Oriel

Noise and Vibration Assessment

October 2020

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Oriel
Creating the centre for advancing eye health

Moorfields Eye Hospital NHS Foundation Trust

NHS

Moorfields Eye Charity

UCL INSTITUTE OF OPHTHALMOLOGY

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Oriel
Noise and Vibration Assesment

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Moorfields Eye Charity

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Contents

Figures (in Appendices B to D)

Tables

1 Introduction

1.1.1 Moorfields Eye Hospital NHS Foundation Trust, on behalf of Oriel[1], commissioned AECOM to undertake an environmental noise and vibration impact assessment report to support a planning application for a new facility that would allow the existing Moorfields Eye Hospital (Moorfields at City Road) and University College London (UCL) Institute of Ophthalmology (IoO) services at Bath Street to relocate into a single new building at the existing St. Pancras Hospital site (hereafter referred to as the 'Proposed Development').

1.1.2 The Proposed Development is located in the north-western part of the St Pancras Hospital, between St Pancras Way and Granary Street, within the London Borough of Camden (LBC) (hereafter referred to as the 'Site').

1.1.3 The following are described within this report:

- The methods used to assess the likely significant noise and vibration effects associated with the Proposed Development;
- The current baseline noise environment at receptor locations within the existing Site and within the surrounding area based upon a long-term noise survey supplemented with short-term noise measurements; and
- Mitigation measures required to prevent, reduce or offset any likely significant adverse noise and vibration effects arising as a result of the Proposed Development.

1.1.4 This assessment has considered the likely noise and vibration effects which may arise during the construction phase, and on completion and occupation of the Proposed Development. It is considered that Proposed Development has the potential to result in noise and vibration effects due to:

- Noise and vibration emissions due to construction activities;
- Noise emissions from the Proposed Development during operation (specifically in relation to building services plant); and
- Changes in noise levels as a result of increases in road traffic movements on the local road network due to the Proposed Development.

1.1.5 Definitions of acoustic terminology relevant to this report are provided in Appendix A.

[1] Oriel is a joint venture between Moorfields Eye Hospital NHS Foundation Trust, University College London Institute of Ophthalmology and Moorfields Eye Charity

2 Legislation and Planning Policy Context

2.1 Legislation

Control of Pollution Act

2.1.1 The Control of Pollution Act 1974 (CoPA) (Ref. 1) requires that Best Practicable Means (BPM) (as defined in section 72 of CoPA) are adopted to control construction noise on any given site as far as reasonably practicable. Sections 60 and 61 of the CoPA constitute the main legislation regarding enabling works and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the Local Authority with instructions to cease work until specific conditions to reduce noise have been adopted.

2.1.2 Section 61 of the CoPA provides a means to apply for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

Environmental Protection Act (1990)

2.1.3 The Environmental Protection Act 1990 (EPA) Part 3 (Ref. 2) prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.

2.1.4 Local Authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve a noise abatement notice. A notice is served on the person responsible for the nuisance and requires either abatement works to be carried out, or it prohibits/ restricts the activity. Contravention of a notice without reasonable excuse is an offence. Right of appeal to the Magistrates Court exists within 21 days of a noise abatement notice having been served.

2.1.5 In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law as no statutory noise limits exist. Demonstrating the use of BPM to minimise noise levels is an accepted defence against a noise abatement notice.

2.2 National Planning Policy

National Planning Policy Framework (2019)

2.2.1 The aim of the National Planning Policy Framework (NPPF) (Ref. 3) in terms of noise and vibration is to prevent both *"new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of…. noise pollution*…" (paragraph 170).

2.2.2 Section 15 of the NPPF is concerned with conserving and enhancing the natural environment, including the matters that should be considered for planning decisions in relation to ground conditions and pollution. This includes, as set out in paragraph 180, ensuring "*that new development is appropriate for its location taking into account the likely effects (including*

cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impacts on health and quality of life[2]; and*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…."*

2.2.3 These policies must be applied in the context of government policy on sustainable development.

Noise Policy Statement for England (2010)

2.2.4 The Noise Policy Statement for England (NPSE) (Ref. 4) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise, and neighbourhood noise.

2.2.5 The NPSE sets out the long-term vision of the government's noise policy, which is to "*promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".*

2.2.6 This long-term vision is supported by three aims:

- *"Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimize adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvements of health and quality of life.""*

2.2.7 The 'Explanatory Note' within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

[2] See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010) (Ref. 4).

2.2.8 With reference to the SOAEL, the NPSE states:

"It is recognised that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

2.2.9 For situations where noise levels are between the LOAEL and SOAEL, all reasonable steps should be taken to mitigate and minimise the adverse effects. However, this does not mean that such adverse effects cannot occur.

Planning Practice Guidance Noise (2019)

2.2.10 The Planning Practice Guidance Noise (PPGN) (Ref. 5) "*advises on how planning can manage potential noise impacts in new development*" and provides guidelines that are designed to assist with implementation of the NPPF.

2.2.11 The PPG states that local planning authorities should take account of the acoustic environment and in doing so should consider:

- "*whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved*."

2.2.12 Factors to be considered in determining whether noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative effects.

2.2.13 Further details on the hierarchy of noise effects are presented in Table 2-1, which has been reproduced from the PPGN.

Table 2-1 Planning Practice Guidance Noise Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the	No Observed Adverse Effect	No specific measures required

Perception	Examples of Outcomes	Increasing Effect Level	Action
	acoustic character of the area but not such that there is a change in the quality of life		
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.3 Regional Planning Policy

The London Plan - the Spatial Development Strategy for London (2016)

2.3.1 The adopted London Plan (Ref. 6) sets a framework for development of London over the next 20 years. With regards to noise, the following policies set out a number of methods for the management of noise in new developments.

- Policy 3.2: Addressing health and health inequalities –requires work with key partners to address significant health issues (i.e. those created / affected by noise levels) in an area, and monitor policies / interventions for their impact on health;

- Policy 5.3: Sustainable design and construction –requires design principles for minimising noise pollution are implemented within developments;
- Policy 7.6: Architecture –states that architecture should make a positive contribution to an area, and consequently new developments should be of the highest architectural quality (including use of materials to minimise noise levels); and
- Policy 7.15: Reducing and managing noise, improving and enhancing the acoustic environment and promoting appropriate soundscapes – requires noise to be managed in order to encourage the right acoustic environment and to promote good health and a good quality of life within the wider context of achieving sustainable development.

The draft new London Plan (Intend to Publish version 2019)

2.3.2 The draft New London Plan was originally published on 27 November 2017 for consultation. Following consultation and the Examination in Public (EiP), the Mayor published the Intend to Publish London Plan (Ref. 7) in December 2019, which was due to be adopted in summary 2020 and may be adopted during the determination period of this application. The Proposed Development has been assessed against the relevant policies of the Intend to Publish London Plan.

2.3.3 It is noted that the draft new London Plan is a material consideration in determining planning applications, while it does not yet form part of the development plan under Section 38(6) of the Planning and Compulsory Purchase Act 2004. The adopted London Plan remains the development plan until such time that the draft new London Plan is adopted.

2.3.4 The following key policies relating to noise and vibration are contained within the draft new London Plan:

- Draft Policy D12: Agent of Change – places the responsibility for mitigating impacts from existing noise generating activities or uses on the proposed new noise-sensitive development. This principle should be applied to all noise-generating uses and activities including schools, places of worship, sporting venues, offices, shops, industrial sites, waste sites, safeguarded wharves, rail and other transport infrastructure. The aim of this policy is to protect businesses and activities that generate noise from being impacted by new noise sensitive developments; and
- Draft Policy D13: Noise – provides details on how noise from new developments may be managed to improve health and quality of life.

City Soundings: The Mayor's London Ambient Noise Strategy (2004)

2.3.5 The London Ambient Noise Strategy (Ref. 8) aims to minimise the adverse effects of noise on people living, working in and visiting London by using the best available practices and technologies within a sustainable development framework.

2.3.6 The Strategy aims to work towards a more compact city development while minimising noise. This requires careful consideration of the adverse effect of noise on, from, within or in proximity to a development.

Sustainable Design and Construction Supplementary Planning Guidance (2014)

2.3.7 The Sustainable Design and Construction Supplementary Planning Guidance (Ref. 9) provides guidance on key noise-related areas and makes reference to the following policies in the adopted London Plan:

- London Plan Policies 3.2, 7.15 – "Areas identified as having positive sound features or as being tranquil should be protected from noise"; and
- London Plan Policies 3.2, 5.3, 7.6, 7.15 – "Noise should be reduced at source, then designed out of a scheme to reduce the need for mitigation measures".

2.4 Local Planning Policy

Camden Local Plan (2017)

2.4.1 The Camden Local Plan (Ref. 10) sets out the planning policies for the borough. Policy A1 relates to managing the impact of a new development and identifies noise and vibration as a factor for consideration. Policy A1 states that to ensure a new development does not cause unacceptable harm to amenity, LBC will:

a. *"seek to ensure that the amenity of communities, occupiers and neighbours is protected;*
b. *seek to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities;*
c. *resist development that fails to adequately assess and address transport impacts affecting communities, occupiers, neighbours and the existing transport network; and*
d. *require mitigation measures where necessary".*

2.4.2 Policy A4 relates to noise and vibration and states:

"*The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:*

a. *development likely to generate unacceptable noise and vibration impacts; or*
b. *development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to

amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development".

2.4.3 In addition, Appendix 3 of the Camden Local Plan provides details of internal and external thresholds that should be applied in noise and vibration assessments.

Camden Planning Guidance – Amenity (2018)

2.4.4 The Camden Planning Guidance – Amenity (Ref. 11) supports the policies in the Camden Local Plan and is a material consideration in planning decisions. The document provides guidance on the methodology to be applied when assessing noise impacts as a result of development.

2.5 Other Relevant Policy, Standards and Guidance

British Standard 4142:2014+A1:2019

2.5.1 BS 4142 'Methods for Rating and Assessing Industrial and Commercial' (Ref. 12) can be used to assess the effect of sound from mechanical services plant. The method compares the difference between the 'rating level' of the new sound, with the 'background level' at the receptor position.

British Standard 7445-1:2003

2.5.2 BS 7445 'Description and Measurement of Environmental Noise' (Ref. 13) defines parameters, procedures and instrumentation required for noise measurement and analysis.

British Standard 5228:2009+A1:2014

2.5.3 BS 5228-1 'Code of practice for noise and vibration control on construction and open sites Noise' (Ref. 14) is the formally adopted Code of Practice under Section 71 of the CoPA. It provides information regarding the control of noise from construction operations. It also includes a method for predicting noise from construction activities.

