

13. Noise and Vibration

13.1 Introduction

13.1.1 This Chapter assesses the likely significant noise and vibration effects associated with the Proposed Development. In particular it examines the effects on existing noise sensitive receptors within the vicinity of the Application Site, which may arise during the construction period and subsequent operation of the completed development. The assessment also considers the suitability of the Site for residential development.

13.1.2 The key noise and vibration aspects for consideration are:

- Construction Effects: noise and vibration effects from plant and activities associated with the demolition and construction phase of the Proposed Development.
- Operational Effects: noise and vibration effects associated with the operation of the Proposed Development, for example building services and noise change associated with increased traffic flows on the local road network.
- Residential Suitability: suitability of the Application Site for residential use in accordance with the appropriate national noise guidance and local authority requirements by reference to baseline surveys and predicted future noise levels, principally from rail and road traffic noise. Reference will be made to noise effects arising from the use of The Millwall FC Stadium during match days, and non-match days.

13.1.3 This Chapter takes as its starting point the Parameter Plans and Development Specification¹ and describes the relevant planning context, assessment methodology and assessment criteria, and baseline situation, in order to assess the potential effects of the Proposed Development. Any limitations, constraints and assumptions relating to the assessment are described in the relevant section. The baseline conditions of the Application Site and its environs are set out both quantitatively (in terms of measured noise levels) and qualitatively. The potential direct and indirect effects arising from the construction of the Proposed Development, operation of the Proposed Development and cumulative effects are addressed, with appropriate mitigation measures required to prevent, reduce or offset the effects and the significance of the residual effects.

13.1.4 A full glossary of acoustic terminology used in this Chapter is provided in the ES Glossary.

13.2 Policy context

National Planning Policy – Planning Policy Guidance Note 24: Planning and Noise (1994)²

- 13.2.1 National planning guidance for noise sensitive and noise generating development is contained within Planning Policy Guidance Note 24: Planning and Noise (PPG 24)². PPG 24 offers guidance to local authorities on the assessment of noise and its potential impact on noise sensitive development.
- 13.2.2 The document defines four Noise Exposure Categories (NEC), which range from A to D and indicate to what extent noise should be considered within the planning process for new residential developments. PPG 24 also defines noise levels for each category, for a variety of noise sources. Table 13.1 below reproduces the summary in PPG 24 relating to the recommended NECs for new dwellings near to mixed noise sources (road noise, rail noise and noise of an industrial nature). Where a site falls exactly on the boundary between two categories, it is generally at the discretion of the local authority to determine the appropriate NEC.

Table 13.1: Summary of PPG 24 Noise Exposure Categories for New Dwellings

Noise Levels and Advice Corresponding to The Noise Exposure Categories for New Dwellings $L_{Aeq,T}$ dB				
Noise Source	Noise Exposure Category (NEC)			
	A	B	C	D
Mixed Noise 07:00 – 23:00 23:00 – 07:00	<55 <45	55 – 63 45 – 57	63 – 72 57 – 66	>72 >66
Advice	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.	Noise should be taken into account when determining planning applications and, where appropriate, conditions should be imposed to ensure a commensurate level against noise.	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.	Planning permission should normally be refused.

- 13.2.3 The levels reported in the above table refer to free-field noise levels, measured on an open site, at least 3.5m away from any reflecting façades, excluding the ground, at a height of 1.2m to 1.5m above the ground. PPG 24 also recommends that the daytime period is 07:00 to 23:00 hours and the night-time period is 23:00 to 07:00 hours. Where internal noise levels are considered, PPG 24 recommends that further guidance on suitable internal noise levels can be found in British Standard 8233 (BS 8233)³.

13.2.4 A further stipulation of PPG 24 in relation to night-time noise levels is that where individual noise events regularly exceed 82 dB L_{Amax} (Slow time weighting) several times in any hour, the site should be treated as being in NEC C, regardless of the $L_{Aeq,8hr}$ (except where the $L_{Aeq,8hr}$ already puts the site in NEC D).

13.2.5 Paragraph 10 of PPG 24 primarily concentrates on proposed new residential units and considers the introduction of a noise generating development and advises that:

“Much of the development which is necessary for the creation of jobs and the construction and improvement of essential infrastructure will generate noise. The planning system should not place unjustifiable obstacles in the way of such development. Nevertheless, local planning authorities must ensure that development does not cause an unacceptable degree of disturbance. They should also bear in mind that a subsequent intensification or change of use may result in greater intrusion and they may wish to consider the use of appropriate conditions.”

13.2.6 Paragraph 15 of PPG 24 notes that:

“The appropriate use of planning conditions can enable many development proposals to proceed where it would otherwise be necessary to refuse permission.”

13.2.7 Paragraph 19 of Annex 3 of PPG 24 recommends that where appropriate, the guidance in British Standard 4142: 1990 (BS 4142)⁴ should be used to assess noise from industrial developments. Subsequent to PPG 24, BS 4142: 1997⁵ has been issued, superseding the 1990 version. This revision is broadly similar, but clarifies certain aspects of the Standard where there had been some ambiguities. An overview of BS 4142:1997 is provided in the methodology section of this Chapter.

13.2.8 In relation to sporting events and entertainment, paragraph 11 of PPG 24 advises that:

“The impact of noise from sport, recreation and entertainment will depend, to a large extent, on frequency of use and the design of facilities. More detailed advice on factors to consider in relation to the major noise sources, including roads, railways, airports, industrial and recreational noise and measurement, are given in Annex 3.”

13.2.9 Paragraph 22 of Annex 3 of PPG 24 states that:

“For these activities (which include open air pop concerts), the local planning authority will have to take account of how frequently the noise will be generated and how disturbing it will be, and balance the enjoyment of the participants against nuisance to other people. Partially open buildings such as stadia may not be in frequent use. Depending on local circumstances and public opinion, local planning authorities may consider it reasonable to permit higher noise emission levels than they would from industrial development, subject to a limit on the

hours of use, and the control of noise emissions (including public address systems) during unsocial hours....”

International Guidance – The World Health Organisation: Guidelines for Community Noise, 2000⁶

13.2.10 The World Health Organisation (WHO) published guidance on the desirable levels of environmental noise in 2000. In this document, Guidelines for Community Noise⁶, the authors consider that sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8hr}$ or an external level of 45 dB $L_{Aeq,8hr}$, measured at 1m from the façade. It is also suggested that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB, should not be exceeded.

13.2.11 For daytime levels, it is considered that:

“To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces, and outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq} . Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.”

13.2.12 However, from a review of health effects based noise assessment methods undertaken for the DETR by Porter et al in 1998⁷, just before the issue of Guidelines for Community Noise, it is noted that:

“Perhaps the main weakness of both WHO-inspired documents is that they fail to consider the practicality of actually being able to achieve any of the stated guideline values.”

13.2.13 The report goes on to state that:

“around 56% of the population in England and Wales are exposed to daytime noise levels exceeding 55 dB L_{Aeq} and that around 65% are exposed to night-time noise levels exceeding 45 dB L_{Aeq} (as measured outside the house in each case). The value of 45 dB L_{Aeq} night-time outdoors is equivalent to the 1995 WHO guideline value of 30 dB L_{Aeq} night-time indoors allowing 15 dB attenuation from outdoors to indoors for a partially open window (for free air ventilation to the bedroom). The percentages exposed above the WHO guideline values could not be significantly reduced without drastic action to virtually eliminate road traffic noise and other forms of transportation noise (including public transport) from the vicinity of houses. The social and economic consequences of such action would be likely to be far greater than any environmental advantages of reducing the proportion of the population annoyed by noise. In addition, there is no evidence that anything other than a small minority of the population

exposed at such noise levels find them to be particularly onerous in the context of their daily lives.”

13.2.14 Based on the most recent national survey of noise exposure carried out in England and Wales in 2000/2001, the percentage of the population exposed to day and night-time noise levels exceeding the WHO guidelines are 54% and 67%, respectively. The studies indicate that:

“the percentage of the UK population exposed to daytime levels of 55 dB $L_{Aeq,16hr}$ or greater, have decreased since 1990, whilst the percentage of the UK population exposed to night-time levels of 45 dB $L_{Aeq,8hr}$ or greater, have increased since 1990, although this change is not considered statistically significant”⁸.

Therefore, the levels suggested in Guidelines for Community Noise may be considered more aspirational than immediately attainable.

Regional Planning Policy – The London Plan Consolidated with Alterations since 2004 (2008)

13.2.15 The London Plan Consolidated with Alterations since 2004 (2008) (the “London Plan”)⁹, outlines a number of policies in response to environmental issues. Specifically Policy 4A.3, Sustainable Design and Construction and Policy 4A.20 – a Reducing Noise and Enhancing Soundscapes, relate to noise reduction and how this should be achieved.

13.2.16 Policy 4A.3 Sustainable Design and Construction, states that:

“The Mayor will, and boroughs should, ensure future developments meet the highest standards of sustainable design and construction and reflect this principle in DPD policies. These will include measures to:

reduce adverse noise impacts.”

