.
- 9.38** It is assumed that trade contractors will comply with all legislation relevant to the control of noise and vibration from construction works.
- 9.39** The predictions of potential demolition and construction noise and vibration effects have assumed the following:
- Demolition and construction plant that is compliant with the sound and vibration levels published within BS 5288;
 - The equipment was positioned in the centre of the building which was closest to the receptors. This is a reasonable worst-case assessment as a change in position by only a few meters would not make a substantial change;
 - All the equipment was modelled as operating at simultaneously. This would not occur during construction and therefore represents a worst-case assessment; and
 - The use of hand-held tools when used for a prolonged period will be adequately screened.
- 9.40** The selected equipment and precise demolition and construction methodology would be dependent on the trade contractor selected for the work. Conservative, reasonable worst-case assumptions have, therefore, been made with regards to operations and activities, and the associated plant and equipment to be used, as presented within **ES Volume 1, Chapter 5: Demolition and Construction**. As such, the predicted demolition and construction noise and vibration levels represent an upper estimate or worst-case scenario of emissions from the site during the works.
- 9.41** The emphasis of the demolition and construction assessment is on the noisiest phases of work, which are likely to arise from the use of plant such as excavators, crushers and piling rigs.
- 9.42** For the purposes of this assessment, predictions have been generally made for the demolition and construction plant located at ground level to represent the worst-case scenario.
- 9.43** The demolition and construction vehicle movements have been reviewed cumulatively with traffic generated by the operational phases of the Proposed Development to determine the potential worst-case increases in traffic noise. This is described in paragraphs 9.50 to 9.58.

⁷ British Standards (BS) 5228-2:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise, December 2008

⁸ British Standards (BS) 5228-2:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration, December 2008

9.44 The equipment and operating hours assumed for the assessments contained herein are provided in **ES Volume 3, Appendix Noise and Vibration – Annex 4**.

Construction Timeslices

9.45 Construction of the plots of the Proposed Development overlap, as illustrated on the indicative works programme shown on Figure 5.1 within **ES Volume 1, Chapter 5: Demolition and Construction**. Due to the overlapping activities, in order to ensure that periods of peak activity (particularly noisy activities) and the introduction of sensitive receptors on site as a result of the phased build out and occupation of the Proposed Development are taken into consideration, seven 'timeslices' across the indicative works programme have been identified and assessed. These timeslices represent points throughout the indicative works programme where there are concurrent construction activities taking place across multiple plots of the Proposed Development and represent periods of peak activity. The timeslices are described below:

- Timeslice 1 (No Development Plots of the Proposed Development will be occupied at this stage):
 - Demolition plots 15 and 18;
 - Infrastructure road (plot 2); and
 - Plot 19 substructure
- Timeslice 2 (No Development Plots of the Proposed Development will be occupied at this stage):
 - Demolition (breakout hard standings);
 - Infrastructure road ;
 - Plots 2 and 19 superstructure; and
 - Plot 18 – substructure.
- Timeslice 3 (No Development Plots of the Proposed Development will be occupied at this stage):
 - Plots 1, 2, 16 and 17 superstructure; and
 - Plots 3 and 15 substructure.
- Timeslice 4 (First occupation of Phase 1 at Plots 2 and 19):
 - Plots 4, 5 and 6 superstructure; and
 - Plots 7 and 8 superstructure.
- Timeslice 5 (Phase 1 will be fully occupied)
 - Demolition plots 9, 10, 11, 12, 13 and 14;
 - Infrastructure road; and
 - Plot 14 substructure.
- Timeslice 6 (Phase 1 will be fully occupied)
 - Plots 9 and 14 superstructure; and
 - Plot 13 – substructure.
- Timeslice 7 (Phase 1 will be fully occupied)
 - Plots 9, 10 and 13 superstructure; and
 - Plot 11 substructure.

9.46 The assessment of timeslices ensures that any peaks in activity that would result in peaks in construction and demolition noise are adequately assessed.

9.47 Where construction works within a particular phase are indicated as ongoing after first occupation, the nearest buildings of the Proposed Development within that phase are assumed to be occupied and therefore considered as noise sensitive receptors. Worst-case self-screening from other buildings within the phase are

assumed (i.e., it is assumed that all other buildings of that phase of the Proposed Development will not provide screening to the noise sensitive receptor/s within that phase).

Building Services (Plant) Noise

9.48 Noise levels from building services plant associated with the Proposed Development will be controlled to ensure that it would not have an effect on nearby noise sensitive premises. Criteria for the assessment are set in accordance with BS 4142⁹.

9.49 The baseline noise levels recorded at positions representative of the locations of sensitive receptors surrounding the Proposed Development have been used to set noise limits for the building services plant.

Traffic Noise

9.50 The assessment of traffic noise effects is based on the Department of Transport Welsh Office Calculation of Road Traffic Noise 1988 (CRTN) and Volume 11 of the Design Manual for Roads and Bridges (DMRB), using traffic data generated by the Applicant's Transport Consultants (Vectos).

9.51 Changes in road traffic noise levels associated with the complete and operational Proposed Development have been calculated following the principles detailed within the CRTN, which provide guidance and procedures for how to calculate noise from road traffic.

9.52 For the Proposed Development's road traffic effects, consideration is given to the Average Annual Weekday Traffic (AAWT) 18 hour flows. The following scenarios have been modelled:

- 2026 Baseline (Do Nothing 2026);
- 2026 D&C Assessment Scenario 1 ('AS1') (Demolition and construction traffic and initial opening of Phase 1);
- 2029 Baseline (Do Nothing 2029);
- 2029 D&C Assessment Scenario 2 ('AS2') (Phase 2 Demolition and construction traffic and full opening of Phase 1);
- 2031 Baseline (Do Nothing 2031); and
- 2031 Full Build Out (Do Something 2031).

9.53 The 2026 D&C AS1 and 2029 D&C AS2 include demolition and construction traffic in addition to the traffic introduced by the Proposed Development. These scenarios, with regards to their respective baselines, have been assessed to evaluate the worst-case traffic noise scenarios. These assessments have been included as part of the construction traffic assessment presented in the 'Potential Effects' section of this ES chapter.

9.54 The assessment has taken account of the traffic flows on the roads and receptors closest to the Proposed Development. The assessment area was limited after a review of the traffic flows indicated that changes on the other roads would result in negligible changes in noise (i.e. <0.99 dB). The roads included in the assessment were:

- A226 Galley Hill Road (Link 13);
- Lower Road (Link 14);
- A226 Stonebridge Road (Link 15);
- Grove Road (Link 16);
- B2175 Stonebridge Road (Link 17);
- A226 (Link 18); and
- Link Road (Link 19).

9.55 In addition to the above, a scenario considering the traffic flows (4,000 total journeys assuming an 8,000 capacity) during a football match (typically 30 events per year) has been provided. These have been assumed to be on Links 18 and 19.

⁹ British Standards (BS) 4142:2014 Method for rating and assessing industrial and commercial sound, October 2014

- 9.56 A computer model of the site and surrounding roads has been developed using CadnaA software taking into account reflections from the Proposed Development, road geometry and average traffic speed.
- 9.57 The results from the model have been used to assess the likely change in ambient noise levels at the locations of receptors off-site.
- 9.58 Events associated with the potential development of the amphitheatre within the Riverside Neighbourhood Character, as noted within the Design and Access Statement, would be designed in line with the guidance provided in Code of Practice on Environmental noise control at concerts. The guide would limit the music noise level and number of events per year such that it would not adversely impact the noise environment.

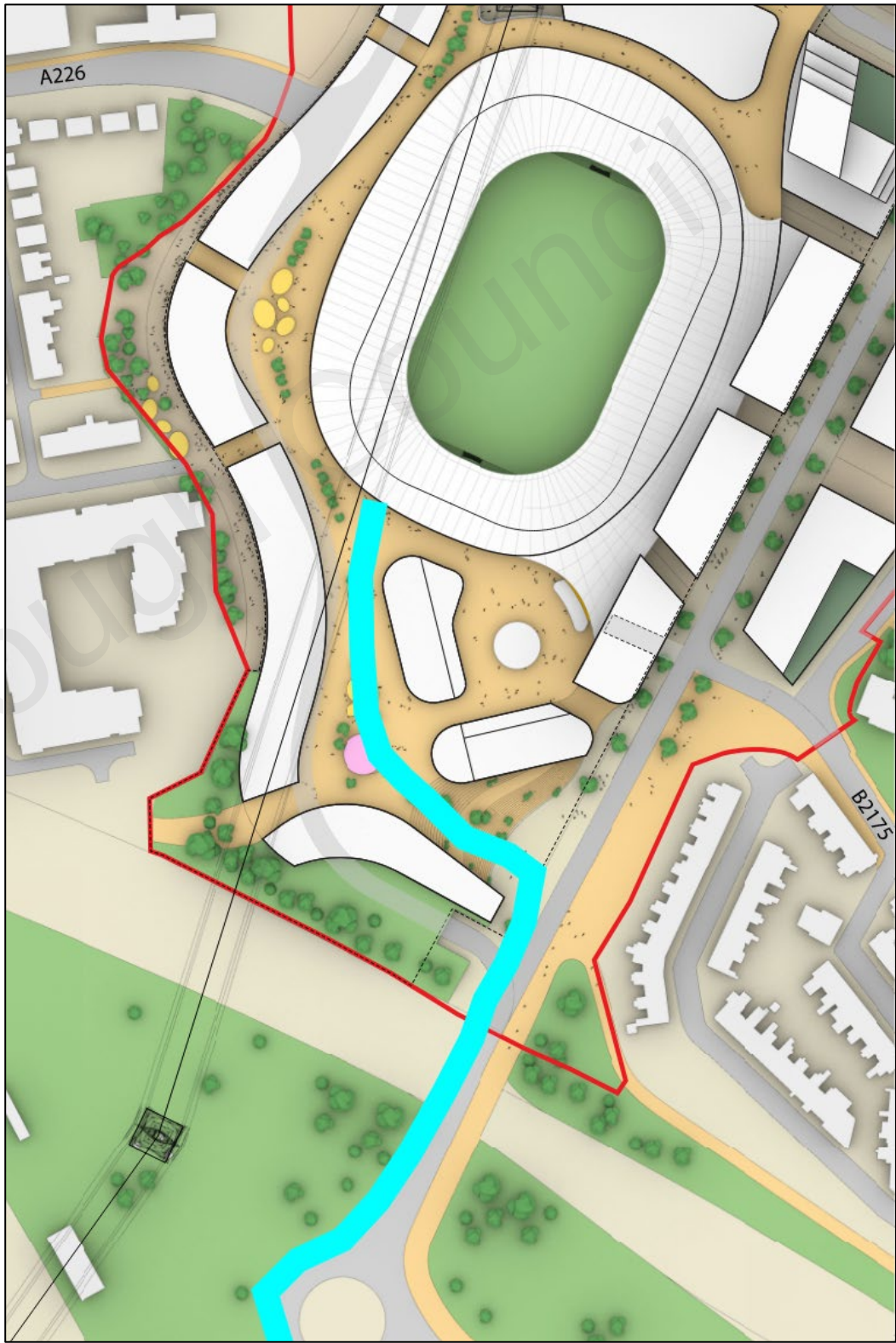
Football Stadium Breakout

- 9.59 The assessment of effects associated with the football stadium has concentrated on high sensitivity receptors (i.e. residential receptors rather than industrial uses).
- 9.60 The stadium has been modelled a semi enclosed space. The modelled stadium is enclosed on all sides but has no roof, as per the Design Code. If the design changes, the assessment should be updated to establish whether the noise levels at the receptors increases.
- 9.61 Crowd stadium noise breakout has been based on the attended noise measurements completed in and around the stadium during a match day, and uplifted in line with the increased future capacity of 8,000 (i.e. $10 \times \log(\text{proposed capacity/attendance during the measurement})$). The measurements have been used to establish a sound level contribution from spectators within the stadium, which has been applied to the Proposed Development.
- 9.62 It is assumed that for the purpose of the assessment, the ambient match day noise levels (measured as part of the baseline conditions) will be the same as when the Proposed Development operates, e.g. will not increase in line with traffic volumes predictions, so as to ensure a worst-case assessment..
- 9.63 For the assessment of site suitability, it is assumed that during a non-match day, the prevailing ambient noise climate will be determined by road traffic and the nearby industrial uses. During a match day it is assumed that the façades adjacent to the stadium will be dominated by stadium noise, which is predominately mid-high frequency content.
- 9.64 Noise breakout via the football stadium associated with the use of the hospitality areas and bar has not been assessed as details of these operations are not known at this stage. However, significant effects can be avoided by appropriately worded license requirements. An appropriately worded license requirement would limit the hours of operation and limit the music noise each area could make.

Football Pedestrian Noise Increases

- 9.65 The assessment of effects associated with the football stadium has concentrated on high sensitivity receptors (i.e. residential receptors rather than industrial uses).
- 9.66 The crowd dispersion noise assessments are based on 8,000 spectators walking to and from the stadium. The route to and from the stadium is to predominately follow the existing routes used i.e. from Ebbsfleet International train station and car park and along A226.
- 9.67 Each spectator is assumed to be talking with a raised vocal effort (L_{WA} 76 dB) and at a speed of 5 km/hr. It is assumed that the spectators will be encouraged to enter the Proposed Development (close to Plot 2) and then enter the stadium.
- 9.68 The anticipated crowd route associated with the Proposed Development and calibrated sound levels are included in the computer model, with the resultant sound pressure levels assessed with respect to the relative short-term change in the 2022 ambient baseline noise levels, at the residential receptors and along the survey routes. The route is indicated in **Figure 9.3** in blue.
- 9.69 Crowds entering the stadium will be encouraged into the concourse areas, which will serve food and beverages prior to the match and at half time. Supporters will not be re-admitted to the stadium once they leave.

Figure 9.3 Indicative Football Spectator Route (Blue)



Vibration Assessment

- 9.70 The assessment of vibration on the Proposed Development has been carried out on the basis of the vibration measurements undertaken at the site.
- 9.71 The surveys included measurements of Vibration Dose Values (VDVs). VDVs measures the magnitude of vibration against time.

