

9 NOISE AND VIBRATION

Introduction

- 9.1 This Chapter assesses the effects of the Proposed Development on Noise and Vibration. In particular it identifies and assesses the likely significant effects resulting from the potential noise and vibration impacts during enabling, construction and operational phases from the Proposed Development.
- 9.2 The Chapter describes the methods used to assess the likely significant effects, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect effects of the development, the mitigation measures required to prevent, reduce, or offset the identified significant effects and the residual effects. It has been written by Cundall.
- 9.3 This Chapter is supported by the following appendices:
- **Appendix 9.1** Plan of Sensitive Receptors
 - **Appendix 9.2** Noise Survey Time History Graphs
 - **Appendix 9.3** Noise Model Result Maps
 - **Appendix 9.4** Full Demolition and Construction Noise Modelling Results

Legislative and Planning Policy Context

Legislation and Regulation

The Environment Protection Act 1990

- 9.4 The Environmental Protection Act 1990 (c. 43 – Parliament of the United Kingdom) defines the fundamental structure for waste management and the control of emissions to the environment, including noise.

The Control of Pollution Act 1974

- 9.5 The Control of Pollution Act (1974 c. 40 - Parliament of the United Kingdom) provides Local Authorities with powers to control noise (and other pollutants) from construction and demolition works. The Act requires that 'best practicable means' are adopted to control noise from construction works.

National Planning Policy and Guidance

National Planning Policy Framework

9.6 The overarching national planning policy document which applies to the Proposed Development in respect of noise is the National Planning Policy Framework (the Framework) (updated in December 2023).

9.7 The key statements of the Framework relevant to the assessment are as follows:

“180 Planning policies and decisions should contribute to and enhance the natural and local environment by;

[...]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;”

191 Planning policies and decisions should also ensure 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 the quality of life;

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.”

Noise Policy Statement for England

9.8 With specific reference to noise effects, the Framework refers to the Noise Policy Statement for England (2010 – Department for Environmental Food and Rural Affairs). The NPSE provides guidance which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases: the No Observed Effect Level (NOEL), the Lowest Observed Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL).

Planning Practice Guidance

- 9.9 In March 2014, the Planning Practice Guidance (June 2021 – Department for Levelling Up, Housing and Communities) for noise was published, and most recently updated in June 2021. This online document advises on how planning can manage potential noise impacts in new development.

Local Planning Policy

- 9.10 The adopted Bury Unitary Development Plan consists of the following relevant policies:
- **Policy EN7/2 – Noise Pollution:** In seeking to limit noise pollution the Council will not permit: development which could lead to an unacceptable noise nuisance to nearby occupiers and/or amenity users ;development close to a permanent source of noise.
- 9.11 Cundall have confirmed via correspondence with Bury Council on 11/07/2023 that noise impact assessment for fixed plant should be undertaken in accordance with BS 4142: 2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS 4142) (refer to **Table 9.2** below).
- 9.12 BS 4142 suggests that, by ensuring that the rating level of all specific sound sources is below the representative background sound level, they should have a low impact on nearby noise-sensitive receptors:

“The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”

Legislation and Guidance

- 9.13 The effects of the Proposed Development upon existing sensitive receptors and impacts upon the Proposed Development are to be assessed with reference to the relevant British Standards and guidance documents set out in **Table 9.1** below.

Table 9.1: Relevant British Standards and Legislation

Source	Description
BS 5228-1:2009+A1:2014 & BS 5223-2:2009 Code of practice for noise and vibration control on construction and open Sites (BS 5228-1 and BS 5228-2)	Recommendations for basic methods of noise and vibration control relating to construction sites where work activities may generate significant noise and / or vibration. It also provides guidance on methods of predicting and measuring noise and vibration, and assessing its impact on receptors.
BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (BS 8233)	Recommendations for desirable internal and external ambient noise levels in dwellings that should not be exceeded for steady external noise sources.
Building Regulations 2010 Approved Document O (ADO)	Building regulation in England setting standards for overheating in new residential buildings. The document presents internal ambient noise level limits in dwellings which should not be exceeded during periods of open window cooling to mitigate overheating.
BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS 4142)	Methods for determining, at the outside of a building, noise levels from industrial and manufacturing premises, fixed installations and other associated activities. The rating method takes into account specific source characteristics, such as tonality, impulsivity and intermittency.
BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration (BS 7385-2).	Presents guide values or limits for transient vibration, above which there is a likelihood of cosmetic damage.
BS 6472:2008 'Guide to evaluation of human exposure to vibration in buildings' (BS 6472)	Describes how to determine the vibration dose value, VDV, from frequency-weighted vibration measurements. The vibration dose value is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings
Design Manual for Roads and Bridges, Sustainability & Environment LA 111 Noise and vibration Revision 2 (DMRB)	Advice on the assessment of noise and vibration impacts due to road traffic. The guidance provides a classification of magnitude of impacts related to changes in road traffic noise levels.
The Department of Transport/Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN)	Describes procedures for traffic noise calculation, and is suitable for environmental assessments of schemes where road traffic noise may have an impact.
British Council for Offices Guide to Specification 2019 (BCO)	Recommendations for desirable internal acoustic design for offices.
Building bulletin 93 Acoustic design of schools: performance standards (BB93)	Guidance on internal acoustic design targets for schools.

Assessment Methodology and Significance Criteria

Consultation and Scoping

- 9.14 Consultation has been undertaken to inform the assessment. Comments received within the EIA Scoping Opinion (included at **Appendix 2.2** of the ES) have been considered in the assessment. **Table 9.2** below summarises the comments received and how these are dealt with within this Chapter.

Table 9.2: Response to Consultation / Scoping

Consultee	Date and Time	Comments	Actions
Bury Council Environmental Health Officer	11/07/2023 12:37	Cundall contacted Bury Council to confirm the suitability of the Survey Methodology, including highlighted measurement positions, undertaken in accordance with BS 7445 and setting plant noise limits in accordance with BS 4142. Response at quoted date and time confirmed suitability of the outlined approach.	Survey undertaken in accordance with agreed approach
Bury Council Environmental Health Officer	23/08/2023 17:26	Cundall contacted Bury Council to confirm that standards relating to calculating rise in traffic noise levels (CRTN and DMRB) do not specifically assess noise from car parks. It was confirmed acceptable to not assess noise from the car park due to the proposed façade elements of the new car park and screening noise from the tram line making it more likely the residential receptors on Highfield Road are more likely to see a decrease in noise levels than an increase.	Subsequent operational traffic assessment as detailed within this Chapter considers elevated traffic levels on the surrounding road network, with the expectation that these will be the worst case receptors than the propose change to the existing car park.

- 9.15 Operational vibration effects during the operational phase of the proposed development is considered not significant as confirmed through the EIA Scoping Opinion (refer to **Appendix 2.2**) and this is confirmed as being scoped out of this assessment.

Extent of Study Area

- 9.16 The identified noise and vibration sensitive receptors in proximity to the site which have been taken into consideration in the assessment are summarised in **Table 9.3** below. Residential properties and schools are generally considered the most highly sensitive due to national legislation requiring the most onerous internal noise levels for the purposes of

health and well-being of occupants. Strict legislation does not apply to the other spaces listed but occupants may still experience adverse noise effects if not properly controlled, as such these are defined as medium sensitivity.

Table 9.3: Sensitive Receptors

Receptor	Existing / Proposed Receptor	Sensitivity
A. Highfield Road Residential	Existing Receptor	High
B. Poppythorn Lane Residential	Existing Receptor	High
C. Our Lady of Grace (OLOG) Presbytery Church	Existing Receptor	Medium
D. Longfield Centre and the Radius Building	Existing Receptor	High
E. 458 - 466 Bury New Road Mixed Commercial	Existing Receptor	Medium
F. Heys Road Residential	Existing Receptor	High
G. The Heys Residential	Existing Receptor	High
H. 440 - 448 Bury New Road Mixed Commercial	Existing Receptor	Medium
I. Prestwich Job Centre	Existing Receptor	Medium
J. Rectory Green Residential	Existing Receptor	High
K. St Mary's C of E Primary School	Existing Receptor	High
L. Proposed Development Phase 1 (Full Application)	Proposed Receptor	Medium
M. Proposed Development Phase 2 (Outline Application)	Proposed Receptor	High

- 9.17 The approximate location of identified sensitive receptors listed above which will be assessed in the ES is presented in **Figure 9.1** below. Receptors shaded in blue are existing receptors, and those shaded in pink are proposed receptors. An approximate site boundary is identified by the dashed red line. This drawing is provided in full scale in **Appendix 9.1**.