13.2.17 Policy 4A.20, Reducing Noise and Enhancing Soundscapes, states that:

“The Mayor will and boroughs in DPDs should reduce noise by:

- *minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*
- *separating new noise sensitive development from major noise sources wherever practicable;*
- *supporting new technologies and improved practices to reduce noise at source, especially in road, rail and air transport;*
- *reducing the impact of traffic noise through highway management and transport policies (see Chapter 3C);*

- *containing noise from late night entertainment and other 24-hour activities, and where appropriate promoting well-managed designated locations (see Chapter 3D);*
- *identifying areas of relative tranquillity, which it is intended should be protected or enhanced.*
- *The Mayor will work with strategic partners to ensure that the transport, spatial and design policies of this plan support the objectives, policies and proposals set out in the London Ambient Noise Strategy.*
- *The policies of the London Plan are intended to support the objectives, policies and proposals of the Mayor's Ambient Noise Strategy (2004).*

Regional Planning Policy

The Draft Replacement London Plan 2009¹⁰

13.2.18 Policy 7.15 'Reducing noise and enhancing soundscapes' states:

'Strategic

A The transport, spatial and design policies of this plan will be implemented in order to reduce noise and support the objectives of the Mayor's Ambient Noise Strategy

Planning decisions

B Development proposals should seek to reduce noise by:

a minimising the existing and potential impacts of noise on, from, within, or in the vicinity of development proposals

b separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference on sole reliance on sound insulation

c promote new technologies and improved practices to reduce noise at source

LDF Preparation

C Boroughs and others with relevant responsibilities should have policies to;

a reduce the adverse impact of noise through the distribution of noise-making and noise-sensitive uses in highway management and transport policies (see Chapter 6)

b identify and protect Quiet Areas and spaces of relative tranquillity or high soundscape quality through borough Open Space Strategies.'

The Mayor's London Ambient Noise Strategy (2004)

13.2.19 In March 2004, The Greater London Authority published the Mayor's Ambient Noise Strategy¹¹. The Strategy is part of a European Union (EU) drive towards more active management of ambient environmental noise. The Strategy primarily relates to the noise impact of transportation sources; however, reference is also made to a number of issues, mainly construction, urban planning and design. The overall vision of the Mayor's Ambient Noise Strategy is set out in Paragraph 3.2, which states that:

“to minimise the adverse impacts of noise on people living and working in, and visiting London using the best available practices and technology within a sustainable development framework.”

13.2.20 The Mayor's Ambient Noise Strategy focuses on improved management of transport systems, town planning and building design. To address these issues a number of different policy statements have been proposed. Some of these policies are aimed at Government, whilst others are aimed at organisations such as Transport for London (TfL) and Network Rail. The policies range from practical approaches required to minimise noise, to proposals for future research and development into transportation noise mitigation and applying appropriate controls as part of the planning system. Early priorities include lower road noise surfaces and improved design of new residential accommodation.

Local Planning Policy - Lewisham Unitary Development Plan 2004¹²

13.2.21 The policies contained in Chapter 4 of the UDP addresses Environmental Protection. The introduction to this chapter states:

“The Council intends with these policies, as far as is possible through the town planning system, to moderate and control the environmental impact of various activities on the environment of the Borough”

13.2.22 Policy ENV.PRO 11 addresses noise generating development as follows;

“The Council will resist development that could lead to unacceptable levels of noise. Where noise-sensitive development is proposed close to an existing source of noise, or when a noise generating development is proposed, the Council may require the developers to have prepared a detailed noise impact survey outlining possible attenuation measures.”

Lewisham Local Development Framework Core Strategy, Submitted 2010¹³

13.2.23 Core Strategy Objective 5: Climate Change contains the following reference to noise;

‘The Council with its partners will take action to ensure that climate change is adapted to and mitigated against including those measures necessary to create a low carbon borough and reduce carbon emissions by:

....

- f. *minimising the environmental impacts of development including water, noise and air pollution'*

13.2.24 Core Strategy Objective 9: Transport and accessibility states that the Council:

"facilitates the movement of freight while minimising the impacts of traffic noise, and emissions"

13.2.25 Strategic Site Allocation (SSA3) for Surrey Canal Triangle contains the following reference:

" The Surrey Canal Triangle site is allocated for mixed use development. The Council will require a comprehensive phased approach to redevelopment inline with an approved Masterplan that delivers the following priorities.....

k. ensures appropriate noise mitigation against the surrounding railway viaducts."

13.3 Methodology and assessment criteria

13.3.1 This section details the methodology and the assessment criteria used to assess noise and vibration arising from and effecting the Proposed Development. The baseline has been defined by undertaking noise and vibration surveys at locations around the Site representative of existing and future noise sensitive receptors.

13.3.2 The future conditions have been predicted using SoundPLAN acoustic modelling software and for noise these calculated levels have been used to determine the suitability of the Site for residential development.

Definition of Significance

Construction Noise and Vibration

13.3.3 British Standard 5228 'Code of practice for noise and vibration control on construction and open sites' (BS 5228)^{13,14} , is a two part standard which provides guidance, information and procedures on the control of noise and vibration from construction sites, including piling.

13.3.4 There are no set standards for the definition of the significance of construction noise effects, however, example criteria for noise are provided in BS 5228 part 1 Annex E, and example criteria for vibration are provided in BS 5228 part 2 Annex B. The assessment of whether changes in noise levels due to construction activity constitute significant effects will be dependent on the absolute levels of ambient and construction noise, as well as the magnitude, duration, time of occurrence and frequency of the noise change.

13.3.5 Part 1 provides basic information and recommendations for methods of noise control relating to construction and open sites where work activities / operations generate significant noise

levels. It includes sections on: community relations; noise and persons on site, neighbourhood nuisance; project supervision; and control of noise. However, annexes include: information on legislative background; noise sources, remedies and their effectiveness (mitigation options); current and historic sound level data on site equipment and site activities; significance of noise effects; calculation procedures estimating noise from sites and noise monitoring; types of piling; and air overpressure.

13.3.6 Part 2 covers basic information and recommendations for basic methods of vibration control relating to construction and open sites where work activities / operations generate significant vibration levels. It includes sections on: community relations; vibration and persons on site; neighbourhood nuisance; project supervision; control of vibration and measurement. BS 5228 Part 2 refers to BS 7385¹⁵ and BS 6472¹⁶, for further advice on the significance of vibration.

13.3.7 Piling and the use of other plant and machinery can generate ground borne vibration at properties close to construction sites. The primary cause of community concern generally relates to building damage, although concerns are often expressed at levels of vibration significantly lower than that likely to cause damage.

13.3.8 The significance of construction noise at dwellings has been determined with reference to BS5228 Part 1, Annex E, section E.3.3 reproduced below;

“Noise levels from construction are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient by 5 dB or more, subject to the lower cut off values of 65 dB, 55 dB and 45 dB L_{Aeq} , period from construction noise alone for daytime, evening and night-time periods respectively, and a duration of one month or more, unless works of a shorter duration are likely to result in a significant impact.

These evaluative criteria are generally applied to the following resources:

- *Residential housing;*
- *Hotels and hostels;*
- *Buildings in religious use;*
- *Buildings in educational use;*
- *Buildings in health and/or community use.*

For public open space, impact might be deemed significant if the total noise (pre-construction ambient plus construction noise) exceeds the preconstruction ambient noise by 5 dB or more for a period of one month or more. However the area impacted relative to the total available area needs to be taken into account.”

Fixed Mechanical Plant

13.3.9 BS 4142⁵ provides a method for rating industrial noise affecting mixed residential and industrial areas. It is used extensively by local authorities and consultants to rate noise from fixed installations, such as plant noise.

13.3.10 The Standard advocates the use of L_{Aeq} , a level that is directly measurable. The L_{Aeq} is either measured or calculated at a receptor location and this is termed the 'specific noise level'. The specific noise level may then be corrected for the character of the noise, if appropriate, and it is then termed the 'rating level', whether or not a correction is applied. A correction of +5 dB is made if the noise contains any discrete tones, e.g. hums or whistles, any impulsive characteristics such as crashes, bangs or thumps, or if the noise is irregular enough in character to attract attention.

13.3.11 When used to rate the likelihood of complaints, the rating level is determined and the L_{A90} background noise level is subtracted from it. Where positive differences occur, the greater the difference between the two levels, the greater the likelihood of complaints. Where negative differences occur, the greater the difference between the two levels, the lesser the likelihood of complaints. A difference of around +10 dB or higher indicates that complaints are likely; a difference of around +5 dB is of marginal significance; and a difference of -10 dB is a positive indication that complaints are unlikely.

13.3.12 BS 4142 states that measurement positions should be outside buildings in free-field conditions, where the microphone is at least 3.5m from any reflecting surfaces other than the ground and at a preferred height of between 1.2m and 1.5m above ground level. However, where it is necessary to make measurements above ground floor level, the measurement position, height and distance from reflecting surfaces should be reported, ideally measurements should be made at a position 1m from the façade of the relevant floor.

Railway Noise

13.3.13 The Department of Transport document, Calculation of Railway Noise (CRN)¹⁷, describes the procedures for measuring and calculating noise from moving railway vehicles as defined in the Noise Insulation (Railway and Other Guided Transport Systems) Regulations. These procedures are necessary to enable entitlement under the Regulations to be determined but they also provide guidance on the calculation of railway noise for more general applications e.g. the assessment of the noise impact of railways, the design and location of new tracks and land use planning in the vicinity of existing or planned railways. The document can also be used to generate scaling factors for expected increases in use.

Road Traffic Noise

13.3.14 The Department of Transport document, Calculation of Road Traffic Noise (CRTN)¹⁸ provides a methodology for predicting noise levels generated by road traffic.

13.3.15 An approach has been used in the UK over a number of years for assessing road traffic and railway noise, based on the premise that subjective response to noise from a new source is proportional to the change in overall noise level. As a 3 dB change in noise level is just noticeable, it is generally accepted that, in environmental assessment terms, this can be assumed as the threshold at which a noise impact becomes significant for traffic noise. In addition, it is often considered useful to categorise the degree of impact according to the extent of the predicted noise change. This is frequently implemented by the use of semantic descriptors associated with noise change bands. The adopted scale is shown below in Table 13.2.