Site Suitability

- 9.72 The site suitability assessments have been based on the Illustrative Masterplan, which represents one possible way the scheme could be realised and indicates the proposed building massing of the residential plots.
- 9.73 The assessments consider the measured baseline, the predicted noise emissions from the operation of the Stadium and the noise emissions from other noise sources, unlikely to have been captured during the survey (see paragraph 9.3).
- 9.74 Accordingly, the following assessment scenarios have been included:
- Existing typical baseline – measured baseline conditions, Britannia Refined Metals and Tilbury Dock wind turbines;
 - Future regular noise environment – football stadium noise emissions; and
 - Occasional high noise industrial activities - CEMEX and Tilbury Dock dredger activity.

Methodology for Defining Effects

- 9.75 The scale and significance of an effect are derived from the magnitude of the impact and the sensitivity of the affected receptor.

Receptors and Receptor Sensitivity

- 9.76 **Table 9.1** summarises the sensitivity of various receptors, including use types relevant to the Proposed Development, and other uses for context, which is based on a mixture of professional experience and industry standards.

Table 9.1 Receptor Sensitivity

Sensitivity of Receptor	Description
High	Residential, hotels and hostels
Medium	Health care (e.g.. doctor's surgery, dentist etc) and educational buildings (including day care centre)
Low	Commercial offices, industrial and retail buildings

- 9.77 Although there are other noise sensitive receptors located at greater distance, it is considered that controlling noise egress at the closest properties will result in acceptable noise levels at all other noise sensitive premises.
- 9.78 In any instances where the noise impact cannot be mitigated to an acceptable level at the nearest noise sensitive receptors, consideration will be given to the impact on receptors at greater separation distances.

Magnitude of Impact

Demolition and Construction

Works Noise

- 9.79 BS 5228 provides practical information on construction noise and vibration reduction measures and promotes a 'Best Practicable Means' approach to control noise and vibration. The calculation method provided in BS 5228 is based on the number and types of equipment operating, their associated Sound Power Level (SWL), and the distance to receptors, together with the effects of any screening.
- 9.80 Magnitude of impact for construction plant noise are based on the 'ABC' methodology set out in BS 5228-1, which aligns thresholds of significant construction noise with respect to the existing ambient noise levels. These thresholds are presented in **Table 9.2**. These levels are external noise levels measured at the façade of the building.

Table 9.2 Construction Works Noise Magnitude of Impact

Magnitude of impact	Daytime construction noise levels	
Negligible	Less than L_{Aeq} 60 dB	Less than $L_{Aeq,10h}$ 65 dB
Low	Between $L_{Aeq,10h}$ 60-65 dB	Between $L_{Aeq,10h}$ 66-70 dB
Medium	Between $L_{Aeq,10h}$ 66-70 dB	Between $L_{Aeq,10h}$ 71-75 dB
High	Greater than $L_{Aeq,10h}$ 70 dB	Greater than $L_{Aeq,10h}$ 75 dB
Receptors it applies to	Residences on Taunton Road and Robinson Way, Residences on Black Eagle Drive, Residences on Railway Street, Residences at Wallis Park, Tower Wharf and all Phase 1	Industrial facilities on Lower Road and Industrial facilities on Grove Road

Demolition and Construction and Operational Road Traffic Noise

- 9.81 The road traffic effects (of the demolition and construction, and operation of the Proposed Development on nearby noise sensitive receptors) can be categorised as noise associated with changes in road traffic movements around the site, as a result of the Proposed Development.
- 9.82 Significance criteria for assessing the traffic effects, construction and operational, are presented in **Table 9.3**. The criteria are based on the IOA/Institute of Environmental Management and Assessment (IEMA) 'Guidelines of Noise Impact Assessment'¹¹.

Table 9.3 Magnitude of Impact – Road Traffic Noise

Magnitude of Impact	Increase in Noise Level (dBA)	Description
Negligible	<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 Vibration

- 9.83 BS 5228-2 provides guidance on the perception of vibration within occupied buildings. This provides a simple method of assessing annoyance associated with vibration.
- 9.84 **Table 9.4** details Peak Particle Velocity (PPV) levels and their potential effect on humans and provides a semantic scale for description of construction vibration impacts on human receptors.

Table 9.4 Peak Particle Velocity (PPV) Levels – Impact on Humans (Annoyance)

Magnitude of Impact Category	Peak Particle Velocity Level	Description
Negligible	<0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
Low	0.14 – 1.0 mm/s	Vibration might be just perceptible in residential environments.

¹⁰ Assessed at the façade most affected by construction activity from the Proposed Development when no construction activity is present

¹¹ Institute of Environmental Management and Assessment (IEMA) and Institute of Acoustics (IOA) Guidelines for Noise Impact Assessment, October 2014

Magnitude of Impact Category	Peak Particle Velocity Level	Description
Medium	1.0 – 10.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
High	>10.0 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

9.85 Levels of vibration required for cosmetic damage are far higher than those that would result in an unacceptable impact in terms of annoyance and, as such, are not presented or assessed in this assessment.

Completed Development

Building Services Plant and Commercial Noise

9.86 Noise levels from building services plant associated with the Proposed Development will need to be controlled to ensure that they will not have an effect on nearby noise sensitive receptors relative to the background sound level. Criteria for the assessment are set in accordance with BS 4142 and the IOA/IEMA ‘Guidelines for Noise Impact Assessment’¹¹, as identified in Table 9.5.

Table 9.5 Magnitude of Impact – Building Services Plant Noise

Magnitude of Impact	Increase in Noise Level (dBA)	Description
Negligible	<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

Football Stadium Breakout and Pedestrian Noise Increases

9.87 Assessment of breakout from the stadium and pedestrians to and from the stadium is conducted on a proposed semantic scale included in the Scoping Report. The semantic scale assesses the noise level produced by a crowd, relative to the short-term change in noise level in the area, as per Table 9.6.

Table 9.6 Magnitude of Impact - Short-Term Noise Sources

Magnitude of Impact	Change in Noise Level	Description
Negligible	Decrease of 6 dBA or more	Significant decrease
Negligible	Decrease of less than 6 dBA	Noticeable decrease
Low	Increase of less than 6 dBA	No significant change
Low	Increase of 6 to 10 dBA	Slight increase
Medium	Increase of 10 to 15 dBA	Moderate increase
High	Increase of 15 to 20 dBA	Substantial increase
High	Increase of more than 20 dBA	Severe increase

9.88 The assessments discussed in the ‘Potential Effects’ section of this ES chapter are worst case assessments.

Defining the Effect

9.89 Table 9.7 details the scale of effects to the sensitivity of the receptor and the magnitude of the impact, based on the IOA/IEMA ‘Guidelines for Noise Impact Assessment’¹¹.

Table 9.7 Scale of Effects

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

Nature

9.90 All noise and vibration effects are considered either adverse or neutral. Whilst beneficial noise effects can occur, this assumes an improvement from the baseline environment and in practice is unlikely when a new development is being introduced to the local environment.

9.91 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.

Geographic Extent of Effect

9.92 The geographic extent of the effect has been identified. At a spatial level, ‘site’ or ‘local’ effects are those affecting the site and neighbouring receptors, while effects upon receptors in Gravesham beyond the vicinity of the site and its neighbours are at a ‘district’ level. Effects affecting Kent are at a ‘regional’ level, whilst those which affect different parts of the country, are considered being at a ‘national’ level.

Effect Duration and Direct and Indirect Effects

9.93 For the purposes of the ES, effects that are generated as a result of the demolition and construction works (i.e. those that last for this set period of time) are classed as ‘temporary’ and either short or medium term. Short term effects are defined effects which will occur for less than two months and medium term effects occur for longer than two months. Effects that result from the completed and operation Proposed Development are classed as ‘permanent’ or ‘long-term’ effects.

9.94 Noise and vibration effects are generally considered to be direct effects (i.e. resulting without any intervening factors).

Categorising the Likely Significant Effects

9.95 Table 9.8 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)¹².

9.96 Table 9.8 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)¹³, 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. Significant effects are those that are either Moderate Adverse or Major Adverse, as indicated in Table 9.8.

Table 9.8 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	Yes	Yes	

¹² Department of Communities and Local Government (2018) Planning Practice Guidance

¹³ Department for Environment, Food and Rural Affairs, Noise Policy Statement for England (NPSE), March 2010

Scale of Effect (Adverse)	Description of Effect	Exceeds SOAEL?	Exceeds LOAEL?	Scale of Effect Significant
	change in the quality of life.			
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	Yes	No
Negligible	No discernible effect on the receptor	No	No	

9.97 For all sources (including from demolition and construction) any adverse effect resulting in moderate / major effects are generally considered significant. Negligible and minor effects are not significant.

Site Suitability

9.98 The aim of the assessment of site suitability is to establish the likely level of risk associated with the Proposed Development from a noise perspective. Assessment is focused on the residential elements of the Proposed Development, as these are high sensitivity.

9.99 As the application is in outline, with detailed plans for the residential elements to be prepared at reserved matters stage, the assessment has been based on the noise categories presented in ProPG: Planning & Noise, as there would be insufficient information to predict the internal noise levels¹⁴. The ProPG states that where free-field noise levels are less than $L_{Aeq,16h}$ 50 dB during the day time, and $L_{Aeq,8h}$ 40 dB during the night time then the development site is likely to be acceptable from a noise perspective for residential receptors..

9.100 Adapting the guidance in ProPG, the noise risk categories for the sites have been determined as described in **Table 9.9**. It is noted that the boundaries between Low, Medium and High in ProPG are necessarily ill-defined, whereas for simplicity of assessment they have been more clearly distinguished. Appropriately, residential plots that span multiple noise risk categories would be ultimately described using the worst-case.

Table 9.9 Noise Risk Categories for Assessing Site Suitability

Noise Risk Category	Daytime (07:00-23:00) Ambient Sound Pressure Level ($L_{Aeq,16h}$ dB)	Night time (23:00-07:00) Ambient Sound Pressure Level ($L_{Aeq,8h}$ dB)	Description
Negligible	<50	<40	These noise level indicate that the development site is likely to be acceptable from a noise perspective without further consideration
Low	50-60	40-50	Site is likely to be acceptable from a noise perspective
Medium	61-70	51-60	Site is less suitable from a noise perspective and a good design process would need to be followed that demonstrates how adverse noise impacts will be avoided
High	>70	>60	Expect advice required to avoid adverse impacts

9.101 It is noted that even where a site is within a Medium or High noise risk category that suitable conditions for residential development can be achieved, though would require specialist designs being adopted and expert advice.

Site Suitability – Industrial Noise Sources

9.102 The scope of ProPG is restricted to new residential developments that will be exposed predominately to airborne noise from transport sources, i.e. not industrial noise sources. Appropriate guidance for evaluating industrial noise impact is contained in BS 4142, which has been adapted to form the assessment criteria for evaluating industrial noise sources.

9.103 **Table 9.10** presents the criteria for assessing noise impacts from industrial noise sources at the Proposed Development.

Table 9.10 Industrial Noise Sources – Acoustic Impact

Noise Risk Category	Acoustic condition	Description
Negligible	Rated sound level does not exceed the representative background sound level	These noise level indicate that the development site is likely to be acceptable from a noise perspective without further consideration
Low	Rated sound level is 1-5 dB above the representative background sound level	The site is likely to be acceptable from a noise perspective
Medium	Rated sound level is 6-10 dB above the representative background sound level	Mitigation measures will need to be adopted to limit noise impact
High	Rated sound level is more than 10 dB above the representative background sound level	

9.104 In accordance with Section 8.5 of BS 4142, the industrial and/or commercial sound forms a component of the acoustic environment. In these circumstances other guidance and criteria in addition to, or in the alternative to, BS 4142 can inform the appropriateness of both introducing a new noise sensitive receptor and the extent of required noise mitigation.

9.105 Alternative standards may include BS 8233¹⁵, which includes recommended indoor noise levels for residential dwellings. These recommendations are included in **Table 9.11**.

Table 9.11 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

Site Suitability – Amenity Spaces

9.106 Noise levels experienced within on-site external residential amenity areas to be provided by the Proposed Development are an important factor in considering the suitability of the site and the likely design mitigation measures.

9.107 There are no generally adopted criteria for Noise Risk Categories in external amenity spaces. The criteria presented in **Table 9.12** are, therefore, have been applied, which have been derived from BS 8233 with reference to BS 4142 for industrial noise sources.

9.108 The assessment of the amenity space considers the period of 07:00-23:00 (day period).

Table 9.12 Noise Level in Residential/Commercial Amenity Space

Noise Risk Category	Acoustic condition	Description
Negligible	$\leq L_{Aeq,16h}$ 50 dB or rated sound level does not exceed the representative background sound level	Absolute sound level meets BS 8233 recommendations or BS 4142 assessment would be Negligible
Low	$L_{Aeq,16h}$ 51-55 dB or rated sound level is 1-5 dB above the representative background sound level	Absolute sound level meets upper BS 8233 recommendations or BS 4142 assessment would be Low
Medium	$L_{Aeq,16h}$ 56-60 dB or rated sound level is 6-10 dB above the representative background sound level	Absolute sound level exceeds BS 8233 recommendation by up to 5 dBA or BS 4142 assessment would be Medium
High	$\geq L_{Aeq,16h}$ 61 dB or rated sound level is 10 dB above the representative background sound level	Absolute sound level exceeds BS 8233 recommendation by more than 5 dBA or BS 4142 assessment would be High

¹⁴ ProPG: Planning & Noise – New Residential Development: Main Guidance

¹⁵ British Standard BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings.

Site Suitability – Vibration

9.109 Categories for assessing the site suitability for residential use with respect to vibration levels has been based guidance set out within BS 6472:2008, as included in **Table 9.13**.

Table 9.13 Vibration Levels (Residential) – Impact Categories

Magnitude of Impact	Vibration Dose Value (m/sec ^{1.75})	Category Description / Criteria
Negligible	≤0.2 (16 hour day) ≤0.1 (8 hour night)	Below the 'low probability of adverse comment' range in BS 6472.
Low	0.2-0.4 (16 hour day) 0.1-0.13 (8 hour night)	Below the 'adverse comment possible' range in BS 6472.
Medium	0.4-0.8 (16 hour day) 0.13-0.4 (8 hour night)	Below the 'adverse comment probable' range in BS 6472.
High	>0.8 (16 hour day) >0.4 (8 hour night)	Above the 'adverse comment probable' range in BS 6472.

BASELINE CONDITIONS

9.110 All measurement positions are shown in **Figure 9.4**.

Typical Noise Levels

9.111 The noise climate around the site is mainly affected by road traffic, train movements, intermittent construction and building services noise from the adjacent commercial and industrial properties. The measurements carried out at the site are expected to be representative of the existing baseline conditions. Measurements at positions N1-N3 were completed in free-field conditions, i.e., at least 3m from vertical acoustically reflective surfaces. Measurements at position N4-N5 were completed under façade conditions, i.e., 1m from a vertical acoustically reflective surface.