2.5.4 BS 5228-2 'Code of practice for noise and vibration control on construction and open sites. Vibration' (Ref. 15) provides comparable information for vibration control, including guidance on the human response to vibration.

Calculation of Road Traffic Noise (1998)

2.5.5 Department of Transport/Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN)' (Ref. 16) describes procedures for calculating traffic noise and is suitable for use in environmental assessments of schemes where road traffic noise may have an effect.

Design Manual for Roads and Bridges (2020)

2.5.6 The Highways Agency's 'Design Manual for Road and Bridges Sustainability & Environment Appraisal LA 111 Noise and Vibration' (DMRB) (Ref. 17) provides guidance on assessing noise effects due to changes in road traffic noise.

Department of Health, Health Technical Memorandum 08-01: Acoustics (2013)

2.5.7 The Department of Health's (DoH) 'Health Technical Memorandum 08-01: Acoustics' (HTM 08-01) (Ref. 18) provides information on the acoustic requirements involved in the development of healthcare facilities

3 Assessment Methodology

3.1 Methodology for Determining Baseline Conditions and Sensitive Receptors

3.1.1 The study area that was considered for the noise and vibration assessment encompasses the Proposed Development and nearby sensitive receptors that may be affected during construction and operation of the Proposed Development.

3.1.2 This section describes the methodology that defines the study area based on the baseline noise and vibration monitoring locations and locations of sensitive receptors.

3.2 Baseline Noise Monitoring Methodology

3.2.1 Baseline noise surveys were undertaken to establish the baseline noise environment around the Site. Additionally, the baseline noise measurements have been used to validate the noise modelling methodology and to provide a means to derive assessment criteria so that potential noise impacts associated with the Proposed Development can be identified.

3.2.2 Baseline noise surveys were undertaken from 27 August to 10 September 2020, comprising unattended long-term noise measurements that were supplemented with short-term attended noise monitoring during the daytime period.

3.2.3 The noise monitoring locations are described in Table 3-1 and illustrated in Appendix B.

Table 3-1 Noise Monitoring Locations

Location ID	Details
ML1	Adjacent to St Pancras Way next to the Post Room.
ML2	On Granary Street adjacent to the North Wing building.
ML3	Fire escape in the north section of space between the Kitchen Block and the Camley Centre.
ML4	Southern boundary of the Site out of 1st floor window of the Residence Building.

3.2.4 Due to constraints associated with the on-going Covid-19 pandemic, there is uncertainty about whether noise data obtained during noise surveys can be considered to be representative of normal conditions given changes in travel patterns and use of public transport with many people still working from home. Consequently, in addition to the baseline noise monitoring undertaken at the Site, existing noise surveys from planning applications submitted for 101 Camley Street (planning reference 2014/4385/P) and 2-6 St Pancras Way (planning reference 2017/5497/P) have been referenced. Although data from these planning applications are four and six years old respectively, it is considered that the 2-6 St Pancras Way data provides a useful guide to determining the validity of the recent baseline noise measurements for the Site whereas the 101 Camley Street data was not considered appropriate.

Methodology for Determining Sensitive Receptors

3.2.5 Potential sensitive receptors (i.e. buildings whose occupants may be disturbed by adverse noise and vibration levels, and structures that are sensitive to vibration) have been taken into consideration when assessing the effects associated with noise and vibration levels from the construction and operational phases of the Proposed Development.

3.2.6 The effect of noise and vibration generated during the construction and operational phases of the Proposed Development has been considered at nearby sensitive receptors. A number of receptors that may potentially be affected have been considered in this assessment, which are the nearest receptors to the Site, i.e. the receptors that will experience the highest levels of noise and vibration. Although noise and vibration may be perceivable at other receptors in the area around the Proposed Development, effects will not be significant if they are suitably controlled at the identified receptors.

3.3 Methodology for Determining Construction and Operational Effects

Methodology for Determining Construction Noise Effects

3.3.1 To assess potential noise impacts due to construction activities, periods (i.e. discrete ‘snapshots’ of construction activities occurring) have been selected from the construction programme that are considered representative of high noise-generating periods (representing a worst case). The construction phases identified to represent the likely highest levels of noise emissions are as follows:

- Demolition;
- Substructure works;
- Superstructure works; and
- Fit-out.

3.3.2 Specific details of the construction works associated with the Proposed Development will be available once a contractor has been appointed and the detailed construction methodology has been prepared following completion of the Stage 4 detailed design. Therefore, at this stage, representative construction activities and reasonable worst-case assumptions, including the likely type and number of construction plant, have been assumed based on AECOM's experience of approaches to construction activities for similar projects.

3.3.3 For the purposes of assessing noise from construction activities, Sound Power Level (Lw) values for equipment to be used during construction activities have been sourced from BS 5228-1. Noise predictions of construction activities have been undertaken using CadnaA noise modelling software. CadnaA applies methodologies described within BS 5228-1 to predict construction noise. A list of indicative plant to be used during the demolition and construction phase is presented in Table C-1 of Appendix C.

3.3.4 BS 5228-1 provides practical information on noise and vibration reduction measures during construction works and promotes a Best Practicable Means (BPM) approach to control noise and vibration. The calculation method provided in BS 5228-1 is based on the number and type of equipment operating, their associated Sound Power Level (Lw), and the distance between the equipment being used and the sensitive receptors.

3.3.5 Criteria for assessing construction noise effects are presented in Table 3-2 and have been defined with reference to 'example method 1 – the ABC method' as defined in BS 5228-1. Category A criteria in the ABC method are interpreted as LOAEL and Category C criteria are considered equivalent to SOAEL. These criteria have been applied in commercial and residential developments throughout London as well as nationally significant infrastructure projects and; therefore, are considered appropriate for this assessment.

Table 3-2 Construction Noise Criteria

Time Periods	Threshold Value ($L_{Aeq,T}$ dB)	
	LOAEL	SOAEL
Day (07:00 – 19:00) Saturday (07:00 – 13:00)	65	75
Weekends (13.00–23.00 Saturdays and 07.00–23.00 Sundays) Evening (19.00 – 23.00)	55	65
Night (23.00 – 07.00)	45	55

Noise effects are expected to occur if the programme of works indicates that the relevant threshold values are likely to be exceeded over a period of at least one month. The values apply to a location one metre from a residential building façade containing a window, ignoring the effect of the acoustic reflection from that façade.

3.3.6 Although a significant effect due to construction activities may be determined through an assessment based on exceedances of the defined SOAELs for construction noise and vibration, additional consideration of the significance of the effect for temporary construction activities is given through qualitative discussion of the following:

- Duration of activities;
- Frequency of events; and
- Sensitivity of receptor.

Construction Works Vibration

3.3.7 In addition to structural piles, sheet piles will be installed adjacent to Granary Street and the North Wing. Although the piling methodology has not been finalised, it is assumed that an auger piling method will be adopted for the structural piles and a push-pull method will be adopted for sheet piling. For the push-pull technique, BS 5228-2 advises that the vibration levels are similar to secant/auger/rotary piling techniques.

3.3.8 Table 3-3 provides Peak Particle Velocity (PPV) levels for different piling activities at various distances from piling locations which are sourced from BS 5228-2. The vibration effect depends on the type of piling, ground conditions, and receptor distance from the vibration source.

Table 3-3 Sample Construction Vibration Levels

PPV Level	Effect	Approximate Distance to Receptor
0.14 to < 0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	> 20 m
0.3 to < 1 mm/s	Vibration might be just perceptible in residential environments.	10 to 20 m
1.0 to < 10 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	5 to 10 m

3.3.9 When defining assessment criteria, reference has been made to BS 5228-2, which provides descriptions of the impact of vibration in terms PPV on human receptors. For residential receptors, the LOAEL has been defined as a vibration dose value of 0.3 mm/s (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL has been defined as a vibration dose value of 1.0 mm/s, this being the level at which construction vibration can be tolerated with prior warning.

3.3.10 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels are controlled to below those which would result in human annoyance then it is highly unlikely that buildings will be damaged by vibration from demolition and construction activities.

Construction Traffic Noise

3.3.11 Road traffic noise levels have been calculated with reference to the methodology within the CRTN which contains an equation for the calculation of the Basic Noise Level (BNL) from a road in terms of the 18-hour AAWT (Average Annual Weekday Traffic) flow from 06:00 to 24:00.

3.3.12 The magnitude of a noise impact due to changes in road traffic noise levels has been assessed with reference to criteria outlined in the DMRB. The criteria used for the assessment of changes in road traffic noise levels arising from construction works have been taken from Table 3.54a of the DMRB and are provided in Table 3-4.

Table 3-4 Road Traffic Noise Assessment Criteria

Magnitude of impact	Increase in BNL (dB)
Negligible	Less than 1.0
Minor	Greater than or equal to 1.0 and less than 3.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Major	Greater than or equal to 5.0

3.3.13 The DMRB also defines the LOAEL as 55 dB $L_{A10,18h}$ and the SOAEL as 68 dB $L_{A10,18h}$. The DRMB goes on to state that:

"Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0dB or over results in a likely significant effect".

3.3.14 This implies that receptors experiencing noise levels exceeding the SOAEL are more sensitive to smaller changes in noise than receptors experiencing absolute noise levels below the SOAEL. As the BNL is calculated at 10 m from the roadside, the absolute noise level is not considered to be representative of the noise levels that nearby receptors may experience; however, the BNL is appropriate for defining a change in noise level. Should an increase in noise of greater than 1 dB be identified from a road where the BNL exceeds the SOAEL, additional calculations are undertaken to identify the absolute noise levels at nearby receptors and the likelihood of significant effects.

3.3.15 Road traffic data used to calculate construction traffic noise effects for the assessed scenarios are presented in Table C-2 of Appendix C.

3.4 Methodology for Determining Operational Effects

Road Traffic Noise

3.4.1 Operational road traffic noise has been assessed by considering the change in traffic flows during the Proposed Development assessment scenarios (see below) with reference to both the CRTN and DMRB. At the selected road traffic noise receptors, the magnitude of the predicted change in noise levels uses the scale presented in Table 3-4. The criteria are based on the current guidance on short-term changes (upon opening) in traffic noise levels in the DMRB. The SOAEL is set at a change in traffic noise of +5 dB and the LOAEL at +1 dB(A).