Figure 9.1: Sensitive Receptor Locations

Significance Criteria

- 9.18 The following sub-sections detail the assessment methodology for potential significant effects from noise and vibration of construction and operational phases.
- 9.19 As this is a hybrid application the assessments are based on a detailed application for Phase 1 and an outline application for Phase 2. Where the assessment methodology determines differing noise and vibration magnitude criteria for the different phases, these are highlighted in relevant sub-sections below. Otherwise the noise and vibration magnitude criteria is the same for both Phases.

Demolition and Construction Noise

- 9.20 BS 5228 provides practical information on demolition and construction noise and vibration reduction measures and promotes a 'Best Practice Means' approach to control noise and vibration. The calculation method provided in BS 5228 Part 1 is based on the numbers and types of equipment operating, their associated Sound Power Levels (SWL), and the distance to receptors, together with the effects of any screening.
- 9.21 The Magnitude criteria for demolition and construction noise have been derived from BS 5228-1 Annex E.2 fixed noise limit guidance. A semantic scale for description of the

magnitude of construction noise effects based on the BS 5228-1 Annex E.2 fixed noise limits is shown in **Table 9.4** below.

Table 9.4 Demolition and Construction Noise Magnitude Criteria

Magnitude	Description
Major	Daytime noise levels greater than 75 dB L_{Aeq} for a total of less than 10 days in any 15-day period, or for a total of days less than or equal to 40 in any 6-month period
Moderate	Daytime noise levels between 70 and 75 dB L_{Aeq}
Minor	Daytime noise levels between 65 and 70 dB L_{Aeq}
Negligible	Daytime noise levels less than or equal to 65 dB L_{Aeq}
No effect	Daytime noise levels more than 10 dB below existing background levels

Demolition and Construction Traffic Noise

- 9.22 Demolition and construction traffic will be assessed by considering the short-term increase in traffic flows during works, following the principles of Calculation of Road Traffic Noise (CRTN) and Design Manual for Roads and Bridges (DMRB). It should be noted that whilst DMRB specifically relates to highways it is widely adopted as a suitable assessment basis for non-highway roads.
- 9.23 The criteria for the assessment of the magnitude of effect of traffic noise changes arising from demolition and construction works have been taken from *Table 3.54a* of DMRB for 'short-term' road traffic noise changes and are provided in **Table 9.5** below.

Table 9.5: Demolition and Construction Traffic Noise Magnitude Criteria (short-term)

Description (change in dBA)	Magnitude of Impact
5 dBA or more	Major
3.0 – 4.9 dBA	Moderate
1.0 – 2.9 dBA	Minor

Description (change in dBA)	Magnitude of Impact
0.1 – 0.9 dBA	Negligible
0 dBA	No effect

Demolition and Construction Vibration

- 9.24 BS 5228-2 provides further guidance on the perception of vibration resulting from demolition and construction activities within occupied buildings. This provides a simple method of determining annoyance alongside evaluation of cosmetic damage associated with vibration.
- 9.25 **Table 9.6** below details potential vibration levels measured in terms of 'Peak Particle Velocity' (PPV) based on Table B.1 of BS 5228-2, and provides a semantic scale for description of demolition and construction vibration impacts on human receptors.

Table 9.6: Construction Vibration Magnitude Criteria

Peak Particle Velocity Level	Description	Magnitude of Impact
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	Major
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Moderate
0.3 mm/s	Vibration might be just perceptible in residential environments.	Minor
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible
0 mm/s	No vibration perceptible.	No effect

- 9.26 Demolition and construction activities that produce vibration may impact on adjacent buildings. The criteria used in this assessment relate to the potential for cosmetic damage, not structural damage. The principal concern is generally transient vibration due to piling. Cosmetic damage is most likely to occur within the first 20 metres (m) of piling activities; at greater distances damage is less likely to occur. Likely levels of vibration at

given distances can be estimated from existing piling vibration data, as provided in BS 5228-2.

- 9.27 BS 7385 establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings. Recommended PPV vibration limits for transient excitation for different types of buildings are presented in **Table 9.7** below.

Table 9.7: Demolition and Construction Vibration Magnitude Criteria (Structural Damage)

Type of building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures	50 mm/s at 4 Hz and above Substantial	
Industrial and heavy commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz ²	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
1 - Values referred to are at the base of the building; 2 - At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded; mm/s – millimeters per second.		

- 9.28 Where vibration experienced at structures exceeds the values shown in the table above, this would be considered to be a significant adverse effect.

Operational Industrial / Commercial Noise

- 9.29 Industrial noise emissions will be assessed in accordance with the methodology set out in BS 4142. This standard provides an assessment methodology and criteria relating to the following industrial noise sources:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

- 9.30 The only relevant industrial / commercial noise sources associated with the operational phase of the development are expected to be fixed items of mechanical and electrical building services plant.
- 9.31 The proposed criteria for the assessment of the magnitude of impact of industrial noise emissions from the Proposed Development are provided below in **Table 9.8** and are based on the relative level difference between the BS 4142 Rating Levels ($L_{A,r,Tr}$) and the representative background sound levels ($L_{A90,T}$).

Table 9.8: BS:4142 Industrial Noise Magnitude Criteria

Description	Magnitude
$L_{A,r,Tr} = L_{A90,T} + 10$	Major
$L_{A,r,Tr} = L_{A90,T} + 5$	Moderate
$L_{A,r,Tr} = L_{A90,T}$	Minor
$L_{A,r,Tr} = L_{A90,T} - 5$	Negligible
$L_{A,r,Tr} = L_{A90,T} - 10$	No effect

Operational Traffic Noise

- 9.32 Operational traffic noise will be assessed by considering the long-term increase in traffic flows following completion of the Proposed Development, following the principles of CRTN and DMRB.
- 9.33 The criteria for the assessment of the magnitude of the impact of long-term traffic noise changes arising from the Proposed Development will be taken from Table 3.54b of DMRB and are provided in **Table 9.9**.

Table 9.9: Operational Traffic Noise Magnitude Criteria (Long-term)

Description (change in dBA)	Magnitude of Impact
10 dBA or more	Major
5.0 – 9.9 dBA	Moderate
3.0 – 4.9 dBA	Minor
0.1 – 2.9 dBA	Negligible
0 dBA or less	No effect

- 9.34 In addition to the above, the DMRB states the following:

“In the period following a change in traffic flow, people may report positive or negative benefits when the actual noise changes are as small as 1 dB(A). As this noise change is equivalent to an increase of 25% or a decrease in traffic flow of 20%, this reaction may be partly attributed to an awareness of the changes in traffic rather than noise.”

- 9.35 As such, it is considered that overall flow increase of less than 25% would cause long-term changes in road traffic noise levels of negligible magnitude, as this falls within the 0.1 – 2.9 dba band specified in **Table 9.9** above.

Noise Effects on Proposed Receptors

Phase 1 - Full Application

- 9.36 For the community, retail and commercial areas of the Proposed Development (Plots A, B and C), there is no requirement with regards to local planning policies to achieve certain noise limits within these areas. Moreover, the detailed design of these spaces ensures that the noise levels within these internal spaces is controlled to an acceptable level with regards to all relevant guidance. As such, it is considered that for these proposed receptors there is an assessed negligible magnitude in impact terms.
- 9.37 The following tables detail recommendations for internal noise levels for the various uses across Plots A, B and C. For some of these areas, such as community and food hall areas, there is no specific guidance or legislation for internal noise levels. Criteria selected for these areas has therefore been based on best practice principles with reference made to the source of the selected criteria (refer to **Table 9.10 – 9.12**), where relevant.