9.112 The minimum recorded background sound levels and ambient noise during the unattended surveys are shown in **Table 9.14** and **Table 9.15**.

Table 9.14 Representative Background Sound Levels

Position	Representative Background Sound Levels $L_{A90,15min}$ (dB)	
	Daytime (07:00 to 23:00)	Night time (23:00 to 07:00)
N1	43 (weekend) and 56 (weekday)	41 (weekend and weekday)
N2	43 (weekend) and 49 (weekday)	40 (weekend and weekday)
N3	51 (weekend) and 56 (weekday)	40 (weekend and weekday)
N4	37 (weekend and weekday)	32 (weekend and weekday)

Table 9.15 Ambient Sound Levels

Position	Ambient Sound Levels $L_{Aeq,T}$ (dB)	
	Daytime (07:00 to 23:00)	Night time (23:00 to 07:00)
N1	61	49
N2	55	50
N3	68	64
N4	53	49

9.113 The representative recorded background sound levels and ambient noise during the attended survey are shown in **Table 9.16** and **Table 9.17**.

Table 9.16 Representative Background Sound Levels

Position	Representative Background Sound Levels $L_{A90,15min}$ (dB)
	Daytime (07:00 to 23:00)
N5	52 (weekday)

Table 9.17 Ambient Sound Levels

Position	Ambient Sound Levels $L_{Aeq,15mins}$ (dB)
	Daytime
N5	70

Football Match Measurements

9.114 Measurements were taken during a football match at the existing football stadium. The measurements were taken on 22 May 2022 between Ebbsfleet United and Chippenham Town. The reported attendance was 2,166. The reported attendance is average of a typical match and therefore considered appropriate for the purposes of assessment.

9.115 The sound levels and ambient noise during attended survey during a football match are shown in **Table 9.18**.

Table 9.18 Sound Levels Measured Before, During and After a Football Match

Position	Time	Sound pressure level (dB)			Notes
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15mn}$	
Before kick off					
PM1	13:00	69	83	54	Road traffic
PM1	13:42	68	80	52	Road traffic
PM2	13:19	72	83	57	Road traffic
PM2	14:20	72	92	59	Road traffic
MM2	14:39	65	77	58	Road traffic
During the match					
MM1	15:00	50	66	47	Fans chanting
MM1	15:15	51	68	47	Fans chanting
MM3	15:39	53	73	47	Fans chanting
MM3	15:56	51	69	47	Chanting and music
MM2	16:18	64	74	58	Road traffic and fans chanting
MM2	16:35	64	79	56	Road traffic and fans chanting
MM2	17:12	67	77	59	Road traffic and fans chanting
After the match					
PM1	17:40	72	80	60	Road traffic

9.116 **Figure 9.4** presents the location of the match day noise measurements.

9.117 The measurements made at PM1 (along pedestrian route) and MM2 (during a football match) are taken to be representative of the noise levels experienced at residences along Railway Street during a matchday. The measurements at MM1 (during a football match) are taken to be representative of the noise levels experienced by residents at Taunton Road, Robinson Way and Black Eagle Drive.

9.118 The measurements at MM3 (during a football match) are taken to be representative of the noise levels experienced by residents at Wallis Park.

Baseline Vibration Levels

9.119 VDV's were measured at two locations. The VDV's measured at the site are presented in Table 9.19.

Table 9.19 Maximum VDV's measured

Time (hh:mm)	VDV (m/s ^{1.75})		
	X axis	Y axis	Z axis
15:02 (V1)	0.00914	0.02646	0.03487
14:31 (V2)	0.00109	0.00144	0.00833

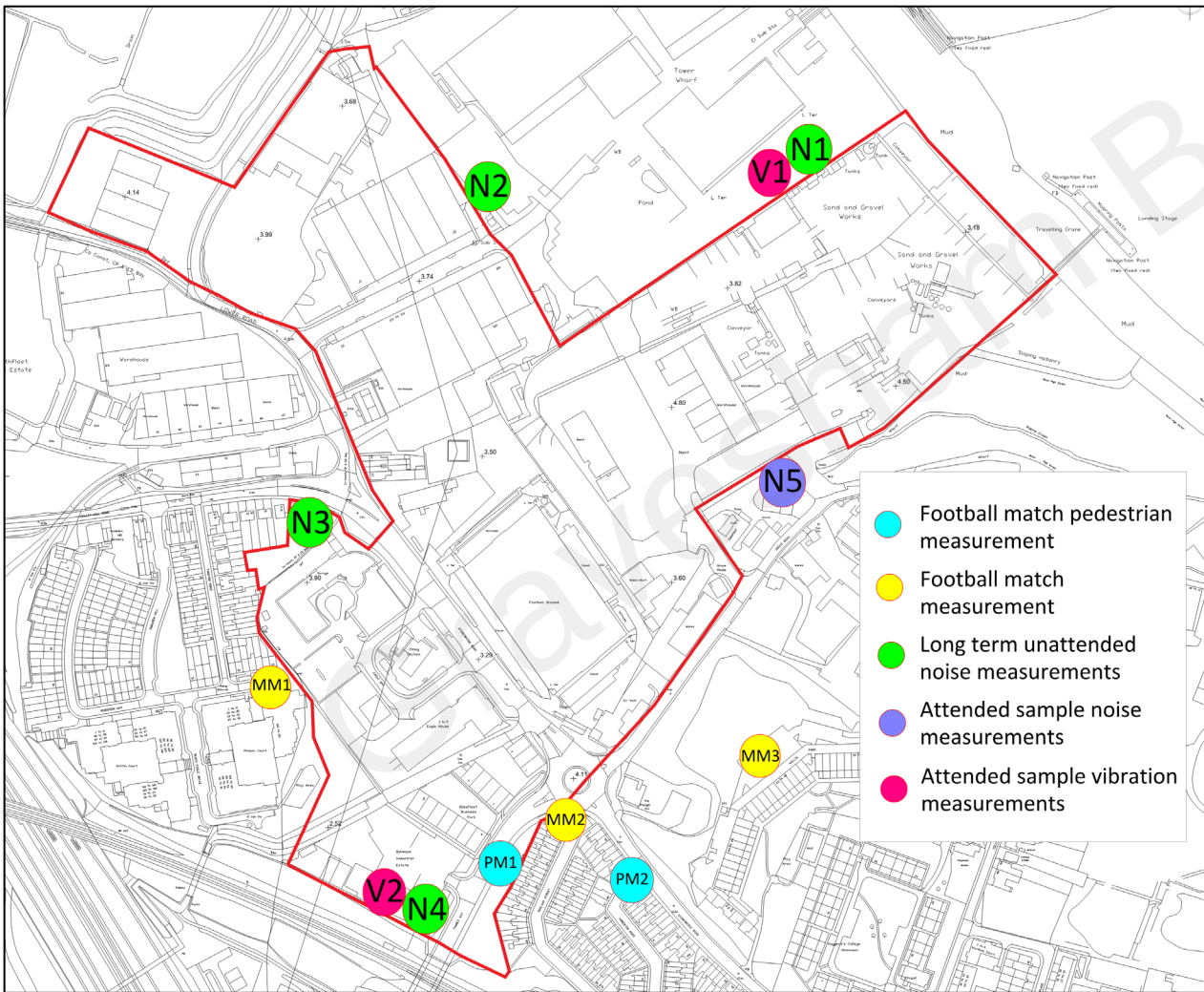
9.120 Table 9.20 presents the calculated VDV, based on the largest measurement.

Table 9.20 VDV's Calculated in the Most Affected Residential Dwelling

Dominant axis	Assessment period	VDV (m/s ^{1.75})
Z Axis	Daytime (07:00-23:00)	0.11
	Night time (23:00-07:00)	0.06

9.121 In addition to the above, the assessed ground borne noise level at the ground floor of Plot 4 was between L_{ASmax} 6 and 28 dB. Vibration will be attenuated further up the building.

Figure 9.4 Measurement Positions



RECEPTORS AND RECEPTOR SENSITIVITY

Existing Receptors

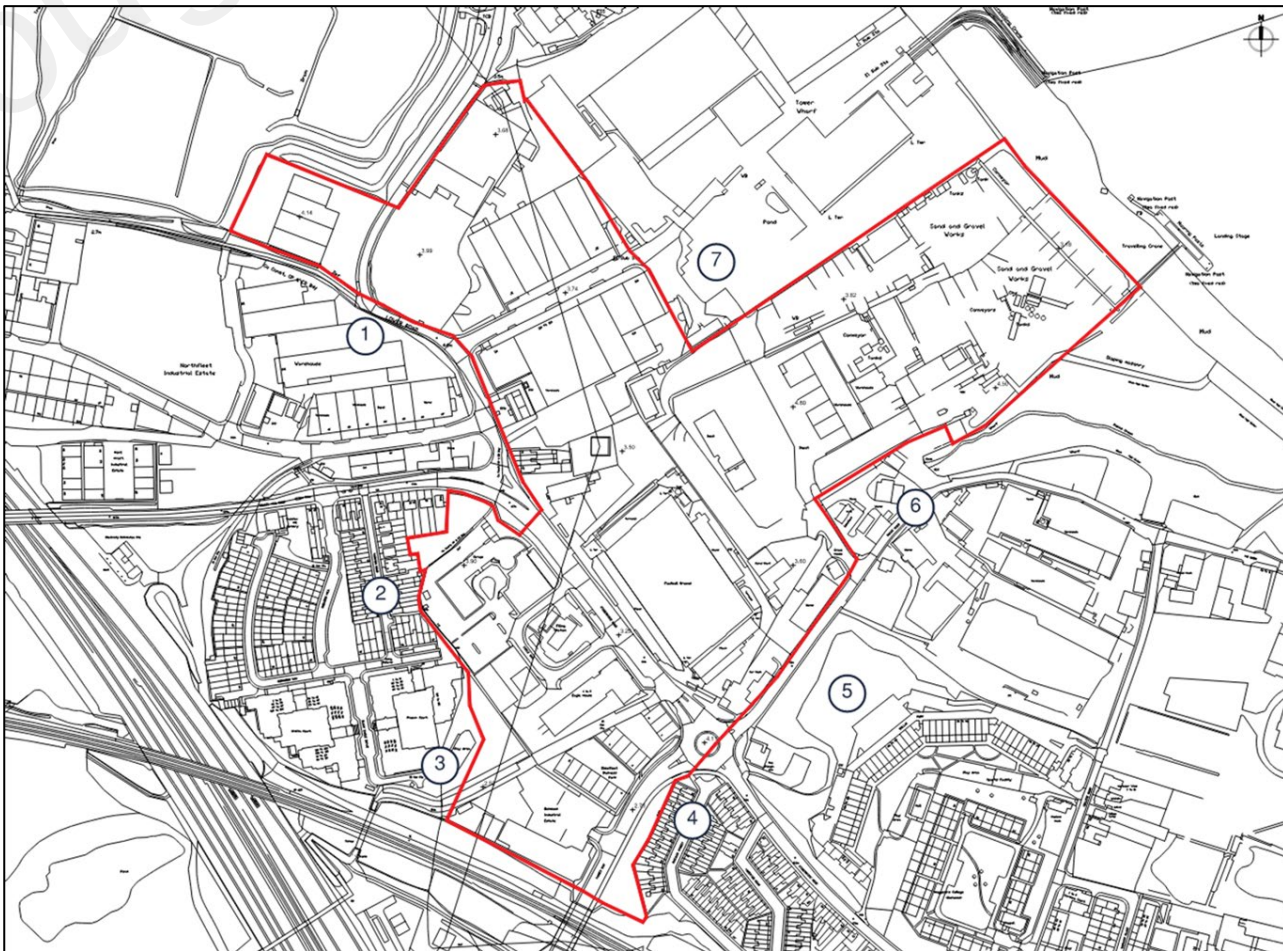
9.122 The receptors assumed in the impact assessment have been identified in Figure 9.5 and listed with their sensitivities in Table 9.21.

Table 9.21 Summary of Existing Receptors

Receptor	Receptor Sensitivity
1 – Industrial facilities on Lower Road	Low
2 – Residences on Taunton Road and Robinson Way	High
3 – Residences on Black Eagle Drive	High
4 - Residences on Railway Street	High
5 – Residences at Wallis Park	High
6 – Industrial facilities on Grove Road	Low
7 – Tower Wharf	Low

9.123 These receptors are considered representative of other potential receptors further away from the site as, if noise levels are not deemed significant at these receptors, the receptors further afield will also not be significantly affected. Receptors further afield will be assessed if significant effects are unanimously identified.

Figure 9.5 Existing Surrounding Receptors



Introduced Receptors

9.124 The Proposed Development will introduce residential uses and areas of commercial uses. The residential properties are considered as high sensitivity receptors in terms of site suitability. The residential receptors will be located in sixteen plots, referred to as Plot 4-19. The plots relative to each other are shown in **Figure 9.6**.

Figure 9.6 Proposed Development Introduced Noise Sensitive Receptors¹⁶



POTENTIAL EFFECTS

Demolition and Construction

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

9.126 The noise levels presented in this ES chapter are the maximum predicted at each building (receptor) identified from the modelling of the Proposed Development. The impacts have been predicted as pre-mitigation and align with the 'Methodology - Assumptions and Limitations' section of this ES chapter.

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

Construction Noise – On-Site Activities

9.128 The time slices modelled and the relevant receptors are summarised below (refer to **ES Volume 1, Chapter 5: Demolition and Construction** for construction programme detail).

Table 9.22 Assessment Time slices

Time slice	Description of Key Activities at Time slice Selected	Introduced receptors
1	Demolition plots 15 and 18, infrastructure road (plot 2) and plot 19 substructure	None
2	Demolition (breakout hard standing), infrastructure, plots 2 and 9 superstructure and plot 18 substructure	None
3	Plots 1, 2, 16 and 18 superstructure and plots 3 and 15 substructure	None
4	Plots 4, 5 and 6 superstructure and plots 7 and 8 superstructure	Plots 2 and 19
5	Demolition plots 9, 10, 11, 12, 13 and 14, infrastructure road and plot 14 substructure	Phase 1 plots
6	Plots 9 and 14 superstructure and plot 13 substructure	Phase 1 plots
7	Plots 9, 10 and 13 superstructure and plot 11 substructure	Phase 1 plots

9.129 **Table 9.23** presents a summary of predicted demolition and construction noise levels. **Table 9.24** presents a summary of the results and the likely effects for each receptor in the absence of mitigation, with images from the modelling provided in **Figure 9.7** to **Figure 9.12**. Where significant effects are predicted (moderate adverse or major adverse), these cells are shaded in grey.

