Stag Brewery, Mortlake

Noise and Vibration EIA Report

For Reselton Properties

February 2018

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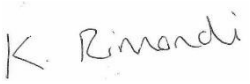

Comments

Comments

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Contents

Figures

Appendices

1. Introduction

This Nosie and Vibration EIA report has been prepared by Waterman Infrastructure and Environment Ltd (Waterman IE) on behalf of Reselton Properties Limited ('the Applicant') in relation to three linked planning applications for the comprehensive redevelopment of the former Stag Brewery site in Mortlake and land at Chalkers Corner ('the Site') within the London Borough of Richmond Upon Thames ('LBRuT').

This report presents the assessment of the likely significant noise and vibration effects on surrounding sensitive receptors associated with the proposed demolition, alteration, refurbishment and construction works ('the Works'), and in respect of noise once the Development is completed and operational (see below for a definition of the Development). This report comprises the Environmental Statement (ES) Chapter and associated figures and appendices.

1.1 Report Context and Approach

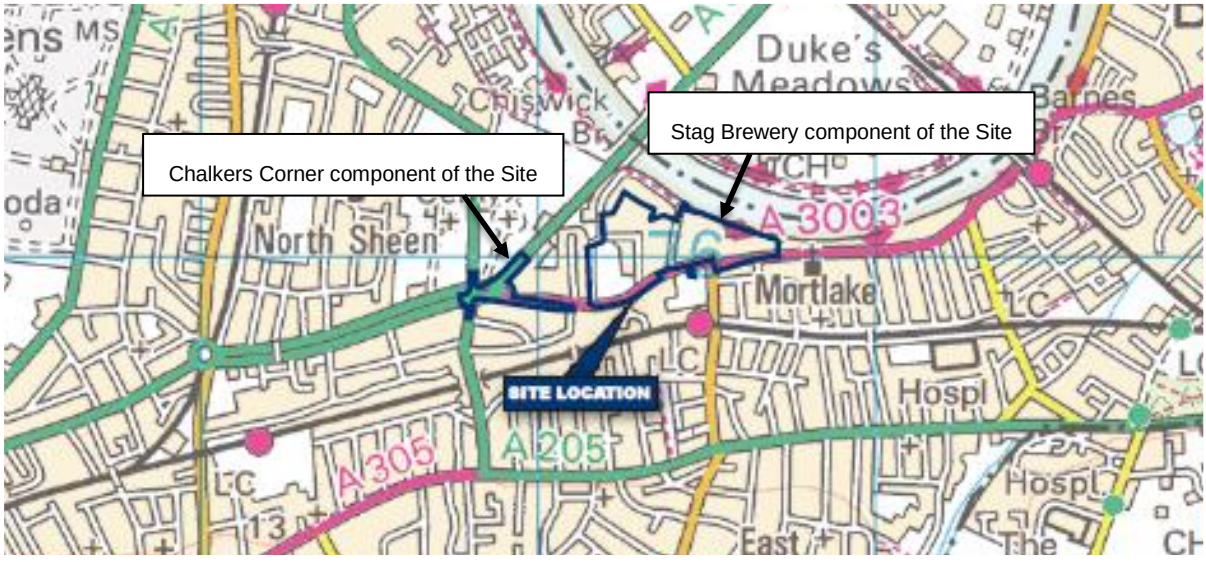
The Development is considered as EIA Development under Schedule 2, Category 10(b) (urban development projects) of the Town and Country Planning (Environmental Impact Assessment) Regulations, 2011 (as amended 2015)[1].

The ES reports the key findings of the EIA process undertaken for the Development and accompanies all three Planning Applications (as described below). At the request of the LBRuT, standalone reports have been provided, but do not differ from those contained within the ES. Justification as to the scope of the ES is summarised in ES Chapter 2: EIA Methodology. Further information on the description of the existing Site and surrounds, the proposed Development, the Works, alternatives and design evolution, and cumulative effects are provided in the ES.

1.2 Site Context and Development Proposals

The location of the Site is shown in Figure 1 below and comprises two components referred to as the 'Stag Brewery component of the Site' and the 'Chalkers Corner component of the Site'.

Figure 1: Site Location



The Stag Brewery component of the Site is bounded by Lower Richmond Road to the south, the river Thames and the Thames Bank to the north, Williams Lane to the east and Bulls Alley (off Mortlake High

[1] HMSO (2015) Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended 2015).

Street) to the west. The Stag Brewery component of the Site is bisected by Ship Lane. The Stag Brewery component of the Site currently comprises a mixture of large scale industrial brewing structures, large areas of hardstanding and playing fields. The Chalkers Corner component of the Site comprises highway and associated landscaping referred to as Chalkers Corner junction which includes the junction with the A316 (Clifford Avenue, A3003 (Lower Richmond Road) and A205 (South Circular). Refer to ES Chapter 3: Existing Site and land uses for further information.

The redevelopment will provide homes (including affordable homes), accommodation for an older population, complementary commercial uses, community facilities, a new secondary school alongside new open and green spaces throughout. Associated highway improvements are also proposed, which include works at Chalkers Corner junction. The proposed floorspace of the Development (made up of the three planning applications) is provided in Table 1 below. Refer to ES Chapter 5: The Proposed Development for further information on the Development. The Works would be carried out over a period of approximately 8 years, anticipated to commence in June 2019 and complete in September 2027 (as set out in ES Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction).

Table 1: Proposed Floorspace of the Development

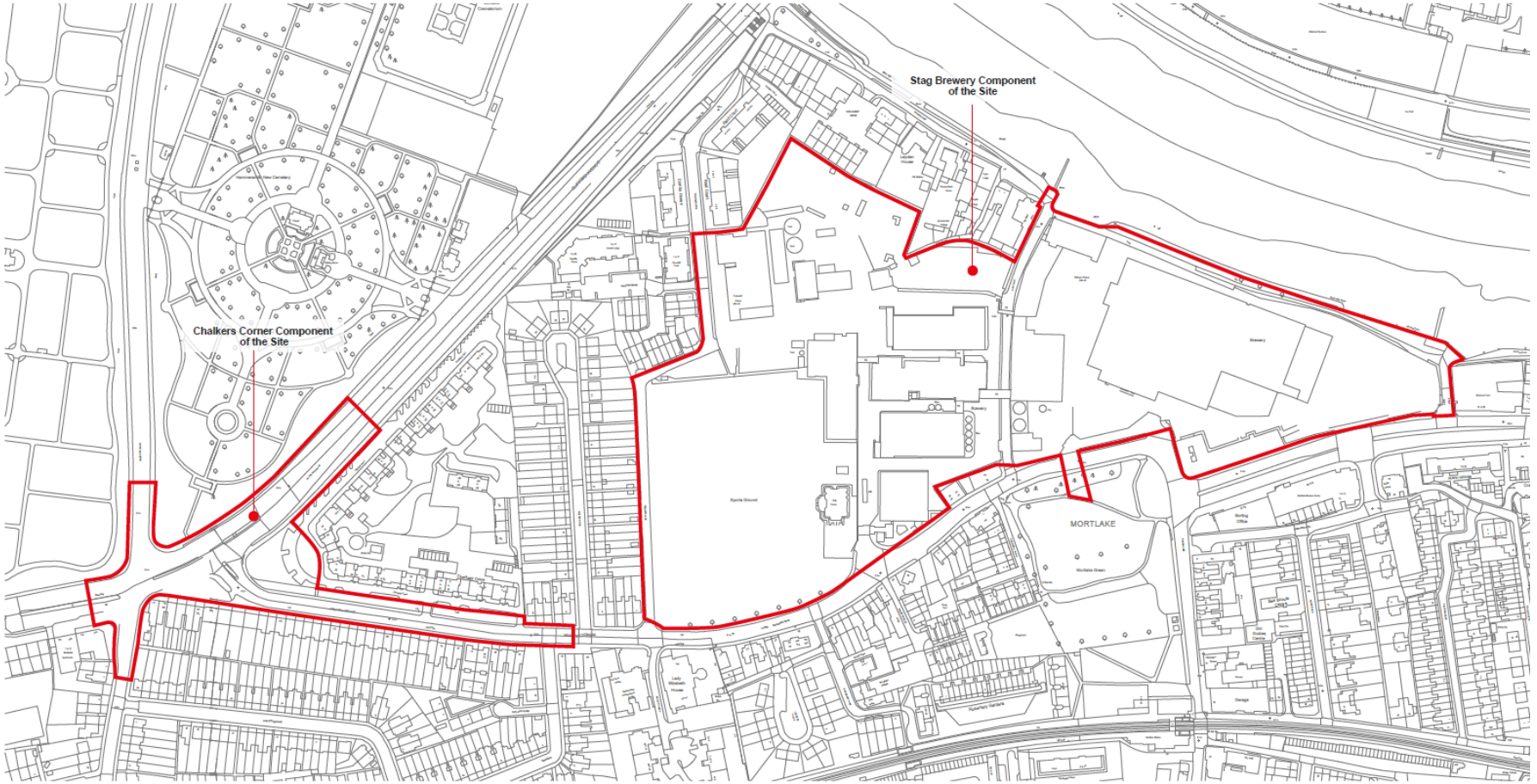
Land Use and Class	Floorspace Area (m^2)	
	Gross External Area (GEA)	Gross Internal Area (GIA)
Residential (Use Class C3, excluding assisted living)	Up to 84,639 (Up to 667 units)	Up to 75,119 (Up to 667 units)
Office (Use Class B1) (including Site management office)	2,674	2,457
Cinema (Use Class D2)	2,565	2,120
Gym (Use Class D2)	912	740
Flexible Uses - Restaurant / bar / retail / community / boathouse (Use Classes A1 / A2 / A3 / A4 / B1 / D1 / Boathouse)	5,308*	4,664*
Hotel (Use Class C1)	1,858	1,668
Assisted Living (Flexible Use Class C2 / C3)	Up to 16,246	Up to 14,738
Nursing and Care Home (Use Class C2)	Up to 10,293	Up to 9,472
School (Use Class D1)	11,430	9,319
Plant and storage.	Up to 4,536 (+ Plant and storage included in school)	Up to 4,244 (+ 249 included in school)
Car parking spaces.	Up to 708 spaces	Up to 708 spaces
Cycle parking spaces.	Up to 1,611 spaces	Up to 1,611 spaces
Basement residential access / circulation	1,868	1,810
Private amenity space.	Up to 5,912	Not applicable
Public amenity space (including external and internal play space for residents and school play space).	Up to 38,943	Not applicable
Play space (including external and internal play space for residents and school play space).	Up to 14,353	Not applicable

The three planning applications are as follows:

- Application A – hybrid planning application for comprehensive mixed use redevelopment of the Stag Brewery component of the Site consisting of:
  - Land to the east of Ship Lane applied for in detail (referred to as 'Development Area 1' throughout); and
  - Land to the west of Ship Lane (excluding the school) applied for in outline detail (referred to as 'Development Area 2' throughout).
- Application B – detailed planning application for the school (on land to the west of Ship Lane within the Stag Brewery component of the Site).
- Application C – detailed planning application for highways and landscape works at Chalkers Corner.

The three Planning Applications are separate applications, but will be linked through a S106 agreement to ensure that the Application B (school) land is handed over at an appropriate time and that the Application C (Chalkers Corner) works are carried out at an appropriate stage in conjunction with either Application A or B. For the purposes of assessment, all three Planning applications are therefore considered together as one comprehensive redevelopment proposal. As such, for the purposes of the EIA and ES, the proposals defined by the Planning Applications are collectively referred to as the 'Development'. Similarly, the collective parcels of land associated with the Planning Applications are referred to as the 'Site', as shown on Figure 2.

Figure 2: The Site for the Purposes of the EIA



2. Assessment

9. Noise and Vibration

Introduction

9.1. This Chapter, prepared by Waterman Infrastructure & Environment (Waterman IE), presents an assessment of the likely significant noise and vibration effects on surrounding sensitive receptors associated with the proposed demolition, alteration, refurbishment and construction works (the Works), and in respect of noise once the Development is completed and operational.

9.2. This Chapter provides a description of the methods undertaken for the assessment. This is followed by a description of the relevant baseline conditions of the Site and surrounding area, and an assessment of the likely significant effects of the Development during the Works and once the Development is completed and operational. Mitigation measures are identified where appropriate to avoid, reduce or offset any adverse effects identified and / or enhance likely beneficial effects. Taking account of the mitigation measures, the nature and significance of the likely residual effects are described.

9.3. Supporting information relating to the noise assessment is contained within the following appendices:

- **Appendix 9.1**: Acoustic Terminology;
- **Appendix 9.2**: Baseline Noise Monitoring;
- **Appendix 9.3:** Demolition and Construction Noise Assessment; and
- **Appendix 9.4:** Road Traffic Assessment.

9.4. As agreed via the EIA scoping process (refer to **Chapter 2: EIA Methodology**) no assessment was undertaken (or is, indeed necessary) in relation to vibration once the Development is completed and operational. This is owing to the fact that there are no significant vibration generating sources (e.g. London Underground Limited, or Mainline Rail Lines) within approximately 195m of the Site. Furthermore, no significant sources of vibration would be introduced as part of the Development. Accordingly, there would be no vibration effects associated with the completed and operational Development.

9.5. Further to the above, and also agreed via the EIA scoping process, an assessment of the acceptability of internal noise levels within the Development itself is a design issue and should not form part of the EIA. As such, an assessment of the suitability of the Site for residential and school development does not form part of this Chapter and has been submitted as a standalone report by Hoare Lea for planning.

Assessment Methodology and Significance Criteria

Assessment Methodology

9.6. The assessment of likely significant noise and vibration effects has involved the following:

- identifying potentially sensitive existing and future sensitive receptors (SRs) on and within the surrounding area of the Site;

- establishing the baseline noise and vibration conditions currently existing at the Site and at existing SRs surrounding the Site using appropriate noise and vibration surveys;
- assessing likely noise and vibration levels generated during the Works associated with the Development;
- establishing design aims for plant and services associated with the Development;
- assessing likely noise levels from the completed and operational Development;
- formulating proposals for mitigation (where appropriate); and
- assessing the likely significance of any residual noise and vibration effects.