Table 9.10 Indoor Ambient Noise Level Criteria – Plot A

Type of space	Source of criterion	Upper limit for external noise intrusion	Upper limit for building services noise
Community	BCO Open Plan Office	NR 40 $L_{eq,T}$ 55 dB $L_{A01,1hour}$	NR 40
Retail	BS 8233 Department Store	55 dB $L_{Aeq,T}$ (Combined external noise intrusion and services noise)	
Library	BB93 Library – Resource Area	40 dB $L_{eq,T}$	NR 35
Training rooms	BCO Cellular office / Meeting rooms	NR 35 $L_{eq,T}$ 50 dB $L_{A01,1hour}$	NR 35

Type of space	Source of criterion	Upper limit for external noise intrusion	Upper limit for building services noise
Open plan offices*	BCO Speculative offices*	NR 38 $L_{eq,T}$ 55 dB $L_{A01,1hour}$	NR 38
Office Entrance	BCO Reception Areas	-	NR 40
Toilets Cycle St. / Shower	BCO Toilets	-	NR 45
* Assumes Cat-A fit-out			

Table 9.11 Indoor Ambient Noise Level Criteria – Plot B

Type of space	Source of criteria	Upper limit for external noise intrusion	Upper limit for building services noise
Retail	BS 8233 Department Store	55 dB $L_{Aeq,T}$ (Combined external noise intrusion and services noise)	
Gym	BB93 Gymnasium	40 dB $L_{Aeq,T}$	NR 35
Toilets	BCO Toilets	-	NR 45

Table 9.12 Indoor Ambient Noise Level Criteria – Plot C

Type of space	Source of criteria	Upper limit for external noise intrusion	Upper limit for building services noise
Seating / Circulation	BS 8233 Restaurant	55 dB $L_{Aeq,T}$ (Combined external noise intrusion and services noise)	
Hot Food	BB93 Kitchen	50 dB $L_{Aeq,T}$	NR 45

Type of space	Source of criteria	Upper limit for external noise intrusion	Upper limit for building services noise
Retail	BS 8233 Department Store	55 dB $L_{Aeq,T}$ (Combined external noise intrusion and services noise)	
Offices	BCO Cellular office / Meeting rooms	NR 35 $L_{eq,T}$ 50 dB $L_{A01,1hour}$	NR 35
Toilets Staff Change	BCO Toilets	-	NR 45

Phase 2 – (Outline Application)

- 9.38 BS 8233 provides design guidelines for appropriate internal acoustic environments within buildings according to their function. It deals with control of noise from outside the building, noise from plant and services within it. BS 8233 guidelines set the following noise limits for internal noise limits for residential properties in **Table 9.13** below.

Table 9.13: BS:8233 Noise Management Criteria

Activity	Location	Daytime	Night-time
		(07:00 – 23:00)	(23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room / Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 9.39 In relation to design criteria for external noise, BS 8233 states:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available,

i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

9.40 The proposed residential properties form part of the Outline Application element. It is therefore considered the above ambient noise levels are achieved in new bedrooms and external amenity spaces will be secured through detailed design, and compliance would therefore mitigate significant effects. Internal ambient noise levels in excess of the above limits would be considered significant.

9.41 Approved Document O (ADO) is a new part of the Building Regulations that came into force in June 2022 and specifically covers the control of overheating and suitable mitigation for new residential buildings. With regard to noise, Section 3 of ADO discusses limitations to ensure the overheating strategy is useable and states:

“Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- *40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).*
- *55 dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).”*

9.42 The residential properties proposed are part of the Outline Application element. It is therefore considered that the requirement to comply with Building Regulations will mean the above targets must be achieved through detailed design, and as such this would therefore mitigate significant effects. Internal ambient noise levels in excess of the above limits would be considered significant.

Determining the Significance Criteria

9.43 For the purpose of this chapter, the Effect Significance Matrix provided in **Table 9.14** for Magnitudes of Impact from ‘Negligible’ to ‘Major’ and Receptor Sensitivities of ‘High’ and ‘Medium’ has been adopted for the Noise and Vibration assessment, as these are the only Receptor Sensitives that have been defined in the vicinity.

Table 9.14: Effect Significance Matrix

Magnitude of Impact	Significance of Effect based on Receptor Sensitivity	
	High	Medium
Major	Major	Major-moderate
Moderate	Major-moderate	Moderate-minor
Minor	Moderate-minor	Minor
Negligible	Negligible	Negligible
No effect	No effect	No effect

9.44 It is considered that any significance of effect that is 'Moderate-Minor' or lower is not significant in EIA terms, whereas effects above this threshold are considered significant.

Assumptions/Limitations

9.45 There are a number of limitations and uncertainties associated with modelling of noise and, where applicable, realistic worst-case scenarios are assumed (based on professional judgement):

- All calculated values which have been presented in this chapter will be the best possible estimates using relevant calculation methods from appropriate standards and modelling processes employing best professional judgement. To minimise uncertainty, a realistic worst-case approach has been taken;
- Environmental noise conditions can vary. No warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times;
- The demolition and construction method information provides overall estimates of noise generating items during entire construction phases, but cannot provide typical quantities on a more micro scale i.e. a day-to-day basis, which is what would dictate the L_{Aeq} levels in a real world scenario. Therefore, professional experience from similar developments has been used to formulate construction phasing scenarios and select typical noisy activities for the assessment of noise. This will enable noise predictions to be made, but by its nature, demolition and construction noise is somewhat variable, and it is not possible to predict/model the noise exactly; and

- A detailed piling strategy is not available at the time of writing. Therefore, an assessment of vibration impacts attributed to reasonable worst-case piling methods (i.e. driven piles) has been used to enable vibration predictions to be made. However, piling vibrations are highly dependent on the specific piling methodology, pile depth requirements, ground conditions, soil-structure interactions and internal structural design and it is not possible to predict / model the exact vibration impacts. However, a undertaking a worst case assessment is a robust approach in determining likely significant effects and identifying the requirements for mitigation.

Baseline Conditions

9.46 In order to assess the existing noise and vibration environment at the site, attended and unattended surveys have been undertaken over the following periods:

- Attended noise and vibration survey from 08:00–10:00 hours on Tuesday 25 July 2023.
- Continuous unattended noise surveys from approximately 12:00 hours on Tuesday 25 July 2023 to 13:00 hours on Tuesday 01 August 2023.

9.47 Details of the measurement positions and reasons for location and time scales are presented in the table below.

Table 9.15: Summary of Noise Measurement Locations

Monitoring location	Survey type	Date / period	Comments
MP1	Attended short-term noise measurements	25/07/2023 08:00–10:00	Selected in order to establish tram noise and vibration levels from the Metrolink line to the east of the proposed development.
VP1	Attended short-term vibration measurements	25/07/2023 08:00–10:00	Timings were selected to establish worst case rush hour movements. Microphone for noise survey located approximately 1.3 m above ground level and approximately 25 m from nearest tram line. Vibration measurements located approximately 25 m from nearest tram line
MP2	Unattended noise logging measurements	25/07/2023 13:00 – 01/08/2023 11:30	Selected in order to establish road traffic noise impacts from Bury New Road, considered to be the primary noise source incident on the proposed site.

Monitoring location	Survey type	Date / period	Comments
			Located approximately 7 m from ground level outside second floor window.
MP3		25/07/2023 12:00 – 01/08/2023 11:00	Selected in order to establish lowest likely background sound levels in the area, located to be shielded from the primary noise source on Bury New Road whilst simultaneously as far from the Metrolink line as feasible. Located approximately 6 m from ground level.

9.48 The approximate measurement locations are shown in **Figure 9.2** below, with the site boundary also identified.

Figure 9.2: Noise and vibration survey measurement locations (©Google 2023)



- 9.49 Weather conditions during all surveys were calm and dry, with temperatures around 15 °C upon setting up and collecting equipment, and wind speeds below 5 m/s during both periods. Calibration certificates for all items equipment used for surveys are available upon request.
- 9.50 The noise levels recorded measured at the attended position MP1 are detailed within **Table 9.16**. The values are the average level $L_{Aeq,15min}$, and the percentile levels $L_{A01,15min}$ and $L_{A90,15min}$. All values are free field, have been rounded to the nearest integer value (as fractions of a decibel are imperceptible) and are given in dBA.

Table 9.16: Summary of MP1 Noise Measurement Data

Monitoring location	Period	dB $L_{Aeq,15min}$	dB $L_{A01,15min}$	dB $L_{A90,15min}$
MP1	08:00 – 08:15	53	66	41
	08:15 – 08:30	55	69	42
	08:30 – 08:45	52	65	43
	08:45 – 09:00	57	67	45
	09:00 – 09:15	56	68	43
	09:15 – 09:30	53	66	43
	09:30 – 09:45	51	62	44
	09:45 – 10:00	54	66	47

- 9.51 A summary of the average ambient noise levels recorded at the unattended positions MP2 and MP3 is detailed within **Table 9.17** below. The values are the logarithmically averaged $L_{Aeq,T}$, the maximum daytime $L_{A01,15min}$, the range of $L_{A90,15min}$ and the 10th highest night-time L_{AFmax} values measured. All values have been corrected from façade values by subtracting 3 dB and have been rounded to the nearest integer value (as fractions of a decibel are imperceptible) and are given in dBA.