Table 9.23 Predicted Enabling, Demolition and Construction Noise Levels

Receptors	Sensitivity	Timeslice 1	Timeslice 2	Timeslice 3	Timeslice 4	Timeslice 5	Timeslice 6	Timeslice 7
Existing Receptors								
Industrial facilities on Lower Road	Low	69	64	64	48	54	44	44
Residences on Taunton Road and Robinson Way	High	61	68	63	48	54	43	43
Residences on Black Eagle Drive	High	70	68	66	52	52	42	42
Residences on Railway Street	High	60	58	65	61	54	42	47
Residences at Wallis Park	High	54	55	55	58	59	48	51

¹⁶ Parameter Plan – Plots Plan (Drawing Reference: NFH-UNS-MAST-DR-1004).

¹⁷ The highest sensitivity has been taken for each receptor

Receptors	Sensitivity	Timeslice 1	Timeslice 2	Timeslice 3	Timeslice 4	Timeslice 5	Timeslice 6	Timeslice 7
Industrial facilities on Grove Road	Low	60	63	57	61	54	42	47
Tower Wharf	Low	67	63	60	53	71	62	62
Introduced Receptors								
Plot 1	Low	N/A	N/A	N/A	N/A	61	55	52
Plot 2	Low	N/A	N/A	N/A	67	73	51	48
Plot 3	High	N/A	N/A	N/A	N/A	61	50	51
Plot 4	High	N/A	N/A	N/A	N/A	65	51	56
Plot 5	High	N/A	N/A	N/A	N/A	75	65	64
Plot 6	High	N/A	N/A	N/A	N/A	60	46	47
Plot 7	High	N/A	N/A	N/A	N/A	66	54	54
Plot 8	High	N/A	N/A	N/A	N/A	73	61	62
Plot 15	High	N/A	N/A	N/A	N/A	75	65	60
Plot 16	High	N/A	N/A	N/A	N/A	74	64	61
Plot 17	High	N/A	N/A	N/A	N/A	63	51	52
Plot 18	High	N/A	N/A	N/A	N/A	62	53	53
Plot 19	High	N/A	N/A	N/A	45	56	43	50

Table 9.24 Predicted Enabling, Demolition and Construction Likely Effects

Receptors	Sensitivity	Timeslice 1	Timeslice 2	Timeslice 3	Timeslice 4	Timeslice 5	Timeslice 6	Timeslice 7
Existing Receptors								
Industrial facilities on Lower Road	Low	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)
Residences on Taunton Road and Robinson Way	High	minor adverse (not significant)	moderate adverse (significant)	minor adverse (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)
Residences on Black Eagle Drive	High	moderate adverse (significant)	moderate adverse (significant)	moderate adverse (significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)
Residences on Railway Street	High	minor adverse (not significant)	negligible (not significant)	minor adverse (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	minor adverse (not significant)
Residences at Wallis Park	High	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)
Industrial facilities on Grove Road	Low	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)
Tower Wharf	Low	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)	minor adverse (not significant)	negligible (not significant)	negligible (not significant)
Introduced receptors								
Plot 1	Low	N/A	N/A	N/A	N/A	negligible (not significant)	negligible (not significant)	negligible (not significant)
Plot 2	Low	N/A	N/A	N/A	negligible	minor	negligible	negligible (not significant)

Receptors	Sensitivity	Timeslice 1	Timeslice 2	Timeslice 3	Timeslice 4	Timeslice 5	Timeslice 6	Timeslice 7
					(not significant)	adverse (not significant)	(not significant)	significant)
Plot 3	High	N/A	N/A	N/A	N/A	minor adverse (not significant)	negligible (not significant)	negligible (not significant)
Plot 4	High	N/A	N/A	N/A	N/A	minor adverse (not significant)	negligible (not significant)	negligible (not significant)
Plot 5	High	N/A	N/A	N/A	N/A	major adverse (significant)	negligible (not significant)	negligible (not significant)
Plot 6	High	N/A	N/A	N/A	N/A	minor adverse (not significant)	negligible (not significant)	negligible (not significant)
Plot 7	High	N/A	N/A	N/A	N/A	moderate adverse (significant)	negligible (not significant)	negligible (not significant)
Plot 8	High	N/A	N/A	N/A	N/A	major adverse (significant)	minor adverse (not significant)	minor adverse (not significant)
Plot 15	High	N/A	N/A	N/A	N/A	major adverse (significant)	minor adverse (not significant)	minor adverse (not significant)
Plot 16	High	N/A	N/A	N/A	N/A	major adverse (significant)	minor adverse (not significant)	minor adverse (not significant)
Plot 17	High	N/A	N/A	N/A	N/A	minor adverse (not significant)	negligible (not significant)	negligible (not significant)
Plot 18	High	N/A	N/A	N/A	N/A	minor adverse (not significant)	negligible (not significant)	negligible (not significant)
Plot 19	High	N/A	N/A	N/A	negligible (not significant)	negligible (not significant)	negligible (not significant)	negligible (not significant)

Figure 9.7 Timeslice 1 – Construction Noise Level (LAeq,10h dB)

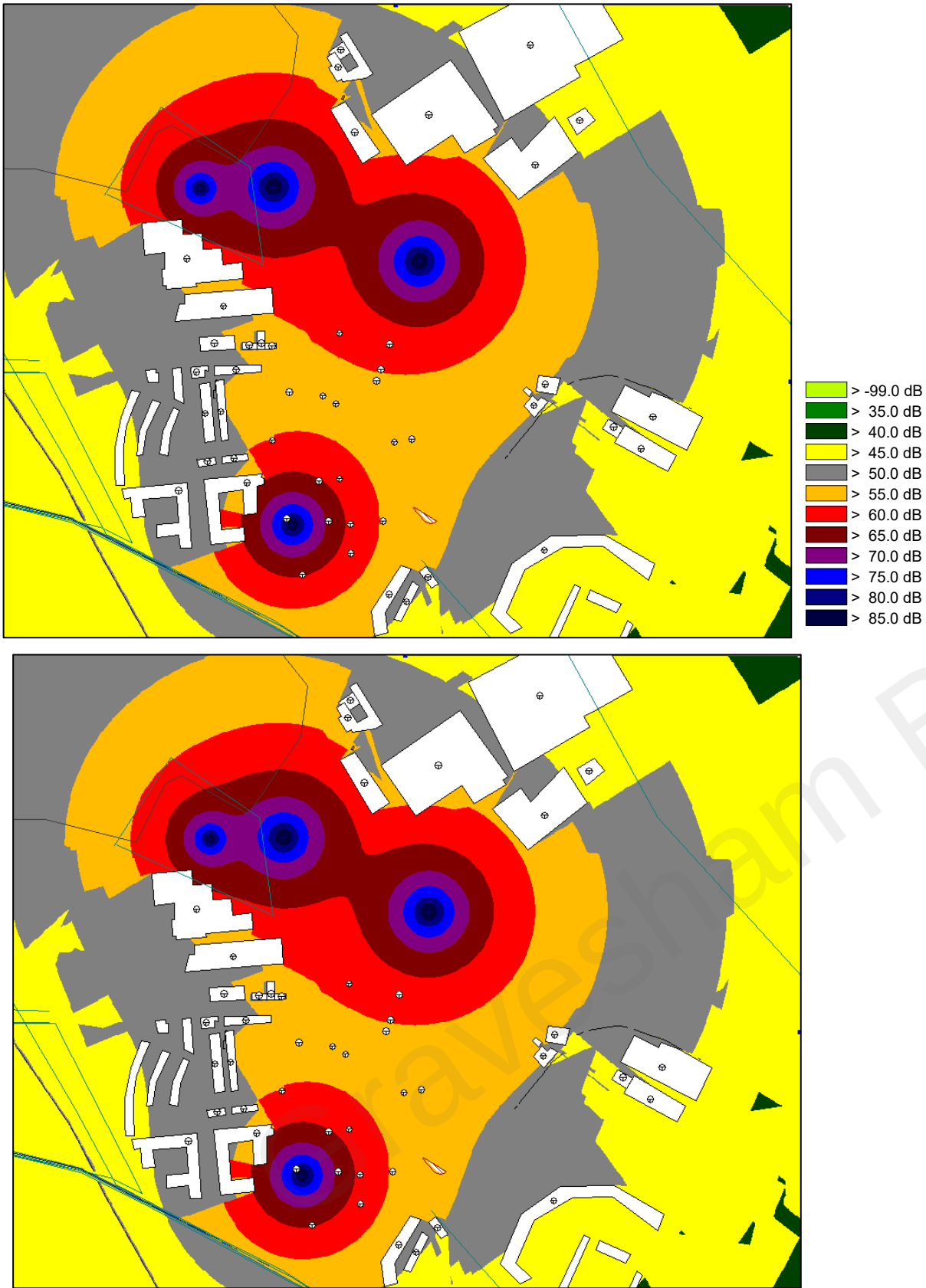


Figure 9.8 Timeslice 2 - Construction Noise Level (LAeq,10h dB)

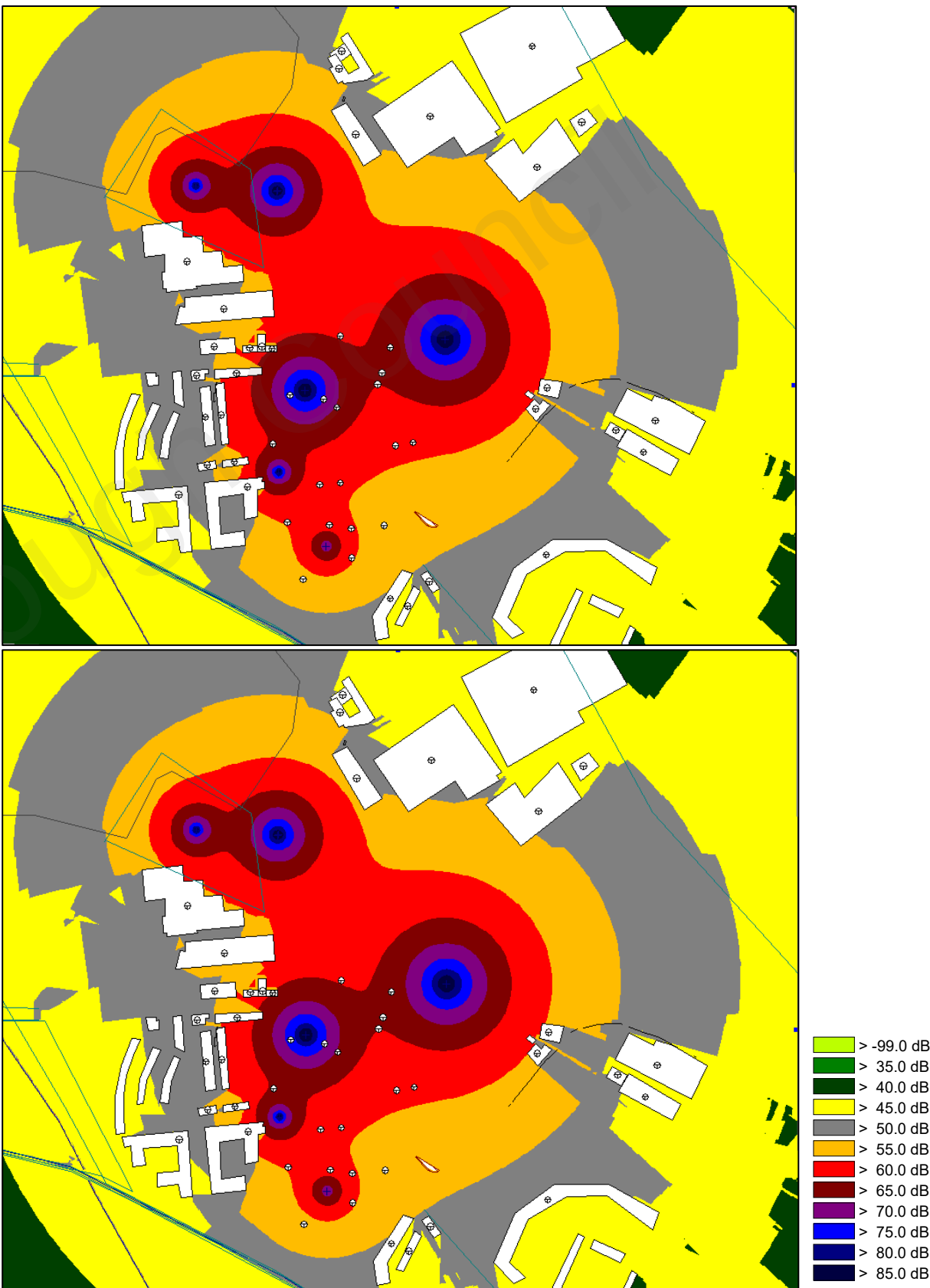


Figure 9.9 Timeslice 3 - Construction Noise Level ($L_{Aeq,10h}$ dB)