3.4.2 Road traffic flows for the following scenarios are presented in Appendix C:

- Scenario 1 – Existing 2020 Baseline;
- Scenario 2 – 2026 Future Baseline; and
- Scenario 3 – 2026 Future Baseline with proposed Development.

3.4.3 BS 4142 provides a means of assessing the significance of building services and plant noise. A key aspect of the BS 4142 assessment procedure is a comparison between the background noise level in the vicinity of residential locations and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

- Background Sound Level, $L_{A90,T}$, defined in the Standard as the 'A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels';
- Specific Sound Level, $L_{Aeq,Tr}$, the 'equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr'; and
- Rating Level, $L_{Ar,Tr}$, the specific sound level plus any adjustment made for the characteristic features of the sound'.

3.4.4 BS 4142 provides guidance as to the likely response from sensitive residential receptors to new fixed noise sources (e.g. building plant or services) through comparison of the rating level of the new noise source with the existing background noise level. The higher the rating noise level in comparison to the background noise level, the greater the likelihood of complaints arising. BS 4142 requires separate analysis for day and night-time periods.

3.4.5 Appendix 3 of the Camden Local Plan sets the LOAEL for fixed plant noise at 10 dB below the background noise level. Fixed plant design criteria at nearby sensitive receptors have been derived against this criterion. Emergency equipment that is only to be used for short periods of time is required to meet the noise criteria of no more than 10 dB above the background level ($L_{A90,15mins}$).

3.4.6 Many of the existing buildings around the east and south of the Site are hospital and healthcare buildings on the St Pancras Hospital site. Consequently, guidance in HTM 08-01, which provides design guidance on acoustic standards and requirements to be achieved at healthcare and hospital facilities, has been referenced.

3.4.7 HTM 08-01 provides guidance on external noise emissions to receptors off the hospital site and also external areas of the hospital and states that the following should apply with the most stringent taking precedence:

- *"Noise levels at the site boundary should meet reasonable standards required by the local authority or other relevant body;*
- *Noise outside the buildings should be controlled to allow the internal noise criteria to be achieved; and*
- *Open external areas should be protected. Noise from services should not exceed the existing day-time background noise level or 50 dB L_{A90}, whichever is the higher. This limit should be achieved in any areas normally occupied by staff (except maintenance staff, notwithstanding the requirements of the Control of Noise at Work Regulations 2005) or the public (for example open courtyards and accessible landscaped areas)".*

3.4.8 It is not known whether noise intrusion at the existing buildings, as a result of the external ambient noise levels, is within the requirements of HTM 08-01. In order that the Proposed Development does not impact the existing hospital buildings, the Proposed Development should result in an increase in the external ambient noise levels outside these existing hospital buildings. In order for there to be no increase in the existing ambient noise levels outside the existing St Pancras Hospital buildings, the noise levels from the project Oriel development should be at least 10 dB below the existing ambient noise levels outside these hospital buildings.

3.5 Limitations and Assumptions

3.5.1 A series of assumptions were made regarding some elements of existing noise sources that have the potential to affect noise levels at the Proposed Development.

3.5.2 To assess the potential noise and vibration effect of the Proposed Development, it was necessary to determine the baseline conditions. It is considered that the baseline noise levels have been appropriately defined using noise survey data logged at the Site from 27 August to 10 September 2020 and historical noise data from adjacent sites. Consequently, noise data presented in this report are considered representative of the typical noise environment of the Proposed Development.

3.5.3 While other less dominant or intermittent noise sources are present (e.g. existing sources such as aircraft or future sources such as car parking and loading / delivery areas), due to the limitations of digital noise modelling, and as the precise details of future operations within the Proposed Development are yet to be finalised, these cannot be accurately included in a model as a continuous noise source. However, the inclusion of the dominant noise sources in the area (road and rail traffic) into the noise models provides a realistic view of the typical noise environment across the Proposed Development.

3.5.4 Construction noise predictions have been undertaken using typical items of equipment that are used in these types of developments (details are provided in Appendix C). These items of plant are taken to be representative of the equipment that will be used during construction of the Proposed Development. Noise predictions were carried out to represent a conservative scenario where all construction plant is operational at the same time. Consequently, the noise predictions may overestimate construction noise levels and can therefore be considered as worst case.

3.5.5 The measured $L_{A90,T}$ background noise level has been used to define design criteria for fixed plant associated with the Proposed Development. Background noise levels may change in the period between the survey and the future assessment years; however, as the $L_{A90,T}$ background noise level is a statistical value based on a range of measured noise data, it is not possible to predict future background noise levels with any degree of accuracy. It is considered that background noise levels are unlikely to reduce in the intervening period between the 2020 baseline survey and the 2026 assessment year due to the ongoing development of areas surrounding the Proposed Development. Consequently, it is considered that the derived design criteria provide suitable noise thresholds to ensure that noise effects from future building services plant are negligible.

4 Baseline Conditions

4.1 Noise Monitoring Results

4.1.1 A summary of baseline noise measurements is presented in Table 4-1. The results of noise measurements and analysis of data in comparison with historical data from planning applications from adjacent developments are presented in more detail in Appendix D. This data is considered representative of typical baseline noise conditions at the Site.

Table 4-1 Noise Monitoring Results

Location	Daytime		Night-time		
	$L_{Aeq,16h}$ dB	$L_{A90,15min}$ dB	$L_{Aeq,8h}$ dB	$L_{A90,15min}$ dB	L_{AFmax} dB
ML1	68*	51	65*	47	85
ML2	62 ($L_{Aeq,1h}$)	55	-	-	-
ML3	52	46	47	43	66
ML4	57	46	48	43	72

*from LT3 (2-6 St Pancras Way) as discussed in Section 0 of Appendix D

4.2 Noise Sensitive Receptors

4.2.1 The nearest existing noise sensitive receptors to the Proposed Development have been selected for the assessment. In addition to existing sensitive receptors, future occupants of a consented development to the north (R13, 2-6 St Pancras Way planning reference: 2017/5497/P), which includes office and residential use may be affected by the Proposed Development.

4.2.2 The receptors identified are listed in Table 4-2 with the locations illustrated in Appendix B. Each existing receptor location has been assigned a measurement location for the purposes of the assessment and appropriate noise level data have been applied at each receptor location for assessment purposes.

Table 4-2. Noise and Vibration Sensitive Residential Receptors

Receptor	Receptor Address	Representative Measurement Location	Receptor Type
R1	North Wing	ML2	Hospital
R2	Huntley Centre	ML4	Hospital
R3	Residences	ML4	Residential
R4	East Wing	ML4	Hospital
R5	West Wing	ML4	Hospital
R6	River Crisis House	ML4	Hospital
R7	Gate House	ML1	Hospital
R8	1-5 St Pancras Way	ML1	Residential
R9	7 St Pancras Way	ML1	Office
R10	9 St Pancras Way	ML1	Hostel

Receptor	Receptor Address	Representative Measurement Location	Receptor Type
R11	11-13 St Pancras Way	ML1	Student Accommodation
R12	2-6 St Pancras Way (consented development)	ML2	Residential/ Office

4.2.3 In addition, King's Cross Central Limited Partnership ('KCCLP') is the development partner of the Camden and Islington Foundation NHS Trust ('the C&I Trust') and they intend to submit a planning application for the remaining part of the St Pancras Hospital site in 2021 (Representative receptors R1-R7).

4.2.4 The design is at an early stage, however it is currently envisaged that the development will retain the existing Chapel, Gatehouse and Workhouse buildings (R3-R7). The buildings to the east of the Site (R1-R2) would be demolished and replaced by three new buildings. It is currently anticipated that planning permission will be sought for a mix of uses including employment, residential and retail/food and drink, as well as some healthcare and office facilities for the C&I Trust.

4.2.5 As this is an emerging scheme, details of the construction programme are not available, however it is unlikely to be constructed and operational prior to the commencement of construction or before the Proposed Development is complete.

5 Assessment of Noise and Vibration Effects

5.1 Introduction

5.1.1 This section presents the results of the assessment of effects to sensitive receptors associated with noise and vibration arising from the construction activities and on completion and occupation of the Proposed Development. Potential vibration effects have been considered during the construction phase of the Proposed Development only, since the Proposed Development will not include any significant vibration sources once it is complete and occupied.

5.2 Effects during Construction

Construction Noise Effects

5.2.1 The worst-case levels of construction noise predicted at the identified existing receptors during each assessment scenario are presented in Table 5-1. These levels have been referenced from noise contour plots in Appendix D, which illustrate the propagation of noise from the Site due to construction activities.

5.2.2 The predicted noise levels demonstrate the level of construction noise that may occur at sensitive receptors during representative periods of high levels of construction activity. A discussion on construction noise effects at R13 has been provided based on the anticipated completion and occupation date for the consented development at 2-6 St Pancras Way.

Table 5-1 Construction Noise Effects (Existing Receptors)

Receptor	Demolition	Substructure	Superstructure	Fit Out
R1	76	76	74	74
R2	76	73	71	71
R3	77	74	72	73
R4	77	76	74	75
R5	75	76	74	74
R6	74	75	73	73
R7	72	74	72	72
R8	71	72	70	71
R9	74	75	73	73
R10	75	75	73	73
R11	74	75	73	73

5.2.3 The identification of construction noise effects has been undertaken with reference to criteria presented in Table 3-2. Due to the proximity of receptors to the Proposed Development, construction noise levels are predicted to exceed the LOAEL at all identified receptors for the duration of the construction programme. Exceedances of the SOAEL are predicted during demolition at R1, R3 and R4; and during substructure works at R1, R4 and R5.

5.2.4 The context of the effect should be considered in terms of receptor sensitivity. It should be noted that the receptors which are predicted to experience noise levels exceeding the SOAEL (R1, R3, R4 and R5) are all located within the wider St Pancras Hospital site and their sensitivity to noise is dependent on the individual use of each building. Consequently, marginal exceedances of the SOAEL at these buildings may not result in a significant effect. However, as R3 is a residential receptor, it can be concluded that significant noise effects are likely to occur at the northern end of R3 during demolition works.

5.2.5 With reference to planning application documents for 2-6 St Pancras Way (R12), Plot C will be located directly adjacent to the Proposed Development and is scheduled to be completed in 2025. Consequently, this building will only be occupied during periods when construction activities associated with the Proposed Development are likely to be minimal (i.e. fit out) and so residents are unlikely to be adversely affected by significant levels of construction noise.