Table 9.17: Summary of MP2 and MP3 Noise Measurement Data

Monitoring location	Assessment period	Date and time	Average dB $L_{Aeq,T}$	Maximum daytime dB $L_{A01,15min}$	Range dB $L_{A90,15min}$	10 th Night-time Highest $L_{AFmax,2min}$
MP2	Daytime	25/07/2023 13:00 – 25/07/2023 23:00	63	79	50 - 59	n/a

Monitoring location	Assessment period	Date and time	Average dB $L_{Aeq,T}$	Maximum daytime dB $L_{A01,15min}$	Range dB $L_{A90,15min}$	10 th Night-time Highest $L_{AFmax,2min}$
	Night-time	25/07/2023 23:00 – 26/07/2023 07:00	60	-	37 - 56	76
	Daytime	26/07/2023 07:00 – 26/07/2023 23:00	65	78	50 - 62	n/a
	Night-time	26/07/2023 23:00 – 27/07/2023 07:00	63	-	37 - 60	78
	Daytime	27/07/2023 07:00 – 27/07/2023 23:00	64	75	46 - 60	n/a
	Night-time	27/07/2023 23:00 – 28/07/2023 07:00	60	-	33 - 55	76
	Daytime	28/07/2023 07:00 – 28/07/2023 23:00	63	74	50 - 58	n/a
	Night-time	28/07/2023 23:00 – 29/07/2023 07:00	60	-	37 - 53	75
	Daytime	29/07/2023 07:00 – 29/07/2023 23:00	62	74	46 - 58	n/a
	Night-time	29/07/2023 23:00 – 30/07/2023 07:00	62	-	40 - 53	76
	Daytime	30/07/2023 07:00 – 30/07/2023 23:00	65	85	49 - 62	n/a

Monitoring location	Assessment period	Date and time	Average dB $L_{Aeq,T}$	Maximum daytime dB $L_{A01,15min}$	Range dB $L_{A90,15min}$	10 th Night-time Highest $L_{AFmax,2min}$
	Night-time	30/07/2023 23:00 – 31/07/2023 07:00	63	-	39 - 60	77
	Daytime	31/07/2023 07:00 – 31/07/2023 23:00	67	82	49 - 64	n/a
	Night-time	31/07/2023 23:00 – 01/08/2023 07:00	63	-	43 - 60	78
	Daytime	01/08/2023 07:00 – 01/08/2023 11:30	65	73	50 - 59	n/a
MP3	Daytime	25/07/2023 12:00 – 25/07/2023 23:00	50	64	38 - 49	n/a
	Night-time	25/07/2023 23:00 – 26/07/2023 07:00	44	-	32 - 45	64
	Daytime	26/07/2023 07:00 – 26/07/2023 23:00	56	76	43 - 53	n/a
	Night-time	26/07/2023 23:00 – 27/07/2023 07:00	53	-	35 - 49	75
	Daytime	27/07/2023 07:00 – 27/07/2023 23:00	52	77	36 - 50	n/a
	Night-time	27/07/2023 23:00 – 28/07/2023 07:00	45	-	32 - 45	67

Monitoring location	Assessment period	Date and time	Average dB $L_{Aeq,T}$	Maximum daytime dB $L_{A01,15min}$	Range dB $L_{A90,15min}$	10 th Night-time Highest $L_{AFmax,2min}$
	Daytime	28/07/2023 07:00 – 28/07/2023 23:00	50	67	38 - 48	n/a
	Night-time	28/07/2023 23:00 – 29/07/2023 07:00	43	-	34 - 44	65
	Daytime	29/07/2023 07:00 – 29/07/2023 23:00	53	66	41 - 52	n/a
	Night-time	29/07/2023 23:00 – 30/07/2023 07:00	44	-	34 - 40	68
	Daytime	30/07/2023 07:00 – 30/07/2023 23:00	55	70	42 - 53	n/a
	Night-time	30/07/2023 23:00 – 31/07/2023 07:00	45	-	33 - 48	66
	Daytime	31/07/2023 07:00 – 31/07/2023 23:00	53	73	38 - 51	n/a
	Night-time	31/07/2023 23:00 – 01/08/2023 07:00	45	-	35 - 47	65
	Daytime	01/08/2023 07:00 – 01/08/2023 11:00	52	71	46 - 51	n/a

9.52 Full time history graphs for the unattended measurements are presented in **Appendix 9.2**.

- 9.53 It is understood that baseline traffic levels are not expected to increase between the present day and the expected completion year of the Proposed Development (no growth has been added to the baseline future year). Changes to the future baseline traffic noise climate would therefore be considered neutral in acoustic terms.
- 9.54 When assessing the level of adverse impact upon existing dwellings to the introduction of new commercial sound sources, BS 4142 requires that the predicted level of new impact (Rating Level) be compared against the existing representative background sound level.
- 9.55 Histograms of the $L_{A90,15min}$ values measured at positions MP2 and MP3 are provided in **Figures 9.3 to 9.6** below. In accordance with the example methodology set out in *Note 4, Section 8.1.4* of BS 4142:2014, statistical analysis has been undertaken to determine the most commonly occurring $L_{AF90,15min}$ value during daytime (07:00 to 23:00) and night-time (23:00 to 07:00) periods. Background noise was noted on site to be dominated by noise on Bury New Road for both measurement positions. The L_{A90} values deemed representative of the background sound level for the purposes of the BS 4142 assessment are highlighted red.