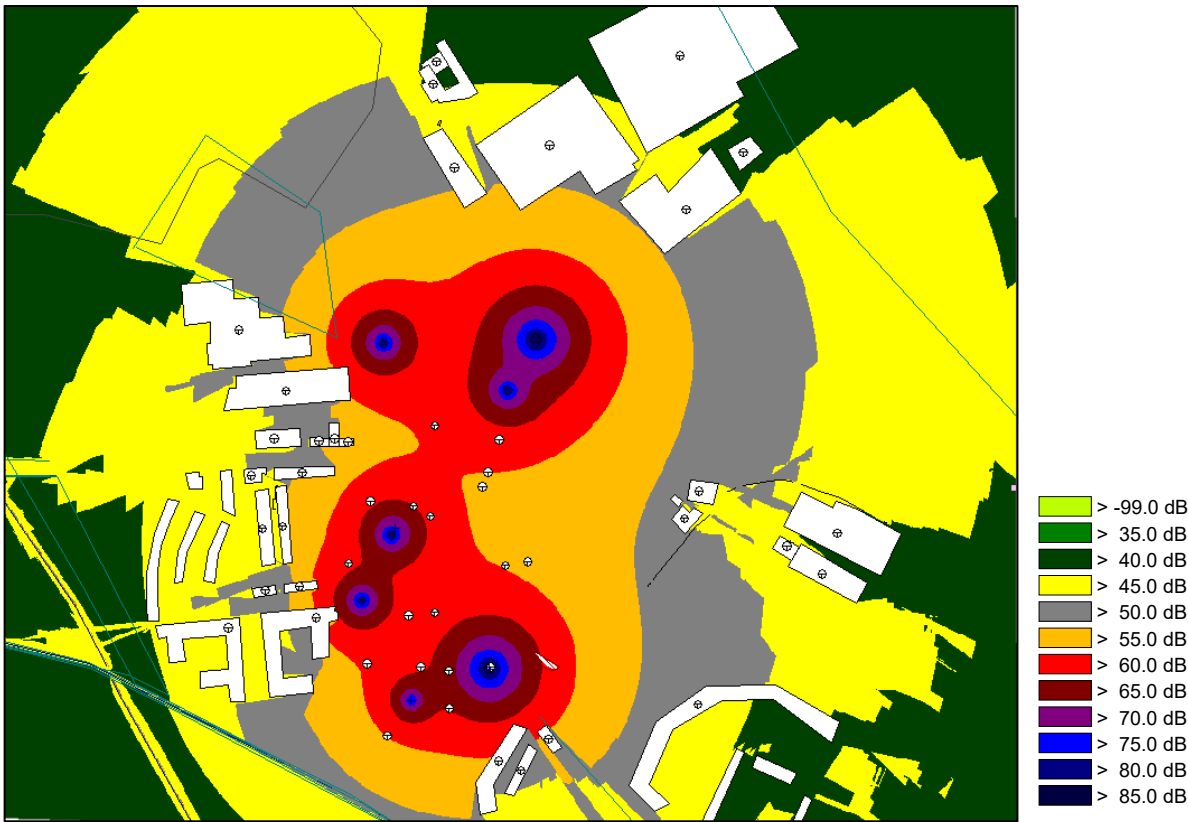


Figure 9.10 Timeslice 4 - Construction Noise Level ($L_{Aeq,10h}$ dB)

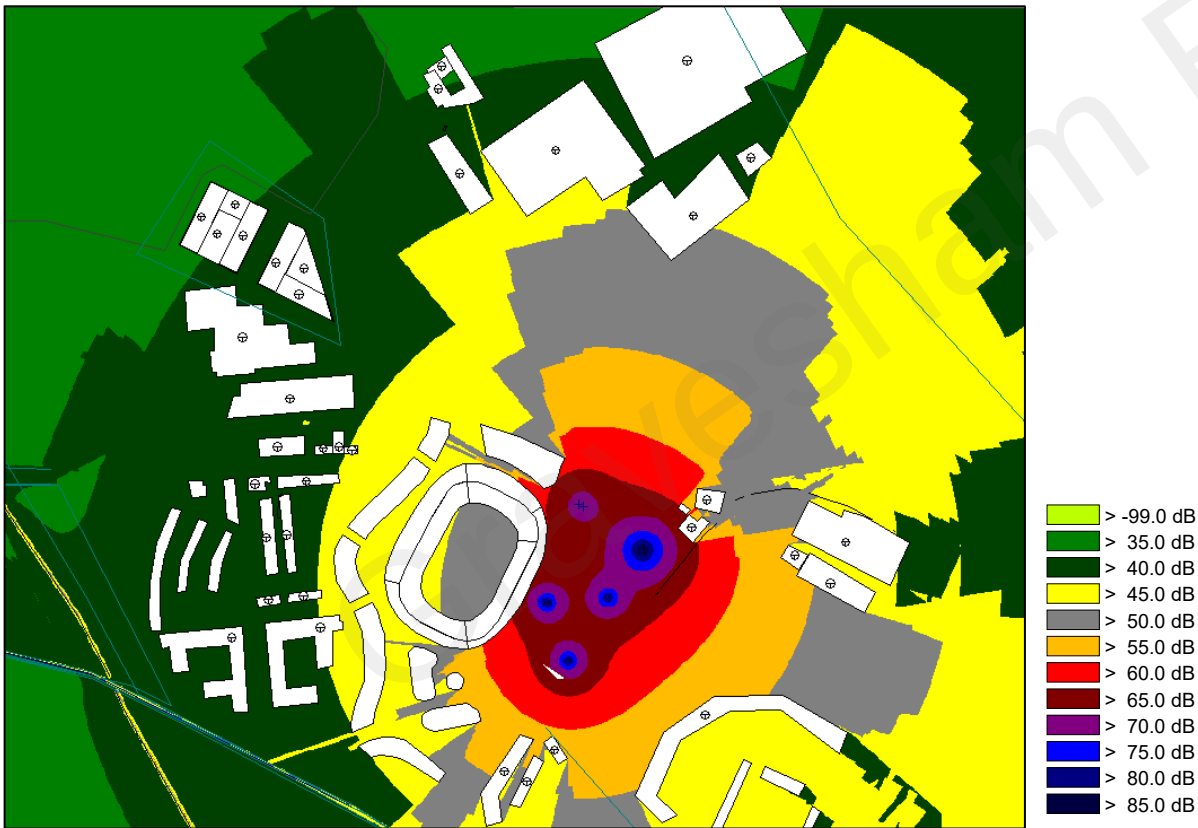


Figure 9.11 Timeslice 5 - Construction Noise Level ($L_{Aeq,10h}$ dB)

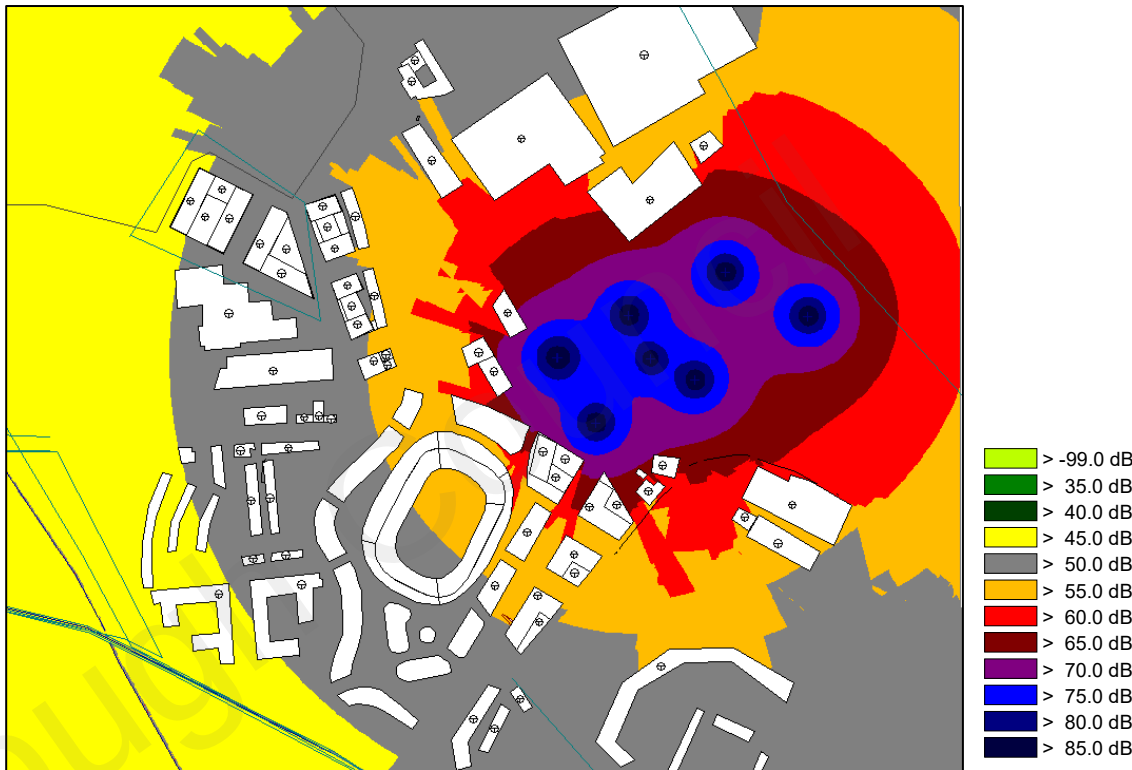


Figure 9.12 Timeslice 6 - Demolition and Construction Noise Level ($L_{Aeq,10h}$ dB)

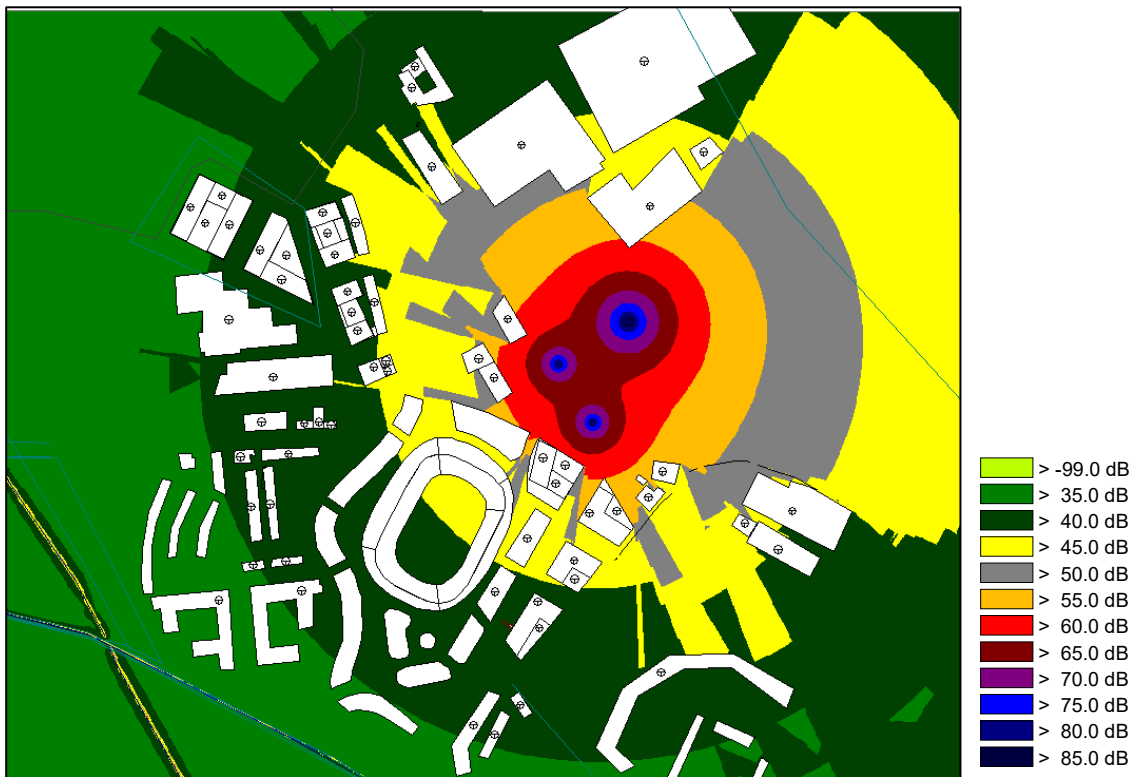
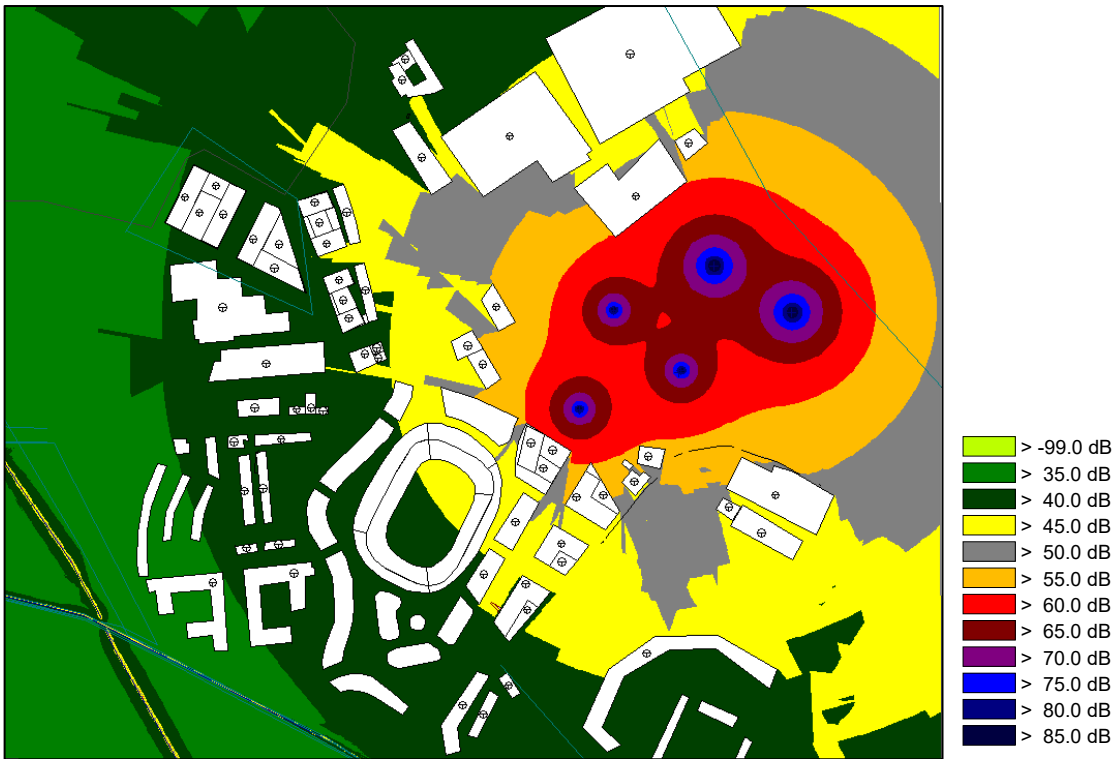


Figure 9.13 Timeslice 7 - Demolition and Construction Noise Level (L_{Aeq,10h} dB)



- 9.130 The results presented in **Table 9.24** indicate that the likely effects during the period of construction works will be major adverse (significant) at Plot 5, 8, 15 and 16 (timeslice 5) and moderate adverse (significant) at residents on Taunton Road/Robinson Way (timeslice 2), Black Eagle Drive (timeslices 1, 2 and 3) and Plot 7 (timeslice 5).
- 9.131 Timeslice 5 represents one of the busiest phases of the construction programme with demolition across multiple plots, infrastructure and plot 14 substructure work. The construction programme indicates these coincident events will take place over approximately 3 months, with reductions in noise expected at other locations
- 9.132 Likely effects during the period of demolition and construction works for all other receptors (including all existing receptors) and timeslices are either negligible (not significant) or minor adverse (not significant).
- 9.133 All reasonable steps shall be taken to mitigate and minimise the effects through adoption of Best Practicable Means (BPM). Noise mitigation measures and noise management plans covering BPM shall be put into place to ensure that noise is minimised at all times. Noise mitigation measures representing BPM (as defined in Section 72 of the COPA¹⁸) are described in the ‘Mitigation Measures, Monitoring and Residual Effects’ section of this ES chapter.
- 9.134 It should be noted that construction noise predictions (at selected time slices) 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

- 9.135 **Table 9.25** presents the highest change in noise level predicted between the 2026 Baseline (Do Nothing) and 2026 D&C AS1 (Demolition and construction traffic and initial opening of Phase 1) scenario for each existing receptor.