Table 13.2: Noise Change – Impact Magnitude Road and Railway Noise

Impact Magnitude	Noise Level Change
High	An increase of 10 – 14.9 dB
Medium	An increase of 5 – 9.9 dB
Low	An increase of 3 – 4.9 dB
No significant change	An increase of less than 3 dB

British Standard 6472 'Guide to evaluation of human exposure to vibration in buildings', 2008¹⁷

13.3.16 The human body is an excellent detector of vibration, which can become perceptible at levels that are substantially lower than those required to cause even cosmetic building damage. The way in which people perceive vibration in buildings depends upon various factors, including the vibration duration, frequency, direction and activity.

13.3.17 Present knowledge indicates that how people inside a building respond to vibration from sources within and outwith the building, with the exception of blasting, is best evaluated with the Vibration Dose Value (VDV), as promoted through British Standard 6472 'Guide to evaluation of human exposure to vibration in buildings, Part 1: Vibration sources other than blasting' (BS 6472-1).

13.3.18 VDV defines a relationship that yields a consistent assessment of intermittent, occasional and impulsive vibration, as well as continuous input, and correlates well with subjective response. The VDV is given by the fourth root of the time integral of the fourth power of the acceleration after it has been frequency weighted. BS 6472-1 provides separate weighting curves related to human response for vibration in the vertical and the horizontal directions.

13.3.19 The VDV is evaluated at the point of entry to the subject. If direct measurement is not possible, for example, on a building that has not yet been built, then BS 6472-1 states that it will be necessary to estimate the vibration environment to be expected within the building. Appendix D of BS 6472-1 contains guidance on the estimation of building vibration response.

13.3.20 The VDV's associated with various probabilities of adverse comment within residential buildings are provided in Table 13.4. For offices and workshops, BS 6472-1 states that multiplying factors of 2 and 4, respectively, should be applied to the values provided in Table 1. The criteria are presented as ranges due to the widely differing susceptibility to vibration evident among members of the population and also their differing expectations of the vibration environment. BS 6472-1 states that adverse comment is not expected for VDV's below the ranges in Table 13.3.

Table 13.3: Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings

Place	Low probability of adverse comment (m/s ^{1.75})	Adverse comment possible (m/s ^{1.75})	Adverse comment probable (m/s ^{1.75})
Residential buildings 16 hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Study Area

13.3.21 The effects likely to arise from the Proposed Development are those from the construction and demolition activities, and those from the operational phase. The effects from the operational phase would arise from any increase in noise levels from additional road traffic on the immediate highway network, and from noise from fixed plant provided as part of the Proposed Development, including the 'Envac' waste system, on both existing receptors around and remaining within the Application Site and future receptors within the Proposed Development.

13.3.22 To capture these effects, the study area considered in this Chapter is bounded to the north by the most northerly point of the Application Site, and is roughly triangular in shape with the

eastern side bounded by Ilderton Road, the western side by the London to Kent Network Rail lines, and to the south by Rollins Street.

13.3.23 The selection of the baseline noise and vibration receptor locations has been chosen to reflect the extent and sensitivities of the study area. These have been derived from the consideration of likely sensitive receptors and include locations within and outwith the Application Site,

Consultations

13.3.24 Initial consultation with LBL was undertaken as part of the formal ES Scoping Exercise, which included noise and vibration matters (Technical Appendix 1.2).

13.3.25 The LBL Scoping Opinion dated 14th July 2010 (Ref: 10/74106) included a section in Appendix 1 on noise and vibration (Technical Appendix 1.2). The matters covered in this section related to the conduct of the baseline noise and vibration surveys, which were requested to be a combination of long term (over a minimum of 4 days and covering a weekend, night time and match days and non match days at Millwall FC Stadium) and short term measurements all undertaken outside the school holidays. Fixed plant noise was requested to be assessed using BS4142 and to achieve a rating level of 5 dB below the lowest background at any time.

13.3.26 Construction and demolition noise was requested to be assessed in terms of BS 5228 and construction and demolition vibration is to be assessed as per the guidance in BS6472. Reference was requested to be made to the South London 'Control of pollution and noise from demolition and construction sites'²⁰ and the S61 procedure under the Control of Pollution Act 1974²¹ is to be used for the demolition and construction phase.

13.3.27 The usability of all proposed public space was requested to be considered as well as the usability of balconies, if proposed.

13.3.28 A clear distinction is to be made between the mitigation provided as part of the Proposed Development and any additional proposed as part of the EIA assessment process.

13.3.29 Further clarification was received by email from the LBL Planning Consultant, Graham Harrington, on 26th October 2010. Within this communication, the baseline noise survey locations for long term surveys were more closely defined to include a position on Millwall FC land that could be used to represent noise levels from, amongst other matters, football matches. Noise measurement locations above ground level were also recommended.

Uncertainty/Assumptions

13.3.30 The baseline noise and vibration measurements for this study have been governed by the availability of suitable locations. The Application Site is currently the source of noise

generating activities associated with the employment and sporting uses therein. The Millwall FC Stadium is to remain on the Application Site and thus will remain a noise source, whereas the current employment uses are to be replaced. As well as including off site noise sources which will remain in the area, the baseline survey includes a contribution from sources which will not be present as part of the Proposed Development, including the waste transfer uses off site to the north of the Application Site, and thus may have led to an overestimation of noise levels when considering site suitability for residential development.

13.3.31 Baseline noise measurements have been made at ground level across the site and at elevation.

13.3.32 The Site provided few locations from which to measure vibration levels. The locations have been chosen to provide representative measurements close the primary sources of vibration, the railway lines, based upon limitations of access, security and the suitability of the ground for mounting the accelerometer array.

13.3.33 The railway inputs into the SoundPLAN noise model have been determined by four separate on-site observations of actual flows, including the peak period 08:00 hrs – 10:00 hrs. Train lengths and speeds have been estimated from these observations. Where there was any uncertainty regarding the length of a train arose, the maximum number of coaches has been used in the model. It is assumed that there are no significant rail freight movements on the railway network that would affect the Proposed Development. This is based on the site observations, contact with freight operators and with reference to the TfL Rail Freight Strategy²², which does not identify this part of the rail network as handling freight traffic.

13.3.34 ISO 9613-2 states that accuracy of the prediction method is +/- 3 dB for distances between 100 and 1,000 m. SoundPLAN claims an accuracy of within 0.2 dB.

13.3.35 It is assumed that there will be no vehicles accessing the waste sites to the north-east of the Application Site on Bolina Road.

13.4 Aspects of the Proposed Development of relevance to the assessment

13.4.1 The following aspects are considered to be of relevance;

- Noise from construction of and demolition for the Proposed Development
- Vibration from construction of and demolition for the Proposed Development
- Noise from road traffic, including servicing traffic, generated by the Proposed Development
- Noise from fixed plant provided in connection with the Proposed Development
- The effect of noise from football matches held at Millwall FC Stadium on noise sensitive uses within the Proposed Development.

Worst case scenario

13.4.2 The following aspects have been taken into account and implemented as part of the assessment;

- Highest recorded number of train movements,
- Highest recorded noise levels of noise from Millwall FC Stadium,
- Closest distances between construction works and receptors used.

13.5 Baseline situation

13.5.1 The Application Site currently consists of a number of noise generating activities ranging from small industrial concerns, vehicle repair units and scaffold yards, to the sports facilities provided in association with Millwall FC Stadium and the Lions Centre. There are two railway lines on embankment and viaduct and bridges along the boundaries of Application Site, the South London Line to the west and a loop of the London to Croydon Line to the west. The London to Croydon and the London to Kent lines are on viaducts and bridges at 20 m and 100 m respectively from the closest easterly points of the Application Site.

13.5.2 The primary noise sources from the surrounding road network arise from Surrey Canal Road, which passes through the Application Site and Ilderton Road to the west of the site. Traffic flows on Zampa Road, Stockholm Road, Bolina Road and Rollins Street are noted to be low and of less significance. The Application Site is over-flown by commercial aircraft of a type and at an altitude that is consistent with air traffic using London Heathrow Airport.

13.5.3 Site observations made during the daytime and night-time including at elevation did not identify the SELCHP plant as a significant noise source. It was not possible to identify any

discernable noise emanating from this site, although its contribution, including noise from vehicle movements, is part of the baseline.

- 13.5.4 In order to establish the baseline conditions, short term and long term noise and short term vibration surveys were carried out at locations on the Application Site. Short term baseline noise and vibration surveys were carried out on 11th November 2009, with additional noise surveys carried out during the football match at Millwall FC Stadium on 9th November 2009. Long term noise surveys were carried out between Sunday 7th and Thursday 18th November 2010 at two elevated locations.

Baseline Noise Monitoring

- 13.5.5 Short term baseline noise surveys were carried out at four locations (N01, N02, N03 and N04) located in Figure 13.1, over 15 minute intervals during the daytime and night-time periods. Measurements were taken at an additional two locations (N05 and N06) during the football match at Millwall FC Stadium.
- 13.5.6 Measurements were taken using a B&K 2250 Class 1 Sound Level Meter. For each survey the meter was mounted on a tripod at a distance of 1.5 m above local ground level in a free-field location (at least 3.5 m away from reflecting surfaces, excluding the ground). The meter was calibrated prior to and following each set of measurements using a B&K 4231 calibrator. There was no significant drift during the survey period. Calibration certificates for the equipment are available on request.
- 13.5.7 Meteorological conditions were observed during the survey periods. On the 9th November 2009 during the football match conditions were dry and mild with wind speeds of approximately 1m/s at measurement locations. During the night-time of 11th November 2009 conditions were dry and mild with wind speeds of less than 1 m/s at measurement locations. During the daytime of 11th November 2009 conditions were mostly dry with occasional showers and wind speeds of approximately 1 m/s at measurement locations. Conditions were therefore considered to be acceptable for noise monitoring.