Figure 9.3: MP2 Daytime representative background levels

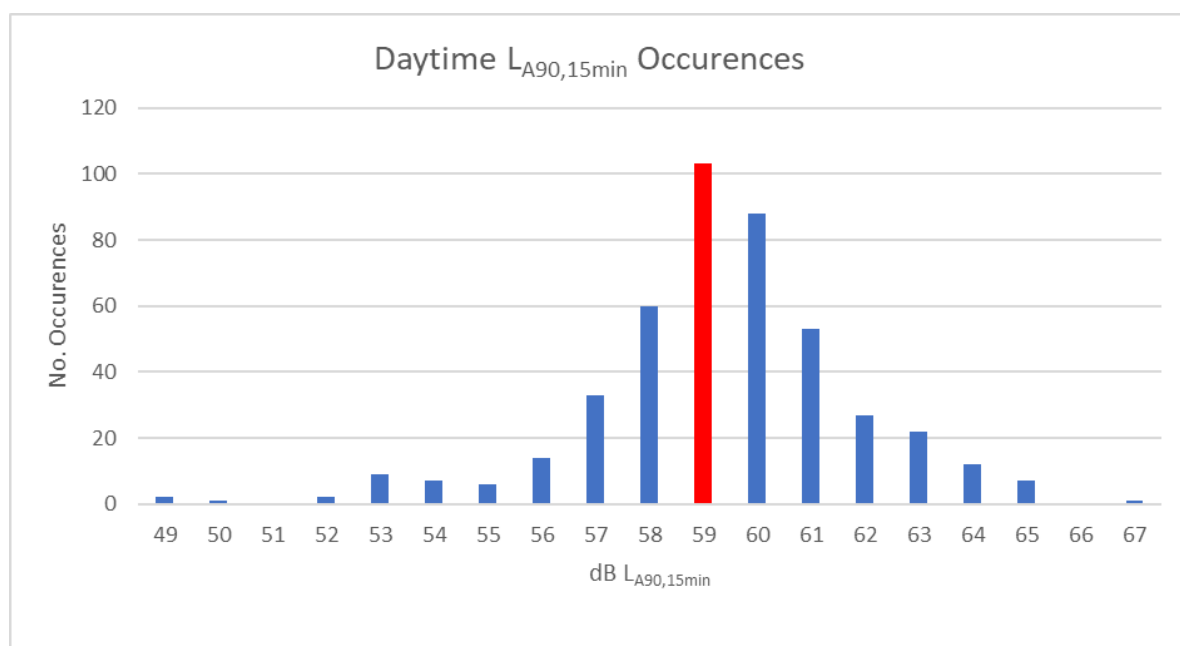


Figure 9.4: MP2 Night-time representative background levels

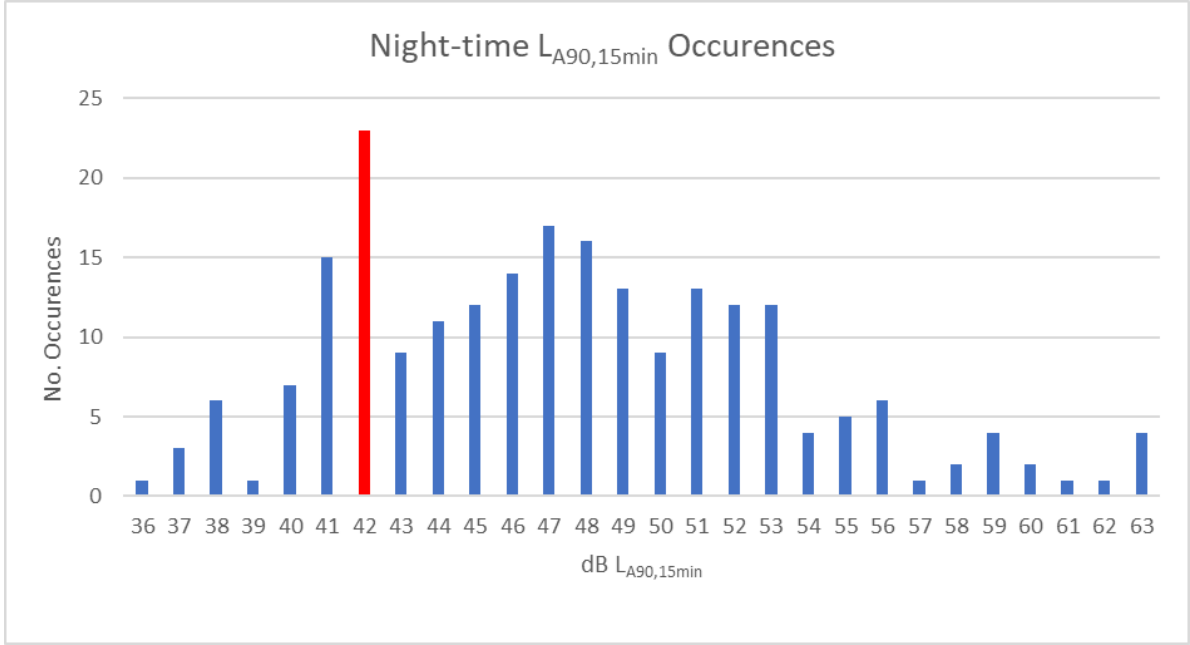


Figure 9.5: MP3 Daytime representative background levels

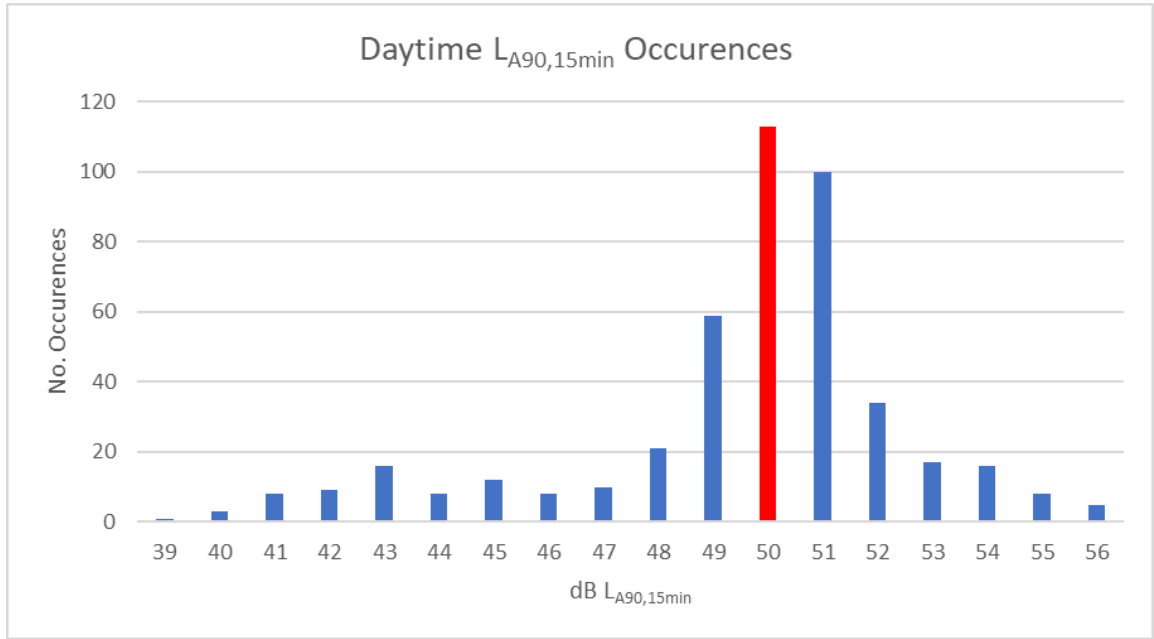
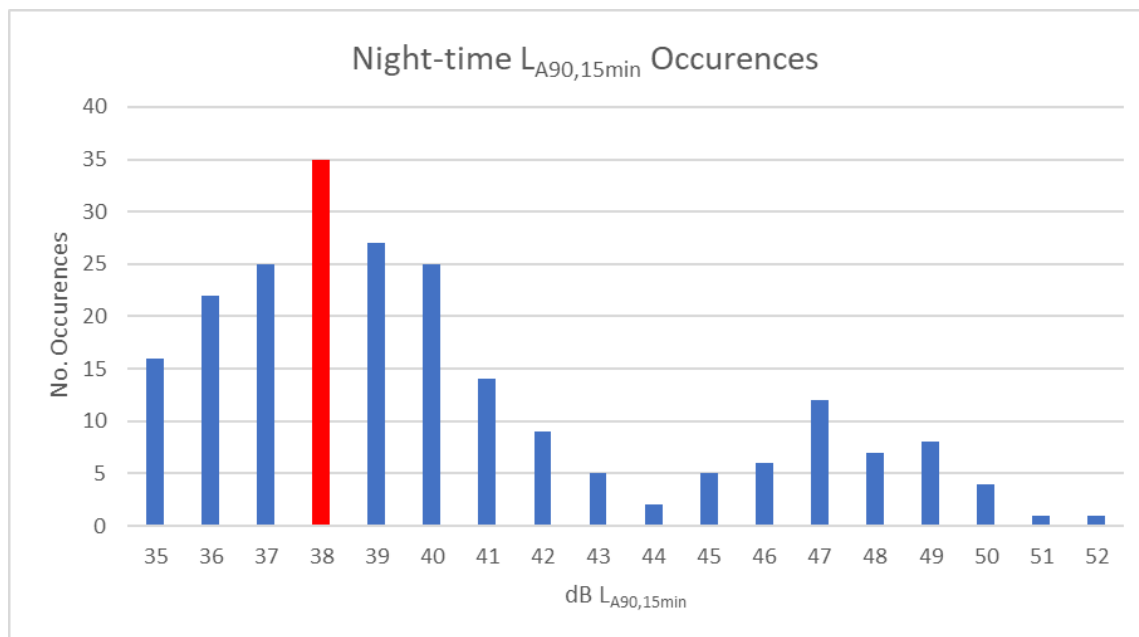


Figure 9.6: MP3 Night-time representative background levels

Embedded Mitigation

Enabling, Demolition and Construction Phase

9.56 It is understood that the Framework Construction Environmental Management Plan (CEMP) (refer to **Appendix 4.3**), has highlighted the following Best Practicable Means (BPM) to minimise the noise and vibration impact on nearby noise sensitive properties:

- Modern plant should be selected;
- Proper use of plant with respect to minimising noise and vibration emissions and regular maintenance. All vehicles and mechanical plant used for the purpose of the works should be fitted with effective exhaust silencers and should be maintained in good efficient working order;
- Selection of inherently quiet plant where appropriate. Electrical plant items (as opposed to diesel powered plant items) should be used wherever practicable. All major compressors should be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use. All ancillary pneumatic percussive tools should be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use should be shut down in the intervening periods between work or throttled down to a minimum;

- The loading and unloading of materials should take place away from residential properties, ideally in locations which are acoustically screened from nearby noise sensitive receptors;
- Materials should be handled with care and be placed, not dropped. Materials should be delivered during normal working hours;
- All ancillary plant such as generators, compressors and pumps should be positioned to cause minimum noise disturbance, i.e. furthest from receptors or behind close boarded noise barriers. If necessary, acoustic enclosures should be provided and/or acoustic shielding;
- Good community relations should be established and maintained throughout the construction process. This should include informing residents on progress and ensuring measures are put in place to minimise noise and vibration impacts;
- Construction contractors should be obliged to adhere to the codes of practice for construction working and piling. Site operations and vehicle routes should be organised to minimise the need for reversing movements, and to take advantage of any natural acoustic screening present in the surrounding topography;
- No employees, subcontractors and persons employed on the site should cause unnecessary noise from their activities e.g. excessive 'revving' of vehicle engines, music from radios, shouting and general behaviour etc. All staff inductions at the site should include information on minimising noise and reminding them to be considerate of the nearby residents; and,
- Measures should be put in place to ensure that employees know that minimisation of noise and vibration will be important at the site.

Completed and Operational Development Phase

- 9.57 For operational industrial noise, it has been agreed with Bury Council that externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level that does not exceed the typical background (L_{A90}) level at the nearest noise sensitive location.
- 9.58 An assessment has been made to identify the level of sound reduction that building façades would need to provide to meet the design targets. For transportation noise sources, if these noise levels are achieved in the respective spaces in the Proposed

Development, it is considered unlikely that future occupants of the Proposed Development would be subject to adverse effects as a result of transportation noise.