Table 9.25 Predicted 16-hour Noise Levels at 1m from Receptors

Receptor	Predicted noise level (L _{Aeq,16hr} dB)			Receptor Sensitivity	Magnitude of Impact	Scale and Nature of Effect and Significance
	2026 Baseline (Do Nothing 2026)	2026 D&C AS1 (Demolition and construction traffic and initial opening of Phase 1)	Change with Proposed Development			
Industrial facilities on Lower Road	68	61	-7	Low	Negligible	negligible (not significant)
Residences on Taunton Road and Robinson Way	70	70	0	High	Negligible	negligible (not significant)
Residences on Black Eagle Drive	55	49	-6	High	Negligible	negligible (not significant)
Residences on Railway Street	67	67	0	High	Negligible	negligible (not significant)
Residences at Wallis Park	63	63	0	High	Negligible	negligible (not significant)
Industrial facilities on Grove Road	64	64	0	Low	Negligible	negligible (not significant)
Tower Wharf	59	67	9	Low	High	minor adverse (not significant)

- 9.136 As shown in **Table 9.25** the predicted ambient noise level is expected to mainly stay the same, except along Lower Road and Black Eagle Drive where the ambient noise is expected to reduce, and at Tower Wharf where the ambient noise level is expected to increase. In most instances a negligible (not significant) effect has been evaluated, with the exception at Tower Wharf where a minor adverse (not significant) effect has been evaluated, due mainly to its Low sensitivity to noise. **Table 9.26** presents the highest change in noise level predicted between the 2029 Baseline (Do Nothing) and 2029 D&C AS2 (Demolition and construction traffic and full opening of Phase 1) scenario for each existing receptor.

Table 9.26 Predicted 16-hour Noise Levels at 1m from Receptors

Receptor	Predicted noise level (L _{Aeq,16hr} dB)			Receptor Sensitivity	Magnitude of Impact	Scale and Nature of Effect and Significance
	2029 Baseline (Do Nothing 2029)	2029 D&C AS2 (Demolition and construction traffic and full opening of Phase 1)	Change with Proposed Development			
Industrial facilities on Lower Road	68	61	-7	Low	Negligible	negligible (not significant)
Residences on Taunton Road and Robinson Way	70	70	0	High	Negligible	negligible (not significant)
Residences on Black Eagle Drive	54	47	-7	High	Negligible	negligible (not significant)
Residences on Railway Street	67	68	1	High	Low	minor adverse (not significant)
Residences at Wallis Park	63	64	1	High	Low	minor adverse (not significant)
Industrial facilities on Grove Road	64	64	0	Low	Negligible	negligible (not significant)
Tower Wharf	59	68	9	Low	High	minor adverse (not significant)

¹⁸ Control of Pollution Act of 1974

9.137 As shown in **Table 9.26** the predicted ambient noise level is expected to decrease at Lower Road and Black Eagle Drive, stay the same at Taunton Road and Robinson Way (worst-case) and increase at Railway Street, Wallis Park and Tower Wharf

9.138 A negligible (not significant) effect has been evaluated at Lower Road, Tauton Road, Robinson Way, Grove Road and Black Eagle Drive. A minor adverse (not significant) effect has been evaluated at Railway Street, Wallis Park and Tower Wharf.

Construction Vibration

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

9.140 Whilst it is not possible to accurately estimate the level of vibration with any certainty (it is dependent on the type of piling, ground conditions, and the distance to the receptor), it is proposed that limits are placed on the vibration at sensitive buildings (receptors) and therefore vibration levels will need to be monitored during construction at the sensitive locations. The guidance within BS 5228-2 states that vibration PPV levels are tolerable within residential properties when they do not exceed 1.0mm/s and prior warning of potential vibration inducing works is given to building occupants.

9.141 Annex C and D of the guidance within BS 5228-2 provide summaries of case histories of vibration measured during piling operations. The examples presented within BS 5228-2 suggest that the potential vibration levels are unlikely to impact any buildings outside of the site, and that at reasonable distances from the location of the works the estimated vibration levels would be expected to be substantially lower than the vibration levels stated above due to geometric propagation attenuation.

9.142 Considering the existing receptors identified within the surrounding area, the following assessment is made taking into account the receptor's distance from the piling locations (typically perimeter of building).

- Existing receptors located over 100m from piling activities -
 - The proposed piling positions are expected to be at levels at or below 0.13 mm/s, which corresponds with a negligible magnitude of impact; and
 - The effects on receptors located at Residences at Wallis Park (High sensitivity) are assessed to be negligible (not significant).
- Existing receptors located between 20 to 100m of piling activities -
 - The proposed piling positions are expected to be at levels at or below 1mm/s, which corresponds with a low magnitude of impact;
 - The effects on receptors located at Residences on Taunton Road, Robinson Way and Railway Street (High sensitivity) are assessed to be minor adverse (not significant); and
 - The effects at Tower Wharf (Low sensitivity) are assessed to be negligible (not significant).
- Existing receptors that are within 20m of piling activities -
 - The proposed piling positions are expected to at levels of between 1mm/s - 3mm/s, which correspond to a medium magnitude of impact;
 - The effects on receptors located at Residences on Black Eagle Drive (High sensitivity) are assessed to be moderate adverse (significant);
 - The effects at Industrial facilities on Lower Road and Grove Road (Low sensitivity) are assessed to be negligible (not significant); and
 - The effects on Tower Wharf (Low sensitivity) are assessed to be negligible (not significant).

9.143 The introduced receptors have been considered with respect to the construction works associated with Phase 2 only, as all Phase 1 piling works would have finished at the first occupation.

- Introduced receptors located over 100m of piling activities -
 - The proposed piling positions are expected to be at levels at or below 0.13 mm/s, which corresponds with a negligible magnitude of impact;
 - The effects on receptors located at Plots 3, 4, 6, 7, 17, 18 and 19 (High sensitivity) are assessed to be negligible (not significant); and

- The effects on receptors located at Plots 1 and 2 (Low sensitivity) are assessed to be negligible (not significant).
- Introduced receptors located between 20 to 100m of piling activities -
 - The proposed piling positions are expected to be at levels at or below 1mm/s, which corresponds with a low magnitude of impact; and
 - The effects on receptors located at Residences on plots 5, 8, 15 and 16 (High sensitivity) are assessed to be minor adverse (not significant).
- There will be no introduced receptors that are within 20m of piling activities -

Completed Development

Road Traffic Noise

9.144 **Table 9.27** presents the highest change in noise level predicted between the 2031 Baseline (Do Nothing) and 2031 Full Build (Do Something 2031) scenario for each existing receptor.

Table 9.27 Predicted 16-hour Noise Levels at 1m from Receptors

Receptor	Predicted noise level (<i>L</i> _{Aeq,16hr} dB)			Receptor Sensitivity	Magnitude of Impact	Scale and Nature of Effect and Significance
	2031 Baseline (Do Nothing)	2031 Full Build (Do Something)	Change with Proposed Development			
Industrial facilities on Lower Road	68	62	-6	Low	Negligible	negligible (not significant)
Residences on Taunton Road and Robinson Way	70	70	0	High	Negligible	negligible (not significant)
Residences on Black Eagle Drive	54	47	-7	High	Negligible	negligible (not significant)
Residences on Railway Street	67	68	1	High	Low	minor adverse (not significant)
Residences at Wallis Park	63	65	2	High	Low	minor adverse (not significant)
Industrial facilities on Grove Road	64	64	3	Low	Negligible	negligible (not significant)
Tower Wharf	59	68	9	Low	High	minor adverse (not significant)

9.145 Predicted noise levels presented above are rounded to the nearest integer value.

9.146 Comparison of road traffic flows indicates that potential long terms changes as a result of the Proposed Development would result in increases in noise levels associated with road traffic at Wallis Park, Railway Street and Tower Wharf. The likely effect has been assessed to be minor adverse (not significant) at these receptors and negligible (not significant) to all other receptors.

Building Services Plant and Commercial Noise

9.147 On the basis of the baseline background noise levels, the total noise from building services plant and commercial noise will be limited in line with the noise levels details in **Table 9.28** at a position 1m from the existing façades.

9.148 Limits have been determined for the closest receptors on the basis that the control of noise emissions from building services plant at these receptors will inherently result in lower noise levels at receptors further away.

9.149 Representative background noise levels are presented as free-field levels, whereas building services noise limits are presented as façade levels.

Table 9.28 Building Services Plant and Commercial Noise Limits

Receptor	Building Services Noise Limits (dB)		Background Noise Level (dB)		Increase in Background Noise Level	Receptor Sensitivity	Magnitude of Impact	Scale of Effects
	Day (0700 to 2300 hours)	Night (2300 to 0700 hours)	Day (0700 to 2300 hours)	Night (2300 to 0700 hours)				
Industrial facilities on Lower Road	41	30	51	40	<0	Low	Negligible	negligible (not significant)
Residences on Taunton Road and Robinson Way	41	30	37	32	<0	High	Negligible	negligible (not significant)
Residences on Black Eagle Drive	41	30	37	32	<0	High	Negligible	negligible (not significant)
Residences on Railway Street	41	30	37	32	<0	High	Negligible	negligible (not significant)
Residences at Wallis Park	41	30	37	32	<0	High	Negligible	negligible (not significant)
Industrial facilities on Grove Road	41	30	52	40 ¹⁹	<0	Low	Negligible	negligible (not significant)
Tower Wharf	41	30	52	40	<0	Low	Negligible	negligible (not significant)

9.150 The building services plant strategy and the operation of the commercial premises would need to be developed to ensure that the limits detailed in **Table 9.28** are achieved. This will be secured by an appropriately worded planning condition.

9.151 It has been assumed that the building services plant would operate in accordance with the manufacturer's instructions and would not result in any noise which is tonal, impulsive or distinctive in nature. Should the noise exhibit any such acoustic features then the relevant 'penalty' / correction should be applied in accordance with BS 4142 to ensure that the resultant rating level falls within the limit levels identified in **Table 9.28**.

9.152 An important aspect of the BS 4142 assessment method is that sound sources should be considered in the context of the residual noise environment. Therefore, once the details of building services plant are confirmed as part of the detailed design process for the Proposed Development, appropriate design and mitigation measures can be identified in the context of BS 4142, accounting for the proposed noise sources.

9.153 As the building services plant would be expected to be designed to achieve the recommended limits shown (in accordance with BS 4142), it is expected that the magnitude of impact will be negligible and the effect will be negligible (not significant).

Stadium Noise Breakout

9.154 The site currently operates with a football stadium and the Proposed Development also includes a football stadium. An assessment has been completed (as detailed earlier in this ES chapter) to evaluate the likely change in ambient noise levels experienced at the nearby receptors during a football match.

9.155 Details on the predicted noise levels from the stadium can be found are summarised in **Table 9.29**.

Table 9.29 Stadium Noise Breakout Assessment

Receptor	Baseline Ambient Noise Level during a Football Match	Assessed Ambient Noise Level during a Football Match	Assessed Increase in Ambient Noise Level (dBA)	Receptor Sensitivity	Magnitude of Impact	Scale of Effects
Residences on Taunton Road and Robinson Way	51	35	0	High	Negligible	negligible (not significant)
Residences on Black Eagle Drive	51	39	0	High	Negligible	Negligible (not significant)
Residences on Railway Street	65	38	0	High	Negligible	Negligible (not significant)
Residences at Wallis Park	52	41	0	High	Negligible	negligible (not significant)

9.156 The assessment indicates that the additional capacity and change in position of the football stadium would not increase ambient noise levels at the closest existing High sensitivity receptors and therefore there this results in a negligible (not significant) effect. This is due to the change in the design which is more enclosed than the current stadium (as per the Design Code). In addition, the screening from the buildings surrounding the stadium increases the noise reduction.

9.157 In order for there to be no increase in ambient noise levels from the baseline measured it will be necessary to design the public address and voice alarm (PAVA) system appropriately, along with maintaining the current design intent of the stadium, i.e. enclosed except above the pitch. Noise emissions from the football stadium are to be assessed in connection with the detailed design subject to the Reserved Matters Application for this Plot and designs implemented to control noise breakout so significant effects are avoided.

Football Pedestrian Noise Emissions

9.158 Details on the predicted noise levels from crowds leaving the venue after an event finish can be found in **ES Volume 3, Appendix Noise and Vibration – Annex 5**. The ambient noise level assessment has been based on a full capacity match, and therefore represents a worst-case in terms of potential adverse effects.

9.159 The assessment has been based on the worst-case 15 minutes, with the assessment completed with respect to the existing ambient noise levels measured along the pedestrian routes. The predicted results from the analysis are provided in **Table 9.30** and routes shown in **Figure 9.14**.

Table 9.30 Pedestrian Noise Assessment

Receptor	Baseline Ambient Noise Level during a Football Match (dBA)	Assessed Ambient Noise Level during a Football Match (dBA)	Assessed Increase in Ambient Noise Level (dBA)	Receptor Sensitivity	Magnitude of Impact	Scale of Effects
Residences on Taunton Road and Robinson Way	51	44	1	High	Low	minor adverse (not significant)
Residences on Black Eagle Drive	51	54	5	High	Low	minor adverse (not significant)
Residences on Railway Street	65	68	5	High	Low	minor adverse (not significant)
Residences at Wallis Park	52	50	2	High	Low	minor adverse (not significant)

¹⁹ Measurements not made during the night, so background at N1 has been taken

Figure 9.14 Current Pedestrian Route to Football Stadium (shown in Pink)



9.160 The assessment indicates that with full capacity attendance, the short-term ambient noise levels may increase by up to 5 dBA, as a worst-case from the existing baseline noise level measured during a football match. At the existing residential receptors, the increase in noise would be expected to result in a worst-case minor adverse (not significant) effect.