Baseline Noise Surveys

9.7. A comprehensive environmental noise survey was undertaken from Friday 24th June to Wednesday 29th June 2016, covering a typical weekday and weekend period, to establish and quantify the existing noise climate at and within the vicinity of the Site. Further to the above additional surveys were completed adjacent to Chalkers Corner on the 25th April 2017 in order to inform the assessment for this area.

9.8. The noise monitoring locations are shown on **Figure 9.1** and described below in **Table 9.1**.

Table 9.1: Noise Monitoring Locations

Monitoring Location (Figure 9.1)	Description	Observations and Predominant Noise Sources
LT1	Free-field measurement at the south-western Site boundary overlooking Lower Richmond Road (the A3003). Microphone located 1.2 m AGL.	Noise climate dominated by constant vehicular traffic on Lower Richmond Road / Mortlake High Street. Although intermittent in comparison, noise from low flying aircraft movements in to Heathrow Airport (located approx. 11 km to the east) was significant, with approximately one plane every minute going over the Site. Contributory noise from human activities, distant road noise and distant aircraft also influence the noise climate to some extent.
LT2	Façade measurement on the second floor of the Stag Brewery Co. building at the south-eastern Site boundary overlooking Mortlake High Street. Microphone located 6.0 m AGL.	
LT3	Façade measurement on the boundary wall to the north-east of the Site overlooking the River Thames. Microphone located 4.0 m AGL.	Noise climate dominated by aircraft noise, as detailed above. Contributory noise from local and distant road traffic and occasional passing cyclists and joggers on the footpath over the river.
LT4	Free-field measurement at the south-western boundary of the Site orientated towards Clifford Avenue / Chiswick Bridge (the A316). Microphone located 2.5 m AGL.	Noise climate influenced by constant vehicular traffic on Clifford Avenue. Contributory noise from domestic activities from nearby residential dwellings.

Monitoring Location (Figure 9.1)	Description	Observations and Predominant Noise Sources
ST1	Free field measurement at the centre of existing sports ground.	Noise climate influenced by distant road traffic noise and some intermittent low flying aircraft noise.
ST 2	Free field measurement north western corner of existing sports ground adjacent to Williams Lane.	Noise climate influenced by distant road traffic noise associated with Clifford Avenue and some intermittent low flying aircraft noise.
ST 3	Free field measurement north western corner of existing sports ground adjacent to Williams Lane.	Noise climate influenced by constant vehicular traffic on Clifford Avenue.
ST 4	Free field measurement adjacent to Ship Lane.	Noise climate influenced by distant road traffic noise and some intermittent low flying aircraft noise.
ST 5	Free field measurement adjacent to Ship Lane.	Noise climate influenced by distant road traffic noise and some intermittent low flying aircraft noise.
ST 6	Free field measurement on southern site boundary adjacent to Lower Richmond Road.	Noise climate influenced road traffic noise associated with Lower Richmond Road.
ST 7	Free field measurement on eastern site boundary with Bulls Alley.	Noise climate influenced road traffic noise associated with Lower Richmond Road.
ST 8	Fee field noise measurement on Lower Richmond Road at Chalkers Corner.	Noise climate influenced road traffic noise associated with Lower Richmond Road.

The Works

Noise

9.9. As noted in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**, construction would occur in phases. Exact timing will be determined dependant on a number of external factors, however, it is anticipated that Works required to facilitate the Development would be carried out over a period of approximately eight years. The works are anticipated to commence in June 2019 and complete in September 2027. An indicative outline programme is set out in **Table 6.1** of **Chapter 6**.

9.10. Noise levels associated with the Works have been estimated based upon the plant typically used for such a development and are based on source noise levels contained within BS 5228-1:2009+A1:2014[1] '*Code of practice for noise and vibration control on construction and open sites –Part 1: Noise*'.

9.11. The Works which are considered to be the nosiest can be divided into five specific activities:

- demolition;
- site preparation;

- substructure works
- superstructure works;
- landscaping and external works; and
- road paving.

9.12. Noise levels associated with these works were predicted based upon the typical source noise levels contained within BS 5228-1:2009+A1:2014.

9.13. To assess the likely significant effects of the Works on both existing SRs and future SRs which may be occupied whilst construction works are taking place on adjacent phases and plots the 'ABC Method' provided in BS 5228-1:2009+A1:2014, has been used. This method defines category threshold values, which are determined by the time of day and existing prevailing ambient noise levels. The noise generated by demolition and construction activities is compared with the threshold value. If the demolition and construction noise level exceeds the 'threshold value', a significant effect is deemed to occur.

9.14. Noise threshold levels have been established for the relevant existing SRs based upon the prevailing baseline noise levels. Noise levels associated with the Works have been predicted using the calculation methodology detailed within BS 5228-1:2009+A1:2014. Calculations representing a worst-case scenario over a one-hour period with plant operating at the closest point to the nearest SR and in the absence of mitigation are presented. In practice, noise levels would tend to be lower owing to greater separation distances, screening effects and periods of plant inactivity.

9.15. Full details of the predictions and assumptions of the assessment of likely noise associated with the demolition and construction works are contained within **Appendix 9.4**.

Vibration

9.16. There are two aspects of vibration that require consideration:

- potential vibration effects on people or equipment within buildings; and
- potential vibration effects on buildings.

9.17. There are currently no British Standards that provide a methodology for predicting levels of vibration from construction activities other than BS 5228-2[2] '*Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'*, which relates to percussive, or vibratory, rolling and piling only. As stated in BS 5228-2, and as generally accepted, the threshold of vibration perception for humans in residential environments is typically in the PPV range 0.15 to 0.3 mm/s at frequencies between 8 Hertz (Hz) and 80Hz with complaints likely at 1 mm/s. Based on historical field measurements undertaken by Waterman and having regard to information contained within BS 5228-2, **Table 9.2** details the distance at which certain activities may give rise to 'just perceptible' levels of vibration.

Table 9.2: Distance at Which Vibration May Just be Perceptible

Construction Activity	Distance from Activity when Vibration may Just be Perceptible (metres)[1]
Heavy vehicles	5 – 10
Excavation	10 – 15
CFA Piling	15 – 20
Rotary Bored Piling	20 – 30
Vibratory Piling	40 – 60
Sheet Piling (driven)	40 - 60

Note: [1]Distances for perceptibility are only indicative and dependent upon a number of factors, such as the radial distance between source and receiver, ground conditions, and underlying geology.

9.18. **Table 9.3** presents typical levels of vibration with distance from CFA and rotary bored vibration.

Table 9.3: Typical Levels of Vibration Resultant from CFA/Rotary Bored and Sheet Piling (Driven)

Distance (m)	Peak Particle Velocity[1] (PPV) mm/s	
	CFA Rotary Bored Piling	Sheet Piling (Driven)
5	0.54	≤13.5
10	0.38	≤4.0
20	0.30	No equivalent data in BS5228-2
30	0.03	≤3.0

Note: [1]Indicative derived from BS5228-2:2009. Dependent on ground conditions and underlying geology.

9.19. The vibration arising from sheet piling using ‘pressed’ method rather than driven, would however give rise to vibrations levels lower than those presented within Table 9.3 which are based on ‘driven’ sheet piles.

9.20. It is a widely held belief that if vibration can be felt, then damage to property is inevitable. However, vibration levels at least an order of magnitude higher than those for human disturbance are required to cause damage to buildings. It is generally accepted that building damage would not arise at PPV levels below 12.5 mm/s.

9.21. Vibration from piling operations has the potential to affect utilities and will be a function of the distance of the works from the utility location. Some statutory undertakers have introduced criteria governing the maximum level of vibrations to which their services should be subjected. In the absence of specific criteria from the undertakers BS5228-2 recommends the following limits:

- maximum PPV for intermittent or transient vibrations 30 mm/s; and
- maximum PPV for continuous vibrations 15 mm/s.

9.22. In the event of encountering elderly and dilapidated brickwork sewers, the base data should be reduced by 20% to 50%. For most metal and reinforced concrete service pipes however, BS85228-2 consider that the values stated within BS5228-2 should be tolerable.

9.23. At this stage the detail of the methods and equipment to be used during the construction works is unconfirmed as they will be established in detailed design stages. Therefore, a detailed assessment cannot be undertaken. Consequently, the significance of vibration effects from the Works cannot be assessed quantitatively and was therefore assessed qualitatively based on

typical plant used and distance of works to the SRs. Vibration level data was drawn from BS5228 Part 2.

Construction Traffic Noise

9.24. Assessment of noise level changes arising from construction traffic was undertaken using the calculation methodology detailed within the Calculation of Road Traffic Noise[3] (CRTN). This involved the use of the forecast construction traffic flow data (for the peak construction phase anticipated to be the year 2022) and the baseline traffic data provided by the Applicant's transport consultant (Peter Brett Associates) as detailed in **Chapter 8: Transport and Access**.

Completed Development

Building Services Plant Noise

9.25. The significance of sound of an industrial and / or commercial nature depends upon a number of factors including the margin by which a sound exceeds the background sound level, its absolute level, the time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood.

9.26. BS 4142:2014 provides an assessment and rating method to assess adverse effects from a range of industrial and/or commercial noise sources, including fixed building services plant. The measured or predicted noise level from the source in question, the 'specific noise' level ($L_{Aeq,T}$), immediately outside the dwellings was compared with the 'background noise' level ($L_{A90,T}$). Where the sound contains certain acoustic features at the assessment location (e.g. tones, impulses, intermittency etc.), then a scaled character correction was added to the specific noise level to obtain the 'rating noise' level ($L_{Ar,Tr}$). The significance of effect is dependent on the context, having consideration to pertinent factors such as the sensitivity of the receptor, the absolute level of sound to the character and level of the residual sound compared to the character and level of the specific sound.

9.27. Based on the noise monitoring data detailed in **Appendix 9.2**, maximum plant emission levels were set in controlling fixed building services plant to an acceptable level. Noise limits apply at a position 1m from the façade of the nearest noise sensitive receptors and include the total contribution of noise from all plant items associated with the Development that may run during any particular period.

Road Traffic Noise

9.28. The changes in noise levels, attributable to changes in operational road traffic flows and volumes resulting from the Development, were calculated using traffic data provided by the Applicant's transport consultant (PBA). Traffic flow data was provided for the 'with' and 'without' Development scenarios for a future year of the completion and operation of the Development (2027).

9.29. Basic Noise Levels (BNLs) were calculated for the road links covered by the PBA (refer to **Appendix 9.3**). The calculations used the 18-hr Average Annual Weekday Traffic (AAWT) flow, % HGV composition and average vehicle speed for each road link. The BNLs were calculated at positions 10 m from the road using the guidance provided in the CRTN. The likely effects of

changes in road traffic noise were evaluated by consideration of the estimated changes in $L_{A10,(18\ hour)}$ road traffic noise level on the local highway network as a result of the operation of the completed Development for the future year 2027.

Retail, Commercial, Community Flexible Space Uses and Servicing Noise

9.30. Specific details concerning the end users of the commercial elements of the Development are not known at this stage and would be dependent on the future tenants. As such, a qualitative assessment has been undertaken of noise sources associated with the commercial elements of the development which includes:

- delivery and servicing;
- noise breakout from units including gym, cinema, community units and proposed restaurant / bar / café uses; and
- basement car parking.

Noise from Proposed School and Play Space

9.31. In the absence of guidelines for assessing the effects of noise generated by schools including playground and outdoor activity noise, the potential noise effects have been assessed by calculating the increase in ambient noise levels from those currently experienced on and in the vicinity of the Development.

Significance Criteria

The Works

Construction Noise & Vibration

9.32. As outlined above, to assess the significance of effects from construction noise on existing SRs, 'The ABC Method' provided in BS 5228-1:2009+A1:2014 was used. The vibration assessment has been made against the criteria for human perception as presented in BS 5228-2:2009.

9.33. The criteria in **Table 9.4** were adopted to provide transparency in the definition of the significance of identified effects. Full details are provided in **Appendix 9.4**.

Table 9.4: Significance Criteria for the Assessment of Construction Noise and Vibration

Significance	Level Above Threshold Value dB(A)	Level of Vibration	Definition
Insignificant	≤ 0 to 2.9	< 0.14 mm/s	The effect is not of concern.
Adverse effect of minor significance	3.0 to 4.9	>0.14 mm/s to <1mm/s	The effect is undesirable but of limited concern.
Adverse effect of moderate significance	5.0 to 9.9	1 mm/s to 3mm/s	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration.

Significance	Level Above Threshold Value dB(A)	Level of Vibration	Definition
Adverse effect of major significance	≥10	>3mm/s	The effect gives rise to serious concern and it should be considered unacceptable.

9.34. With regard to potential damage to utilities and grade II listed buildings / structures, provided vibration is ≤7.5 mm/s (derived from BS5228-2 advice) the potential effect is negligible. For all other buildings a vibration level of ≤10 mm/s is negligible with regard to building damage.

Construction Traffic

9.35. The criteria proposed for Development generated road traffic noise as detailed in **Table 9.5** would also be appropriate for construction road traffic noise and has accordingly been adopted in this assessment.

Building Services Plant Noise

9.36. The guidance provided in BS 4142: 2014 and the requirements of LBRuT have been used to determine noise limits for items of fixed plant introduced as part of the Development.

9.37. LBRuT require that the rated noise level from any fixed plant and building services shall be at least 10 dB(A) below the prevailing background noise level at the nearest noise sensitive premises.

Retail, Commercial Uses and Servicing Noise

9.38. In the absence of published guidelines for assessing the effects of noise from retail, delivery, servicing, and car parks, the significance criteria in **Table 9.5,** which are based on the predicted change in the prevailing noise level have been adopted. The criteria are widely used by acoustic practitioners throughout the UK.