Noise Monitoring Location 1 N01

- 13.5.8 Noise Monitoring Location 1 (N01) was to the north-west of the Application Site on the northern apex of Bolina 1 and 2, in the yard area behind the current industrial buildings, with line of sight to railway lines running to the north and west of the Site. Sources of noise at this location were railway trains, aircraft, announcements at South Bermondsey station, vehicles moving on the nearby industrial site, general noise from industrial buildings and music. Noise from railway trains and announcements were dominant when present. However, during the rest of the periods noise from the industrial buildings was dominant.

Noise Monitoring Location 2 N02

13.5.9 Noise Monitoring Location 2 (N02) was on Stockholm Road between Stockholm 1 and Stadium Avenue, approximately 60 m from the railway line running to the west. Sources of noise in this location were road traffic on Ilderton Road, railway trains from the line running to the west, aircraft and vehicle movements with the Millwall FC Stadium car park.

Noise Monitoring Location 3 N03

13.5.10 Noise Monitoring Location 3 (N03) was on the public footpath opposite Surrey Canal Road between Stockholm 1 and Stockholm 2. The dominant noise source in this location was traffic on Surrey Canal Road. Other sources of noise were aircraft and railway trains.

Noise Monitoring Location 4 N04

13.5.11 Noise Monitoring Location 4 (N04) was on the public footpath opposite Surrey Canal Road, on the eastern boundary of Orion, approximately 20 m to the west of the railway bridge. The dominant noise source in this location was traffic on Surrey Canal Road. Other sources of noise were aircraft and railway trains.

Noise Monitoring Location 5 N05

13.5.12 Noise Monitoring Location 5 (N05) was between Bolina West and Stadium Avenue, on the pavement of Bolina Road, opposite the Lion's Centre, approximately 40 m from Millwall FC Stadium. Sources of noise included fans singing and shouting, whistles from the football match, vehicles moving on Bolina Road and in Millwall FC Stadium car-park and people talking and shouting in the street.

Noise Monitoring Location 6 N06

13.5.13 Noise Monitoring Location 6 (N06) was on Stockholm Road between The Stadium and Stockholm 2, approximately 15 m from Millwall FC Stadium. Sources of noise included fans singing and shouting, whistles from the football match, vehicles moving in Millwall FC Stadium car-park, traffic on Ilderton Road and railway trains.

Noise Monitoring Location 7 LT01

13.5.14 Long term Noise Monitoring Location 7 (LT01) was between Bolina West and Stadium Avenue, on the roof of the west stand of the Millwall FC Stadium overlooking the pitch. The microphone was at a height of approximately 22 metres above ground level. South Bermondsey railway station was approximately 300m to the north-east, with the South London rail line approximately 100m to the east. Sources of noise in this location were activities in and around the Millwall FC Stadium, traffic on Ilderton Road and Surrey Canal Road, railway trains and aircraft. During the measurement period there were two first team football matches held at the stadium on Tuesday 9th November 2010 (kick-off 19:45 hrs) and on Saturday 13th November 2010 (kick-off 15:00 hrs).

Noise Monitoring Location 8 LT02

13.5.15 Long term Noise Monitoring Location 8 (LT02) was on the southern boundary of the Application Site between Excelsior 3 and Excelsior 4, on the roof of 'Guild House', a 19th century brick-built industrial building of 4 storeys with a flat roof. The microphone was at a height of approximately 15 metres above ground level. South Bermondsey railway station was approximately 570m to the north-west, with the South Bermondsey rail line approximately 150m to the west. Sources of noise at this location were railway trains, aircraft, announcements at South Bermondsey station, vehicles moving in the nearby industrial site, and general noise from industrial buildings. Noise from railway trains was dominant in terms of noise energy, however, in periods when no trains were passing noise from the industrial buildings on the Application Site could be clearly heard.

Baseline Noise Monitoring Results

13.5.16 A summary of the measured noise levels is provided in Tables 13.4 to 13.6 below. Data have been rounded to zero decimal places. The full data sets can be found in Technical Appendix 13.1. The long term measurement data has been adjusted to remove periods of wind speeds greater than 5 m/s and significant rainfall. The number of hours in each data set is reported in the tables;

Table 13.4 Summary of Long Term Measured Survey Data LT01 Millwall FC Stadium

Date at Start of Period	Day	Daytime (07.00 to 19.00 hours)		Daytime (07.00 to 23.00 hours)			Night-time (23.00 to 07.00 hours)		
		L _{Aeq,12h} (dB)	Hours in Dataset	L _{Aeq,16h} (dB)	L _{A90} (dB)	Hours in Dataset	L _{Aeq,8h} (dB)	L _{A90} (dB)	Hours in Dataset
07/11/2010	Sunday	55	12	54	47	16	49	45	8
08/11/2010	Monday	55	3	53	48	7	49	43	4
09/11/2010	Tuesday*	58	9	71	56	13	52	46	8
10/11/2010	Wednesday	60	12	60	52	16	53	46	6
11/11/2010	Thursday	59	3	59	54	6	55	48	8
12/11/2010	Friday	59	6	59	55	6	52	45	8
13/11/2010	Saturday*	69	12	68	52	16	50	44	5
14/11/2010	Sunday	62	7	61	48	11	50	45	8
15/11/2010	Monday	57	12	56	50	16	49	45	6
16/11/2010	Tuesday	56	12	56	50	15	49	45	7
17/11/2010	Wednesday	54	12	54	50	14	50	46	2
18/11/2010	Thursday	53	7.25	53	50	7.25			0
Mean	Mon - Fri	57		58	52		51	46	
	Mon - Sat	58		59	52		51	45	
	Sun	59		58	48		50	45	
Minimum	All Days	53		53	47		49	43	
Mean	All Days	58		59	51		47	42	

* Includes football match played at the Stadium

Table 13.5 Summary of Long Term Measured Survey Data LT01 Guild House

Date at Start of Period	Day	Daytime (07.00 to 19.00 hours)		Daytime (07.00 to 23.00 hours)			Night-time (23.00 to 07.00 hours)		
		L _{Aeq,12h} (dB)	Hours in Dataset	L _{Aeq,16h} (dB)	L _{A90} (dB)	Hours in Dataset	L _{Aeq,8h} (dB)	L _{A90} (dB)	Hours in Dataset
07/11/2010	Sunday	60	12	60	53	16	55	48	8
08/11/2010	Monday	62	3	61	54	7	56	49	4
09/11/2010	Tuesday	63	9	63	58	13	57	50	8
10/11/2010	Wednesday	63	12	62	56	16	58	51	6
11/11/2010	Thursday	65	3	65	58	6	64	53	8
12/11/2010	Friday	65	6	65	58	6	56	49	8
13/11/2010	Saturday	61	12	61	54	16	56	47	5
14/11/2010	Sunday	60	7	60	52	11	56	49	8
15/11/2010	Monday	63	12	63	57	16	55	49	6
16/11/2010	Tuesday	63	12	62	57	15	56	49	7
17/11/2010	Wednesday	62	12	62	57	14	59	52	2
18/11/2010	Thursday	62	7.75	62	57	7.75			0
Mean	Mon - Fri	63		63	57		58	50	
	Mon - Sat	63		63	57		57	50	
	Sun	60		60	53		56	49	
Minimum	All Days	60		60	52		55	48	
Mean	All Days	62		62	56		52	46	

Table 13.6 : Summary of Short Term Measured Noise Levels

Location	Date / Time	Period	Noise Survey Metric (dB)			
			L _{Aeq}	L _{ASmax}	L _{A10}	L _{A90}
1	11/11/2009 00:05	Night-time	47	68	46	34
	11/11/2009 01:33	Night-time	43	68	42	33
	11/11/2009 10:03	Daytime	57	67	61	50
	11/11/2009 11:32	Daytime	58	76	61	48
	11/11/2009 13:49	Daytime	56	66	60	48
2	11/11/2009 00:27	Night-time	49	63	50	46
	11/11/2009 01:54	Night-time	50	71	52	46
	11/11/2009 10:26	Daytime	60	78	62	52
	11/11/2009 11:55	Daytime	59	70	61	54
	11/11/2009 14:12	Daytime	58	75	60	51
3	11/11/2009 00:49	Night-time	62	78	64	37
	11/11/2009 02:14	Night-time	62	81	62	36
	11/11/2009 10:46	Daytime	71	83	75	60
	11/11/2009 12:14	Daytime	72	86	75	58
	11/11/2009 14:31	Daytime	71	82	75	56
4	11/11/2009 01:10	Night-time	59	77	62	36
	11/11/2009 02:33	Night-time	56	71	60	34
	11/11/2009 11:05	Daytime	70	82	74	61
	11/11/2009 12:55	Daytime	70	81	73	57
	11/11/2009 14:50	Daytime	73	92	75	62
5	09/11/2009 19:46*	During minute's silence prior to football match	50	55	52	47

6	09/11/2009 19:48	During football match	67	77	70	58
	09/11/2009 20:36	During football match	63	75	67	55
	09/11/2009 20:12	During football match	67	80	71	57
	09/11/2009 20:56	During football match	66	77	69	58

*measurement taken over a 30s period only

13.5.17 The baseline contains a significant contribution from the current uses on the Site as shown by the comments for both the long and short term measurements. At some parts of the Site station announcements from South Bermondsey station are also reported. Transportation noise from air, rail and road sources are also present. Examination of the long term data for the two periods when there was a football match showed an elevation in noise levels during the period from approximately 1 hour before the matches kicked off and a return to more typical baseline noise levels in the hour after the matches finished.

Baseline Vibration Monitoring

13.5.18 Baseline vibration monitoring was carried out at one location on the Application Site and at one location adjoining the Application Site. This first location (V1) was in the north-west corner on Bolina East approximately 25 m from the railway line running to the west and 70 m from the railway running to the north. Vibration monitoring of train pass-bys was undertaken between 11:30 and 15:30 on the 11th November 2009.