MITIGATION, MONITORING AND RESIDUAL EFFECTS

Demolition and Construction Mitigation

9.161 Good industry standards, guidance and practice procedures (i.e., Considerate Contractors scheme) will be followed in order to minimise noise and vibration effects during demolition and construction. Noise and vibration will be managed to avoid and minimise significant impacts, and mitigation measures will be documented within a Construction Environmental Management Plan (CEMP), which will take into account the relevant key guidance documents. Paragraphs 9.162 to 9.170 document the mitigation measures not inherently included within assessments completed.

Mitigation of Demolition and Construction Noise

9.162 The underlying objective would be for the mitigation measures to be employed to ensure that potential noise impacts at nearby sensitive receptors, as a result of demolition and construction activities, are minimised.

9.163 The preferred approach for controlling demolition and construction noise is to reduce source levels where possible, but with due regard to practicality. The simplest and most effective method of reducing noise at nearby receptors is to ensure that noisy plant is located as far from receptors as practicable and screened using temporary barriers.

9.164 Noise experienced by receptors can also be reduced by limiting the daily time that noisy equipment is operated; however, it is acknowledged that sometimes a greater noise level may be acceptable if the duration of the activity, and therefore length of disruption, is reduced.

9.165 Noise shall be minimised by adopting BPM as standard working practices across the site to ensure that noise is reduced whenever practicable. The following provisions are examples of BPM and will be adhered to where

practicable throughout the demolition and construction programme:

- The production of a construction noise and vibration report that evaluates the construction activities and provides specific BPM to reduce noise and vibration;
- Limiting high impact activities (e.g. piling) to specific times during the day, e.g. 1 hour on – 1 hour off, or 09:00-12:00 and 14:00-17:00;
- 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;
- Where feasible, all stationary plant would be located so that the noise effect at all occupied residential and commercial properties is minimised and, if practicable, every item of static plant when in operation is to be sound attenuated using methods based on the guidance and advice given in BS 5228;
- 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; and
- The timing of building operations will 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 occupants of buildings are maintained.

9.166 The assessment of potential construction noise and vibration impacts in this ES chapter does not take account of the above BPM measures (i.e. the assessment is of unmitigated effects).

9.167 During the detailed working up of the construction programme and preparation of the CEMP, the BPM measures to mitigate potential noise and vibration impacts on nearby noise sensitive premises will be defined and agreed with GBC. The primary method for the control of noise and vibration being a Section 61 agreement under the Control of Pollution Act 1974 (COPA) with LBC being established.

9.168 It is expected that a Section 61 agreement under the COPA will contain appropriate noise and vibration limits at the nearby properties. These limits shall be monitored and reported, with the reports highlighting when it is likely that the construction limits will be exceeded, so that construction activities can be effectively altered to mitigate exceedances.

9.169 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 would potentially exceed the agreed noise and vibration limits or must occur at times when such work is otherwise not approved. Such dispensation/variation 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 (BPM), as defined in Section 72 of the COPA.

9.170 It has been predicted that significant noise effects (unmitigated) have the potential to occur at several receptors locations during the period of demolition and construction works associated with Phase 1 and Phase 2, and could represent intermittent, temporary significant effects. Through implementation of mitigation measures representing BPM, it is conservatively assumed that construction noise effects can be reduced by one order of magnitude in terms of impact, resulting in a range at the worst impacted properties from **Negligible** (not significant) to **Moderate Adverse** (Significant).

Construction and Proposed Development Traffic Noise

9.171 The following measures are to be employed as best practice to ensure that construction traffic noise effects remain insignificant:

- Vehicles employed for any activity associated with the construction works will, where reasonably practicable, be fitted with effective exhaust silencers and shall be maintained in good working order and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable;
- Time slots are adopted for deliveries to ensure that convoys of vehicles do not arrive simultaneously and avoid unnecessary idling on-site;

- Strict control to prevent temporary parking on kerbsides in the vicinity of noise sensitive receptors; and
- The use of sufficient clear signage to ensure that construction vehicles use only designated routes.

9.172 Likely residual noise effects, due to increases in road traffic as a result of the combined addition of construction and Proposed Development traffic, are expected to remain no worse than **Minor Adverse** (not significant)

Mitigation of Construction Vibration

9.173 Adverse effects are only likely to occur if piling activities are taking place in close proximity to sensitive receptors (i.e. assuming the worst case, less than 20m distance). In reality, high vibration generating activities are unlikely to occur so close to sensitive receptors as detailed planning methodology (i.e. Piling Method Statement) and solutions can seek to further reduce the potential for adverse impacts, and if they do, they would be of short-term duration and appropriately monitored.

9.174 Given that there is potential for predicted impacts to be significant under the worst case scenario, mitigation measures will be put in place to ensure that vibration effects are minimised as far as practicable through the use of an appropriate piling technique, design and methodology.

9.175 To reduce potential vibration impacts due to piling, the contractor shall use a piling technique that is least likely to cause adverse vibration impacts (e.g. auger piling), to ensure that the likely effect of vibration is reduced or avoided at nearby receptors.

9.176 A 'Piling Method Statement' will also be provided and agreed prior to the commencement of these works. Vibration limits will be set in accordance with BS5228-2 to minimise the risk of complaints or building damage. These limits will be controlled through implementation of the CEMP and vibration monitoring. The statement will also include vibration and noise monitoring and action levels.

9.177 It is considered that, with the appropriate and successful implementation of the mitigation proposed, the likely adverse effects predicted would reduce (for example, this assumes that no piling will occur within 5 m of a high sensitivity receptor, and that should the piling methodology be able to prevent piling occurring within a 10-15m radius of the receptor, it is considered that the likely effects can be reduced further). However, until the final piling strategy and detailed construction planning are identified, for the purpose of this assessment, it is concluded a worst case effects at the closest receptors of **Moderate Adverse** (Significant). These worst-case effects would be expected to occur around timeslice 5 (after phase 1 is complete) and at the introduced receptors within plot 5, 8, 15 and 16.

Completed Development Mitigation

Building Services Plant and Commercial Noise

9.178 Building services plant will be designed to achieve the recommended limits set out in **Table 9.28** (in accordance with BS 4142). As such, it is expected that the magnitude of impact will be Negligible and the effect will be **Negligible** (not significant). Typical measures to be considered to ensure that the building services noise criteria are achieved include low-noise equipment, in-duct attenuators and acoustic enclosures.

9.179 Industrial and commercial noise egress would be expected to be suitably controlled to achieve the recommended limits set out in **Table 9.28**. As such, it is expected that the magnitude of impact will be Very Low and the effect will be **Negligible** (not significant). Typical measures to be considered to ensure that the industrial and commercial noise criteria are achieved include suitable façade design, the use of screening around any external yards and suitable operational restrictions (such as restrictions on carry out noisy works during night-time hours).

Road Traffic

9.180 No mitigation is proposed. The residual effects would remain **Minor Adverse** or **Negligible** (not significant).

Football Stadium Noise Breakout

9.181 The noise emissions from the football stadium have been assessed to be **Negligible** (not significant) at existing receptors. Nevertheless, the design of the stadium is to be developed so that noise emissions are adequately controlled. This will impact the design of the envelope (enclose the noise) and the PAVA.

Pedestrian Noise

9.182 No mitigation is required. The residual effects would remain **Minor Adverse** (not significant) at the residential receptors along the pedestrian routes.

9.183 Additional crowd management measures, as required, will be identified through monitoring of crowd dispersion when in operation.

RESIDUAL EFFECTS

9.184 All of the residual effects resulting from the Proposed Development, are presented in **Table 9.31**, identifying whether the effect is significant or not.

Table 9.31 Residual Effects

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	St Mt Lt
Demolition and Construction							
Plots 5, 8, 15 and 16 (timeslice 5)	Construction Noise	Moderate Adverse	Significant	L	D	T	Mt
Taunton Road/Robinson Way (timeslice 2), Black Eagle Drive (timeslices 1, 2 and 3) and Plot 7 (timeslice 5)	Construction Noise	Minor Adverse	Not significant	L	D	T	Mt
Industrial facilities on Lower Road, Residences on Railway Street, Residences at Wallis Park, Industrial facilities on Grove Road, Tower Wharf, Plot 3, Plot 4, Plot 6, Plot 17, Plot 18, Plot 19	Construction Noise	Negligible	Not significant	L	D	T	Mt
Black Eagle Drive	Construction Vibration	Moderate Adverse	Significant	L	D	T	Mt
Taunton Road, Robinson Way, Railway Street, Plot , Plot 5, Plot 8, Plot 15 and Plot 16	Construction Vibration	Minor Adverse	Not Significant	L	D	T	Mt
Wallis Park, Lower Road, Grove Road and Tower Wharf, Plot 1, 2,3,4,6,7, 17,18 and 19	Construction Vibration	Negligible	Not Significant	L	D	T	Mt
Tower Wharf, Railway Street, Wallis Park	Construction Traffic	Minor Adverse	Not Significant	L	D	T	Mt
Lower Road, Taunton Road, Robinson Way, Black Eagle Drive, Grove Road	Construction Traffic	Negligible	Not Significant	L	D	T	Mt
Completed Development							
Wallis Park, Railway Street, Tower Wharf	Road Traffic	Minor Adverse	Not Significant	L	D	P	Lt
Lower Road, Taunton Road and Robinson Way, Black Eagle Drive, Grove Road	Road Traffic	Negligible	Not Significant	L	D	P	Lt
All receptors	Building Services Plant	Negligible	Not Significant	L	D	P	Lt

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	St Mt Lt
All receptors	Commercial Noise	Negligible	Not Significant	L	D	P	Lt
Black Eagle Drive, Wallis Park, Taunton Road, Robinson Way, Railway Street	Stadium Noise Breakout Assessment	Negligible	Not Significant	L	D	P	Lt
Black Eagle Drive, Wallis Park, Taunton Road, Robinson Way, Railway Street	Football Pedestrian Noise Emissions	Minor Adverse	Not Significant	L	D	P	Lt
Key/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							

SITE SUITABILITY

9.185 The Proposed Development will 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 dwellings;
- The noise levels in external residential amenity areas; and
- Groundborne vibration.

9.186 The site suitability assessments have been based on the illustrative scheme, which indicates the proposed building massing of the residential plots. The illustrative scheme is only one possible way the Proposed Development can come forward, although it is expected that the plots would be developed to a similar layout, i.e. blocks of apartments. The illustrative scheme building massing would provide a degree of beneficial screening andalso facilitates the analysis of noise levels at heights above ground level, which otherwise may be screened from distant noise sources. Accordingly, the illustrative masterplan provides a reasonable method of assessing potential realistic impacts on the Proposed Development.

9.187 The assessments are undertaken to each noise sensitive plot within the Site. If the illustrative scheme changes it is expected the range of noise and vibration levels experienced across the site would not change significantly.

Noise Level Analysis

9.188 The assessments consider the measured baseline, the predicted noise emissions from the operation of the Stadium and the noise emissions from the other noise sources referred to in paragraph 9.3.

9.189 Accordingly, the following assessment scenarios have been included:

- Future road traffic (2031) and railway noise (transportation noise sources only);
- Industrial (including Tilbury Wind Turbines) noise sources from existing surrounding building (existing industrial);
- The combined transportation and industrial plant noise;
- Football stadium noise emissions; and
- CEMEX and Tilbury Dock dredger activity.

9.190 Table 9.32 presents the calculated highest external façade noise levels for each of the above scenarios.

Table 9.32 Highest Calculated Façade Noise Levels

Proposed Development Plots	Transportation noise sources		Industrial sources		Combined transportation and industrial sources		Football Stadium Noise Emissions		CEMEX Dredger		Tilbury Dock Dredger	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Plot 3	60	57	36	26	60	57	58	N/A	34	34	40	40
Plot 4	56	53	41	35	56	53	58	N/A	39	39	40	40
Plot 5	54	50	45	40	54	50	54	N/A	40	40	45	45
Plot 6	67	63	29	23	67	63	29	N/A	29	29	40	40
Plot 7	67	63	32	24	67	63	29	N/A	33	33	44	44
Plot 8	67	64	33	26	67	64	41	N/A	33	33	45	45
Plot 9	53	50	47	42	53	50	46	N/A	39	39	41	41
Plot 10	55	51	47	41	55	51	24	N/A	39	39	46	46
Plot 11	52	48	42	37	52	49	17	N/A	41	41	47	47
Plot 12	49	45	59	49	59	50	39	N/A	42	42	47	47
Plot 13	50	47	54	49	58	50	42	N/A	41	41	41	41
Plot 14	53	50	53	47	55	50	50	N/A	41	41	41	41
Plot 15	64	61	57	52	65	61	24	N/A	41	41	45	45
Plot 16	66	62	52	47	66	62	52	N/A	41	41	35	35
Plot 17	59	55	50	46	59	55	51	N/A	42	42	35	35
Plot 18	58	54	51	46	58	55	41	N/A	46	46	39	39
Plot 19	54	50	46	41	55	50	32	N/A	46	46	35	35

ProPG – Transportation Noise Sources

9.191 Based on the assessment criteria presented in Table 9.9 and the highest calculated façade noise levels.

9.192 The noise risk categories presented in Table 9.9 have been assigned for each plot based on the highest calculated transportation noise levels in Table 9.32. It is noted that the noise levels in Table 9.32 are façade noise levels and would be 3 dB higher than equivalent free-field noise levels needed to assess the noise risk.

9.193 The assessed noise risk categories are presented in Table 9.33.

Table 9.33 ProPG Noise Risk Category (Transportation Noise Sources Only)

Proposed Development Plots	Noise Risk Category
Plot 3	Medium
Plot 4	Low
Plot 5	Low
Plot 6	Medium
Plot 7	Medium
Plot 8	High
Plot 9	Low
Plot 10	Low
Plot 11	Low

Proposed Development Plots	Noise Risk Category
Plot 12	Low
Plot 13	Low
Plot 14	Low
Plot 15	Medium
Plot 16	Medium
Plot 17	Medium
Plot 18	Medium
Plot 19	Low

9.194 The assessment of transportation noise sources indicates that all plots would need to consider the noise impact as part of their design to avoid adverse noise impacts. This would be secured with an appropriately worded planning condition.