Table 9.5: Significance Criteria for Non-Residential and Servicing Noise Assessment

Significance	Change in Prevailing Noise Level dB(A)	Definition
Insignificant	< 3.0	The effect is not of concern.
Adverse effect of minor significance	3.0 to 4.9	The effect is undesirable but of limited concern.
Adverse effect of moderate significance	5.0 to 9.9	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration.
Adverse effect of major significance	≥ 10	The effect gives rise to serious concern and it should be considered unacceptable.

9.39. Where specific details are unknown then a qualitative assessment is undertaken based on available information.

Noise from Proposed School and Play Space

9.40. In the absence of published guidelines for assessing the effects of noise from schools and play space the significance criteria in **Table 9.5,** which are based on the predicted change in the prevailing noise level, have been adopted. The criteria are widely used by acoustic and are based on human perception and response to changes in environmental noise levels.

9.41. Where SRs have no prior knowledge of the existing noise climate i.e. new receptors introduced as part of the proposed Development assessment would be completed against guidance provided by Sports England in their document *'Artificial Grass Pitches (AGP) – Acoustics – Planning Implications'*[4] which suggests a noise limit of 50dB L_{Aeq} at 1m from any residential façade.

Road Traffic Noise

9.42. The Design Manual for Roads and Bridges, Volume 11 Section 3 Part 7-'*Traffic Noise and Vibration*' (DMRB)[5] provides significance criteria for changes in road traffic noise levels which are reproduced in **Table 9.6** and have been used in this assessment.

9.43. DMRB state that: "*a change in road traffic noise of 1 dB $L_{A10,18h}$ in the short term (e.g. when a project is opened) is the smallest that is considered perceptible*". Notwithstanding this, it is generally accepted by acoustic practitioners that subjectively an increase of 3dB in environmental noise is just noticeable, whereas an increase of 10dB, a tenfold increase in intensity is judged by most people as a doubling of loudness.

Table 9.6: Significance Criteria for Road Traffic Noise Assessment

Significance	Change or Difference in Noise Level, dB(A)
Insignificant	0 to 0.9
Adverse effect of minor significance	1.0 to 2.9
Adverse effect of moderate significance	3.0 to 4.9
Adverse effect of major significance	≥ 5

Limitations and Assumptions

The Works

9.44. The BS 5228 calculation methodology allows accurate noise levels to be determined for various demolition and construction activities. However, at this stage specific detail on the construction plant and machinery to be used (make / model) is not known. A number of assumptions have therefore been made regarding the number and type of plant to be utilised, their location, and detailed operating arrangements. Some of this information would be clarified as the detailed design progresses and later when resources are mobilised and the contractor is appointed, but other information (such as exactly where the plant operates and for how long) would remain uncertain, even after works have commenced. As such, construction noise levels have been based on generic plant detail contained within BS5228-1:2009+A1:2014 and as detailed in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**. The available information is considered sufficient to undertake a noise

assessment of the demolition and construction work, focussing on key activities operating at the Site, with the aim of identifying whether a significant, albeit temporary, adverse noise effect is likely to arise at the nearest sensitive receptors. In this respect, a medium to high degree of confidence is assigned to the predicted significance of the potential effects.

Fixed Plant & Building Services

9.45. At this stage of the Development, the specific type and configuration of fixed plant are not defined although locations are indicated for the detailed element of the Development. Consequently, it is not possible to undertake predictions to determine whether appropriate standards would be met, so instead appropriate plant noise emission limits have been set.

Baseline Conditions

The Site and Surrounding Area

Sensitive Receptors

9.46. The area surrounding the Site is urban in nature predominantly consisting of residential and commercial uses. Existing receptors within the vicinity of the Site are identified in **Table 9.7** and illustrated in **Figure 9.1**.

Table 9.7: Significance Criteria for Road Traffic Noise Assessment

Sensitive Receptor Number	Type of Receptor	Address / Name	Approximate Distance from Site Boundary
SR A	Existing residential	5-68 Watney Road	20 m west of Stag Brewery Site Boundary.
SR B	Existing residential	4-24 Williams Lane	20 m north-west of Stag Brewery Site Boundary.
SR C	Existing residential	1-69 Lower Richmond Road	25 m south of Stag Brewery Site Boundary.
SR D	Existing Residential	Chertsey Court	20 m from Chalkers Corner.
SR E	Existing Residential Receptors	139 Lower Richmond Road	15 m from Chalkers Corner.

9.47. Where a number of sensitive receptors are located close to each other, the nearest sensitive receptor is given to represent the immediate area.

9.48. Given the phased nature of the Works associated with the Development some of the new residential / school elements of the Development could be occupied whilst construction continues on other plots. As such, when considering the Works in relation to the Development consideration has also been given to potential future noise sensitive receptors which form part of the Development.

9.49. In addition to the sensitive receptors outlined above, there would be a number of structures retained as part of the Works. These include the Maltings, the Former Hotel (façade retention only) and the Former Bottling Building, retained historic elements of the boundary wall, railway tracks, paving and moorings. Potential effects in terms of construction vibration upon these receptors has also been considered. The memorial plaques and historic gates would be stored for protection in containers on the Site during the Works and re-instated post-construction.

Baseline Noise Monitoring

9.50. A summary of the measured daytime (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00) noise levels at these locations are presented in **Table 9.8** and **Table 9.9**, with full results displayed graphically in time-history format in **Appendix 9.2**.

Table 9.8: Summary of Unattended (Long Term) Baseline Noise Measurements (free-field)

Monitoring Location (Figure 9.1)	Period	Duration	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB		$L_{AFmax,5min}$ dB	
			Ave[1]	Ave[2]	Range	Ave[2] (mode)	Range	90th %tile[3]
LT1	Day	12hr	71	74	47 - 67	59 (61)	76 - 104	86
	Evening	4hr	69	73	43 - 62	52 (53)	74 - 98	83
	Night	8hr	65	65	33 - 63	42 (40)	56 - 98	83
LT2	Day	12hr	70	71	48 - 68	62 (63)	72 - 107	89
	Evening	4hr	68	69	43 - 66	57 (58)	70 - 102	85
	Night	8hr	63	63	32 - 64	43 (39)	57 - 99	80
LT3	Day	12hr	61	63	42 - 59	50 (51)	62 - 100	78
	Evening	4hr	59	61	38 - 53	47 (48)	50 - 98	75
	Night	8hr	55	51	34 - 54	42 (41)	46 - 82	73
LT4	Day	12hr	60	64	42 - 60	48 (48)	61 - 89	76
	Evening	4hr	58	61	38 - 52	46 (47)	49 - 83	74
	Night	8hr	55	50	31 - 54	39 (36)	43 - 79	73

Notes: [1] Logarithmic average over the daytime/evening/night-time survey periods; [2] Arithmetic average over the daytime/evening/night-time survey periods. [3] The 90th percentile L_{AFmax} value (equivalent to the 10th highest measured L_{AFmax} level) is presented for the long term noise monitoring results and is considered to fairly represent typical L_{AFmax} levels being experienced, within the spirit of WHO and BS 8233 guidance. All figures rounded to nearest whole decibel.

Table 9.9: Summary of Attended (Short Term) Baseline Noise Measurements (free-field)

Monitoring Location (Figure 9.1)	Period	Duration	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB	$L_{AFmax,5min}$ dB
			Ave[1]	Ave[2]	Ave[2]	Ave[2]
ST1	Day	30mins	61	64	54	74
ST2	Day	30mins	66	63	53	76
ST3	Day	25mins	75	78	65	88
ST4	Day	20mins	61	65	51	72
ST5	Day	20mins	61	64	50	77
ST6	Day	30mins	69	71	64	80
ST7	Day	20mins	65	68	57	76
ST8	Day	3hrs	72	76	62	84

Notes: [1] Logarithmic average over the daytime survey periods; [2] Arithmetic average over the daytime survey periods. All figures rounded to nearest whole decibel.

9.51. The highest ambient ($L_{Aeq,T}$) noise levels, were measured to the south (LT1) of the Site adjacent to Lower Richmond Road. Average ambient noise levels of 71 dB $L_{Aeq,12hr}$, 69 dB $L_{Aeq,4hr}$, and 65 dB $L_{Aeq,8hr}$, were recorded during the day, evening and night-time periods respectively. All long-term locations exhibited typical diurnal variation in environmental noise levels, with lower noise levels during the night-time period when traffic volumes are reduced together with reduction human activity.

Likely Significant Effects

The Works

Demolition and Construction Noise

9.52. **Table 9.10** presents the predicted un-mitigated noise levels at the selected receptors (**Table 9.6**) during the Works associated with the Development. Noise levels presented are representative of a worst-case scenario when works are undertaken at the closest point to the receptors, taken as being either the Site boundary, or the closest existing structure to be demolished / dismantled or piling location.

9.53. Given the Works associated with the Development is phased, and as indicated within **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction,** there is the potential that the school (Plot 3) could be occupied whilst latter parts of Plot 1, and all of Plot 2 are being constructed, and Plot 1 could be occupied whilst Plot 2 is being constructed.

9.54. To take account of this, calculations for future receptors which form part of the Development were based on a minimum distance of 15 m from construction works to determine the likely significant effects. This is considered to be a reasonable conservative approach as in most cases it is likely that works would be undertaken at greater distance.

9.55. Full details of the calculations undertaken are presented in **Appendix 9.3**.

Table 9.10: Predicted Demolition & Construction (un-mitigated) Noise Levels dB L_{Aeq}

Fig 9.1 Ref	Description	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure)	Floor Slab (superstructure)	Public Realm & Landscaping	Highways Pavement
A	5-68 Watney Road	67	79	77	65	67	67	67	68	85	80
B	4-24 Williams Lane	83	87	67	81	82	82	82	83	85	80
C	1-69 Lower Richmond Road	84	87	76	76	77	78	77	79	85	80
D	Chertsey Court	65	87	60	60	61	62	61	62	85	80
E	139 Lower Richmond Road	63	87	62	63	64	65	64	65	85	80
F	Future SR Within the Development	n/a	84	85	81	82	82	82	83	81	77

9.56. **Table 9.11** presents the level of significance of noise effects at the nearest receptors resultant from demolition and construction noise. It should be noted that the significance of effects presented are when works are being undertaken at the shortest distance to the SRs and would therefore reduce as works are undertaken at greater distance. The construction threshold noise level for SRs A and B as well as future SRs to be introduced as part of the Development is taken as 65dB L_{Aeq} and is taken as 75dB L_{Aeq} based on monitored baseline noise levels for SRs C, D and E.

Table 9.11: Significance of Demolition & Construction Noise Effects (un-mitigated)

Fig 9.1 Ref	Description	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure)	Floor Slab (superstructure)	Public Realm & Landscaping	Highways Pavement
A	5-68 Watney Road	Insig	Maj	Maj	Insig	Insig	Insig	Insig	Min	Maj	Maj
B	4-24 Williams Lane	Maj	Maj	Insig	Maj	Maj	Maj	Maj	Maj	Maj	Maj
C	1-69 Lower Richmond Road	Mod	Maj	Insig	Insig	Insig	Min	Insig	Min	Maj	Mod
D	Chertsey Court	Insig	Maj	Insig	Insig	Insig	Insig	Insig	Insig	Maj	Mod

Fig 9.1 Ref	Description	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure)	Floor Slab (superstructure)	Public Realm & Landscaping	Highways Pavement
E	139 Lower Richmond Road	Insig	Maj	Insig	Insig	Insig	Insig	Insig	Insig	Maj	Mod
F	Future SR Within the Development	n/a	Maj	Maj	Maj	Maj	Maj	Maj	Maj	Maj	Maj

Note: Insig – insignificant; Min – minor; Mod – moderate; Maj – major:

9.57. Insignificant effects are predicted when works are being undertaken at distance from SRs. The distance at which insignificant effects are predicted to occur varies with type of works and the adopted threshold noise level.

9.58. At SR A (Watney Road), the effects are predicted to be predominantly insignificant with major adverse effects when works are being undertaken proximate to the Site boundary, such as enabling, landscaping and highways pavement works.

9.59. At SR B (Williams Lane), the effects are predicted to be predominantly major adverse due to the assumed proximate location of works to these SRs.

9.60. At SRs C and E on Lower Richmond Road and SR D (Chertsey Court), the effects are predicted to be predominantly insignificant due to distance from works and higher construction threshold noise level based on higher prevailing noise levels dominated by road traffic noise. Major adverse effects are predicted when enabling and landscaping works are undertaken proximate to the Site boundary. During highways pavement works moderate adverse effects are predicted.

9.61. When works are being conducted within 15m of future SR within the Development, there are the potential for temporary, short-term local adverse effects of up to major significance.

9.62. Overall, effects are identified as **insignificant** to **temporary, short-term local adverse** effects of **minor** to **major significance**. It should be noted that, in reality, construction works would be transient in nature, with works for the most part taking place at locations significantly removed from the SRs. Nonetheless, given that some major adverse effects have been predicted, mitigation measures would be required to reduce noise levels from the demolition and construction phase of the proposed Development.

Construction Traffic Noise

9.63. Construction traffic flow data as provided by PBA show that for this Development there is anticipated to be a peak in construction vehicle movements in 2022 of 82 one-way vehicle trips accessing the Site per day, of which 57 one-way trips are likely to be undertaken by Heavy Goods Vehicles (HGVs) and 25 one-way trips by Light Goods Vehicles (LGVs). During the peak construction period, access to the Site for construction vehicles would be taken via two access points off Lower Richmond Road, opposite Waldeck Road, and Mortlake High Street, adjacent to

Bulls Alley. The AAWT 18-hour baseline traffic flows along the construction route reveals construction traffic accounts for less than 1% as a proportion of 2022 forecast do-minimum base flows. This equates to a noise level increase of less than 1dB, which is not large enough to cause any discernible effect. As such, the likely effect of construction traffic noise generated by the Development on existing and future sensitive receptors is concluded to be **insignificant**.