5.2.6 Plot B of 2-6 St Pancras Way is scheduled to be completed and occupied by 2023 and is located approximately 80m to the north of the Site. However, when Plot B is completed, construction works will commence on Plot C, which is situated between Plot B and the Site. Consequently, noise generated by construction activities on Plot C is likely to dominate over noise emissions from construction activities at the Proposed Development. Given the distance from the Proposed Development to Plot B and the construction activities that will be taking place in the intervening land, Plot B is unlikely to be adversely affected by significant levels of construction noise arising from the Proposed Development.

5.2.7 It should be noted that construction noise predictions are based on the worst-case scenario that is representative of high periods of activity where, over the course of a working day, all plant are operational in all areas of all worksites during each assessed works stage. In reality, it is likely that the worst-case noise levels predicted will only occur for limited periods of time when plant are operational at the closest location to sensitive receptors.

Construction Vibration Effects

5.2.8 The estimated distances from identified sensitive receptors to the Proposed Development are presented in Table 5-2 along with the potential vibration effect based on sample data in Table 3-3.

Table 5-2 Construction Vibration Effects

Receptor	Approximate Distance to Proposed Development (m)	Estimated Level of Piling Vibration	Potential Vibration Impact
R1	10	0.3 to < 1.0 mm/s	Between LOAEL and SOAEL
R2	30	0.14 to < 0.3 mm/s	Below LOAEL
R3	15	0.3 to < 1.0 mm/s	Between LOAEL and SOAEL
R4	10	0.3 to < 1.0 mm/s	Between LOAEL and SOAEL
R5	10	0.3 to < 1.0 mm/s	Between LOAEL and SOAEL
R6	15	0.3 to < 1.0 mm/s	Between LOAEL and SOAEL

Receptor	Approximate Distance to Proposed Development (m)	Estimated Level of Piling Vibration	Potential Vibration Impact
R7	10	0.3 to < 1.0 mm/s	Between LOAEL and SOAEL
R8	20	0.14 to < 0.3 mm/s	Below LOAEL
R9	15	0.3 to < 1.0 mm/s	Between LOAEL and SOAEL
R10	20	0.14 to < 0.3 mm/s	Below LOAEL
R11	20	0.14 to < 0.3 mm/s	Below LOAEL

5.2.9 Based on the predictions presented in Table 5-2, potential vibration levels affecting sensitive receptors are likely to exceed the LOAEL at R1, R3, R4, R5, R6, R7 and R9. At all other receptors, vibration levels are expected to be below the LOAEL. At all receptors, vibration levels are unlikely to exceed the SOAEL. Construction vibration is not considered to be significant; however, mitigation measures covering Best Practice Measures (BPM) will be put in place to ensure that vibration is minimised at all times throughout the construction programme. Further details are provided in Section 6 of this report and the Outline CMP which is submitted with the planning application.

Construction Traffic Noise Effects

5.2.10 The magnitude of change of road traffic noise due to construction traffic associated with the Proposed Development has been identified through BNL calculations using road traffic data presented in Appendix C. The results of the construction traffic noise assessment are presented in Table 5-3.

Table 5-3 Construction Traffic Noise Effects

Road Link	2020 Baseline BNL dB	2020 Baseline with Construction Traffic BNL dB	Change in BNL dB	Magnitude of Change
St Pancras Way - north of Granary Street	67.9	68.0	+0.1	Negligible
St Pancras Way - south of Granary Street	68.1	68.3	+0.2	Negligible
Granary Street - west of service bay	64.5	64.8	+0.3	Negligible
Granary Street - east of service bay	64.5	64.8	+0.3	Negligible
St Pancras Road - east of St Pancras Way	70.5	70.8	+0.3	Negligible

5.2.11 Using the BNL road traffic calculation methodology, it has been calculated that at a worst case the construction road traffic associated with the Proposed Development will result in an increase in road traffic noise of up to 0.3 dB. This increase in noise is equivalent to a negligible impact and is not significant.

5.3 Effects Once the Proposed Development is Complete and Occupied

Road Traffic Noise Effects

5.3.1 Table 5-4 presents the calculated BNLs and the change in noise levels between the future 2026 baseline scenario and the 2026 baseline with the Proposed Development scenario (based on traffic flows presented in Appendix C). The resultant change in noise levels is considered to be representative of the change in road noise that may be experienced at nearby noise receptors.

Table 5-4 Operational Road Traffic Noise Effects

Road Link	2026 Baseline BNL dB	2026 Baseline with Development BNL dB	Change in BNL	Magnitude of Change
St Pancras Way - north of Granary Street	68.2	68.2	0.0	Negligible
St Pancras Way - south of Granary Street	68.4	68.5	+0.1	Negligible
Granary Street - west of service bay	64.8	65.0	+0.2	Negligible
Granary Street - east of service bay	64.8	64.9	+0.1	Negligible
St Pancras Road - east of St Pancras Way	70.8	70.8	0.0	Negligible

5.3.2 Comparison of the calculated baseline BNLs with the future operational BNLs calculated from operational road traffic flows associated with the Proposed Development indicates that changes in road traffic flows will result in a change in noise level of less than 1 dB and a negligible impact at receptors adjacent to all road links. Consequently, changes in road traffic noise levels as a result of the Proposed Development are not considered to be significant.

Building Services Plant Noise Effects

5.3.3 Building services and plant will be designed to achieve suitable operational noise levels at nearby sensitive receptors. The building services plant will be required to achieve noise levels set to 10 dB below the measured $L_{A90,T}$ background noise level representative of the receptor location. For hospital buildings, a limit of 10 dB below the $L_{Aeq,T}$ ambient noise level has been set.

Temporary limits during emergencies have been set at 10 dB above the measured $L_{A90,T}$ background noise level

5.3.4 These operational noise limits have been derived from the background noise measurements taken at the Site and LBC criteria for both typical and emergency operating conditions. Night-time noise limits have not been identified for office receptors since these are unlikely to be occupied at night (e.g. R9).

5.3.5 Table 5-5 presents the recommended noise limits for proposed building services plant associated with the Proposed Development to ensure that noise effects at nearby sensitive receptors are negligible.

5.3.6 As night-time noise measurements were not undertaken at ML2, the night-time background noise level at this location has been estimated based on the largest difference between daytime and background noise levels at other monitoring locations, which is 4 dB at ML1.

Table 5-5 Recommended Building Services and Plant Noise Limits

Receptor Group	Daytime (07:00-23:00) Operational Noise Limit $L_{Aeq,1h}$ dB		Night-time (23:00-07:00) Operational Noise Limit $L_{Aeq,15min}$ dB	
	Typical	Emergency	Typical	Emergency
R1	52	65	48	61
R2	47	56	38	53
R3	47	56	38	53
R4	47	56	38	53
R5	47	56	38	53
R6	47	56	38	53
R7	58	61	55	57
R8	41	61	37	57
R9	41	61	-	-
R10	41	61	37	57
R11	41	61	37	57
R12	45	65	41	61

5.3.7 It is assumed that the building services plant will be operated in accordance with manufacturers' instructions and will not result in any noise which is tonal, impulsive or distinctive in nature. Should the plant noise exhibit any such acoustic features then the relevant 'penalty'/ correction should be applied in accordance with BS 4142 to ensure that the resultant rating level falls within the limit levels identified in Table 5-5 above.

5.3.8 An important aspect of the BS 4142 assessment method is that sound sources should be considered in the context of the residual noise environment. Therefore, once the details of building services and plant at Proposed Development are confirmed during the Stage 4 detailed design stage, appropriate mitigation measures will be specified with reference to guidance within BS 4142 considering the proposed noise sources in context.

5.3.9 As the building services plant will be designed to achieve the recommended limits shown in Table 5-5; operational building services noise from the Proposed Development will be below the LOAEL and so noise effects are considered to be not significant.

6 Mitigation and Monitoring

6.1.1 This section describes any required noise and vibration monitoring regimes, including monitoring of specific receptors/resources, or monitoring the effectiveness of mitigation measures.

6.2 Mitigation during Construction

6.2.1 Mitigation will be provided through the adoption of BPM, as defined in section 72 of the CoPA. Noise mitigation measures and noise management plans to implement BPM will be put into place to ensure that noise is minimised at all times throughout the construction programme.

6.2.2 Good industry standards, guidance and practice procedures (i.e. compliance with the Considerate Constructor's Scheme) will be followed in order to minimise noise and vibration effects during construction. Noise and vibration arising during the construction works will be managed to avoid and minimise impacts, and mitigation measures will be documented within a Construction Environmental Management Plan (CEMP) which will be prepared by the Principal Contractor, which will take into account the relevant guidance documents and standards relating to noise and vibration. Further details are provided in the Outline CMP which is submitted with the planning application.

The CEMP will provide the basis for a live / working document that will be implemented and updated by the Principal Contractor during the construction works.

Mitigation of Construction Noise

6.2.3 Mitigation measures will be employed to ensure that potential noise impacts at nearby sensitive receptors due to construction activities are minimised. The preferred approach for controlling construction noise is to reduce source levels where possible, but with due regard to practicality. The simplest and most effective method of reducing noise at nearby receptors is to ensure that noisy plant is located as far from receptors as practicable and is screened using temporary, localised barriers. Noise can also be reduced by limiting the daily time that noisy equipment is operated; however, it is acknowledged that sometimes a greater noise level may be acceptable if the

duration of the construction activity, and therefore length of disruption, is reduced.

6.2.4 Section 4 of BS 5228-1 provides details on the effectiveness of a good communication strategy. Consequently, it is recommended that prior to works being undertaken, liaison is undertaken with occupiers of sensitive receptors that may be adversely affected by construction noise. Providing information regarding construction works and advance notice of when high noise generating activities are to take place can reduce adverse effects. All communications will contain contact details for the person to whom any questions or complaints should be directed.

6.2.5 Noise will also be minimised through the adoption of BPM as standard working practices across the Proposed Development to ensure that noise are reduced whenever practicable. The following provisions, although not exhaustive, will be adhered to where practicable throughout the construction programme:

- Vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, maintained in good and efficient working order, and operated in such a manner as to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements;
- Machines in intermittent use will be shut down or throttled down to a minimum when not in use;
- Compressors will be fitted with properly lined and sealed acoustic covers which will be kept closed whenever in use. Pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Equipment which breaks concrete, brickwork or masonry by bending, bursting or “nibbling” will be used in preference to percussive tools. Where possible, the use of impact tools will be avoided where the site is close to occupied premises;
- Rotary drills and bursters activated by hydraulic, chemical, or electrical power will be used for excavating hard or extrusive material;
- Wherever possible, equipment powered by mains electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity;
- No part of the works nor any maintenance of plant will be carried out in such a manner as to cause unnecessary noise except in the case of an emergency when the work is absolutely necessary for the saving of life or property or the safety of the works;
- Plant will be maintained in good working order so that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum; and
- Noise emitting machinery which is required to run continuously will be housed in a suitable acoustically lined enclosure.