13.5.19 The second location (V2) was land adjacent to Stockholm Road. The measurements were made just beneath the surface of the ground, approximately 20 m from the railway line. The accelerometers were attached to a heavy metal plate and arranged vertically, radially and tangentially to the source. Some of the vibration measurements were influenced by interference from non-rail sources. However, only measurements where there was no interference were used for the vibration assessment. The methodology adopted for deriving the vibration levels can be found in Technical Appendix 13.2. The train samples used considered all the train types, tracks and directions, to provide a worst-case assessment. Tables 13.7 to 13.11 summarise the inputs and show the results of the vibration assessment.

13.5.20 VDV_v are determined in both the vertical and horizontal directions for the daytime period (07:00 to 23:00 hours) and for the night-time period (23:00 to 07:00 hours).

Table 13.7: Location V1 - Summary of Vibration Levels, Daytime

	VDV _{d, DAY} (m/s ^{1.75})	VDV _{d, DAY} (m/s ^{1.75})	VDV _{b, DAY} (m/s ^{1.75})	Semantic Rating (as BS 6472) (Residential)		
	x	y	z	x	y	z
Ground Floor	0.00	0.00	0.03	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'

Upper Floors	0.00	0.00	0.02	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'
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Table 13.8: Location V1 - Summary of Vibration Levels, Night-time

	$VDV_{d,NIGHT}$ ($m/s^{1.75}$)	$VDV_{d,NIGHT}$ ($m/s^{1.75}$)	$VDV_{b,NIGHT}$ ($m/s^{1.75}$)	Semantic Rating (as BS 6472) (Residential)		
	x	y	z	X	y	z
Ground Floor	0.00	0.00	0.02	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'
Upper Floors	0.00	0.00	0.01	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'

Table 13.9: Location V2 - Measured Vibration Levels

Description	Duration (s)	VDV_d ($m/s^{1.75}$)	VDV_d ($m/s^{1.75}$)	VDV_b ($m/s^{1.75}$)
		x	Y	z
Passenger Train, Mean Values	10	0.0029	0.026	0.0064
Passenger Train, Maximum Values	10	0.0040	0.0036	0.0071
Background	10	0.0008	0.0008	0.0021

Table 13.10: Location V2 Summary of Vibration Levels, Daytime

	$VDV_{d,DAY}$ ($m/s^{1.75}$)	$VDV_{d,DAY}$ ($m/s^{1.75}$)	$VDV_{b,DAY}$ ($m/s^{1.75}$)	Semantic Rating (as BS 6472) (Residential)		
	x	y	z	X	y	z
Ground Floor	0.00	0.00	0.07	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'
Upper Floors	0.00	0.00	0.04	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'

Table 13.11: Location V2 Summary of Vibration Levels, Night-time

	VDV _{d,NIGHT} (m/s ^{1.75})	VDV _{d,NIGHT} (m/s ^{1.75})	VDV _{b,NIGHT} (m/s ^{1.75})	Semantic Rating (as BS 6472) (Residential)		
				X	Y	Z
Ground Floor	0.00	0.00	0.04	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'
Upper Floors	0.00	0.00	0.03	'Adverse comment not expected'	'Adverse comment not expected'	'Adverse comment not expected'

13.5.21 The conclusions of the baseline vibration survey are that, as may be anticipated the predominant sources of vibration that would affect the Proposed Development are from the railways on the boundaries of the Site, and that from the measured vibration levels 'adverse comment' from such levels would 'not be expected'.

13.6 Identification and assessment of effects

13.6.1 The Proposed Development has the potential to generate noise and vibration effects during the construction period on sensitive receptors around the Application Site and, as the development progresses, on sensitive receptors within the Application Site. During the operational phase, noise from additional road traffic movements, and from fixed plant to be provided with the Proposed Development will have the potential to affect sensitive receptors around the Application Site and, as the development progresses, affect sensitive receptors within the Application Site. Regard has also been given to the 'snapshot' year (referred to in the ES Scoping Response from the London Borough of Lewisham (Technical Appendix 1.2) , where only part of the Proposed Development is completed and occupied. The effects are no different from the effects described below.

Construction effects

13.6.2 The construction of the Proposed Development would take place in phases. The indicative phasing by plot name is as listed below;

- Phase 1a: Excelsior 1 to Excelsior 4
- Phase 1b: Orion

- Phase 2: Timber Wharf 1 and Timber Wharf 2
- Phase 3: Stockholm 1 and Stockholm 2
- Phase 4: Stadium Avenue and Senegal Way 1 and Senegal Way 2
- Phase 5a: Bolina North 1, Bolina North 2 and Bolina West
- Phase 5b: Bolina East

13.6.3 At this stage a detailed construction programme for each of the phases has yet to be finalised.

13.6.4 Noise emissions from the Site during the construction phase have been predicted using SoundPLAN noise modelling software, which implements the methodology contained within Annex F of BS 5228-1. Source terms have been obtained from Annex C of BS 5228-1 based on typical construction plant and activities for demolition and earthworks, and construction.

13.6.5 Hours of working will be managed as described in the Development Specification as informed by the South London Code of Practice²⁰. Hours of external working and noisy activity will be limited to 08:00 to 18:00 hours Monday to Friday and 08:00 to 13:00 hours on Saturdays. Best practicable means, as defined in BS5228^{14,15} will be employed at all times to reduce noise and vibration to a minimum. However, in some cases working outside these hours will be required to facilitate essential construction activities such as extended concrete pours or power floating slabs cast previously. On such occasions, formal notification will be provided to LBL Environmental Health Officers at least 48 hours in advance and every possible endeavour will be made to minimise these occurrences and any potential noise effects.

13.6.6 Further details regarding construction can be found in Chapter 5 'Demolition and Construction' of this ES.

13.6.7 The parts of the Proposed Development that are occupied prior to final completion of the whole development would be affected by construction activities. Also, those uses remaining within the Application Site whilst construction activities are taking place on earlier phases would also be affected. The receptors within and outside the Application Site that have been considered for construction noise are as follows and are shown in Figure 13.2;

- Flats south side of Rollins Street (outside Application Site)
- House and live work units Rollins Street (within Application Site)
- Houses Ilderton Road (outside Application Site)
- 'Caravan' Site Ilderton Road (outside Application Site)
- Façades within the Proposed Development (within Application Site)

- Bridge House Meadows (outside Application Site)
- Millwall Memorial Garden (within Application Site)

13.6.8 The maximum noise predicted noise levels at the closest affected facades of the sensitive receptors for demolition and construction are reported in Table 13.12 below. The assumptions and source terms used in the construction noise assessment can be found in Technical Appendix 13.3. Ambient noise levels have been taken from the long term monitoring locations LT01 and LT02.

Table 13.12: Assessment of construction noise

Phase	Receptor(s)	Demolition $L_{Aeq, T}$ (dB)	Construction $L_{Aeq, T}$ (dB)	Predicted level above ambient $L_{Aeq, T}$ (dB)	Significant
1a and 1b	Houses and Live Work Units, Flats Rollins Street, Bridge House Meadows	69	67	+4, +2	Low
2	Flats Rollins Street	68	62	+3, - 3	Low
3	Timber Wharf Blocks 6 and 9	71	67	+6, +2	Medium
4	Stockholm 1 and 2 Millwall Memorial Garden	74	70	+9, +5	Medium
5a	Stadium Avenue Block 1	63	60	-2, -5	No
5b	Bolina West Blocks 2 and 3	70	68	+5, +3	Medium

13.6.9 The table above shows that predicted noise level would be significant during construction and/or demolition during Phases 1 a, 1b, 2, 3, 4 and 5b. It is noted that the maximum noise level of $L_{Aeq, T}$ 75 dB, as generally used to control noise levels in London and other urban locations, is not predicted to be exceeded.

13.6.10 The construction of the Proposed Development would be over a fifteen year period over different parts of the Site. As such the application of best practicable means to control noise and vibration for this term is recognised as a fundamental requirement to reduce the effects from this process. Effects from the noise from demolition and construction are predicted to be local, medium temporary and reversible.

13.6.11 It is considered that changes to the phasing considered in Table 13.12 are not likely to result in any significant changes to the effects reported in this table.

13.6.12 Vibration within sensitive premises, (dwellings offices etc), may arise as a consequence of the demolition and construction process. At present, there is insufficient information to predict with accuracy the levels of vibration that may result primarily from any piling and demolition activities. The effects of vibration are likely to be local, medium, temporary and reversible.

Site Suitability

13.6.13 Due to the size of the Application Site, affected as it is by road and rail traffic, and the varying proposed building heights, the Site suitability assessment has been undertaken in two ways;

- With reference to baseline data as detailed in 13.5 above
- With reference to modelled, combined road and rail noise

13.6.14 The first approach has been used to identify the areas of the Site in relation to current noise levels in line with the NEC categories with reference to existing noise levels. As has been noted in 13.5, the noise levels from which these categories have been derived, are likely to have been affected to some degree by on-site light industrial activities, which may have led to an over estimation of future levels.

Table 13.13: NEC categories for Proposed Development

Plot	Short Term	Long Term	NEC Day	NEC Night
Bolina North	N01	LT01	B	B
Bolina East	N01	LT01	B	B
Bolina West	N01	LT01	B	B
Stadium Avenue	N02	LT01	B	B
Stockholm 1	N02, N03	LT01	B/C	B/C
Stockholm 2	N02,N03	LT01	B/C	B/C
Senegal Way	N02	LT01	B	B

Orion	N04	LT01, LT02	B/C	B/C
Excelsior	N03	LT02	B/C	B/C
Timber Wharf	N03	LT02	B/C	B/C

13.6.15 The advice regarding NEC B is that:

'noise should be taken into account when determining planning applications and, where appropriate, conditions should be imposed to ensure a commensurate level against noise'

13.6.16 As is common in cities along transport corridors such as Surrey Canal Road, potential residential parts of sites, as is the case here fall within NEC C, where the advice is;

'planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.'