Demolition and Construction Vibration

9.64. The primary source of vibration associated with the Works is likely to be sheet piling and to a lesser extent CFA piling, although some vibration may arise during both demolition, Site preparation works and construction works. It is understood that sheet piling would be required as part of the substructure works to form a retaining wall for the basement structure and for sections of the river wall. Whilst where piled foundations are required rotary bored / CFA piling would be used to minimise noise and vibration effects.

9.65. With regard to the human perception of vibration levels, **Table 9.2** indicates that PPV levels arising from sheet piling can occur up to 40-60 m depending on ground conditions. Based on distance of sheet piling from SRs, this is only likely to affect SRs A, C and potentially future residential SRs which form part of the Development. Existing SRs A (Watney Road) and C (1-69 Lower Richmond Road) are located 35 and 40m respectively from potential sheet piling works. Based on information within Table 9.3 (derived from BS5228-2), this could give rise to PPV levels of up to 3 mm/s, subject to ground conditions. On this basis there is the potential for **temporary**, **short-term**, **local adverse** effects up to **moderate significance** when sheet piling works are undertaken within 40m for SRs. At all other SRs, excepting future SR within Development, the potential effects are predicted to be **insignificant** due to distance from works.

9.66. With regards to potential vibration levels arising from CFA / rotary bored piling, due to distance from works and SRs, all significance of effects are predicted to be **insignificant** in the absence of mitigation up to **temporary, local** effects up to **minor adverse** significance.

9.67. Vibration arising from activities other than piling are anticipated to be predominantly **insignificant** due to distance separation, with the potential of some **temporary**, **local effects** up to **minor adverse** significance when works are undertaken proximate to the Site boundary.

9.68. As previously discussed with regards to building damage vibration levels at least an order of magnitude higher than those for human disturbance are required to cause damage to buildings. It is generally accepted that building damage would not arise at PPV levels below 12.5 mm/s. Notwithstanding this for existing structures that are to be retained within the Development some consideration to vibration control would be required, in particular during sheet piling if driven method is used. Potential vibration control measures are discussed in the relevant mitigation section of this Chapter.

9.69. At all building receptors due to distance separation, potential building damage effects from CFA / rotary bored piling would be **insignificant** in the absence of mitigation.

9.70. It is not possible at this stage to accurately predict the significance of the effect from vibration on underground utilities such as the main water mains sewer which Thames Water has identified runs immediately adjacent to the Site. Nonetheless, a comparative study has been carried out comparing measured values of ground vibration from similar piling activities with British Standard

guideline values for underground structures and buildings. Empirical models for the estimation of piling vibration levels were discounted for this assessment as they are considered to be highly variable over short propagation distances. British Standard BS 5228-2 offers guidance on vibration levels from piling activities and provides a summary of measured levels from particular sites, a selection of which is included as **Table 9.12**.

Table 9.12: Summary of measured vibration levels (BS5228:2009)

Piling Methodology	Location and source	Activity	Measured Level (Peak Particle Velocity mm/s)
Effect	C1 1972, London EC2 in overburden and London Clay	Driving Casing	12.5 mm/s at 1 m
	C8 1971, London WC2 in overburden and London Clay	Diesel hammer	20 mm/s at 1 m
	C8 1972, London WC2 in overburden and London Clay	Air hammer	10 mm/s at 1 m
	C53 1979, Molesey (Surrey) in gravel over London Clay	Driving Sheets	4.3 mm/s at 5 m
	C56 1979 Bromley (Greater London) in gravel	Driving Sheets	42 mm/s at 3 m
Pressed In/CFA/Rotary Bored Piling	2000 New Orleans	Pressed in steel sheet piles	4.3 mm/s at 5 m
	1992 Utrecht	Pressed in steel sheet piles	0.7 mm/s at 7 m
	1971 London EC2 in made ground/gravel and London Clay	Rotary Bored Pile	1 mm/s at 4 m
	1981 London EC3 Fill dense ballast and London Clay	Auguring	0.23 mm/s at 20 m
Excavation and Breaking Out[1]	Hydraulic breakout of concrete	Hydraulic Breaker	2.3 mm/s at 8 m
	Excavation of materials	Excavator	1 mm/s at 8 m

9.71. As can be seen from the selected data presented as **Table 9.12**, vibration levels can vary significantly based on site conditions and driving methods. It should also be noted that the above measurements are of PPV in soil; PPV values at the sewer / pipe wall itself are likely to be lower due to imperfect vibration coupling between the soil and the sewer / pipe.

9.72. Based on the above data, it can be concluded that the magnitude of the ground vibration resulting from the Works, if effect piling is to be used is likely to be of the order of 10 mm/s and for the more likely CFA solution vibration levels of no greater than 1 mm/s would be expected. With regards to excavation and breaking out of existing concrete a maximum PPV level of 2.3 mm/s would be expected.

[1] Source: Federal Transit Association

9.73. As previously discussed, Annex B.4 of BS 5228-2 considers the effect of vibration on underground services and recommends a vibration limit of 30 mm/s PPV for intermittent or transient vibration and 15 mm/s for continuous vibration. This limit is conservative as far as the integrity of the pipe/sewers concerned. Even a PPV of 30 mm/s gives rise to a dynamic stress which is equivalent to only 5% of the allowable working stress in typical pipe work. As such, in light of the above the potential effects of the Works on underground utilities is considered to be **insignificant**. Despite this, vibration monitoring would be advised where piling works are proposed proximate to underground services and utilities.

Completed Development

Building Services Plant Noise

9.74. At this stage of the Development, the specific type, configuration (or location for the outline area) of fixed plant are not defined and therefore appropriate plant noise emission limits have been set, as detailed later in the relevant mitigation section of this Chapter.

9.75. As part of the detailed element of the Development within the Stag Brewery component of the Site (Application A – Development Area 1), plant areas are to be provided throughout the single level basement area as well as at roof level for each individual block. Roof level plant will predominantly consist of smoke extract and heat rejection plant whilst basement plant is likely to include air handling units, boilers and pumps as required.

9.76. At this stage in the design, plant specification would be sufficiently flexible to ensure that suitably quiet, non-tonal plant can be procured and / or mitigation options such as screening (e.g. acoustic louvres) could be installed as necessary to ensure that the plant noise criteria is met. In the absence of not setting maximum plant noise levels or the stipulated noise levels not achieved, the likely effect on existing surrounding receptors and future receptors within the Development from building services noise would be **long term, local adverse** and up to **moderate significance**.

Retail Commercial Uses and Services

9.77. The detailed element of the Development within the Stag Brewery component of the Site (Application A – Development Area 1) includes a mix of uses, including employment, retail, community and leisure uses, sui generis uses, a hotel and residential units. Basement car park and servicing area also forms part of the detailed development and would be located to the east of Ship Lane. Vehicular access and egress to the eastern basement would be via dedicated access points on Ship Lane and Mortlake High Street between Blocks 5 and 10 of the Development. The outline element of the Development located to the west of Ship Lane (Application A – Development Area 2) includes areas of residential and accommodation which is being applied for flexibly as assisted living accommodation or residential. This area also includes basement level car parking for these uses.

9.78. During future design stages of the Development, the sound insulation performance requirements of the external building fabric would be appropriately specified to control noise break-out, having regard to the nature of future uses and occupants of each unit. This is to ensure internally generated noise would be attenuated to a level as to be unobtrusive at the nearest residential areas. Standard controls, secured through planning conditions relating to the noise emissions,

building construction, opening hours and use of outside space would be used to minimise likely noise effects. Therefore, noise effects associated with non-residential, retail / commercial uses of the Development on existing receptors surrounding the Development and future sensitive receptors within the Development are expected to be **insignificant**.

9.79. The majority of service vehicles would enter the Site from Mortlake High Street onto the new high street via a controlled access. The number of delivery vehicles associated with non-residential retail / commercial uses would be largely dependent upon the final occupants, however it is currently predicted by PBA that there would be 48 trips per day to the Site east of Ship Lane and 12 trips per day to Development west of Ship Lane. Vehicle movement on the highway network are accounted for in the road traffic assessment below. However, consideration of delivery activities is required. It is considered that standard controls, secured through planning conditions relating to hours of delivery, combined with acoustic attenuation measures, would be used to minimise likely noise effects. Therefore, noise effects associated with servicing and deliveries on existing receptors surrounding the Development and future sensitive receptors within the Development would be **insignificant** to at worst **long-term**, **local**, **intermittent**, **adverse** effects of up to **minor significance.**

9.80. Mitigation would be required to reduce the effect from this source should it occur during the night-time period.

9.81. With regard to bedrooms located directly above the main access points to the basement car parking there is the potential for **long-term**, **local**, **intermittent**, **adverse** effects of up to **minor significance** to arise during peak hours or if large numbers of vehicles enter or exist the car park during the night-time period.

Road Traffic Noise

9.82. The likely change in road traffic noise resulting from operational traffic associated with the Development was determined in accordance with CRTN; the results of which are presented in **Table 9.13**. The 2027 baseline scenario '*without Development'* includes traffic increases due to natural traffic growth and committed developments. The '*with Development'* scenario (which includes the Chalkers Corner works) is intended to identify the likely effects solely as a result of the Development. Full details of the road traffic noise assessment are provided within **Appendix 9.4**.

Table 9.13: Summary of Road Traffic Noise Assessment

Road Link	Difference in dB $L_{A10,18hr}$ BNL (Base + Development) - (Base)		
	2027 - Without Development (Base)	2027 - With Development (Base + Development)	Change
A316 Clifford Ave	75.1	75.1	0.0
A316 Lower Richmond Road	73.2	73.3	0.1
South Circular (north of A316)	69.4	69.5	0.1
South Circular (south of A316)	70.3	70.3	0.0
A3003 Lower Richmond Road (Watney's Sports Ground)	70.8	71.1	0.2
A3003 Lower Richmond Road (Mortlake Green)	70.9	71.1	0.2
Williams Lane	51.6	56.7	5.1
Mortlake High Street	71.3	71.4	0.1
The Terrace (west of Barnes Bridge Station)	71.0	71.1	0.1
White Hart Lane (south of Mortlake High Street)	64.8	64.9	0.1
Sheen Lane (north of Level Crossing)	64.8	65.1	0.3
Sheen Lane (south of Level Crossing)	64.4	64.7	0.3
Sheen Lane (south of South Circular)	63.3	63.5	0.2
South Circular Road (west of Sheen Lane)	71.1	71.1	0.0

9.83. For all road links assessed presented as **Table 9.13**, the difference in operational road traffic noise (considering the 2027 baseline situation both 'with' and 'without' Development) is less than 1dB(A) and therefore **insignificant**, except along Williams Lane. When considering vehicle movements along Williams Lane there is expected to be an increase in noise levels of around 5.1dB which with reference to the significance criteria presented in **Table 9.6** would give rise to at worst long-term, local adverse effect of major significance. The predicted noise level 'without' Development should however be treated with caution, as the AAWT-18 hour flow on this link is below the range of the predictive CRTN methodology. Further to this, the noise climate at this location is likely to be dominated by road traffic noise from Lower Richmond Road with BNL predicted noise levels of 71dB $L_{A10,18h}$ and A316 Clifford Avenue with BNL predicted noise levels of 75dB $L_{A10,18h}$. Noise from these major roads is likely to mask any noise increase resultant from increase traffic flow along Williams Lane, which is some 20 to 25dB lower. On this basis the potential effect from changes in road traffic noise along Williams Lane is anticipated to be **insignificant** up to **long-term**, **local adverse** effect of **minor** significance.

Noise from Proposed School and Play Space

9.84. Up to 4,084 m^2 GEA would be children's play space for future residents and 10,305 m^2 GEA including the sports hall and roof top play space which would be provided as part of the proposed school Play facilities for different age groups are positioned within residential courtyards, parks, plazas and open space areas.

9.85. Play elements and facilities are provided in a range of forms within the public and private realms of the Development, including designated and fenced playgrounds, unfenced but contained play spaces with a range of play elements and carer seating, topographic variation and play opportunities in the landscape (within planting areas) and 'play on the way' elements within circulation spaces and public realm areas. Refer to Parameter Plan P10736-00-001-123 for the location of play space provision in the outline component of the Development (Application A – Development Area 2) and the Landscape Design and Access Statement for the detailed component of the Development (Application A – Development Area 1).

9.86. Although there would be the potential for local play facilities to generate a degree of noise, the levels generated would be relatively low and would in general not be of concern to local residents. Of primary concern would be noise effects associated with larger more formalised play space and sports pitches such as those associated with the proposed school.

9.87. The proposed school would provide semi enclosed play space at roof level (refer to planning applications drawing C645_Z3_P_RF_001), an indoor sports hall and activity studio on the first floor (refer to planning application drawing C645_Z3_P_01_001), an external MUGA to the south of the school building and a full sized artificial all weather playing pitch with spectator facilities to the west of the school building.

9.88. With regards to noise effects there would be the potential for noise associated with the proposed school facilities to effect upon both existing receptors surrounding the Development and future sensitive receptors within the Development. The primary sources of noise associated with the school are likely to include the semi-enclosed play space at roof level, the external MUGA and the full sized artificial all weather pitch.

9.89. In order to assess the potential effects associated with this school element of the Development noise levels have been predicted based on noise source measurements during use of similar sized sports pitches. When considering existing SRs the change in ambient noise levels has been assessed.

9.90. For those receptors introduced as part of the Development which have no prior knowledge of the existing noise climate assessment against the absolute criteria of 50dB L_{Aeq} as recommended by Sports England has been undertaken. The assessment has been completed for the closest SRs to the sports pitches only. The assessment results are presented as **Table 9.14**.

Table 9.14: Assessment of Noise Effects Associated with Sports Pitches

SR (Figure 9.1)	Existing Ambient Noise Level (dB(A))	Predicted Noise Level from Sports Pitches (3G sports pitch & MUGA)	Combined Ambient and Predicted 3G sports pitch & MUGA Noise Level (dB(A))	Change in Noise Level (dB)
SR A – Watney Road	60 day	61	64	4
	58 evening	61	63	5
SR B – Williams Lane	60 day	63	65	5
	58 evening	63	64	6
SR C – Lower Richmond Road	71 day	63	72	1
	69 evening	63	70	1
Closest Future SR	n/a	63	n/a	n/a

Note: Daytime period 07:00-19:00; evening period 19:00-23:00, although this does not necessarily reflect operational (usage) times of 3G sports pitch and MUGA.