Assessment of Likely Significant Effects

Enabling, Demolition and Construction Noise

Assessment of Phase 1 (Full Element)

- 9.59 A 3D noise model in SoundPLAN v9.0 has been used to predict the noise impacts created during the demolition and construction of Phase 1 and associated infrastructure, in accordance with BS 5228-1.
- 9.60 Cundall's extensive experience of similar developments has been used in conjunction with likely plant and equipment anticipated to be used during demolition and construction to select typical noisy activities for the noise assessment.
- 9.61 Based on an anticipated enabling, demolition and construction programme, the following demolition and construction scenarios have been assessed for the full application. It should be noted that the following scenarios are indicative at this stage and there could be slight variations to this which will be determined by the appointed contractor prior to the commencement of development. However, for the purposes of the assessment, the scenarios set out below have been assessed:
- Scenario 1 – Travel Hub (Plot G) Groundworks;
 - Scenario 2 – Travel Hub (Plot G) Substructure + Phase 1 Demolition;
 - Scenario 3 – Travel Hub (Plot G) Substructure + Market Hall (Plot C) Groundworks;
 - Scenario 4 – Market Hall (Plot C) Substructure + Phase 1 Demolition;
 - Scenario 5 – Market Hall (Plot C) Superstructure + Community Hub (Plot A) Groundworks;
 - Scenario 6 – Community Hub (Plot A) Groundworks + Retail Hub (Plot B) Groundworks;
 - Scenario 7 – Community Hub (Plot A) Substructure + Retail Hub (Plot B) Substructure; and,
 - Scenario 8 – Community Hub (Plot A) Superstructure + Retail Hub (Plot B) Superstructure.

9.62 Demolition and construction plant noise source data has been taken from BS 5228-1. **Table 9.18** lists the source data used in the modelling process, as well as the percentage 'on time' during a working day.

Table 9.18 Demolition and Construction Noise Source Data

Phase	Plant Item	Sound Pressure Level @ 10m/dBA	On Time (%)	BS 5228-1 Reference
Demolition / Groundworks	Caged material hoist	68	80%	C4.61
	Gas cutter	79	80%	C1.18
	Tracked Excavator	82	80%	C1.12
	Road planer	82	80%	C5.7
	Breaker mounted on wheeled backhoe	92	80%	C1.1
	Dump truck (tipping fill)	79	80%	C2.30
	Skip Wagon	78	80%	C8.21
	Diesel Generator	60	100%	C4.77
	Water Pump	65	80%	C2.45
	Road Sweeper	76	80%	C4.90
	Compressor for hand-held pneumatic breaker	65	80%	C5.5
Substructure	Gas cutter	79	80%	C1.18
	Caged material hoist	68	80%	C4.61
	Breaker mounted on wheeled backhoe	92	80%	C1.1
	Dump truck (tipping fill)	79	80%	C2.30
	Tower crane	77	80%	C4.49
	Skip Wagon	78	80%	C8.21
	Diesel Generator	60	100%	C4.77
	Water Pump	65	80%	C2.45
	Concrete mixer truck (discharging) & concrete pump (pumping)	75	80%	C4.28
	Road Sweeper	76	80%	C4.90
	Compressor for hand-held pneumatic breaker	65	80%	C5.5
	Piling (assumed augered)	68	80%	C3.6

Phase	Plant Item	Sound Pressure Level @ 10m/dBA	On Time (%)	BS 5228-1 Reference
Superstructure	Caged material hoist	68	80%	C4.61
	Gas cutter	79	80%	C1.18
	Grinder	80	80%	C4.93
	Tower crane	77	80%	C4.49
	Skip Wagon	78	80%	C8.21
	Diesel generator	60	100%	C4.77
	Concrete mixer truck (discharging) & concrete pump (pumping)	75	80%	C4.28
	Road Sweeper	76	80%	C4.90
	Tracked mobile crane	71	80%	C4.50

9.63 **Table 9.19** presents the highest magnitude of impact and therefore the assessed significance of effect prior to the adoption of further mitigation measures at existing nearby noise sensitive receptors, during the demolition and construction scenarios described above. Embedded mitigation measures (as outlined above) provided in the framework CEMP cannot be quantified in terms of noise reduction at this stage and as such detailed reductions in the predicted noise levels cannot be applied. Therefore, the assessment presented below is the assessment of the effect (worst case) prior to the adoption of mitigation measures.

9.64 Full results are provided in **Appendix 9.4**.

Table 9.19 Demolition and Construction Noise Assessment (Phase 1 – Full Application)

Receptor	Sensitivity	Predicted Worst Case Noise Level / $L_{Aeq,T}$ dB	Relevant Worst Case Construction Noise Scenario	Magnitude of Impact	Significance of Effect
A. Highfield Road Residential	High	77	Scenario 1	Major	Major
B. Poppythorn	High	53	Scenario 1	Negligible	Negligible

Receptor	Sensitivity	Predicted Worst Case Noise Level / $L_{Aeq,T}$ dB	Relevant Worst Case Construction Noise Scenario	Magnitude of Impact	Significance of Effect
Lane Residential					
C. Our Lady of Grace (OLOG) Presbytery Church	Medium	79	Scenario 1	Major	Major – moderate
D. Longfield Centre and the Radius Building	High	82	Scenario 4	Major	Major
E. 458 – 466 Bury New Road Mixed Commercial	Medium	85	Scenario 6	Major	Major – moderate
F. Heys Road Residential	High	59	Scenario 2	Major	Major
G. The Heys Residential	High	55	Scenario 3	Negligible	Negligible
H. 440 – 448 Bury New Road Mixed Commercial	Medium	80	Scenario 6	Negligible	Negligible
I. Prestwich Job Centre	Medium	77	Scenario 4	Major	Major – moderate
J. Rectory Green Residential	High	80	Scenario 6	Major	Major
K. St Mary's C of E Primary School	High	82	Scenario 6	Major	Major

9.65 It can be seen from the results presented in **Table 9.19** that noise effects, as a result of unmitigated demolition and construction activities are assessed as **Negligible to Major Adverse**, prior to mitigation.

9.66 The above numerical assessment process based on BS 5228 source level data does not account for the implementation of a detailed CEMP, i.e. the sound pressure source data presented in BS 5228-1 does not account for significant noise levels reductions due to the implementation of Best Practicable Means (BPM) beyond the framework already provided within the Embedded Mitigation and Framework CEMP. As such the mitigation afforded by the detailed CEMP is discussed in the Further Mitigation Section of this Chapter.

Assessment of Phase 2 (Outline Element)

- 9.67 Noise impacts created during the demolition and construction of Phase 2 have utilised the same modelling software and standards guidance as undertaken for the Phase 1 assessment.
- 9.68 Based on anticipated enabling, demolition and construction programme, the following demolition and construction scenarios have been assessed for the outline application;
- Scenario 9 – Outline Application Groundworks.
 - Scenario 10 – Outline Application Substructure.
 - Scenario 11 – Outline Application Superstructure.
- 9.69 Demolition and construction plant noise source data has been taken from BS 5228-1, as listed in the previous section in **Table 9.18**.
- 9.70 **Table 9.20** presents the highest magnitude of impact and significance of effect prior to further mitigation measures at existing nearby noise sensitive receptors, during the demolition and construction scenarios described above. Embedded mitigation (as outlined above) provides a framework CEMP and as such detailed reductions in the predicted noise levels cannot be applied. Full results are provided in **Appendix 9.4**.

Table 9.20 Demolition and Construction Noise Assessment (Phase 2 – Outline Application)

Receptor	Sensitivity	Predicted Worst Case Noise Level / $L_{Aeq,T}$ dB	Relevant Worst Case Construction Noise Scenario	Magnitude of Impact	Significance of Effect
A. Highfield Road Residential	High	53	Scenario 10	Negligible	Negligible
B. Poppythorn Lane Residential	High	52	Scenario 9	Negligible	Negligible
C. Our Lady of Grace (OLOG) Presbytery Church	Medium	72	Scenario 10	Moderate	Moderate – minor
D. Longfield Centre and the Radius Building	High	74	Scenario 9	Moderate	Major – moderate

Receptor	Sensitivity	Predicted Worst Case Noise Level / $L_{Aeq,T}$ dB	Relevant Worst Case Construction Noise Scenario	Magnitude of Impact	Significance of Effect
E. 458 - 466 Bury New Road Mixed Commercial	Medium	51	Scenario 9	Negligible	Negligible
F. Heys Road Residential	High	68	Scenario 10	Minor	Moderate – minor
G. The Heys Residential	High	54	Scenario 10	Negligible	Negligible
H. 440 - 448 Bury New Road Mixed Commercial	Medium	65	Scenario 9	Minor	Minor
I. Prestwich Job Centre	Medium	81	Scenario 9	Major	Major – moderate
J. Rectory Green Residential	High	81	Scenario 9	Major	Major
K. St Mary's C of E Primary School	High	75	Scenario 9	Major	Major
L. Proposed Development Phase 1	Medium	79	Scenario 9	Major	Major – moderate

9.71 It can be seen from the results presented in **Table 9.20** that noise effects, as a result of unmitigated demolition and construction activities are predicted to be **Negligible to Major Adverse**, prior to mitigation.