BS 4142 – Industrial Noise Assessment

9.195 Three separate industrial noise assessments have been completed, in respect of each of the following noise sources:

- Continuous industrial noise sources from surrounding premises and wind turbines at Tilbury Dock;
- CEMEX site dredger noise; and
- Tilbury Dock dredger noise.

9.196 For the assessment of the continuously industrial noise sources the rated sound level includes a 10 dB acoustic feature correction to account for the potential of clearly perceptible tone (+4 dB) and clearly perceptible impulsivity (+6 dB).

9.197 The assessment of CEMEX and Tilbury Dock dredgers includes a 12 dB acoustic feature correction to account for the potential of highly perceptible tonality (+6 dB) and clearly perceptible impulsivity (+6 dB).

9.198 **Table 9.34** presents the assessed rated sound level of the industrial noise sources with respect to the representative weekday background noise level.

Table 9.34 BS 4142 Assessment

	Representative Façade Background Noise Level (L_{A90} dB)		Continuous Industrial Noise		CEMEX Dredger		Tilbury Dredger	
	Day	Night	Day	Night	Day	Night	Day	Night
Plot 3	52	37 ^[1]	-9	-4	-9	-4	-9	6
Plot 4	52	37 ^[1]	-4	5	-4	5	-4	11
Plot 5	52	37 ^[1]	0	10	0	10	-3	12
Plot 6	52	37 ^[1]	-16	-7	-16	-7	-14	1
Plot 7	52	37 ^[1]	-13	-6	-13	-6	-10	5
Plot 8	52	37 ^[1]	-12	-4	-12	-4	-10	5
Plot 9	56	41	-2	8	-2	8	-8	7
Plot 10	56	41	-2	7	-2	7	-8	7
Plot 11	56	41	-7	3	-7	3	-6	9
Plot 12	56	41	10	15	10	15	-5	10
Plot 13	56	41	5	15	5	15	-6	9

	Representative Façade Background Noise Level (L_{A90} dB)		Continuous Industrial Noise		CEMEX Dredger		Tilbury Dredger	
	Day	Night	Day	Night	Day	Night	Day	Night
Plot 14	56	41	4	13	4	13	-6	9
Plot 15	56	41	8	18	8	18	-6	9
Plot 16	49	40	10	14	10	14	1	10
Plot 17	49	40	8	13	8	13	2	11
Plot 18	49	40	9	13	9	13	6	15
Plot 19	49	40	4	8	4	8	6	15

^[1] Night time based on typical reduction in background noise level measured at the long-term noise monitoring positions around the site.

Table 9.35 Assessment of Industrial Noise Sources

	Continuous Industrial Noise		CEMEX Dredger		Tilbury Dredger	
	Day	Night	Day	Night	Day	Night
Plot 3	Negligible	Negligible	Negligible	Medium	Negligible	High
Plot 4	Negligible	Low	Negligible	High	Negligible	High
Plot 5	Low	High	Negligible	High	Low	High
Plot 6	Negligible	Negligible	Negligible	Low	Negligible	High
Plot 7	Negligible	Negligible	Negligible	Low	Low	High
Plot 8	Negligible	Negligible	Negligible	Low	Low	High
Plot 9	Negligible	Medium	Negligible	Medium	Negligible	Medium
Plot 10	Negligible	Medium	Negligible	Medium	Negligible	High
Plot 11	Negligible	Low	Negligible	Medium	Low	High
Plot 12	High	High	Negligible	High	Low	High
Plot 13	Low	High	Negligible	Medium	Negligible	Medium
Plot 14	Low	High	Negligible	Medium	Negligible	Medium
Plot 15	Medium	High	Negligible	Medium	Negligible	High
Plot 16	High	High	Low	High	Negligible	Low
Plot 17	Medium	High	Low	High	Negligible	Low
Plot 18	Medium	High	Medium	High	Negligible	Medium
Plot 19	Low	Medium	Medium	High	Negligible	Low

9.199 The assessment of industrial noise sources indicates that each plot would likely fall within either Medium or High risk for noise disturbance. The assessment is being mainly determined by the potential impact during the night, when background noise levels are lower. While the other contributing factor is the relatively high acoustic feature correction included. In all instances it would be appropriate for the design of the plots to consider the impact from industrial noise sources, i.e., include appropriate façade mitigation to reduce internal noise levels.

9.200 An appropriately worded planning condition, for internal rated sound levels to comply with BS 8233 (**Table 9.11**) is required. A further condition, to control low frequency dredger noise (50 Hz) within the dwellings will also be adopted, e.g., internal noise levels no higher than 50dB at 63 Hz.

Football Stadium Noise Breakout

9.201 Inspection of **Table 9.32** indicates that with the exception of Plots 4 and 5, all other plots are expected to be exposed to higher ambient noise levels from transportation noise sources than from football stadium breakout, i.e. facade sound insulation to reduce transportation noise in the introduced receptors of the Proposed Development is required at these locations.

9.202 The design of Plots 4 and 5 will need to take consideration of the noise emissions from the stadium and include appropriate designs to reduce the impact on the occupants. This would be secured by an appropriately worded planning condition.

Outline Mitigation Measures

9.203 For the site to be suitable for residential use the design of the buildings would need to consider the airborne noise intrusion. As outlined, this would require planning condition(s) to mitigate noise from transportation and industrial noise sources. In each case the design of the buildings would likely need to incorporate sufficient facade sound insulation measures, so that BS 8233 (**Table 9.11**) are achieved (when considering acoustic features).

9.204 From the assessments completed this would necessitate the likely adoption of the mitigation measures outlined in **Table 9.36**.

Table 9.36 Indicative Façade Sound Insulation Requirements (R_w+C_{tr} dB)

Proposed Development Plots	Indicative Façade Sound Insulation Requirements (R_w+C_{tr} dB)
Plot 3	29
Plot 4	25
Plot 5	29
Plot 6	35
Plot 7	35
Plot 8	36
Plot 9	25
Plot 10	30
Plot 11	31
Plot 12	36
Plot 13	31
Plot 14	30
Plot 15	34
Plot 16	34
Plot 17	28
Plot 18	30
Plot 19	30

9.205 It is noted that in all plots, the mitigation of transportation noise sources is expected to provide sufficient mitigation to reduce industrial noise sources. This will be confirmed for each plot during their Reserved Matters Applications. These assessments will need to consider if changes are made to the current industrial uses (none proposed, though potential for intensification), night time maximum noise events and their control of overheating.

9.206 Example glazing build-ups and ventilation strategies that can provide the necessary acoustic losses are presented in **Table 9.37**.

Table 9.37 Example Glazing Build-Ups and Ventilation Strategies

Sound Insulation	Example Double Glazing Configurations (Glass / Airspace / Glass)	Ventilation strategy
R_w+C_{tr} 15-27 dB	6 mm glass/16 mm cavity/6 mm glass	Acoustically attenuated passive ventilation (e.g., trickle vents)
R_w+C_{tr} 28-29 dB	6.8 mm acoustic laminate/16 mm cavity /6 mm glass	Acoustically attenuated passive ventilation (e.g., trickle vents)
R_w+C_{tr} 30-32 dB	8.8 mm acoustic laminate /16 mm cavity/6 mm glass	Acoustically attenuated passive ventilation (e.g., trickle vents)
R_w+C_{tr} 33-36 dB	8.8 mm acoustic laminate/16 mm cavity/10 mm glass	High performance acoustically attenuated passive ventilation

9.207 The precise design details of the façade and the ventilation provisions will be finalised as the design of the Proposed Development progresses, however, **Table 9.37** demonstrates that appropriate glazing specifications are feasible and that these coupled with an appropriate ventilation strategy, can meet the indoor ambient noise level criteria recommended in BS 8233:2014 (refer **Table 9.11**). It is expected that overheating will be considered during the design of the buildings.

9.208 Noise predictions indicate that suitable internal noise levels can be achieved within the Proposed Development through the implementation of appropriate glazing. Consequently, the Proposed Development is considered to be suitable for its proposed residential uses.

External Amenity Noise Level Assessments

9.209 An outline assessment of the external amenity spaces is presented in **Table 9.38**.

Table 9.38 Amenity Noise Risk Category

Proposed Development Plots	Noise Risk Category	Outline Mitigation Measures for Private Amenity Spaces
Plot 3	Medium ^[1]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road.
Plot 4	Medium ^[1]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road.
Plot 5	Low	No specific measures
Plot 6	High ^[1]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road.
Plot 7	High ^[1]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road.
Plot 8	High ^[1]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road.
Plot 9	Low	No specific measures required
Plot 10	Low	No specific measures
Plot 11	Low	No specific measures
Plot 12	High ^[2]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the adjacent industrial spaces.
Plot 13	Low	No specific measures
Plot 14	Low	No specific measures
Plot 15	High ^[1]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road.
Plot 16	High ^[1]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road.
Plot 17	Medium ^[3]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road and industrial plots.
Plot 18	Medium ^[3]	Acoustic balconies or winter gardens for sections of the residential plot overlooking the road and industrial plots.
Plot 19	Medium ^[4]	Acoustic balconies or winter gardens for sections of the residential plot with views of the CEMEX site

^[1] Transportation noise source

^[2] Existing surrounding industrial source

^[3] Existing surrounding industrial and transportation sources

^[4] CEMEX dredger activity

9.210 An alternative option to the outline design measures for the private amenity spaces would be to include shared amenity within the development plot where appropriate conditions are achieved, i.e., either a Low or Negligible daytime impact.

Vibration and Structure-borne Noise

9.211 The measurements in **Table 9.20** indicate that tactile vibration would be a negligible risk on the Proposed Development. Paragraph 9.121 indicates that there would be low levels of structure borne noise on the Proposed Development. On the above basis, mitigation measures would not be necessary to reduce environmental sources of vibration.

ASSESSMENT OF THE FUTURE ENVIRONMENT

Evolution of the Baseline

9.212 The noise climate is driven by road traffic and industrial sources, and as such any changes to the future baseline condition are dependent on changes to traffic behaviour or changes to the businesses. As detailed in the **ES Volume 1, Chapter 7: Traffic and Transport**, there is expected to be a marginal increase in traffic due to general population changes in the area, though this is insignificant compared to the high volumes of traffic currently travelling on the nearby roads. There is no information on potential changes in the surrounding industrial uses, though the noise emissions could change (increase or decrease) over time.

9.213 Given the proposed Phase 1 opening year of 2029, there are not expected to be significant changes to the percentage of electric cars as compared to internal combustion engine cars to cause material changes to the baseline noise condition.

9.214 The other potential significant changes to the baseline conditions could be caused by changes to the adjacent railway. There are currently no published and readily available plans to install additional track or otherwise increase the number of trains that use the tracks. Irrespective, it would require a large increase in the number of trains to result in a significant change in ambient noise levels.

9.215 The baseline would need to be appraised for the reserved matters applications for the site and secured by condition. A suitably qualified acoustician will need to be consulted for each application and decide the extent of additional baseline surveys if at all required, i.e. if industrial facilities reduce or are removed then the baseline presented would be a worst-case and may not need separate surveys.

Cumulative Effects Assessment

9.216 This section identifies the effects of the Proposed Development in combination with the effects of the nearby schemes that are approved or under consideration (Tier 1 schemes) and those associated with schemes that are withdrawn or yet to be submitted (Tier 2 schemes). The schemes are identified in **ES Volume 1, Chapter 2: EIA Methodology**.

9.217 Generally, the assessments consider schemes that are closest to the Proposed Development, where receptors are shared. This limits the cumulative schemes to the following:

- Land North of Hive Lane Northfleet, Embankment West The Shore Northfleet, Gravesend Kent DA11 9AN (Tier 1), planning application EDC/21/0081;
- Land At Former Northfleet Cement Works The Shore Northfleet Gravesend Kent DA11 9A (Tier 1), planning application EDC/16/0004;
- Swanscombe Peninsula and land adjacent to Ebbsfleet Station (The 'London Resort' (Tier 2), planning application BC080001;
- Ebbsfleet Central East (Tier 2); and
- Land Adj To Northfleet Harbour Grove Road Northfleet Gravesend Kent (Tier 2), planning application EDC/21/0102.

9.218 It follows that the Tier 1 applications include detail about their respective development that could facilitate a quantitative assessment, whereas information is not available for the Tier 2 proposals so a qualitative assessment is required.

Tier 1 Assessments

Construction Activity

9.219 The construction activities are not quantitatively assessed in the Tilbury Freeport, Land North of Hive Lane and in the Land at Former Northfleet Cement Works applications. There are also no common receptors listed between these schemes and those identified within the Proposed Development assessments.

9.220 In practice there is potential for construction activities to affect the noise levels at the residential properties in Wallis Park. The residual effects of the Proposed Development are limited to **Negligible** (not significant), so any coincident noise would likely result in **Minor Adverse** (not significant) when due consideration for noise/vibration is taken by the two sites.

Road Traffic

9.221 The Tier 1 cumulative schemes 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. Therefore, a **Negligible** (not significant) residual effect would remain.

Building Services Plant and Commercial Noise Emissions

9.222 Mitigation measures are proposed in order to control noise from building services plant and the commercial uses of the Proposed Development. It is reasonable to expect that the cumulative schemes would 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.

Tier 2 Assessments

Construction Activity

9.223 The London Resort, Ebbsfleet Central East and 'Land Adjacent to Northfleet Harbour Grove Road' schemes are unlikely to share common receptors as the Proposed Development.

9.224 No information is available on the progress of the planning applications for these sites, though it is potentially feasible that they could come forward at a similar time and result in similar noise levels at receptors that are a similar distance away from them as the Proposed Development is from its receptors. On this basis, the residual effects are likely to remain unchanged.

Road Traffic

9.225 The traffic from the Tier 2 schemes are not known. However, if the traffic flows from the withdrawn London Resort scheme are assumed, there will be no changes to traffic flows most relevant to the Proposed Development (as assessed in Assessment Scenario 5 of **ES Volume 1, Chapter 7: Traffic and Transport**). Therefore, the cumulative residual effects with regards to road traffic noise will remain as established for the Proposed Development in isolation, i.e., worst case of **Minor Adverse** (not significant).

Building Services Plant and Commercial Noise Emissions

9.226 The building services plant and commercial noise limits for the Proposed Development have been set to achieve a negligible effect. It is reasonable to expect that the cumulative schemes will 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

9.227 The assessments indicate that there will be residual significant effects due to construction works for noise. The adverse effects are temporary and limited in geographic extent.

9.228 The assessments do not indicate any permanent significant effects as a result of the complete and operational Proposed Development. There are also no additional temporary or permanent significant cumulative effects expected.