9.91. With reference to the assessment in **Table 9.14** it can be seen that there would be a maximum increase in noise levels of 4dB for SR A – Watney Road and 5dB for SR B – Williams Lane, as a result of noise from use of 3G sports pitch and MUGA sports facilities. A 1dB increase is predicted for SR C – Lower Richmond Road. These temporary increases in noise levels, during usage of the facilities, would give rise to **insignificant** effects at receptors on Lower Richmond Road. This is in part due to the relatively high prevailing noise levels at this location due to road traffic on Lower Richmond Road. At SR A the effect is considered to be **long-term, local, intermittent adverse** of **minor** to **moderate adverse** significance and at SR B **long-term, local, intermittent adverse** of **moderate adverse** significance, based on predicted change in prevailing noise levels. It should be noted however that a noise level of 63dB(A) is within the noise level range for normal conversations, which ranges from 55 to 65dB(A).

9.92. With regards to future noise sensitive receptors, noise levels associated with the sports pitches would be in the region of 63 dB at the nearest future SRs, thereby above the recommendations set out by Sport England, however consideration should be given to the future prevailing noise climate when assessing the significance of this. Based on measured prevailing noise levels, it is likely that an increase in noise level would be experienced by the nearest future SRs which are distant from Lower Richmond Road. The increase is likely to be comparable to that predicted from SRs A and B. On this basis, the effect during usage of 3G sports pitch and MUGA facilities is anticipated to be **long-term, local, intermittent adverse** of **minor** to **moderate adverse** significance.

Mitigation Measures and Likely Residual Effects

The Works

9.93. As detailed in **Chapter 6: Development Programme, Demolition, Alteration, Refurbishment and Construction**, a Construction Environmental Management Plan (CEMP) would be formulated in consultation with LBRuT, relevant legislation and other relevant guidance. The CEMP would set out a range of mitigation measures and environmental controls which would include the management of demolition and construction related noise and vibration. The Site

would also be registered for the Considerate Constructors Scheme. Control measures to minimise noise would include:

- use of hoarding to the required height and density appropriate to the noise sensitivity of the Site;
- use of modern, quiet and well maintained machinery such as electric powered plant, where possible and hoists should use the Variable Frequency Converter drive system;
- vehicles and mechanical plant used for the works would be fitted with exhaust silencers, which would be maintained in good and efficient working order and operated in such a manner as to minimise noise emissions in accordance with the relevant EU / UK noise limits applicable to that equipment or no noisier than would be expected based the noise levels quoted in BS 5228. Plant should be properly maintained and operated in accordance with manufacturers' recommendations. Electrically powered plant would be preferred, where practicable, to mechanically powered alternatives;
- establish noise and vibration target levels (a Section 61 agreement under the Control of Pollution Act 1974[6] (COPA)) to reduce noise and vibration to a minimum in accordance with best practicable means, as defined in Section 72 of COPA;
- where required, monitoring of noise and vibration levels;
- changing where possible methods and processes to keep noise levels low;
- positioning plant as far away from residential property as physically possible;
- works would be limited to the specified hours and would be subject to agreement with LBRuT and hours worked on noisy operations would be limited; and
- liaison with the occupants of adjacent properties most likely to be affected by noise or vibration from activities on the Application Site should also take place. The occupants should be informed of the nature of the works, proposed hours of work and anticipated duration prior to the commencement of activities.

9.94. With regards to traffic management during the Works, as detailed in **Chapter 8: Transport and Access**, all traffic logistics would be agreed between LBRuT, contractors and the Applicant. Such measures would be set out within a Construction Logistics Plan. Consideration would also be given to the avoidance (or limited) use of road during peak hours, where practicable.

Noise

9.95. Accounting for the implementation of mitigation, as set out above, which should afford 10 dB(A) reduction, the likely residual noise levels associated with the Works are presented in **Appendix 9.3** and summarised in **Table 9.15** with significance of residual effects, which would be localised short-term and temporary in nature, presented as **Table 9.16**.

Table 9.15: Predicted Demolition & Construction (mitigated) Noise Levels dB L_{Aeq}

Fig 9.1 Ref	Description	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure)	Floor Slab (superstructure)	Public Realm & Landscaping	Highways Pavement
A	5-68 Watney Road	<65	69	67	<65	<65	<65	<65	<65	<75[1]	70
B	4-24 Williams Lane	73	<75[1]	<65	71	72	72	72	73	<75[1]	70
C	1-69 Lower Richmond Road	74	77	66	66	67	68	67	69	75	70
D	Chertsey Court	<65	77	<60	<60	<61	<62	<61	<62	75	70
E	139 Lower Richmond Road	<63	77	<62	<63	<64	<65	<64	<65	75	70
F	Future SR Within the Development	n/a	74	<75[1]	71	72	72	72	73	71	67

Note: [1] Additional mitigation assumed when works proximate to site boundary thereby allow up to 15dB attenuation to be achieved. This would be achieved either by additional shielding, change in method of working. Reducing on-time etc.

Table 9.16: Significance of Demolition & Construction Noise Effects (mitigated)

Fig 9.1 Ref	Description	Demolition	Enabling	Sheet Piling (substructure)	Excavation (substructure)	CFA (substructure)	Concreting (substructure)	Steel Frame (superstructure)	Floor Slab (superstructure)	Public Realm & Landscaping	Highways Pavement
A	5-68 Watney Road	Insig	Min	Insig	Insig	Insig	Insig	Insig	Insig	Mod	Mod
B	4-24 Williams Lane	Mod	Mod	Insig	Mod	Mod	Mod	Mod	Mod	Mod	Mod
C	1-69 Lower Richmond Road	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig
D	Chertsey Court	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig
E	139 Lower Richmond Road	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig	Insig
F	Future SR Within the Development	n/a	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Insig

Note: Insig – insignificant; Min – minor; Mod – moderate; Maj – major: [1] Receptor within 20m of work therefore deconstruction method assumed.

9.96. With mitigation, residual effects are predicted to reduce to **insignificant**, to **temporary, short-term**, **local**, **adverse** effects of up **minor** to **moderate significance**. It should be borne in mind that the assessment is worst case based on when works are being undertaken at the shortest distance to the receptors.

Vibration

9.97. With the implementation of the vibration related mitigation measures as detailed above, human perception residual effects are likely to be predominantly **insignificant** and at worst, **temporary, short-term**, **local, adverse** effects of **minor significance.** The residual effect on buildings to be retained would remain **insignificant.**

Traffic

9.98. As insignificant effects as a result of construction traffic are predicted mitigation measures are not proposed and residual effects would remain **insignificant**.

Completed Development

Building Services Plant Noise

9.99. Based upon BS4142 and requirements of LBRuT, noise emissions from fixed mechanical plant would be limited to at least 10 dB below background at the nearest identified noise receptor with a minimum value of 45 and 40 dB $L_{Ar,Tr}$ (as defined by BS4142:2014) recommended during the day and night-time periods respectively for non-residential receptors, taking account of prevailing noise levels. With regard to residential receptors a minimum night-time noise limit of 35dB $L_{Ar,Tr}$ is recommended where prevailing background noise levels are less than 45dB $L_{A90,T}$ with a maximum daytime noise limit of 45dB $L_{Ar,Tr}$ where prevailing background noise levels are greater than 55dB L_{A90}. **Table 9.17** presents the recommended plant noise limits based on the establish prevailing noise levels to safeguard the existing amenity.

Table 9.17: Recommended Plant Noise Limits

Location (Ref Figure 9.1)	Period	Representative $L_{A90,5min}$	Plant Noise Emission Limit ($L_{Ar,Tr}$ as defined by BS4142:2014)
NSR A & B (noise limit inferred from LT4)	Daytime (07:00 and 23:00)	48 (mode 48)	38
	Night-time (23:00 and 07:00)	39 (mode 36)	35
NSR C (noise limit inferred from LT1)	Daytime (07:00 and 23:00)	59 (mode 61)	45
	Night-time (23:00 and 07:00)	42 (mode 40)	35

9.100. With regard to future residential properties within the Development, plant noise levels should not exceed 40 dB $L_{Ar,Tr}$ at 1 m from the façade of the nearest property. This would result in an IANL of 25-30 dB L_{Aeq}, thereby satisfying the BS8233 night-time criteria with windows open. Typical mitigation includes the following measures:

- procurement of 'quiet' non-tonal plant;
- locate plant and air vents away from sensitive receptors;
- acoustic enclosures;
- in-duct attenuators;
- acoustic louvres; and
- isolation of plant from building structures.

9.101. Should the recommended plant noise limits be achieved, the likely residual effects of noise from fixed plant and building services on the nearest sensitive receptors would be **insignificant.**

Retail Commercial Uses & Services

9.102. During the detailed design stages of the Development, the sound insulation performance requirements of the external building fabric would be appropriately specified to control noise break-out, having regard to the nature of future uses. As stated previously, noise from non-residential uses would be subject to standard controls that could be secured through planning conditions. The likely residual noise effects associated with non-residential uses of the Development on existing and future sensitive receptors are expected to be **insignificant**.

9.103. At this stage, it has not been possible to quantify the noise effect from deliveries and servicing as details regarding the final tenants and associated servicing and delivery areas are not known. Prior to the occupation of each Development area, a detailed Delivery and Servicing Plan (DSP) (based on the outline DSP submitted for planning) should be prepared to include:

- managing the deliveries (including by courier) and servicing requirements of retail, office and leisure tenants;
- hours of operation of the for any servicing areas and loading bays; and
- refuse and recycling collections.

9.104. With the implementation of the DSP, the likely residual effects of noise from the servicing and deliveries within the Development to existing receptors surrounding the Development and future sensitive receptors within the Development is likely to be **insignificant.**

9.105. Potential adverse effects from ingress/egress of cars to the basement carpark to residential units located above could be mitigated through internal layouts so bedrooms do not directly overlook the access point, or provision of enhanced glazing to potentially affected rooms thereby rendering residual potential effects **insignificant**.

Road Traffic Noise

9.106. Potential effects are insignificant. Therefore, mitigation is not proposed and residual effects remain **insignificant**.

Noise from Proposed School and Play Space

9.107. Predicted effects associated with noise from the proposed school and play space range from insignificant to long-term local, intermittent adverse of minor to moderate adverse significance. Provision of boundary treatment to the west and north of the 3G sports pitch could be considered, however given the intermittent use of the 3G sports pitch and MUGA and with overall predicted noise levels being within the range of normal conversation, temporary increases in the prevailing noise levels should be acceptable. Mitigation is therefore not proposed and residual effects remain **insignificant to long-term local, intermittent adverse of minor to moderate adverse significance**. Further to this, it should be noted that the view between SRs A, B and sports pitches would be visually screened by trees. Although this would not have a direct acoustic benefit in reducing noise levels, psychologically it would have a positive benefit.

Summary

9.108. **Table 9.18** summarises the likely significant effects, mitigation measures, and likely residual effects identified within this Chapter.

Table 9.18: Summary of Likely Significant Effects, Mitigation Measures and Likely Residual Effects

Issue	Likely Significant Effect	Mitigation Measures	Likely Residual Effect
The Works			
Temporary increase in noise levels from work activities affecting receptors close to the Site.	**Temporary, short-term local** effects of **major adverse significance**.	Implementation of a CEMP.	**Insignificant** to t**emporary, short-term, local residual effect** of **minor** to **moderate adverse**.
Vibration generated during sheet piling operations affecting receptors close to the Site.	**Insignificant** to **temporary, short-term, local adverse** effects of **moderate significance**.		**Insignificant** to **temporary, short-term, local adverse** effects of **minor significance**.
Vibration effects on building structures and underground utilities (assuming CFA or rotary bored piling techniques).	**Insignificant**.	None required.	**Insignificant**.
Increase in heavy plant movements on strategic roads.	**Insignificant**.	None required, however a Construction Traffic Management Plan would also be implemented.	**Insignificant**.
Completed Development			
Noise from fixed plant and building services.	**long-term, local adverse effects** of up to **moderate significance**.	Inherent mitigation would allow plant and building services noise to meet the required plant noise limit of LBRuT.	**Insignificant**.
Noise from non-residential land-uses.	**Insignificant**. **Long-term, local, intermittent adverse effects** up to **minor significance** from ingress / egress of vehicles to the basement parking areas during peak hours or should this occur during the night-time period.	Control through planning conditions and implementation of Delivery and Servicing Plan.	**Insignificant**.

Issue	Likely Significant Effect	Mitigation Measures	Likely Residual Effect
Noise from changes in road traffic.	**Insignificant**.	None required.	**Insignificant**.
Noise from proposed school and play space.	**Insignificant** to. long-term, local, **intermittent adverse effects** up to **minor** and **moderate** significance	None proposed.	**Insignificant to long-term, local, intermittent adverse effects** up to **minor significance** during usage of 3G sports pitch and MUGA.

References

1 British Standards Institution (2014); 'BS 5228:1: 2009 +A1 2014: Code of practice for noise and vibration control on construction and open sites. Noise', BSI, Great Britain.

2 British Standards Institution (2009); 'BS 5228:2 2009: Code of practice for noise and vibration control on construction and open sites, Vibration', BSI, Great Britain.

3 DoT (1988); 'Calculation of Road Traffic Noise', HMSO.

4 Sports England (2015); 'Artificial Grass Pitch (AGP) Acoustics – Planning Implications', Sports England.

5 Highways Agency (2011); 'Design Manual for Road and Bridges, Volume 11 Environmental Assessment, Section 3, Environmental Assessment Techniques, Part 7 Noise and Vibration', The Stationery Office.