9.72 The above numerical assessment process based on BS 5228 source level data does not account for the implementation of a detailed CEMP, i.e. the sound pressure source data presented in BS 5228-1 does not account for significant noise levels reductions due to the implementation of Best Practicable Means (BPM) beyond the framework already provided within the Embedded Mitigation. As such the mitigation afforded by the CEMP is discussed in the Further Mitigation Section of this Chapter.

Assessment of Combined Development (Phase 1 and 2)

9.73 For completeness an assessment of the combined development is presented in **Table 9.21**. It presents the highest magnitude of impact and significance of effect prior to further mitigation measures at existing nearby noise sensitive receptors, during the demolition and construction scenarios described above. Embedded mitigation (as outlined above)

only provides a framework CEMP and as such detailed reductions in the predicted noise levels cannot be applied. Full results are provided in **Appendix 9.4**.

Table 9.21 Demolition and Construction Noise Assessment (Combined Development)

Receptor	Sensitivity	Predicted Worst Case Noise Level / $L_{Aeq,T}$ dB	Relevant Worst Case Construction Noise Scenario	Magnitude of Impact	Significance of Effect
A. Highfield Road Residential	High	77	Scenario 1	Major	Major
B. Poppythorn Lane Residential	High	53	Scenario 1	Negligible	Negligible
C. Our Lady of Grace (OLOG) Presbytery Church	Medium	79	Scenario 1	Major	Major – moderate
D. Longfield Centre and the Radius Bulding	High	82	Scenario 4	Major	Major
E. 458 - 466 Bury New Road Mixed Commercial	Medium	85	Scenario 6	Major	Major – moderate
F. Heys Road Residential	High	68	Scenario 10	Minor	Moderate – minor
G. The Heys Residential	High	55	Scenario 3	Negligible	Negligible
H. 440 - 448 Bury New Road Mixed Commercial	Medium	80	Scenario 6	Negligible	Negligible
I. Prestwich Job Centre	Medium	81	Scenario 9	Major	Major – moderate
J. Rectory Green Residential	High	81	Scenario 9	Major	Major
K. St Mary's C of E Primary School	High	82	Scenario 6	Major	Major
L. Proposed Development Phase 1	Medium	79	Scenario 9	Major	Major – moderate

9.74 It can be seen from the results presented in **Table 9.21** that noise effects, as a result of unmitigated demolition and construction activities are predicted to be **Negligible to Major Adverse**, prior to mitigation.

- 9.75 The above numerical assessment process based on BS 5228 source level data does not account for to implementation of a detailed CEMP, i.e. the sound pressure source data presented in BS 5228-1 does not account for significant noise levels reductions due to the implementation of Best Practicable Means (BPM) beyond the framework already provided within the Embedded Mitigation. As such the mitigation afforded by the CEMP is discussed in the Further Mitigation Section of this Chapter.

Demolition and Construction Traffic Noise

Assessment of Phase 1 (Full Element)

- 9.76 Based on information provided by the Transport Consultant, it is understood that the baseline number of annual average weekday traffic flow movements (18 hour AAWT) along Bury New Road is 22,572, of which 785 are HGV movements.
- 9.77 Based on a reasonable worst-case scenario of 10% increase in HGV traffic flows due to demolition and construction traffic, the noise change in dB at affected receptors would be <1dB for HGVs only, with the overall increase in traffic in proportion to all vehicle movements being lower than this still. The magnitude of impact would therefore be Negligible. For the highest sensitivity of receptor, it is therefore assessed that the significance of effect, due to demolition and construction traffic noise will be **Negligible** and therefore not significant.

Assessment of Phase 2 (Outline Element)

- 9.78 It is understood that baseline traffic levels are not expected to change between the present day and the operation of the proposed development. The assessment summarised for Phase 1 (Full Element) is therefore applicable to all phases of demolition and construction. It is similarly expected that for Phase 2, a reasonable worst-case scenario of 10% increase in HGV traffic flows due to demolition and construction traffic would see the noise change in dB at affected receptors be <1dB for HGVs only, with the overall increase in traffic in proportion to all vehicle movements being lower than this still. The magnitude of impact would therefore be Negligible. For the highest sensitivity of receptor, it is therefore assessed that the significance of effect, due to demolition and construction traffic noise will be **Negligible** and therefore not significant.

Assessment of Combined Development (Phases 1 and 2)

- 9.79 It is understood that baseline traffic levels are not expected to change between the present day and the operation of the proposed development. The assessment

summarised for Phase 1 (Full Element) is therefore applicable to all phases of demolition and construction. It is similarly expected that for elements of demolition and construction traffic for Phase 2 overlap with Phase 1, a reasonable worst-case scenario of 10% increase in HGV traffic flows due to demolition and construction traffic would see the noise change in dB at affected receptors be <1dB for HGVs only, with the overall increase in traffic in proportion to all vehicle movements being lower than this still. The magnitude of impact would therefore be Negligible. For the highest sensitivity of receptor, it is therefore assessed that the significance of effect, due to demolition and construction traffic noise will be **Negligible** and therefore not significant.

Demolition and Construction Vibration

Assessment of Phase 1 (Full Element)

- 9.80 Demolition and construction stage works will include the construction of new buildings and associated infrastructure and landscaping. These types of work may lead to vibration and cause nuisance and disturbance to nearby noise sensitive receptors.
- 9.81 BS 5228-2 makes reference to the Transport Research Laboratory (TRL) report 429 '*Groundborne Vibration Caused by Mechanised Construction Works*'. Figure 50 of the TRL report indicates that ground vibration from miscellaneous vehicle operations on construction sites (including scrapers, rollers, dumpers, breakers, dozers and HGVs) are in the region of 1 mm/s PPV at approximately 10 m, decreasing to the region of 0.1 mm/s PPV at approximately 50 m. As part of the embedded mitigation to be provided as part of a CEMP, HGV speeds will be limited to <5 mph on access routes, and routes and road surfaces will be regularly maintained. Based on this, the magnitude of impact from vibration from vehicles on the access roads will be minimised to a negligible level and the significance of effect is assessed as **Negligible** i.e. not significant.
- 9.82 BS 5228-2 indicates that demolition and construction activities (particularly piling) generally only generate significant vibration impacts when they are located less than 20m from sensitive locations. The impact depends on the type of piling, ground conditions, and receptor distance.
- 9.83 As detailed in **Table 9.22**, the magnitude of impact for potential vibration sources affecting nearby human receptors (i.e. occupants of dwellings adjacent to the site) is therefore expected to result in a negligible to minor magnitude of impact for plan distances of $\geq 20\text{m}$ from the construction vibration source. For plan distances of <20m between the piling vibration source and human receptors, there is the potential that construction vibration sources may result in a moderate to major magnitude of impact

and therefore potentially significant effects. This is dependant on the piling method chosen – driven piling is more likely to result in significant effects, whilst alternative low-vibration methods such as continuous flight augered (CFA) piling is expected to result in lower magnitudes of impact. The exact method of pilling is unknown at this stage, so the below potential magnitude of impacts have assumed worst case vibration levels from driven piling. The quoted distances have been based on the nearest edge of receptor buildings to the nearest edge of proposed buildings.

Table 9.22: Magnitude of Impact for Construction Vibration Impacts (Phase 1 – Full Application)

Receptor	Sensitivity	Approximate Plan Distance/m	Potential Magnitude of Impact	Potential significance of effect
A. Highfield Road Residential	High	11	Moderate / Major	Major-moderate / Major
B. Poppythorn Lane Residential	High	35	Negligible / Minor	Negligible / Moderate
C. Our Lady of Grace (OLOG) Presbytery Church	Medium	5	Moderate / Major	Moderate-minor / Major-moderate
D. Longfield Centre and the Radius Building	High	9	Moderate / Major	Major-moderate / Major
E. 458 - 466 Bury New Road Mixed Commercial	Medium	0	Moderate / Major	Moderate-minor / Major-moderate
F. Heys Road Residential	High	70	Negligible / Minor	Negligible / Moderate
G. The Heys Residential	High	110	Negligible / Minor	Negligible / Moderate
H. 440 - 448 Bury New Road Mixed Commercial	Medium	13	Moderate / Major	Moderate-minor / Major-moderate
I. Prestwich Job Centre	Medium	21	Negligible / Minor	Negligible / Minor
J. Rectory Green Residential	High	23	Negligible / Minor	Negligible / Moderate
K. St Mary's C of E Primary School	High	27	Negligible / Minor	Negligible / Moderate

9.84 It should be noted that the above assessment of potential construction vibration effects is based upon a theoretical worst-case assessment for unmitigated works and does not fully account for mitigation measures being in place. These are discussed in the further mitigation section of this Chapter.