13.6.17 L_{Amax} noise levels measured during the night-time at both long term and short term locations, with the exception of the period 23:00 11th November 2010 to 07:00 12th November 2010 at LT02, do not exceed L_{Amax} 82 dB, which would require the reclassification of area within NEC A or NEC B as NEC. A comparison of this period with the rest of the data indicates that this is an infrequent occurrence, not typical of the prevailing noise climate, and as such cannot be categorised as regularly *'exceeding $L_{Amax(S)}$ 82 dB several times in any hour'*.

13.6.18 The second approach has been used to determine, in relation to the internal noise levels contained within the Development Specification, what the requirements will be for the building design to meet these requirements. The modelled results for combined road and rail noise for the fully completed development, excluding and including those for the proposed East London Line Extension (derived from the Environmental Statement²³ for the Extension) and Thameslink 2000, and predict that the highest noise levels will occur at the elevations facing Surrey Canal Road, where noise levels are as shown in Tables 13.14 and 13.15 below, together with the anticipated sound insulation that would be afforded by thermal insulating windows taken from BS8233:1999 Table 10. The full results are provided in Technical Appendices 13.3 and 13.4, with noise contour plots provided as Figures 13.3 and 13.4:

Table 13.14: Predicted combined road and rail noise levels without East London Line Extension and Thameslink 2000 07:00 - 23:00

Plot	Predicted L_{Aeq} (dB)	Required internal noise environment	Minimum sound insulation thermal	Achieved internal noise environment

		windows closed (dB)	insulating units (6-12-6) (dB)	windows closed (dB)
Bolina East Plot 1 (1.5m-55.5m)	49 - 60	38	33	16 - 27
Bolina East Plot 3 (1.5m-34.5m)	46 - 61	38	33	13 - 28
Bolina East Plot 4 (1.5m-22.5m)	59 - 60	38	33	26 - 27
Bolina North 1 (1.5m-58.5m)	47 - 62	38	33	14 - 29
Bolina North 2 (1.5m-82.5m)	49 - 60	38	33	16 - 27
Bolina West Plot 1 (1.5m-40.5m)	48 - 61	38	33	15 - 28
Bolina West Plot 2 (1.5m-31.5m)	48 - 61	38	33	15 - 28
Bolina West Plot 3 (1.5m-22.5m)	59 - 61	38	33	26 - 28
Bolina West Plot 4 (1.5m-4.5m)	50 - 53	38	33	17 - 20
Bolina West Plot 5 (1.5m-67.5m)	55 - 63	38	33	22 - 30
Excelsior 1 (1.5m-22.5m)	67 - 72	38	33	34 - 39 ¹
Excelsior 3 Plot 1 (1.5m-25.5m)	51 - 60	38	33	18 - 27
Excelsior 3 Plot 2 (1.5m-70.5m)	62 - 66	38	33	29 - 33

Excelsior 4 (1.5m-19.5m)	60 - 62	38	33	27 - 29
Excelsior 5 (1.5m-10.5m)	58 - 63	38	33	25 - 30
Orion 1 (1.5m-16.5m)	50 - 63	38	33	17 - 30
Orion 2 (1.5m-28.5m)	67 - 70	38	33	34 - 37
Senegal Way 2 (1.5m-37.5m)	48 - 61	38	33	15 - 28
Stadium Avenue Plot 1 (1.5m-40.5m)	54 - 62	38	33	21 - 29
Stadium Avenue Plot 3 (1.5m-25.5m)	55 - 58	38	33	22 - 25
Stockholm 1 Block 2 (1.5m-49.5m)	54 - 69	38	33	21 - 36
Stockholm 1 Plot 3 (1.5m-16.5m)	62 - 69	38	33	29 - 36
Stockholm 1 Plot 4 (1.5m-70.5m)	54 - 69	38	33	21 - 36
Stockholm 2 Plot 1 (1.5m-16.5m)	61 - 69	38	33	28 - 36
Stockholm 2 Plot 2 (1.5m-70.5m)	58 - 65	38	33	25 - 32
Timber Wharf 1 Plot 1 (1.5m-52.5m)	60 - 74	38	33	27 - 41 ²
Timber Wharf 1 Plot 2 (1.5m-43.5m)	56 - 63	38	33	23 - 30
Timber Wharf 1 Plot 3 (1.5m-16.5m)	55 - 61	38	33	22 - 28
Timber Wharf 1 Plot 4	54 - 64	38	33	21 - 31

(1.5m-25.5m)				
Timber Wharf 1 Plot 6 (1.5m-28.5m)	66 - 74	38	33	33 – 41 ²
Timber Wharf 1 Plot 9 (1.5m-28.5m)	66 - 74	38	33	33 – 41 ²
Timber Wharf 2 Block 1 (1.5m-16.5m)	62 -64	38	33	29 - 31
Timber Wharf 2 Plot 2 (1.5m-25.5m)	61 - 63	38	33	28 - 30

¹ At 1.5m facing Surrey Canal Road

² At 1.5m to 7.5m floor facing Surrey Canal Road

Table 13.15: Predicted combined road and rail noise levels with East London Line Extension and Thameslink 2000 07:00 – 23:00

Plot	Predicted L _{Aeq} (dB)	Required internal noise environment windows closed (dB)	Minimum sound insulation thermal insulating units (6-12-6) (dB)	Achieved internal noise environment windows closed (dB)
Bolina East Plot 1 (1.5m-55.5m)	49 - 60	38	33	16 - 27
Bolina East Plot 3 (1.5m-34.5m)	46 - 61	38	33	13 - 28
Bolina East Plot 4 (1.5m-22.5m)	59 - 60	38	33	26 - 27
Bolina North 1 (1.5m-58.5m)	47 - 62	38	33	14 - 29
Bolina North 2 (1.5m-82.5m)	49 - 60	38	33	16 - 27

Bolina West Plot 1 (1.5m-40.5m)	48 -61	38	33	15 - 28
Bolina West Plot 2 (1.5m-31.5m)	48 -61	38	33	15 - 28
Bolina West Plot 3 (1.5m-22.5m)	59 - 61	38	33	26 - 28
Bolina West Plot 4 (1.5m-4.5m)	51- 53	38	33	18 - 20
Bolina West Plot 5 (1.5m-67.5m)	55 - 63	38	33	22 - 30
Excelsior 1 (1.5m-22.5m)	68 - 72	38	33	35 -39 ¹
Excelsior 3 Plot 1 (1.5m-25.5m)	65 -71	38	33	32 - 38
Excelsior 3 Plot 2 (1.5m-70.5m)	63- 70	38	33	30 - 37
Excelsior 4 (1.5m-19.5m)	62-63	38	33	29 - 30
Excelsior 5 (1.5m-10.5m)	60 - 65	38	33	27 - 32
Orion 1 (1.5m-16.5m)	56 - 69	38	33	23 - 36
Orion 2 (1.5m-28.5m)	68 – 71	38	33	35 -38
Senegal Way 2 (1.5m-37.5m)	60 - 67	38	33	27 - 34
Stadium Avenue Plot 1 (1.5m-40.5m)	54 - 62	38	33	21 - 29
Stadium Avenue Plot 3 (1.5m-25.5m)	56 - 58	38	33	23 - 25
Stockholm 1 Block 2	54 -69	38	33	21 - 36

(1.5m-49.5m)				
Stockholm 1 Plot 3 (1.5m-16.5m)	62 - 69	38	33	29 - 36
Stockholm 1 Plot 4 (1.5m-70.5m)	55 - 69	38	33	22 - 36
Stockholm 2 Plot 1 (1.5m-16.5m)	65 - 70	38	33	32 - 37
Stockholm 2 Plot 2 (1.5m-70.5m)	59 - 65	38	33	26 - 31
Timber Wharf 1 Plot 1 (1.5m-52.5m)	60 - 74	38	33	27 – 41 ²
Timber Wharf 1 Plot 2 (1.5m-43.5m)	56 - 63	38	33	23 - 30
Timber Wharf 1 Plot 3 (1.5m-16.5m)	55 - 61	38	33	22 - 28
Timber Wharf 1 Plot 4 (1.5m-25.5m)	54 - 64	38	33	21 - 31
Timber Wharf 1 Plot 6 (1.5m-28.5m)	67 - 74	38	33	34 – 41 ²
Timber Wharf 1 Plot 9 (1.5m-28.5m)	66 - 74	38	33	33 – 41 ³
Timber Wharf 2 Block 1 (1.5m-16.5m)	63 - 65	38	33	30 - 32
Timber Wharf 2 Plot 2 (1.5m-25.5m)	62 - 64	62 - 64	33	29 - 31

¹ At 7.5m AOD facing Surrey Canal Road

² At 4.5m to 10.5m AOD facing Surrey Canal Road

³ At 4.5m to 13.5m AOD facing Surrey Canal Road

13.6.19 Table 13.14 indicates that the majority of the facades which would be most affected by noise will meet the internal noise criterion for the period 07:00 - 23:00 using conventional thermal insulating glazing. It is noted that the internal level is to be achieved based on 15 minute

assessment period. Site observations made during the baseline noise measurements confirm that road and rail traffic levels are relatively stable during throughout the period 07:00 – 23:00.

13.6.20 The highest noise levels are predicted to occur at the lower levels of the plots, which in the case of the following areas of the Proposed Development would be in non residential uses. This is due to the relative proximity of the lower levels of the plots to the transport noise sources. As the distance between these noise sources and the upper levels increases, the amount of sound attenuation also increases, resulting in lower received noise levels at higher storeys;

- Stockholm 1 and 2
- Stadium Avenue
- Excelsior 1
- Timber Wharf 1
- Senegal Way 1

13.6.21 Observed night time noise levels from both the short term measurements on Surrey Canal Road (NO3) shows a decrease of between 9 and 10 dB from daytime ambient noise levels. This indicates that internal noise levels between 23:00 and 07:00 will also be met at the most affected facades, and throughout the Proposed Development.