FIGURES

Stag Brewery Component of the Site

Chalker's Corner Component of the Site

ST1 ST2 ST3 ST4 ST5 ST6 ST7 ST8

LT1 LT2 LT3 LT4

A B C D E

MORTLAKE

Sports Ground

Brewery

Mortlake Green

Rosemary Gardens

Lady Elizabeth House

Leyden House

Hammersmith New Cemetery

Crematorium

Chertsey Court

Garage

Sorting Office

Girl Guides Centre

Sea Scouts Centre

N

The Site

Noise Sensitive Receptor

Long Term Noise Monitoring Locations

Short Term Noise Monitoring Locations

Project Details	WIE10667-101: Stag Brewery, Mortlake
Figure Title	Figure 9.1: Noise Monitoring and Sensitive Receptor Locations
Figure Ref	WIE10667-101_GR_ES_9.1A
Date	2018
File Location	\\s-lncs\wiel\projects\wie10667\101\graphics\es\issued figures

APPENDICES

A. Appendix 9.1: Acoustic Terminology

APPENDIX 9.1
ACOUSTIC TERMINOLOGY

Appendix 9.1: Glossary of Acoustic Terminology

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0dB to 140dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3dB. A 3dB noise change is generally considered to be just noticeable, a 5dB change is generally considered to be clearly discernible and a 10dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

Examples of typical sound intensity levels within the decibel range of 0 to 120dB are listed below:

- Four engine jet aircraft at 100m 120dB
- Riveting of steel plate at 10m 105dB
- Pneumatic drill at 10m 90dB
- Circular wood saw at 10m 80dB
- Heavy road traffic at 10m 75dB
- Telephone bell at 10m 65dB
- Male speech, average at 10m 50dB
- Whisper at 10m 25dB
- Threshold of hearing, 1000Hz 0dB

Frequency

Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18,000Hz. The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.

A-Weighting

The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Sound Power Level (L_W) and Sound Pressure Level (L_P)

These two units are used to express sound level. Sound power level is the inherent property of a source, whilst sound pressure level is dependent on surroundings/distance/directivity etc. The sound level that is measured on a meter is the sound pressure level, L_P.

$L_{Aeq,T}$

The A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

L_{A10}	The noise level exceeded for 10% of the measurement period. It has been used in the UK for the assessment of road traffic noise.
L_{A90}	The noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quieter parts of the measurement period.
L_{Amax}	Maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax\ F}$, or Fast, is averaged over 0.125 of a second and $L_{Amax\ S}$, or Slow, is averaged over 1 second. Maximum noise levels were all monitored using the Fast response.
$L_{10,1\text{-hour}}$	The L_{10} level measured over a 1-hour period.
$L_{10,18\text{-hour}}$	The arithmetic average of the $L_{10,1\text{-hour}}$ levels for the 18-hour period between 06:00 hours and 24:00 hours on a normal working day. It is a common traffic noise descriptor.
Ambient noise	The totally encompassing sound in a given situation.
Free Field	Free field noise levels are measured or predicted such that there is no contribution made up of reflections from nearby building façades.
Façade Noise Level	A noise level measured or predicted at the façade of a building, typically at a distance of 1m, containing a contribution made up of reflections from the façade itself (+3dB).
Sound Reduction Index (R)	The sound reduction index is a single-number rating of the sound reduction through a wall or other building element. Since the sound reduction may be different at different frequencies, test measurements are subjected to a standard procedure which yields a single number that is about equal to the average sound reduction in the middle of the human hearing range.
Weighted Sound Reduction Index (R_W)	The R_W incorporates a correction for the ears' response. It is derived from comparing the window sound insulation to frequency curve with a family of reference curves.
R_{TRA}	Traffic noise reduction – by adopting an idealised but typical spectrum of road traffic noise dominated by low frequencies, an index R_{TRA} (reduction of road traffic noise) is derived. By comparing this with the sound reduction of the window in dB(A) it represents the likely in service performance for road traffic noise attenuation.
$D_w + C_{tr}$	An on-site measure of airborne sound insulation. The C_{tr} correction is a spectrum adaptation term which 'penalises' low frequency noise.
Vibration	A to-and-fro motion; a motion which oscillates about a fixed equilibrium position.
VDV	Vibration Dose Value is a measure of vibration exposure.
PPV	Peak Particle Velocity is the parameter normally used to assess ground vibration measured in mm/s. Peak particle velocity refers to the maximum speed of a particular particle as it oscillates about a point of equilibrium.

B. Appendix 9.2: Baseline Noise Monitoring

APPENDIX 9.2
BASELINE NOISE MONITORING

Appendix 9.2: Baseline Noise Monitoring

To inform the noise and vibration assessment required for the ES for Stag Brewery, Mortlake, a comprehensive noise survey was undertaken over a five-day period from Friday 24 June to Wednesday 29 June 2016, covering a typical weekday and weekend period in order to establish and quantify the existing noise climate at and within the vicinity of the Site.

Baseline Noise Survey

The noise monitoring locations are shown on **Figure 9.1** and described below in **Table 9.2.1**.

Table 9.2.1: Noise Monitoring Locations

Monitoring Location (Refer to Figure 9.1)	Description	Observations and Predominant Noise Sources
LT1	Free-field measurement at the south-western Site boundary overlooking Lower Richmond Road (the A3003). Microphone located 1.2m AGL.	Noise climate dominated by constant vehicular traffic on Lower Richmond Road / Mortlake High Street. Although intermittent in comparison, noise from low flying aircraft movements in to Heathrow Airport (located approx. 11km to the east) was significant, with approximately one plane every minute going over the Site. Contributory noise from human activities, distant road noise and distant aircraft also influence the noise climate to some extent.
LT2	Façade measurement on the second floor of the Stag Brewery Co. building at the south-eastern Site boundary overlooking Mortlake High Street. Microphone located 6.0m AGL.	
LT3	Façade measurement on the boundary wall to the north-east of the Site overlooking the River Thames. Microphone located 4.0m AGL.	Noise climate dominated by aircraft noise, as detailed above. Contributory noise from local and distant road traffic and occasional passing cyclists and joggers on the footpath over the river.
LT4	Free-field measurement at the south-western boundary of the Site orientated towards Clifford Avenue/Chiswick Bridge (the A316). Microphone located 2.5m AGL.	Noise climate influenced by constant vehicular traffic on Clifford Avenue. Contributory noise from domestic activates from nearby residential dwellings.

A summary of the measured daytime (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00) noise levels are presented in **Table 9.2.2**, with full results displayed graphically in time-history format below. A summary of attended short-term daytime measurement results are presented in **Table 9.2.3** out of completeness.

Table 9.2.2: Summary of Unattended (Long Term) Baseline Noise Measurements (free-field)

Monitoring Location (Figure 9.1)	Period	Duration	$L_{Aeq,T}$ dB		$L_{A10,T}$ dB		$L_{A90,T}$ dB		$L_{AFmax,5min}$ dB	
			Range	Ave[1]	Range	Ave[2]	Range	Ave[2] (Mode)	Range	90th Percentile[3]
LT1	Day	12hr	65 - 81	71	69 - 78	74	47 - 67	59 (61)	76 - 104	86
	Evening	4hr	65 - 77	69	69 - 75	73	43 - 62	52 (53)	74 - 98	83
	Night	8hr	43 - 73	65	41 - 76	65	33 - 63	42 (40)	56 - 98	83
LT2	Day	12hr	64 - 87	70	68 - 75	71	48 - 68	62 (63)	72 - 107	89
	Evening	4hr	60 - 79	68	64 - 74	69	43 - 66	57 (58)	70 - 102	85
	Night	8hr	42 - 79	63	42 - 74	63	32 - 64	43 (39)	57 - 99	80
LT3	Day	12hr	51 - 72	61	53 - 73	63	42 - 59	50 (51)	62 - 100	78
	Evening	4hr	43 - 76	59	46 - 69	61	38 - 53	47 (48)	50 - 98	75
	Night	8hr	38 - 66	55	41 - 71	51	34 - 54	42 (41)	46 - 82	73
LT4	Day	12hr	48 - 70	60	50 - 70	64	42 - 60	48 (48)	61 - 89	76
	Evening	4hr	44 - 63	58	46 - 68	61	38 - 52	46 (47)	49 - 83	74
	Night	8hr	35 - 66	55	38 - 70	50	31 - 54	39 (36)	43 - 79	73

Notes: [1] Logarithmic average over the day/evening/night survey periods; [2] Arithmetic average over the day/evening/night survey periods; [3] The 90th percentile L_{AFmax} value (equivalent to the 10th highest measured L_{AFmax} level) is presented and considered representative of typical L_{AFmax} levels experienced. All figures rounded to nearest whole decibel.

Table 9.2.3: Summary of Attended (Short Term) Baseline Noise Measurements (free-field)

Monitoring Location (Figure 9.1)	Period	Duration	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB	$L_{AFmax,5min}$ dB
			Ave[1]	Ave[2]	Ave[2]	Ave[2]
ST1	Day	30mins	61	64	54	74
ST2	Day	30mins	66	63	53	76
ST3	Day	25mins	75	78	65	88
ST4	Day	20mins	61	65	51	72
ST5	Day	20mins	61	64	50	77
ST6	Day	30mins	69	71	64	80
ST7	Day	20mins	65	68	57	76
CRTN	Day	3hrs	72	76	62	84

Notes: [1] Logarithmic average over the daytime survey periods; [2] Arithmetic average over the daytime survey periods. All figures rounded to nearest whole decibel.

Figures 9.2.1 to **9.2.4** present the time history plots of the long-term noise monitoring locations LT1 to LT4 respectively.