Construction Noise Monitoring

6.2.6 A construction noise monitoring strategy will be agreed with the LBC once a Principal Contractor has been appointed. Noise monitoring will be undertaken at receptor locations that are considered to be at risk to potential high noise levels. Noise monitoring will determine compliance with LBC limits and the need for any additional mitigation if noise limits are exceeded.

Mitigation of Construction Vibration

6.2.7 To ensure that potential vibration impacts due to piling are minimised, the contractor, where feasible, will use a piling technique that is least likely to cause adverse vibration impacts (e.g. auger piling), to ensure that the effect of vibration is minimised and controlled to a negligible or minor adverse significance at nearby receptors. In addition, best practice should be adopted during the demolition phase to ensure that unnecessary levels of vibration are generated.

Mitigation of Construction Traffic

6.2.8 Although construction traffic has been predicted as having, at worst, a negligible (not significant) effect, where feasible the following measures will be implemented to ensure that construction traffic noise effects are not significant:

- Vehicles employed for any activity associated with the construction works will, where reasonably practicable, be fitted with effective exhaust silencers and shall be maintained in good working order and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable;
- Time slots will be adopted for deliveries to ensure that convoys of vehicles do not arrive simultaneously and to avoid unnecessary idling on-site or nearby;
- Strict control to prevent temporary parking on kerbsides in the vicinity of noise sensitive receptors near the Proposed Development.

6.3 Mitigation Once the Proposed Development is Complete and Occupied

6.3.1 Noise effects as a result of the operational Proposed Development due to changes in road traffic flows were identified as being not significant. Consequently, no additional mitigation measures are recommended.

6.3.2 All building services plant will be designed to achieve the operational limits consistent with the requirements of BS 4142, which may require mitigation to be incorporated into the fixed plant design to achieve the noise criteria detailed in Table 5-5. It is assumed that the building services plant will be operated in accordance with manufacturers' instructions and will not result in any noise which is tonal, impulsive or distinctive in nature. Should the noise exhibit any such acoustic features then the relevant penalty/correction should be applied in accordance with BS 4142 to ensure that the resultant rating level falls within the limit levels.

7 Conclusions

7.1.1 An assessment of potential noise and vibration effects due to temporary works undertaken during the construction phase and permanent changes to the noise environment due to the operational Proposed Development has been carried out.

7.1.2 Noise and vibration generated by construction activities associated with the Proposed Development are likely to exceed the LOAEL at nearby sensitive receptors throughout the construction programme. Noise emissions during demolition and substructure works may result in exceedances of the SOAEL at existing receptors that are part of the wider St Pancras Hospital site.

7.1.3 Through an effective communication strategy, noise monitoring to determine compliance with noise limits and adoption of BPM to reduce construction noise as far as reasonably practicable, it is considered that all reasonable steps have been undertaken to reduce noise emissions and, therefore, exceedances of the SOAEL will be minimised.

7.1.4 Changes in road traffic noise due to both construction and operational traffic associated with the Proposed Development have been identified as negligible and not significant.

7.1.5 Building services plant will be required to achieve noise levels set to 10 dB below the measured background noise level with temporary limits during emergencies set at 10d B above the measured background noise level. Building services plant will be designed to achieve the specified noise limits at nearby sensitive receptors.

8 References

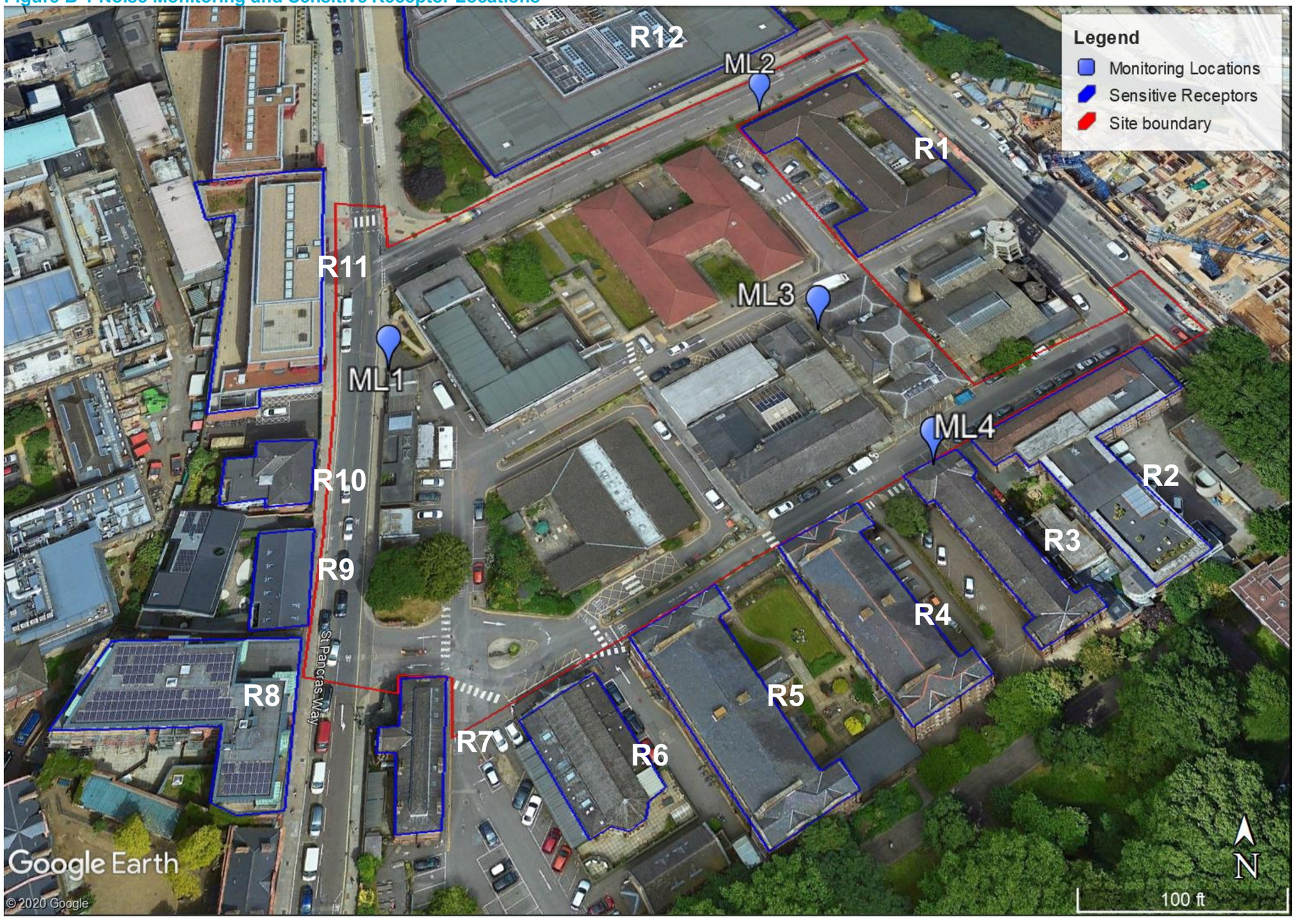
Ref. 1. Her Majesty's Stationery Office (1974); Control of Pollution Act.
Ref. 2. Her Majesty's Stationery Office (1990); Environmental Protection Act 1990.
Ref. 3. Department for Communities and Local Government (2012, last updated 2019); National Planning Policy Framework.
Ref. 4. Department for Environment Food and Rural Affairs (2010); Noise Policy Statement for England (2010);
Ref. 5. Department for Communities and Local Government (2019); Planning Practice Guidance.
Ref. 6. Greater London Authority (2016); The London Plan - The Spatial Development Strategy for London - Consolidated with Alterations since 2011.
Ref. 7. Greater London Authority (2019); The Intend to Publish London Plan.
Ref. 8. Greater London Authority (2004); City Soundings: The Mayor's London Ambient Noise Strategy.
Ref. 9. Greater London Authority (2014); The London Plan Supplementary Planning Guidance - Sustainable Design and Construction.
Ref. 10. London Borough of Camden (2017); Camden Local Plan.
Ref. 11. London Borough of Camden (2018); Camden Planning Guidance Amenity.
Ref. 12. British Standards Institution (2014); BS 4142 – Methods for rating and assessing industrial and commercial sound, BSi, London.
Ref. 13. British Standards Institution (2003); BS 7445-1 – Description and Measurement of Environmental Noise. Part 2: Guide to the Acquisition of Data Pertinent to Land Use, BSi, London.
Ref. 14. British Standards Institution (2014), BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise. BSi, London.
Ref. 15. British Standards Institution (2014), BS 5228-2:2009+A1:2014 – Code of practice for Noise and Vibration control on construction and open sites. Part 2: Vibration, BSi, London.
Ref. 16. Department of Transport/Welsh Office (1998); Calculation of Road Traffic Noise.
Ref. 17. Highways Agency (2020); Design Manual for Road and Bridges Sustainability & Environment Appraisal LA 111 Noise and Vibration.
Ref. 18. Department of Health (2013); Health Technical Memorandum 08-01: Acoustics

Appendix A Acoustic Terminology

Term	Description
Decibel (dB)	The range of audible sound pressures is approximately 2 x 10-5 Pa to 200 Pa. Using decibel notation presents this range in a more manageable form, 0dB to 140dB. Mathematically Sound Pressure level = 20 log {p(t)/p0} Where P0 = 2 x 10-5 Pa.
"A" Weighting (dB(A))	The human ear does not respond uniformly to different frequencies. "A" weighting is commonly used to simulate the frequency response of the ear. It is used in the assessment of risk of damage of hearing due to noise.
Frequency (Hz)	The number of cycles per second, for sound this is subjectively perceived as pitch.
Frequency Spectrum	Analysis of the relative contributions of different frequencies that make up a noise.
Ambient Sound	Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far (The ambient sound comprises the residual sound and the specific sound when present).
Ambient Sound Level La = $L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Equivalent Continuous A-weighted Sound Pressure Level $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation: $LAeq,T = 10 \times log\left\{\left(\frac{1}{T}\right)\left(\frac{P_A^2}{P_o^2}\right)dt\right\}$ Where p0 is the reference sound pressure (20μPA); and PA(t) is the instantaneous A-weighted sound pressure level at time t
Peak Particle Velocity	Is the greatest instantaneous particle velocity during a given time interval. If measurements are made in 3-axis then the resultant PPV is the vector sum is the square root of the summed squares of the maximum velocities, regardless of when in the time history those occur.