13.6.22 The significance of effects is medium.

Noise from Millwall FC Stadium

13.6.23 Noise levels associated with the Millwall FC Stadium form part of the soundscape of the area. Measurements of two football matches were made during the baseline noise survey. These have been included in data used to undertake the site suitability assessment using the PPG 24 NEC categories as reported above.

13.6.24 A separate assessment has been undertaken to determine the effects of noise generated as a consequence of matches on dwellings to be provided within the Proposed Development. Tables 13.16 and 13.17 below show the hourly noise levels immediately before the matches kicked off until ambient noise returned to the prevailing levels. Both sets of measurements are taken from the LT01 site on the west stand of the stadium overlooking the pitch;

Table 13.16: Noise levels from football match at Millwall FC Stadium 9th November 2010 (evening)

	L_{Aeq}, 1 hour (dB)	L_{Amax} (dB)	
17:30	56	74	

18:30	66	88	
19:30	78	95	Kick Off 19:30
20:30	78	99	
21:30	75	98	
22:30	53	73	

Table 13.17: Noise levels from football match at Millwall FC Stadium 13th November 2010 (day)

	L_{Aeq}, 1 hour (dB)	L_{Amax} (dB)	
13:00	57	78	
14:00	70	88	
15:00	76	95	Kick off 15:00
16:00	77	90	
17:00	54	71	
18:00	54	78	

13.6.25 Noise levels rise by maximum of 25 dB, with the highest recorded L_{Amax} of 99 dB. These noise levels are considered to arise predominantly from the noise of the crowd.

13.6.26 The floors of the plots within the Proposed Development above the roofs of the Millwall FC Stadium stands which would be most affected by these levels are;

- Bolina East
- Bolina West
- Stadium Avenue
- Stockholm 1 and 2
- Senegal Way 1 and 2

13.6.27 Noise from Millwall FC Stadium has been modelled assuming it behaves as a line source propagating from the edge of the stands closest to the Proposed Development, with the sound power uniformly distributed along the source line. The results of these predictions are presented in Table 13.18;

Table 13.18: Noise levels from football matches at the closest proposed residential receptors

Receptor	Distance from inner edge of closest stand to facade (m)	Distance attenuation	Façade Level L_{Aeq} (dB)	Façade level L_{Amax} (dB)
Bolina East	40	16	62	83
Bolina West	44	16	62	83
Stadium Avenue	56	17	61	82
Stockholm 1	62	18	60	81
Stockholm 2	40	16	62	83
Senegal	42	16	62	83

13.6.28 There are no recognised standards for assessing the effects of noise from football matches.

These events are of a limited and defined duration and do not occur at antisocial hours, although they may occur on Sunday. Noise levels of the order presented in the table above fall within NEC B. Thermal insulating glazing units are calculated to achieve the noise levels within premises when closed.

13.6.29 The predicted levels are above the levels which are presented in WHO GCN for balconies and terraces, based on a 16 hour time base as the level for serious annoyance. The time base in the case of a football match is much less than this, and GCN gives no guidance as to the level effect that would ensue from shorter, specific events. As the maximum duration of elevated noise levels is 4 hours, isolation of the effect of the football match from the 16 hour time base would result in calculated levels 6 dB lower than those presented above. This would result in noise levels that are around the WHO level of L_{Aeq} 55 dB level for serious annoyance.

13.6.30 L_{Amax} noise levels are predicted around those specified in PPG24 for night-time noise levels as necessitating a reclassification change to NEC C, but occur during the period 15:00 – 21:30. This is a less sensitive time than night-time.

13.6.31 The long term measurements at LT02 for these periods, representative on Timber Wharf and Excelsior also show an increase in noise levels during the periods of the football match, but the increases in noise levels recorded are between 0 - 7 dB. Any effects in these parts of the Proposed Development will be significantly less than those tabulated above.

13.6.32 The attendances at the two matches were 10,211 for 9th November 2010 and 11,312 for 13th November 2010. It is understood that Millwall FC Stadium has a capacity of 20,000 although for operational reasons this maxima is not used. The highest home attendance so far for the 2010-2011 season has been 13,292 on Saturday 14th August 2010. An increase in crowd numbers to this level is not considered to affect the results of this assessment significantly.

Noise levels on balconies, terraces and outdoor living areas

13.6.33 With reference to Technical Appendices 13.3 and 13.4, noise levels from road and rail are predicted to exceed the levels which World Health Organisation Guidelines for Community Noise identify with annoyance at some or all levels at all blocks. This is addressed in 13.7 of this chapter.

Vibration

13.6.34 The vibration levels measured and reported in 13.5 above are representative of locations close to the railway lines and are not considered to be a constraint on the Proposed Development. The significance of vibration is low.

Operational effects

13.6.35 The main effects from the operation of the Proposed Development are;

- Changes to road traffic flows as a result of the Proposed Development;
- Noise from fixed plant provided as part of the Proposed Development

Road Traffic

13.6.36 Road traffic flows for the baseline year, and future years including committed cumulative development have been modelled using SoundPLAN and CRTN and are shown in Figure 13.3. The results of the noise change between the future 'with', which uses the traffic flows from the completed development supplied by PBA, Renewal's Transport Consultant, and 'without development' scenarios for existing receptors along the links specified below are presented in Table 13.19. The road traffic input data can be found at Technical Appendix 13.5;

Table 13.19: Road traffic noise change for completed development

Link Name	Opening Year without Development minus Baseline 2010	Opening Year with Development minus Opening Year without Development
Ilderton Road	0.0	0.1
Surrey Canal Road	0.0	0.1
Zampa Road	0.0	0.1

Bolina Road	0.0	0.0
Silwood Street	0.0	0.0
Rotherhithe New Road	0.0	0.1
Stockholm Road	0.0	1.2
Rollins Street	0.1	0.6

13.6.37 From the table above, it can be seen that there are no changes in noise levels predicted to be greater than 1.2 dB for all three comparisons. This is below the level of 3 dB where significance is considered to occur. The effect from increases in road traffic noise generated by the Proposed Development is considered to be of low significance.

Noise from fixed plant

13.6.38 Noise from fixed plant is likely to arise from the following sources;

- Air handling plant provided with the retail, commercial and leisure uses
- The Envac waste handling facility, likely to be located on the Orion Plot
- The back up energy plant and any combined heat and power units provided as part of the Proposed Development

13.6.39 At present the design and specification of the plant has not been finalised. The Development Specification requires all fixed plant to be designed to achieve a rating level of 5 dB below the lowest measured background noise level. Plant noise levels of this magnitude would not produce a significant effect.

13.7 Opportunities for further mitigation measures

Construction and demolition

13.7.1 All works of construction and demolition would be carried out employing 'best practicable means' as defined in BS5228 and in line with the South London Code of Practice²⁰.

Internal residential noise levels

13.7.2 Internal noise level predictions have been based on the lower sound insulation value for thermal insulating units given in BS8233 and not taking into account the added attenuation that would be provided from full façade insulation. Where residential development is provided at lower levels, glazing with a higher specification would be used to achieve the required façade specifications. The internal noise levels proposed in the Development Specification would be met by standard façade constructions.

Balconies and terraces

- 13.7.3 Noise levels in excess of those recommended in Guidelines for Community Noise can be mitigated by the installation of winter gardens on the affected facades.
- 13.7.4 As with balconies, the main sources of noise affecting roof terraces arise from road and rail sources which are below the heights of the proposed terraces as shown in Technical Appendix 13.4. These areas can be protected from noise by the modification of the barriers around their perimeter, which would be done by increasing the mass and/or height to achieve the noise levels required. Barriers can be constructed of transparent material to maintain views if required.

13.8 Summary of residual effects

- 13.8.1 An assessment of the potential significant effects arising from noise and vibration at the Application Site and Proposed Development has been undertaken. Existing sources in the vicinity of the Site consist of both localised and distant road traffic and railway noise. In addition, operational noise from the Millwall FC Stadium is also part of the existing soundscape.

Construction Noise and Vibration

- 13.8.2 Compliance with proposed hours of working and other noise mitigation measures as detailed in the Development Specification will ensure minimal construction noise and vibration effects. There will be no irreversible effects due to construction noise or vibration after construction has ended.

Operational Noise

- 13.8.3 Based on an assessment of the information provided, there are no significant residual noise or vibration effects, either for existing residents or occupiers and users of the Proposed Development provided that the incorporated mitigation measures detailed in 13.7 above and in the Development Specification are implemented.
- 13.8.4 It is therefore considered that the Proposed Development would not give rise to any significant residual noise or vibration effects.

13.9 Assessment of cumulative effects

- 13.9.1 Cumulative effects have been considered as part of the assessment of road traffic noise, and presented in Table 13.20 below. The effects are of low significance;

Table 13.20: Road traffic noise change for completed development

Link Name	Opening Year without Development minus Baseline 2010	Opening Year with Development minus Baseline 2010
Ilderton Road	0.0	0.1
Surrey Canal Road	0.0	0.1
Zampa Road	0.0	0.1
Bolina Road	0.0	0.0
Silwood Street	0.0	0.0
Rotherhithe New Road	0.0	0.1
Stockholm Road	0.0	1.2
Rollins Street	0.1	0.7

13.10 References

- 1 The Renewal Group. Surrey Canal Triangle Development Specification
- 2 Department of the Environment. Planning Policy Guidance: Planning and Noise (PPG 24). HMSO. 1994.
- 3 British Standards Institution. British Standard 8233: Sound insulation and noise reduction for buildings - Code of practice. 1999
- 4 British Standards Institution. British Standard 4142: Method for Rating industrial noise affecting mixed residential and industrial areas. 1990.
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- 9 Mayor of London. The London Plan: Spatial Development Strategy for Greater London Consolidated with Alterations since 2004. Greater London Authority. February 2008.