Figure 9.2.1: Time History Plot LT1

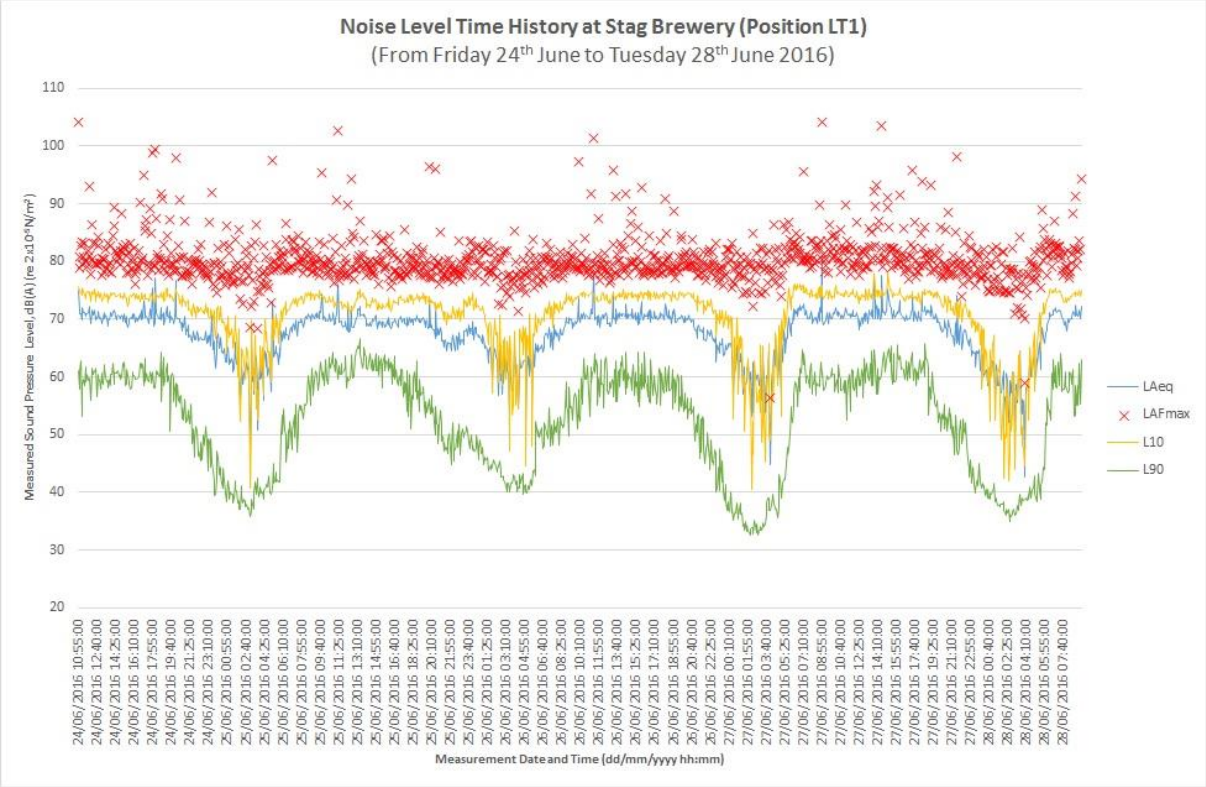


Figure 9.2.2: Time History Plot LT2

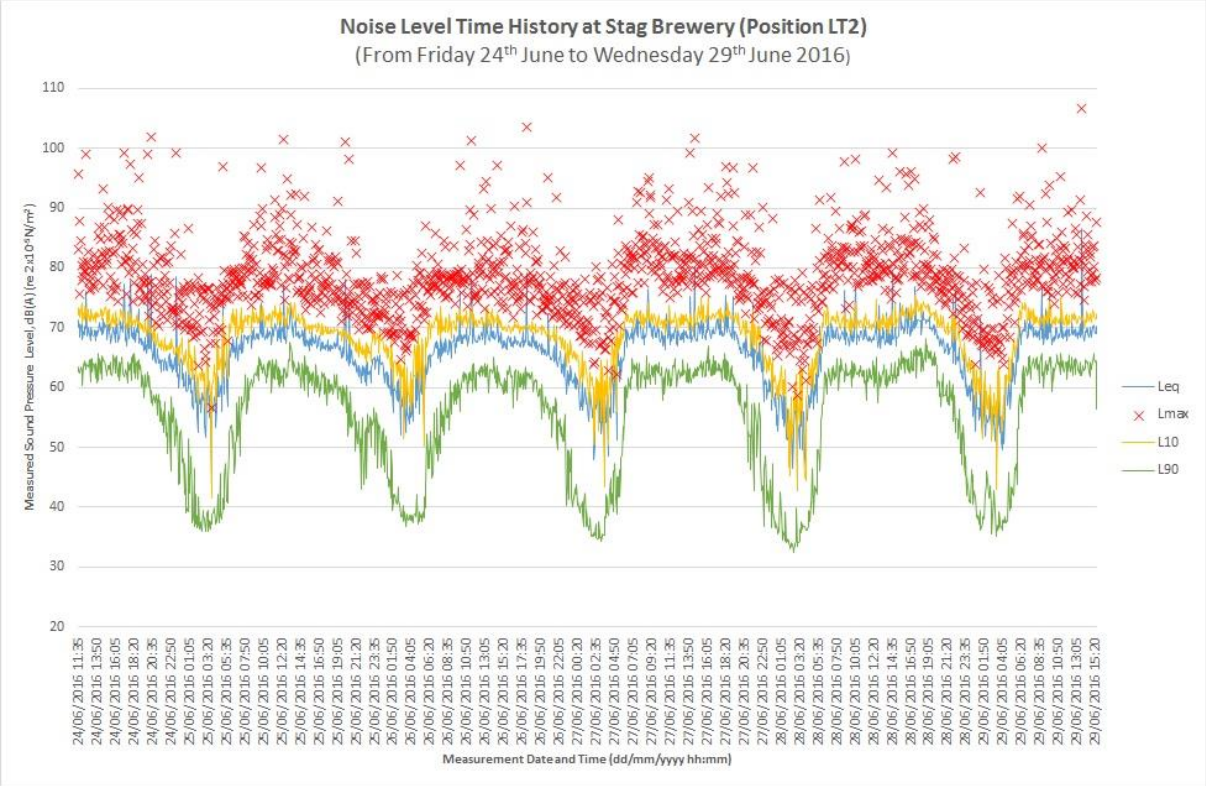


Figure 9.2.3: Time History Plot LT3

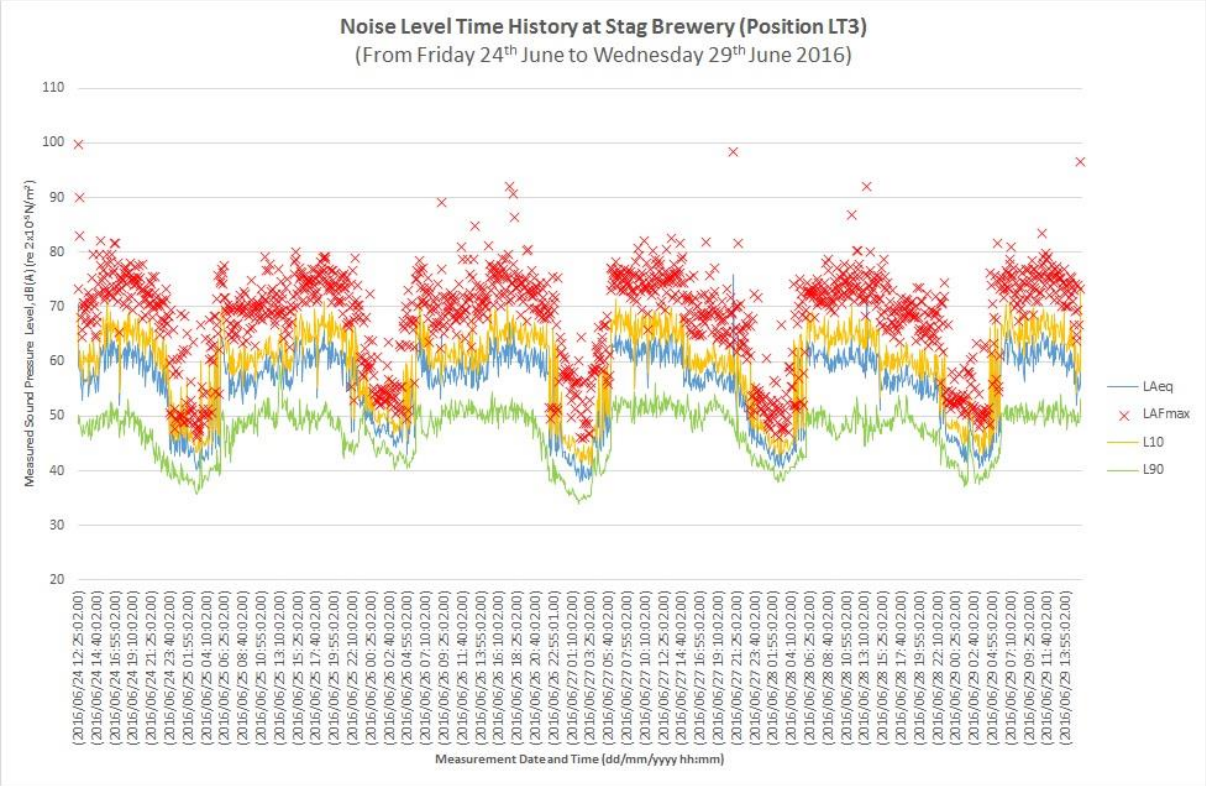
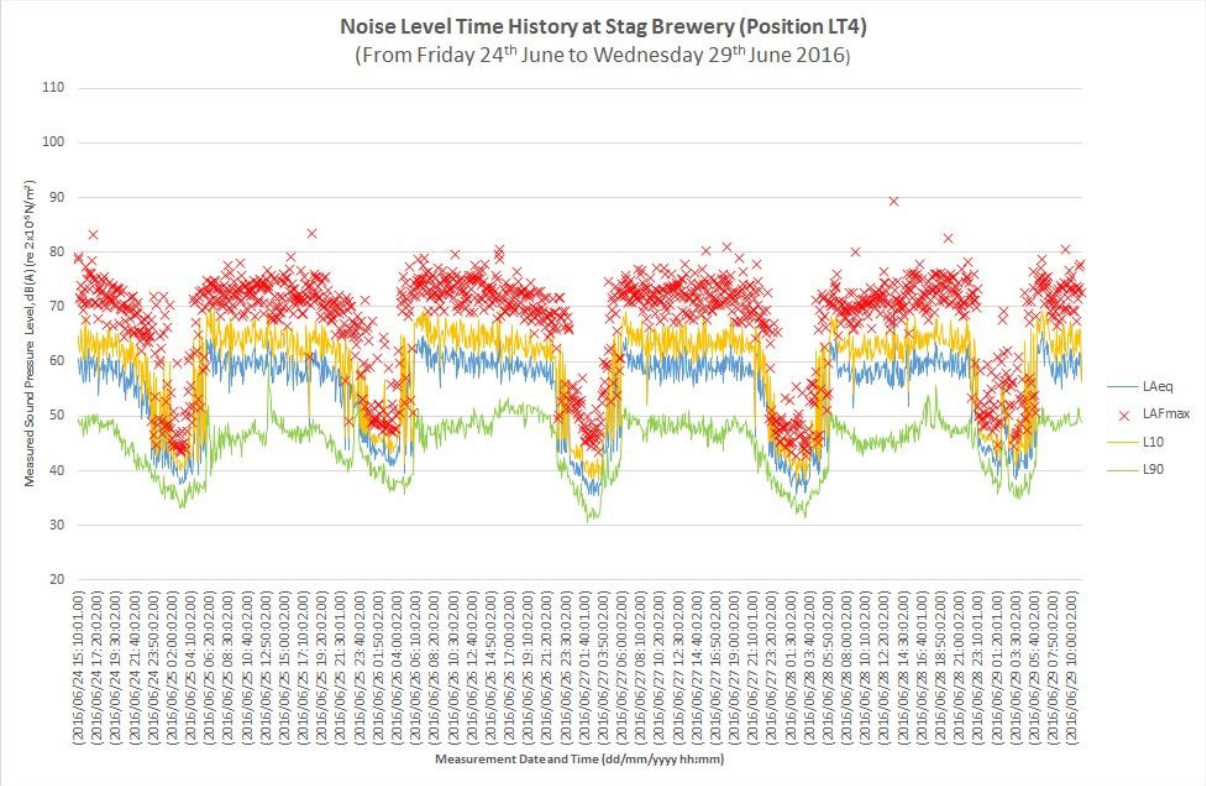


Figure 9.2.4: Time History Plot LT4



C. Appendix 9.3: Demolition and Construction Noise Asessement

APPENDIX 9.3
DEMOLITION AND CONSTRUCTION NOISE ASSESSMENT

Appendix 9.3: Demolition and Construction Noise Assessment

The significance criteria for the noise assessment of the preparation and construction works are based on '*The ABC Method'* from BS 5228-1:2009+A1:2014. An extract describing this method is provided below in **Table 9.3.1**.

Table 9.3.1: ABC Categories

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A[A)]	Category B[B)]	Category C[C)]
Night-time (23.00-07.00)	45	50	55
Evenings and weekends[D)]	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75

NOTE 1 A significant impact has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

NOTE 3 Applied to residential receptors only.

[A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

[B)] Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

[C)] Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

[D)] 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays.

Source: BS 5228-1:2009+A1:2014, Page119

Calculations have not been undertaken for the evening or night-time periods as it is assumed that evening and night-time demolition and construction work would only be undertaken under exceptional circumstances and not without prior approval. Exceptional circumstances may include concreting operations where the pumping of concrete to foundations has to be a continuous process which may require operations outside the daytime period.

Table 9.3.2 presents the ABC BS5228 construction threshold daytime noise levels based on the measured prevailing noise levels for key sensitive receptors (SRs).

Table 9.3.2: Construction Threshold Noise Levels

SR Ref	SR Description	Measured Daytime Noise Level dB $L_{Aeq,T}$	BS5228 ABC Threshold Noise Level dB $L_{Aeq,T}$	Distance from Demolition (approx. m)	Distance from Site Boundary (approx. m)
A	5-68 Watney Road	60 (LT4)	65	150	25
B	4-24 William Lane	60 (LT4)	65	22	5
C	1-69 Lower Richmond Road	71 (LT1)	75	20	5
D	Chertsey Court	72 (ST8)	75	180	5
E	139 Lower Richmond Road	72 (ST8)	75	215	5
F	Future Residential	-	65	n/a	15 (from nearest works)

Generic calculations were undertaken using the data and procedures set out in BS 5228-1:2009+A1:2014 for the noisiest construction phases, to derive indicative noise levels at selected sensitive receptors (SRs).

The highest noise levels tend to be associated with plant associated with, demolition, piling, construction of the substructure and superstructure. During the fit-out, construction noise would be significantly lower. The calculations assume that plant would be operating at the closest point to the SR, and do not take into account any existing or proposed screening. The noisiest construction phases and associated noise levels are considered to be as follows:

- Demolition 90 dB $L_{Aeq,1h}$ at 10m
- Enabling Works 87 dB $L_{Aeq,1h}$ at 10m
- Substructure, Basement Sheet Piling 88 dB $L_{Aeq,1h}$ at 10m
- Substructure, Excavation 84 dB $L_{Aeq,1h}$ at 10m
- Substructure, CFA 85 dB $L_{Aeq,1h}$ at 10m
- Substructure Concreting 86 dB $L_{Aeq,1h}$ at 10m
- Superstructure, Building Steel Frame 85 dB $L_{Aeq,1h}$ at 10m
- Superstructure, Concrete Floor Slab (incl power floating) 86 dB $L_{Aeq,1h}$ at 10m
- Public Realm & Landscaping 85 dB $L_{Aeq,1h}$ at 10m
- Highways Pavement 80 dB $L_{Aeq,1h}$ at 10m

Table 9.3.3 presents the generic plant and on-time used in the calculation of the demolition and construction noise levels. A maximum worst case noise level over a one hour period was calculated, assuming that plant would be operating at the closest point to the nearest NSRs in the absence of mitigation. In practice, noise levels would tend to be lower owing to greater separation distance as the works progress. They would also tend to reduce over a 12-hour working day (week-day, 5 hours Saturday) owing to periods of plant inactivity.