Appendix B Baseline Noise Monitoring and Sensitive Receptor Locations

Figure B-1 Noise Monitoring and Sensitive Receptor Locations



Appendix C Noise Modelling Methodology

Noise Modelling Software

CadnaA® is a sophisticated noise modelling software package that predicts noise levels based on the appropriate input data e.g. location and orientation of equipment and sound power data. The software package can take into account a variety of information about the Site including topography, buildings, and demolition and construction noise sources.

Noise Modelling Assumptions

The following assumptions have been made when producing the noise model:

- The ground conditions around the Site are mainly roads therefore the ground has been modelled as fully reflective;
- Air temperature was assumed to be 10 degrees and humidity 70%; and
- One order of reflection was modelled.

Construction Noise Predictions

CadnaA noise mapping software was used to predict construction noise levels at the selected receptors. The construction noise model followed the procedures for prediction of demolition and construction noise set out in BS 5228-1. Sound power levels for each of the following demolition and construction activities have been calculated:

- Demolition;
- Substructure;
- Superstructure; and
- Fit-out.

Typical plant that is used on construction projects of this nature have been determined based on experience of previous projects. Noise source data for demolition and construction plant are presented in Table C-1. This list of plant and corresponding sound power data (referenced from BS 5228-1) have been used to derive the total sound power output level for each construction activity.

Construction noise predictions were carried out to represent a worst-case scenario where all plant is operational on-site at the same time. Consequently, demolition and construction noise predictions may overestimate construction noise levels and can be considered as worst case.

Table C-1. Assumed Construction Plant

Plant	Sound Power Level dB	Reference	Demolition	Sub-structure	Super-structure	Fit Out
Bulldozers	111	BS 5228-1: Table C.5, Item 15	✓	-	-	-
Dumpers/ Spoiler Trucks	106	BS 5228-1: Table C.8 Item 18	✓	-	-	-
Crawler & Mobile Cranes	104	BS 5228-1: Table C.4, Item 48	✓	✓	✓	-
Tower Cranes	104	BS 5228-1: Table C.4, Item 48	-	✓	✓	✓
Platform Hoists	96	BS 5228-1: Table C.4, Item 61	-	✓	✓	✓
Cutters, drills and small tools	107	BS 5228-1: Table D.7, Item 72	✓	✓	✓	✓
Crushers	112	BS 5228-1: Table C.1 item 15	✓	-	-	-
360º excavators	105	BS 5228-1: Table C.2, Item 14	✓	✓	-	-
Forklift truck	104	BS 5228-1: Table D.7, Item 93	✓	✓	✓	✓
Generators	93	BS 5228-1: Table C.6, Item 39	✓	✓	✓	-
Compressors	93	BS 5228-1: Table C.5, Item 5	✓	✓	✓	-
Hydraulic benders and cutters	107	BS 5228-1: Table C.1, Item 18	✓	✓	✓	-
HGVs/lorries/vans	96	BS 5228-1: Table C.4, Item 61	✓	✓	✓	✓

Plant	Sound Power Level dB	Reference	Demolition	Sub-structure	Super-structure	Fit Out
Piling rigs	100	BS 5228:1 Table C.12, item 46	-	✓	-	-
Scaffolding and mobile hydraulic access platforms	96	BS 5228-1: Table C.4, Item 61	✓	✓	✓	✓
Ready-mix concrete lorry	102	BS 5228-1: Table D.6 Item 17	-	✓	✓	-
Concrete pump	107	BS 5228-1: Table C.4 Item 30	-	✓	✓	-
Water Pump	96	BS 5228-1: Table C.4, Item 88	✓	-	-	-
Power Tools	107	BS 5228-1: Table C.4, Item 72	✓	✓	✓	✓
Hand Tools	91	BS 5228-1: Table C.1, Item 6	✓	✓	✓	✓

Construction Phase Road Traffic Data

Table C-2. Construction Phase Road Traffic Data

Road Link	2020 Baseline		2020 Baseline with Construction		2026 Baseline		2026 Baseline with Development		Speed (km/h)
	AAWT	HGV%	HGV%	HGV%	AAWT	HGV%	AAWT	HGV%	
St Pancras Way - north of Granary Street	6,578	15	6,619	15	7,050	15	7,329	15	36.9
St Pancras Way - south of Granary Street	7,138	15	7,179	15	7,651	15	7,982	14	36.9
Granary Street - west of service bay	2,846	17	2,846	17	3,050	17	3,232	16	34.4
Granary Street - east of service bay	2,846	17	2,846	17	3,050	17	3,134	16	34.4

Road Link	2020 Baseline		2020 Baseline with Construction		2026 Baseline		2026 Baseline with Development		Speed (km/h)
	AAWT	HGV%	HGV%	HGV%	AAWT	HGV%	AAWT	HGV%	
St Pancras Road - east of St Pancras Way	13,168	14	13,199	14	14,113	13	14,294	13	29.3

Appendix D Baseline Noise Data and Comparison with Historical Data

Noise Monitoring Results

Table D1. ML1 Noise Data

Date	Day		Evening		Night		
	$L_{Aeq,12h}$ dB	$L_{A90,15min}$ dB	$L_{Aeq,4h}$ dB	$L_{A90,15min}$ dB	$L_{Aeq,8h}$ dB	$L_{A90,15min}$ dB	L_{AFmax} dB
27-Aug-20	66	54	65	49	60	47	83
28-Aug-20	65	52	64	50	60	48	84
29-Aug-20	65	50	64	49	59	48	83
30-Aug-20	64	49	63	48	63	47	93
31-Aug-20	64	49	63	48	61	47	84
01-Sep-20	65	52	62	48	60	47	85
02-Sep-20	66	52	64	49	60	48	86
03-Sep-20	66	53	63	49	61	47	84
04-Sep-20	67	53	64	49	62	47	87
05-Sep-20	64	50	63	48	61	47	84
06-Sep-20	65	49	63	48	60	47	87
07-Sep-20	67	53	63	49	60	47	85
08-Sep-20	65	53	62	49	61	48	86

Date	Day		Evening		Night		
	$L_{Aeq,12h}$ dB	$L_{A90,15min}$ dB	$L_{Aeq,4h}$ dB	$L_{A90,15min}$ dB	$L_{Aeq,8h}$ dB	$L_{A90,15min}$ dB	L_{AFmax} dB
09-Sep-20	68	54	63	49	60	47	84

Table D-2. ML2 Noise Data

Date	Time	Duration	$L_{Aeq,1h}$ dB	$L_{A90,15min}$ dB	L_{AFmax} dB
3-Sep-20	12:30	60 mins	62	55	83
10-Sep-20	10:45	60 mins	63	55	85

Table D-3. ML3 Noise Data

Date	Day		Night		
	$L_{Aeq,16h}$ dB	**$L_{A90,15min}$ dB**	**$L_{Aeq,8h}$ dB**	**$L_{A90,15min}$ dB**	**L_{AFmax} dB**
03-Sep-20	51	47	47	43	69
04-Sep-20	53	47	47	44	68
05-Sep-20	52	45	45	43	63
06-Sep-20	51	44	45	42	63
07-Sep-20	54	47	49	43	68

Table D-4. ML4 Noise Data

Date	Day		Night		
	$L_{Aeq,16h}$ dB	$L_{A90,15min}$ dB	$L_{Aeq,8h}$ dB	$L_{A90,15min}$ dB	L_{AFmax} dB
03-Sep-20	55	47	48	42	74

Date	Day		Night		
	$L_{Aeq,16h}$ dB	$L_{A90,15min}$ dB	$L_{Aeq,8h}$ dB	$L_{A90,15min}$ dB	L_{AFmax} dB
04-Sep-20	56	47	49	43	71
05-Sep-20	56	45	47	44	65
06-Sep-20	58	43	47	42	67
07-Sep-20	56	47	50	42	81
08-Sep-20	56	47	48	45	72
09-Sep-20	57	47	48	42	71

Comparison with Historical Data

2-6 St Pancras Way Data

Locations of noise monitoring undertaken at the 2-6 St Pancras Way site are presented in Figure D. Noise monitoring was undertaken from 9th to 16th September 2016.

The 2-6 St Pancras Way site is directly to the north of the Site so measurement locations LT1, LT3, ST2 and ST3 provide relevant data to the Site. LT2 provides data for a week of continuous monitoring so is a good source of data for comparison; however, ST2 and ST3 measurements lasted for 20 minutes so only provide a snapshot of noise conditions. Therefore, data from these sites are considered less reliable for providing representative noise conditions than measurements at LT1 and LT3.

LT1 is comparable to attended noise monitoring at location ML2. The results of daytime noise monitoring at LT1 provided an $L_{Aeq,12h}$ of 62 dB, which is equivalent to the average $L_{Aeq,1h}$ from the two attended measurements at ML2. The $L_{A90,15min}$ at ML2 was 55 dB, whereas it was measured at 57 dB at LT1. Although the ML2 $L_{A90,15min}$ is lower than historic data from LT2, this metric is used to define criteria for fixed plant, so the lower value is more conservative.

LT3 provides data for road traffic noise from St Pancras Way and can be considered equivalent to ML1. A comparison between data from ML1 and LT3 is presented in Table D-5. As data for LT3 was presented for day, evening and night periods; the noise data for ML1 has been presented similarly.

Table D-5. ML1 and LT3 Noise Data Comparison

Location ID	LT3	ML1	Difference
Day $L_{Aeq,12h}$ dB	68	66	-2
Evening $L_{Aeq,4h}$ dB	67	63	-4
Night $L_{Aeq,8h}$ dB	65	60	-5
Day $L_{A90,15min}$ dB	55	52	-3
Evening $L_{A90,15min}$ dB	52	49	-3
Night $L_{A90,15min}$ dB	50	47	-3

The $L_{Aeq,T}$ noise metric logged at ML1 is consistently lower during day, evening and night than historic data from LT3. This provides some uncertainty on whether traffic flows on St Pancras Way have been affected by the Covid-19 pandemic. Consequently, a precautionary approach will be taken when defining baseline noise levels. This approach will use the higher historic noise data for any design purposes to ensure that noise mitigation for the façade of the new Proposed Development is suitably robust. However, when defining noise criteria for assessing noise impacts due to the Proposed Development on existing receptors, the lower noise data from ML1 will be applied.