- 10 Mayor of London. The London Plan Spatial Development and Strategy for Greater London Draft Replacement Plan 2009
- 11 Mayor of London. The London Plan: Spatial Development Strategy for Greater London Consolidated with Alterations since 2004. Greater London Authority. February 2008.
- 12 London Borough of Lewisham – Unitary Development Plan 2004
- 13 London Borough of Lewisham – Local Development Framework Core Strategy 2010
- 14 British Standards Institution. British Standard 5228: Code of practice for noise and vibration control on construction and open sites. Part 1: Noise. 2009.
- 15 British Standards Institution. British Standard 5228: Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration. 2009
- 16 British Standards Institution. British Standard 7385: Evaluation and measurement for vibration in buildings. Part 2: Guide for damage levels from groundborne vibration. 1993.
- 17 British Standards Institution. British Standard 6472: Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting. 2008
- 18 Department of Transport. Calculation of Railway Noise. HMSO. 1995
- 19 Department of Transport. Calculation of Road Traffic Noise. HMSO. 1988
- 20 South London Boroughs. Control of pollution and noise from demolition and construction sites May 2008
- 21 The Stationery Office Limited. Control of Pollution Act, Chapter 40, Part III. 1974
- 22 Transport for London. London Rail - Rail Freight Strategy 2007
- 23 London Underground Ltd. East London line Southern Extensions Environmental Statement 2000

Figure 13.1 : Baseline noise and vibration monitoring points

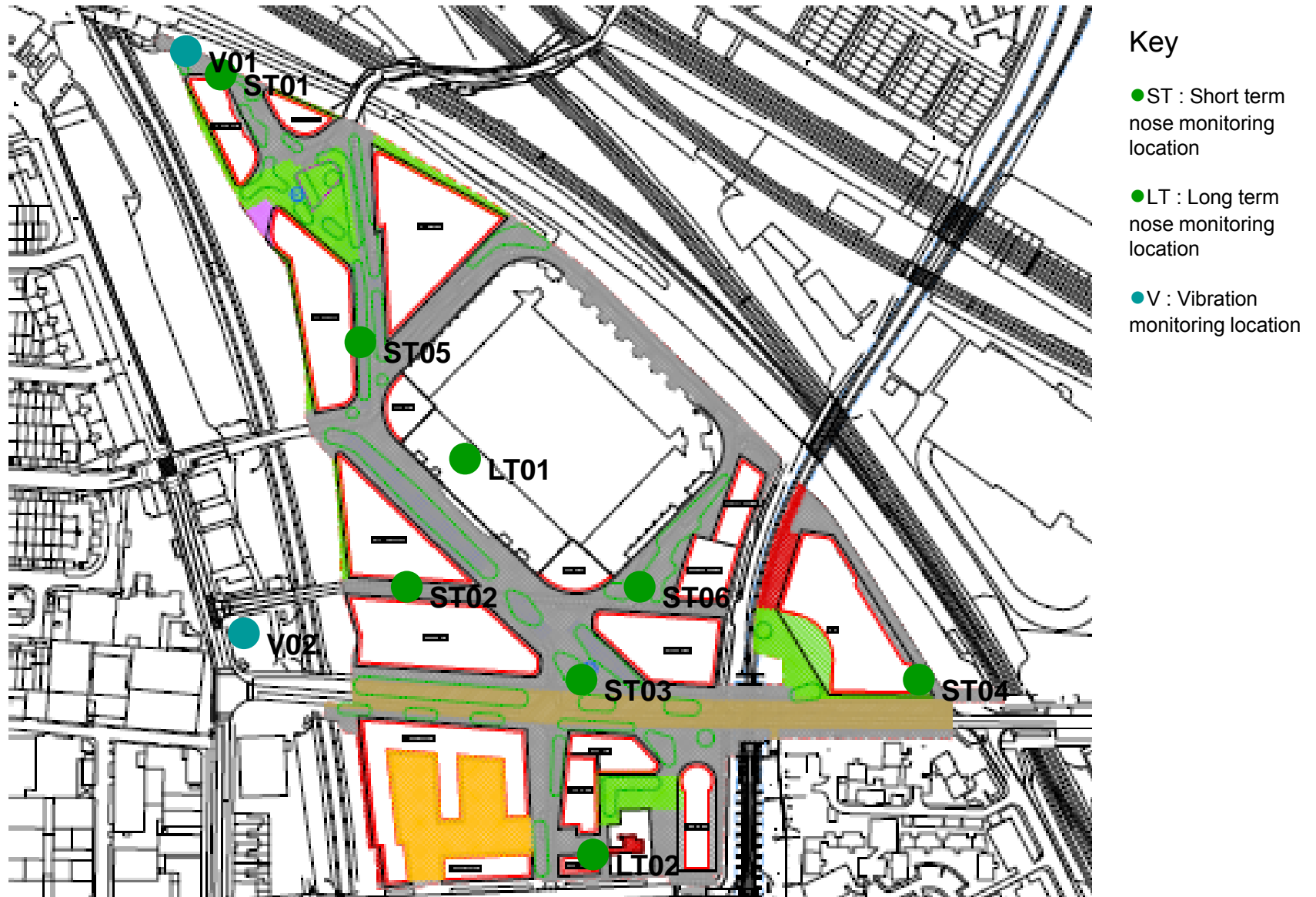


Figure 13.2 : Existing Noise Sensitive Receptors



Figure 13.3 : SoundPLAN 4 Metre Contour Road Noise – Future With Development

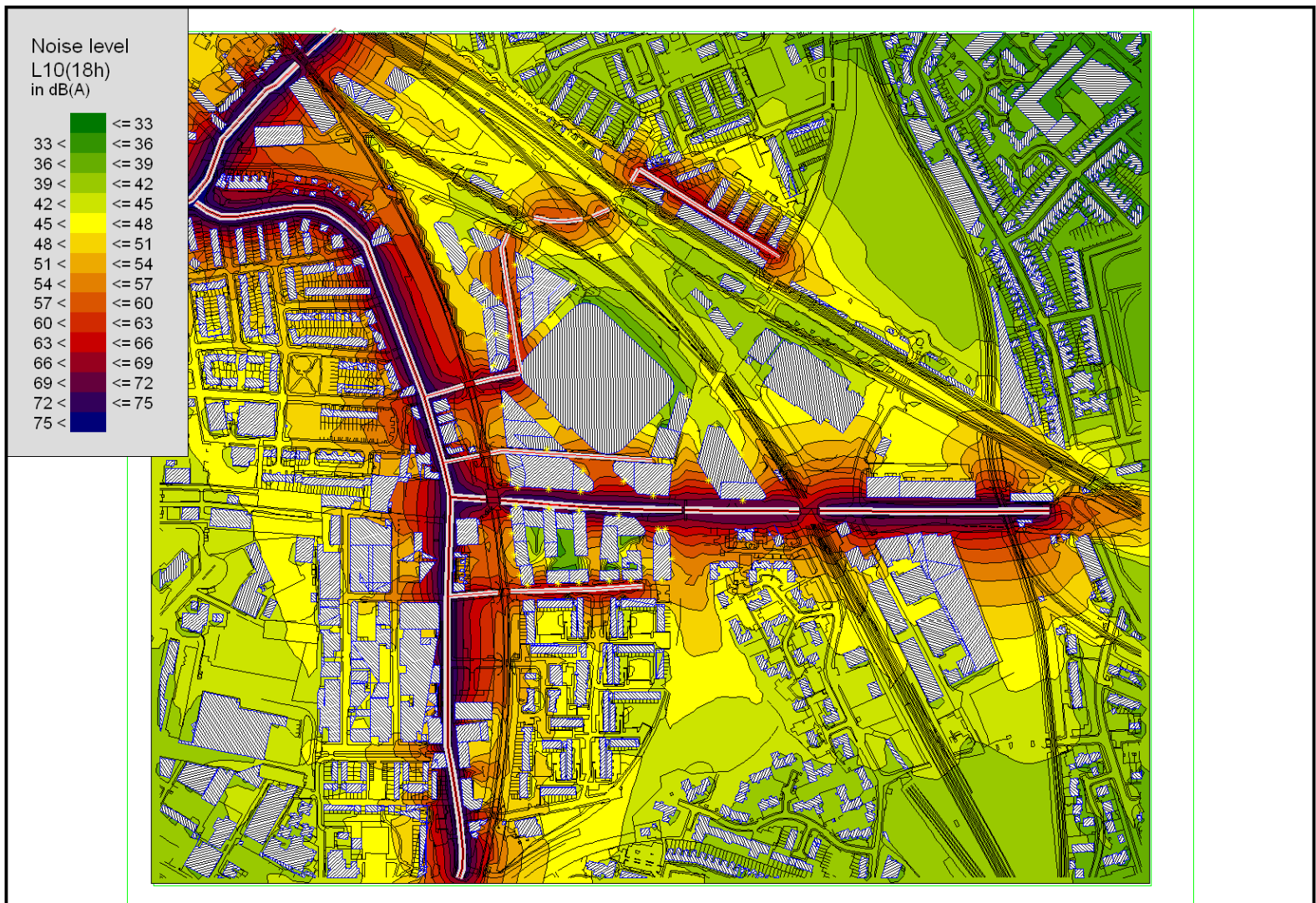


Figure 13.4 : SoundPLAN 4 Metre Contour Rail Noise with ELLX – Future With Development