Table 9.3.3: Generic Construction Noise Levels

Phase / Plant	Source	LW	LAeq @10m	Distance From Boundary to NSR (m)	Kh	(t/T)*100	Partial Exposure	Barrier Attenuation	Noise Level @ NSR LAeq,1h (dB)	Overall LAeq,1h (dB)
Demolition Buildings										**90**
High Reach Hydraulic Excavator	CAT 340F UHD	106	78	10	0	1.00	0	0	78	
Tracked Crusher (47t)	BS5228 Table C1 ref 14		82	10	0	0.25	-6	0	76	
Breaker Mounted on Wheeled Backhoe (7.4t)	BS5228 Table C1 ref 1		92	10	0	0.50	-3	0	89	
Dozer (11t)	BS5228 Table C2 ref 13		78	10	0	0.25	-6	0	72	
Hand Held Pneumatic Breaker (concrete foundation)	BS5228 Table C1 ref 6		83	10	0	0.25	-6	0	77	
Wheeled Backhoe Loader (8t)	BS5228 Table C2 ref 8		68	10	0	0.50	-3	0	65	
Compressor	BS5228 Table C5 ref 5		65	10	0	0.50	-3	0	62	
Lump Hammer	BS5228 Table C1 ref 19		69	10	0	0.25	-6	0	63	
Hand-held circular saw (Petrol-cutting concrete blocks)	BS5228 Table C4 ref 72		79	10	0	0.10	-10	0	69	
Scaffold poles and clips	BS5228 Table D7 ref 1		80	10	0	0.20	-7	0	73	
Tracked Mobile Crane	BS5228 Table C4 ref 50		71	10	0	0.50	-3	0	68	
Lorry x 2	BS5228 Table C2 ref 34		83	10	0	0.10	-10	0	73	
Enabling Works										**87**
Breaker Mounted on Wheeled Backhoe (7.4t)	BS5228 Table C1 ref 1		92	10	0	0.25	-6	0	86	
Hand Held Pneumatic Breaker (concrete foundation)	BS5228 Table C1 ref 6		83	10	0	0.25	-6	0	77	
Hand-held circular saw (Petrol-cutting concrete blocks)	BS5228 Table C4 ref 72		79	10	0	0.10	-10	0	69	
Tracked Crusher (47t)	BS5228 Table C1 ref 14		82	10	0	0.25	-6	0	76	
Wheeled Backhoe Loader (8t)	BS5228 Table C2 ref 8		68	10	0	0.50	-3	0	65	
Lorry x 2	BS5228 Table C2 ref 34		83	10	0	0.10	-10	0	73	
Tracked Excavator (14t)	BS5228 Table C2 ref 7		70	10	0	1.00	0	0	70	
Sheet Piling (substructure)										**88**
Vibratory Sheet Piling	BS5228 Table C3 ref 8		88	10	0	1.00	0	0	88	

Phase / Plant	Source	LW	LAeq @10m	Distance From Boundary to NSR (m)	Kh	(t/T)*100	Partial Exposure	Barrier Attenuation	Noise Level @ NSR LAeq,1h (dB)	Overall LAeq,1h (dB)
Dewatering Pumps	BS5228 Table C2 ref 45		65	10	0	1.00	0	0	65	
Water Jet Pump	BS5228 Table C3 ref 13		63	10	0	1.00	0	0	63	
Excavation (substructure)										**84**
Tracked Excavator (14t)	BS5228 Table C2 ref 7		70	10	0	1.00	0	0	70	
Tracked Excavator (14t)	BS5228 Table C2 ref 7		70	10	0	1.00	0	0	70	
Wheeled Backhoe Loader (8t)	BS5228 Table C2 ref 8		68	10	0	1.00	0	0	68	
Hydraulic Vibratory Compactor (Tracked Excavator)	BS5228 Table C2 ref 42		78	10	0	1.00	0	0	78	
Dozer (11t)	BS5228 Table C2 ref 13		78	10	0	1.00	0	0	78	
Lorry (4-axle wagon)	BS5228 Table C2 ref 34		80	10	0	1.00	0	0	80	
CFA (substructure)										**85**
Crawler mounted rig - Continuous Flight Auger Piling Cast In-Situ	BS5228 Table C3 ref 21		79	10	0	1.00	0	0	79	
Tracked Excavator	BS5228 Table C3 Ref 23		68	10	0	1.00	0	0	68	
Tracked Excavator Inserting Cylindrical Metal Cage	BS5228 Table C3 Ref 24		74	10	0	1.00	0	0	74	
Truck Mounted Concrete Pump + Boom Arm	BS5228 Table C4 ref 29		80	10	0	1.00	0	0	80	
Concrete Mixer Truck	BS5228 Table C4 Ref 20		80	10	0	1.00	0	0	80	
Pump Boom + Vibrating Poker	BS5228 Table C4 ref 36		71	10	0	1.00	0	0	71	
Concreting (substructure)										**86**
Truck Mounted Concrete Pump + Boom Arm	BS5228 Table C4 ref 29		80	10	0	1.00	0	0	80	
Concrete Mixer Truck	BS5228 Table C4 Ref 20		80	10	0	1.00	0	0	80	
Pump Boom + Vibrating Poker	BS5228 Table C4 ref 36		71	10	0	1.00	0	0	71	
CM60 Concrete Batching Plant	Manufacturer's Data	111	83	10	0	1.00	0	0	83	
Building Steel Frame (superstructure)										**85**
Mobile Telescopic Crane	BS5228 Table C4 ref 39		77	10	0	1.00	0	0	77	
Mobile Telescopic Crane	BS5228 Table C4 ref 39		77	10	0	1.00	0	0	77	
Site Lift Worker	BS5228 Table C4 ref 62		66	10	0	1.00	0	0	66	

Phase / Plant	Source	LW	LAeq @10m	Distance From Boundary to NSR (m)	Kh	(t/T)*100	Partial Exposure	Barrier Attenuation	Noise Level @ NSR LAeq,1h (dB)	Overall LAeq,1h (dB)
Diesel scissor lift	BS5228 Table C4 ref 59		78	10	0	1.00	0	0	78	
Diesel scissor lift	BS5228 Table C4 ref 59		78	10	0	1.00	0	0	78	
Power for welder diesel	BS5228 Table C4 ref 85		77	10	0	1.00	0	0	77	
Power for welder diesel	BS5228 Table C4 ref 85		77	10	0	1.00	0	0	77	
Building Floor Slab (superstructure)										**86**
Truck Mounted Concrete Pump + Boom Arm	BS5228 Table C4 ref 29		80	10	0	1.00	0	0	80	
Concrete Mixer Truck	BS5228 Table C4 Ref 20		80	10	0	1.00	0	0	80	
Pump Boom + Vibrating Poker	BS5228 Table C4 ref 36		71	10	0	1.00	0	0	71	
CM60 Concrete Batching Plant	Manufacturer's Data	111	83	10	0	1.00	0	0	83	
Power Float	Manufacturer's Data	105	77	10	0	1.00	0	0	77	
Public Realm & Landscaping										**85**
Tracked Excavator (14t)	BS5228 Table C2 ref 7		70	10	0	1.00	0	0	70	
Tracked Excavator (14t)	BS5228 Table C2 ref 7		70	10	0	1.00	0	0	70	
Wheeled Backhoe Loader (8t)	BS5228 Table C2 ref 8		68	10	0	1.00	0	0	68	
Hydraulic Vibratory Compactor (Tracked Excavator)	BS5228 Table C2 ref 42		78	10	0	1.00	0	0	78	
Dozer (11t)	BS5228 Table C2 ref 13		78	10	0	0.50	-3	0	75	
Lorry (4-axle wagon)	BS5228 Table C2 ref 34		80	10	0	1.00	0	0	80	
Concrete Mixer Truck	BS5228 Table C4 Ref 20		80	10	0	0.25	-6	0	74	
Truck Mounted Concrete Pump + Boom Arm	BS5228 Table C4 ref 29		80	10	0	0.25	-6	0	74	
Mobile Telescopic Crane	BS5228 Table C4 ref 39		77	10	0	0.50	-3	0	74	
Highways - Pavement										**80**
Road planer	BS5228 Table C5 ref 7		82	10	0	0.50	-3	0	79	
Spreading chip and fill	BS5228 Table C5 ref 12		77	10	0	0.25	-6	0	71	
Vibratory roller	BS5228 Table C5 ref 20		75	10	0	0.25	-6	0	69	
Asphalt paver (+ tipper lorry)	BS5228 Table C5 ref 30		75	10	0	0.25	-6	0	69	

Phase / Plant	Source	LW	LAeq @10m	Distance From Boundary to NSR (m)	Kh	(t/T)*100	Partial Exposure	Barrier Attenuation	Noise Level @ NSR LAeq,1h (dB)	Overall LAeq,1h (dB)
Vibratory compactor (asphalt)	BS5228 Table C5 ref 29		82	10	0	0.50	-3	0	79	
Lorry (4-axle wagon)	BS5228 Table C2 ref 34		80	10	0	0.25	-6	0	74	

Predicted construction noise levels of the demolition and construction works both with and without mitigation are summarised in **Table 9.3.4** to **Table 9.3.9**.

Table 9.3.4: Demolition and Construction Predicted Noise Levels

SR	Demolition / Construction Activity	Threshold Limit (dB(A))	Predicted Site Noise Level (dB(A))	Significance of Effect	Predicted Site Noise Level With Mitigation (dB(A))	Significance of Residual Effect
SR A	Demolition	65	67	Insignificant	<65	Insignificant
	Enabling		79	Major	69	Minor
	Sheet Piling (substructure)		77	Major	67	Insignificant
	Excavation (substructure)		65	Insignificant	<65	Insignificant
	CFA (substructure)		67	Insignificant	<65	Insignificant
	Concreting (substructure)		67	Insignificant	<65	Insignificant
	Steel Frame (superstructure)		67	Insignificant	<65	Insignificant
	Floor Slab (superstructure)		68	Minor	<65	Insignificant
	Public Realm & Landscaping		85	Major	<75[1]	Moderate
	Highways Pavement		80	Major	70	Moderate
SR B	Demolition	65	83	Major	73	Moderate
	Enabling		87	Major	<75[1]	Moderate
	Sheet Piling (substructure)		67	Insignificant	<65	Insignificant
	Excavation (substructure)		81	Major	71	Moderate
	CFA (substructure)		82	Major	72	Moderate
	Concreting (substructure)		82	Major	72	Moderate
	Steel Frame (superstructure)		82	Major	72	Moderate
	Floor Slab (superstructure)		83	Major	73	Moderate
	Public Realm & Landscaping		85	Major	<75[1]	Moderate
	Highways Pavement		80	Major	70	Moderate
SR C	Demolition	75	84	Moderate	74	Insignificant
	Enabling		87	Major	77	Insignificant
	Sheet Piling (substructure)		76	Insignificant	66	Insignificant
	Excavation (substructure)		76	Insignificant	66	Insignificant
	CFA (substructure)		77	Insignificant	67	Insignificant

SR	Demolition / Construction Activity	Threshold Limit (dB(A))	Predicted Site Noise Level (dB(A))	Significance of Effect	Predicted Site Noise Level With Mitigation (dB(A))	Significance of Residual Effect
	Concreting (substructure)		78	Minor	68	Insignificant
	Steel Frame (superstructure)		77	Insignificant	67	Insignificant
	Floor Slab (superstructure)		79	Minor	69	Insignificant
	Public Realm & Landscaping		85	Major	75	Insignificant
	Highways Pavement		80	Moderate	70	Insignificant
SR D	Demolition	75	65	Insignificant	<65	Insignificant
	Enabling		87	Major	77	Insignificant
	Sheet Piling (substructure)		60	Insignificant	<60	Insignificant
	Excavation (substructure)		60	Insignificant	<60	Insignificant
	CFA (substructure)		61	Insignificant	<61	Insignificant
	Concreting (substructure)		62	Insignificant	<62	Insignificant
	Steel Frame (superstructure)		61	Insignificant	<61	Insignificant
	Floor Slab (superstructure)		62	Insignificant	<62	Insignificant
	Public Realm & Landscaping		85	Major	75	Insignificant
	Highways Pavement		80	Moderate	70	Insignificant
SR E	Demolition	75	63	Insignificant	<63	Insignificant
	Enabling		87	Major	77	Insignificant
	Sheet Piling (substructure)		62	Insignificant	<62	Insignificant
	Excavation (substructure)		63	Insignificant	<63	Insignificant
	CFA (substructure)		64	Insignificant	<64	Insignificant
	Concreting (substructure)		65	Insignificant	<65	Insignificant
	Steel Frame (superstructure)		64	Insignificant	<64	Insignificant
	Floor Slab (superstructure)		65	Insignificant	<65	Insignificant
	Public Realm & Landscaping		85	Major	75	Insignificant
	Highways Pavement		80	Moderate	70	Insignificant
SR F	Demolition	65	n/a	n/a	n/a	n/a
	Enabling		84	Major	74	Moderate
	Sheet Piling (substructure)		85	Major	<75[1]	Moderate

SR	Demolition / Construction Activity	Threshold Limit (dB(A))	Predicted Site Noise Level (dB(A))	Significance of Effect	Predicted Site Noise Level With Mitigation (dB(A))	Significance of Residual Effect
	Excavation (substructure)		81	Major	71	Moderate
	CFA (substructure)		82	Major	72	Moderate
	Concreting (substructure)		82	Major	72	Moderate
	Steel Frame (superstructure)		82	Major	72	Moderate
	Floor Slab (superstructure)		83	Major	73	Moderate
	Public Realm & Landscaping		81	Major	71	Moderate
	Highways Pavement		77	Major	67	Insignificant

Note: [1] Additional mitigation assumed when works proximate to site boundary thereby allow up to 15dB attenuation to be achieved. This would be achieved either by additional shielding, change in method of working. Reducing on-time etc.

D. Appendix 9.4: Road Traffic Noise Assessment Calculations

APPENDIX 9.4
ROAD TRAFFIC NOISE ASSESSMENT CALCULATIONS

Appendix 9.4: Road Traffic Noise Assessment Calculations

Table 9.4.1: Future Year 2027 With and Without Development

Road		Base + Cumulative Committed Developments			Base + Cumulative Committed Developments			% Flow Change	BNL 18hr		
		2027			2027	+ Development					
		% HGV	Speed (kph)	Flow	% HGV	Speed (kph)	Flow		2027 Without Development	2027 With Development	Change
1	A316 Clifford Ave	10.0	64.0	36800	10.0	64.0	37299	1.4	75.1	75.1	0.0
2	A316 Lower Richmond Road	6.0	48.0	40326	6.0	48.0	40917	1.5	73.2	73.3	0.1
3	South Circular (north of A316)	6.4	48.0	16313	6.4	48.0	16553	1.5	69.4	69.5	0.1
4	South Circular (south of A316)	4.1	48.0	23229	4.1	48.0	23325	0.4	70.3	70.3	0.0
5	A3003 Lower Richmond Road (Watney's Sports Ground)	8.9	45.5	20277	8.6	45.5	21703	7.0	70.8	71.1	0.2
6	A3003 Lower Richmond Road (Mortlake Green)	10.0	41.7	20473	9.6	41.7	21939	7.2	70.9	71.1	0.2
7	Williams Lane	7.1	41.1	747	5.7	41.1	1456	94.9	51.6	56.7	5.1
8	Mortlake High Street	10.8	41.6	21558	10.5	41.6	22569	4.7	71.3	71.4	0.1
9	The Terrace (west of Barnes Bridge Station)	8.9	46.4	20697	8.8	46.4	21568	4.2	71.0	71.1	0.1
13	Sheen Lane (south of South Circular)	8.0	39.8	5815	7.9	39.8	5955	2.4	64.8	64.9	0.1
14	South Circular Road (west of Sheen Lane)	3.4	48.0	6987	3.5	48.0	7443	6.5	64.8	65.1	0.3

UK and Ireland Office Locations