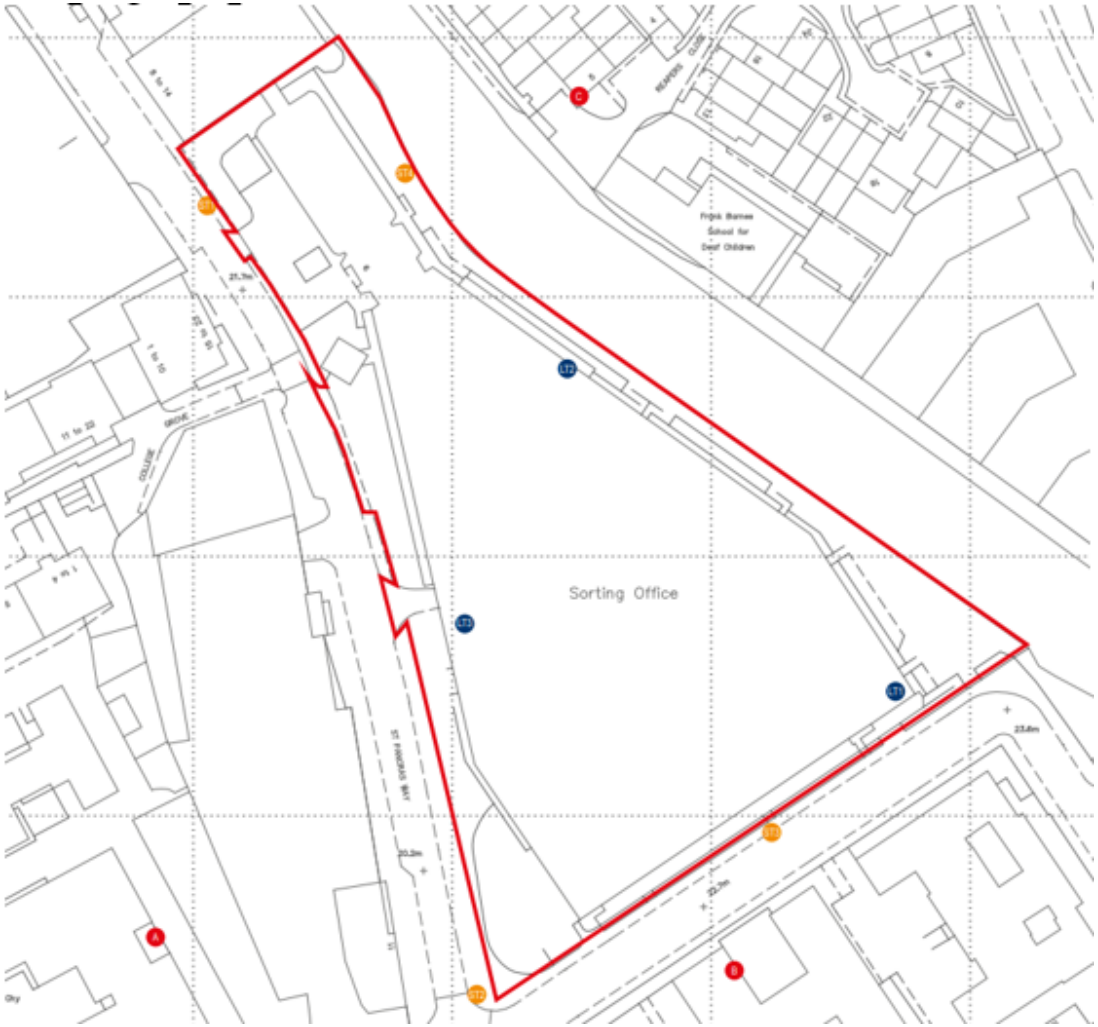


Figure D-1 2-6 St Pancras Way Monitoring Locations (Blue – Long-term, Yellow – Short-term, Red – Receptors)

101 Camley Street Data

Locations of noise monitoring at the 101 Camley Street site are presented in Figure D-1. Noise monitoring was undertaken from 11th to 16th June 2014.

The 101 Camley Street site is situated to the east of the Site and is separated from the Site by a row of hospital buildings in the wider St Pancras Hospital site. The noise monitoring locations for this assessment are not directly comparable to the noise monitoring locations from the 101 Camley Street planning application. Consequently, a comparison of AECOM noise data with historic noise data from the 101 Camley Street planning application is not appropriate.

Figure D-1 101 Camley Street Monitoring Locations

Conclusion

Noise monitoring has been undertaken to determine ambient and background noise at the Proposed Development. The results of noise monitoring have been compared to historic noise monitoring data for sites nearby where practicable.

Ambient noise conditions on the Site have been found to be comparable to historic noise monitoring data available for 2 – 6 St Pancras Way adjacent to the north of the Site. Although comparable data have only been determined at one monitoring location, this is considered sufficient to conclude that noise measurements of activity at the hospital between 12:45pm on 27th August and 11:45am 9th September 2020 are representative of normal noise levels and are unaffected by changes arising from the Covid-19 pandemic.

Road traffic noise from St Pancras Way at monitoring location ML1 between 12:45pm on 27th August and 11:45am 9th September 2020 has been measured as being lower than historical data. This indicates that there may be a reduction in traffic on St Pancras Way as a result of the Covid-19 pandemic. As such, historical data will be used to inform the design of the Proposed development. Where noise data is used to determine assessment criteria, the new lower data has been used to ensure the noise assessment of the Proposed Development is robust.

Appendix E Construction Noise Contour Plots

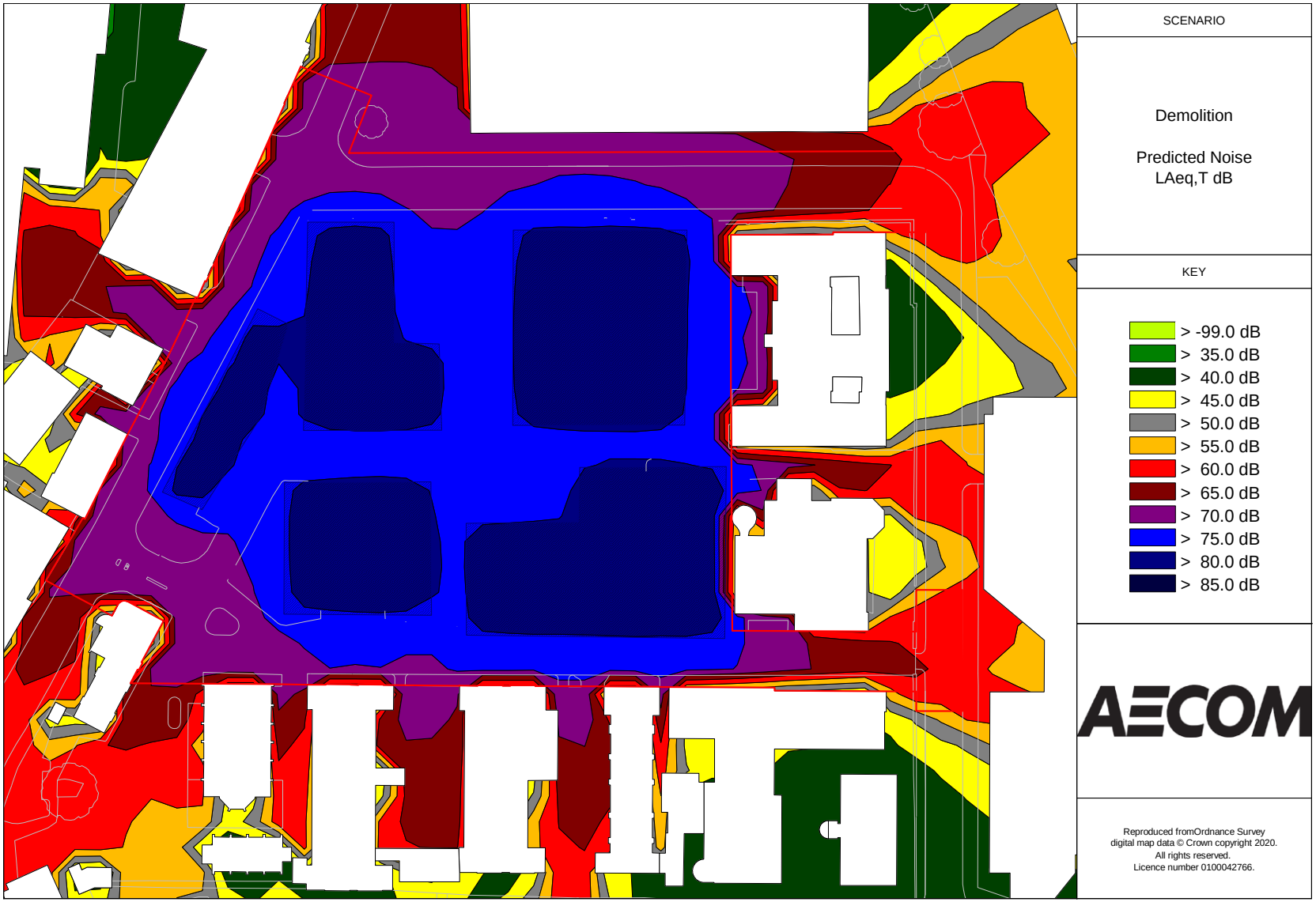


Figure E-1 Demolition Noise Predictions

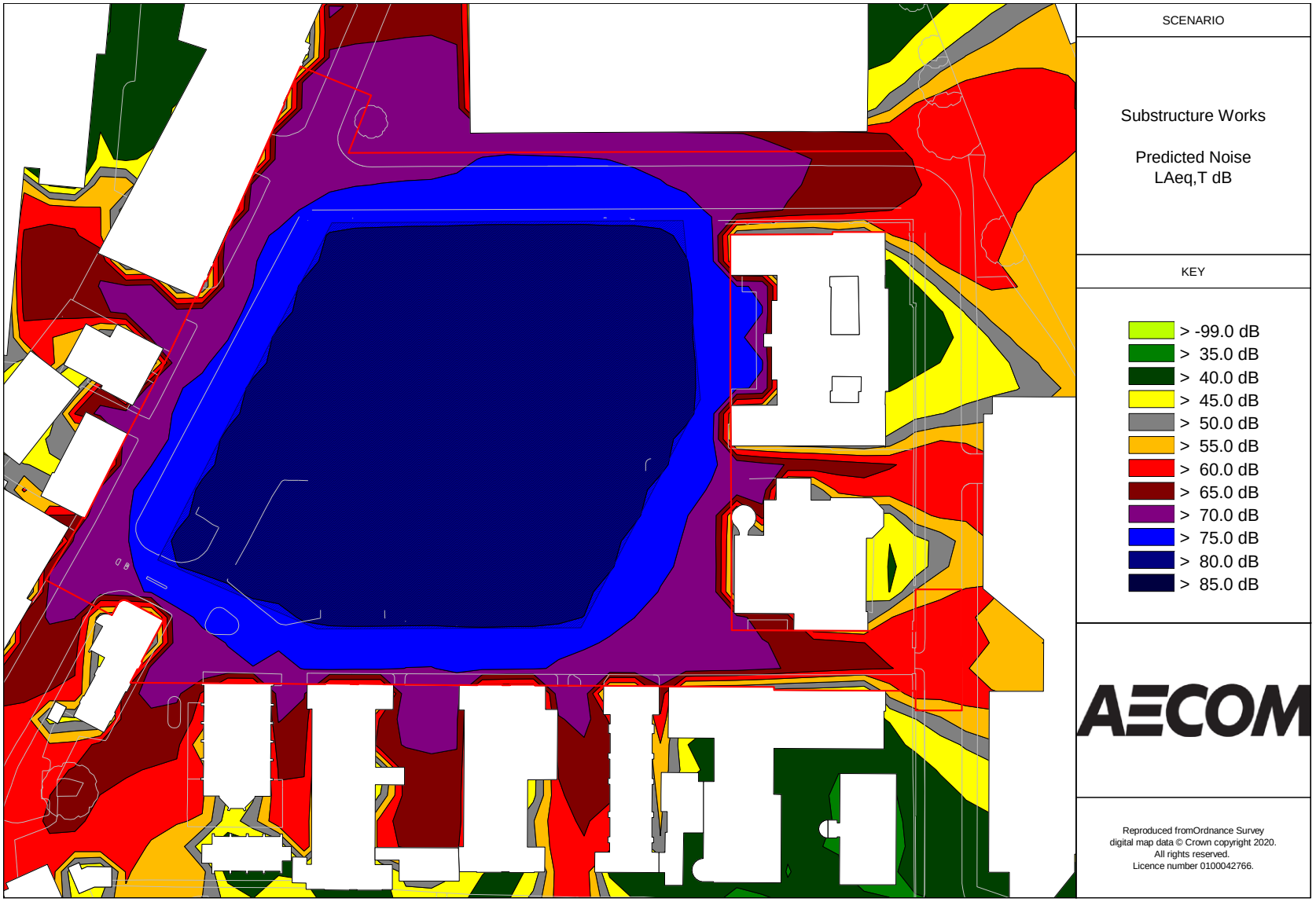


Figure E-2 Substructure Works Noise Predictions

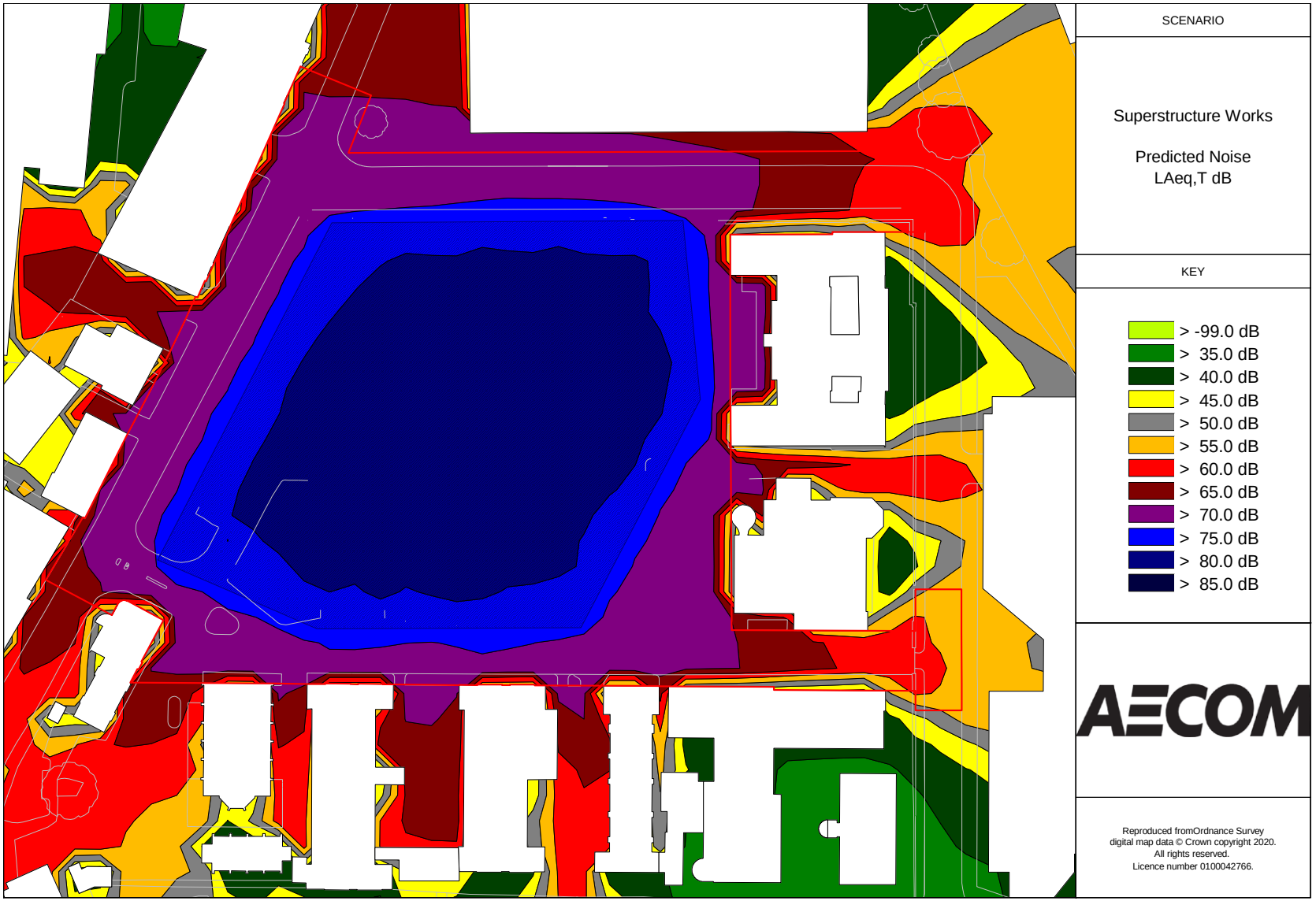


Figure E-3 Superstructure Works Noise Predictions

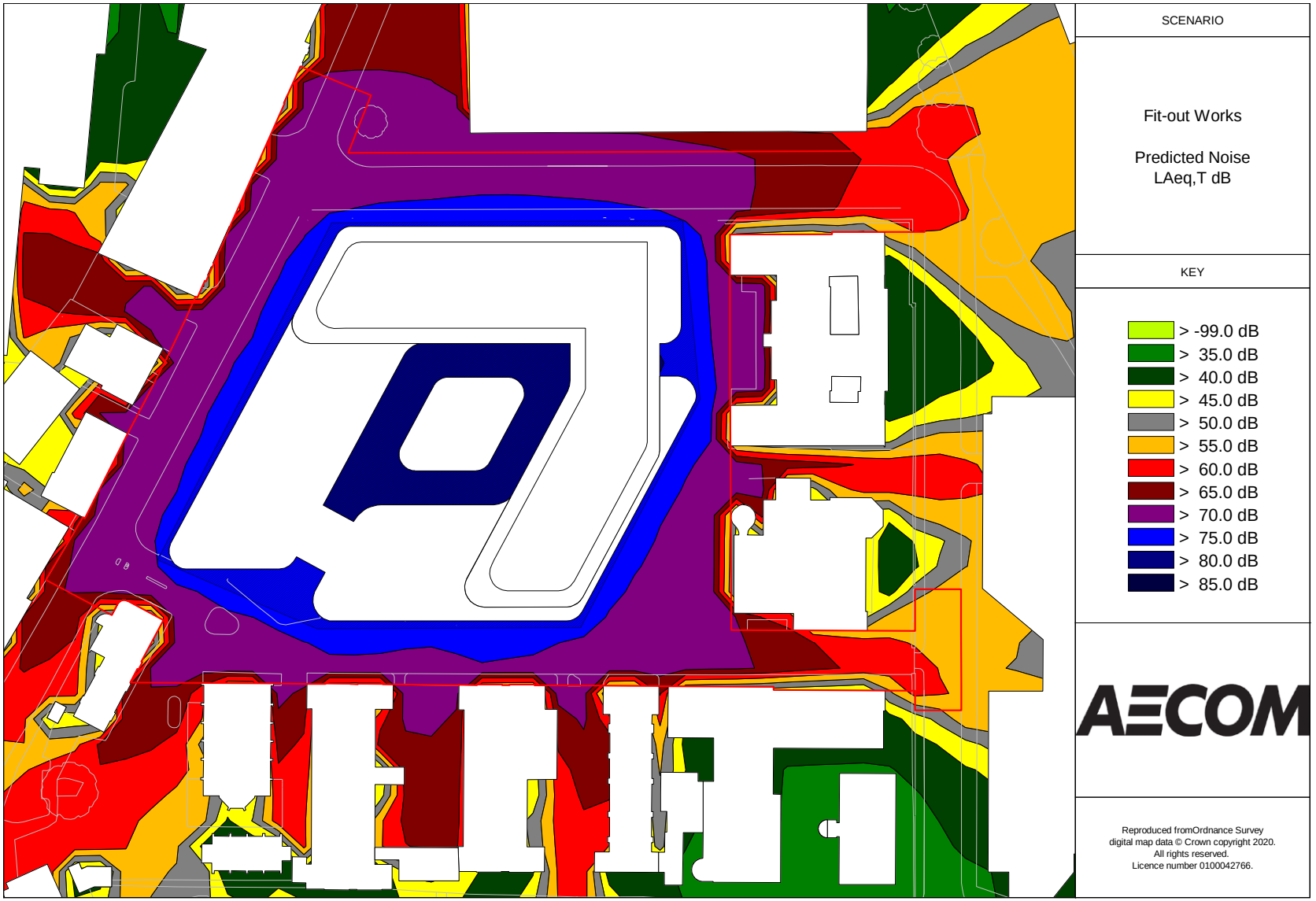


Figure E-4 Fit-out Works Noise Predictions

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