Assessment of Phase 2 (Outline Element)

9.85 **Table 9.23** applies the same principles of construction vibration impacts as discussed for Phase 1 but additionally considers the approximate nearest plan distance from the Outline Application to the completed Phase 1 plots. For plan distances of <20m between the piling vibration source and human receptors, there is the potential that construction vibration sources may result in a moderate to major magnitude of impact and therefore potentially significant effects. This is dependent on the piling method chosen – driven piling is more likely to result in significant effects, whilst alternative low-vibration methods such as continuous flight augered (CFA) piling is expected to result in lower magnitudes of impact. The exact method of piling is unknown at this stage, so the below potential magnitude of impacts have assumed worst case vibration levels from driven piling. The quoted distances have been based on the nearest edge of receptor buildings to the nearest edge of proposed buildings.

Table 9.23: Magnitude of Impact for Construction Vibration Impacts – (Phase 2 – Outline Application)

Receptor	Sensitivity	Approximate Plan Distance/m	Potential Magnitude of Impact	Potential significance of effect
A. Highfield Road Residential	High	90	Negligible / Minor	Negligible / Moderate
B. Poppythorn Lane Residential	High	78	Negligible / Minor	Negligible / Moderate
C. Our Lady of Grace (OLOG) Presbytery Church	Medium	17	Moderate / Major	Moderate-minor / Major-moderate
D. Longfield Centre and the Radius Building	High	11	Moderate / Major	Major-moderate / Major
E. 458 - 466 Bury New Road Mixed Commercial	Medium	78	Negligible / Minor	Negligible / Minor
F. Heys Road Residential	High	74	Negligible / Minor	Negligible / Moderate
G. The Heys Residential	High	102	Negligible / Minor	Negligible / Moderate
H. 440 - 448 Bury New Road Mixed Commercial	Medium	92	Negligible / Minor	Negligible / Minor
I. Prestwich Job Centre	Medium	21	Negligible / Minor	Negligible / Minor
J. Rectory Green Residential	High	23	Negligible / Minor	Negligible / Moderate
K. St Mary's C of E Primary School	High	27	Negligible / Minor	Negligible / Moderate
L. Proposed Development Phase 1	Medium	8	Moderate / Major	Moderate-minor / Major-moderate

- 9.86 It should be noted that the above assessment of potential construction vibration effects is based upon a theoretical worst-case assessment for unmitigated works and does not fully account for mitigation measures being in place. These are discussed in the further mitigation section of this Chapter.

Assessment of Combined Development (Phases 1 and 2)

- 9.87 Since the phasing of demolition and construction works for the full and outline applications will not see worst case vibration effects (with worst case levels likely as a result of piling) occur concurrently, the assessment for the combined development considers each phase separately – refer to the above sections.

The Completed and Operational Phase

Operational Commercial Noise

Assessment of Phase 1 (Full Element) and Assessment of Phase 2 (Outline Element)

- 9.88 Plant noise limits to be complied with at nearby noise sensitive receptors must consider cumulative noise impacts from operational building services plant associated with both phases of the development. For example, if both phases assessed separately found plant to be equal to existing background levels, then the combined effect would mean background levels were exceeded when assessed in conjunction with one another. See Combined Development assessment.

Assessment of Combined Development (Phase 1 and 2)

- 9.89 It is proposed that representative levels for each of the identified receptors is determined as follows:
- Receptors primarily exposed to Bury New Road as the main noise source to have representative levels calculated as per levels measured at position MP2.
 - Receptors primarily exposed to The Metrolink tram line as the main noise source to have representative levels calculated as per levels measured at position MP3.
- 9.90 Based on relevant representative background sound levels during the daytime and night-time periods at each measurement position, the plant noise limits for the combined application to be achieved at 1 m from the nearest noise-sensitive receptor can be defined as set out in **Table 9.24**. Limits are provided on the basis that the plant noise rating level does not exceed the existing representative background sound level at sensitive receptors.

Table 9.24: Proposed Plant Noise Limits (Combined)

Noise sensitive receptor	Measurement position for representative background	Time period	Plant noise rating level not to be exceeded at 1 m from nearest noise-sensitive receptor dB L _{Ar,Tr}
A. Highfield Road Residential C. Our Lady of Grace (OLOG) D. Longfield Centre and the Radius Building E. 458 - 466 Bury New Road Mixed Commercial H. 440 - 448 Bury New Road Mixed Commercial K. St Mary's C of E Primary School L. Proposed Development Phase 1	MP2	Daytime (07:00–23:00)	59
		Night-time (07:00–23:00)	42
B. Poppythorn Lane Residential F. Heys Road Residential G. The Heys Residential I. Prestwich Job Centre J. Rectory Green Residential M. Proposed Development Phase 2	MP3	Daytime (07:00–23:00)	50
		Night-time (07:00–23:00)	38

- 9.91 The noise limits set out in **Table 9.24** relate to the total cumulative noise level at receptors from all fixed plant noise sources associated with both phases of the Proposed Development, whilst the units are operating under their normal design duty conditions.
- 9.92 Items of external noise generating plant items are to be located on rooftop levels on Plot A, B and C for Phase 1. Information for proposed plant items has been provided by M&E consultants and **Table 9.25** below details the proposed quantities of each plant item.

Table 9.25: Phase 1 proposed rooftop plant items

Plot	Item description	Quantity
Plot A	Air Handling Units (AHUs)	3
	Air Source Heat Pumps (ASHPs)	2
Plot B	Air Handling Units (AHUs)	2
	Air Source Heat Pumps (ASHPs)	2
Plot C	Condensers	2

9.93 Data for the sound power level (L_w) of the above items is available from the respective manufacturers and is reproduced in **Table 9.26** below. It is understood from the M&E consultants that, due to demand on these units not being known at this stage of the design, appropriate sizing of the AHUs is not possible, and as such the following plant noise assessment has assumed the largest predicted AHU necessary for all units as provided by the M&E consultants.

Table 9.26: Plant noise sound power data

Plot	Item Description	Manufacturer's reference	Sound Power Level dBA (L_w)
Plot A	AHU01 Supply	MP Air Handling – [Non-Standard] 20502	71
	AHU01 Supply Casing		42
	AHU01 Extract		80
	AHU01 Extract Casing		41
	AHU02 Supply		71
	AHU02 Supply Casing		42
	AHU02 Extract		80
	AHU02 Extract Casing		41
	AHU03 Supply		71
	AHU03 Supply Casing		42
	AHU03 Extract		80
	AHU03 Extract Casing		41
	Air Source Heat Pumps	Mitsubishi EAHV-M1500YCL(-N)	83
Plot B	AHU01 Supply	MP Air Handling – [Non-Standard] 20502	71
	AHU01 Supply Casing		42

Plot	Item Description	Manufacturer's reference	Sound Power Level dBA (L _w)
	AHU01 Extract		80
	AHU01 Extract Casing		41
	AHU02 Supply		71
	AHU02 Supply Casing		42
	AHU02 Extract		80
	AHU02 Extract Casing		41
	Air Source Heat Pumps	Mitsubishi MEHP-iS-G07 0102	82
Plot C	Condensers	Mitsubishi MXZ-2F42VF3	59

- 9.94 In order to assess the predicted sound level at the nearest receptors as a result of proposed new services plant installations, a 3D sound model of the site has been created using SoundPLAN 9.0 software. This software is capable of predicting sound propagation, by taking into account variations in topography, barrier attenuation provided by existing acoustic screens and buildings, and distance attenuation.
- 9.95 Results of the noise modelling process are presented in **Table 9.27** below. This presents an assessment of all plant running at full design duty overnight, and as such assesses a worst case scenario by comparing noise levels against night-time background level limits. The resultant noise levels have been assessed against magnitude of impact criteria for industrial noise (refer to **Table 9.8**). At this stage no specific BS 4142 acoustic feature corrections (i.e. tonality, intermittency, impulsivity) have been identified, and the existing general environment is already dominated by general traffic and plant noise from the existing commercial properties – hence corrections applied for differences with the existing environment are also not applicable.

Table 9.27: Plant Noise Impact Assessment Results

Receptor	Sensitivity	Representative Night-time Background Noise Level / L _{A90,15min} dB	Predicted Worst Case Noise Level / L _{A,T} dB	Magnitude of Impact	Significance of Effect
A. Highfield Road Residential	High	42	19	Negligible	Negligible
B. Poppythorn Lane Residential	High	38	12	Negligible	Negligible
C. Our Lady of Grace (OLOG) Presbytery Church	Medium	42	18	Negligible	Negligible
D. Longfield Centre and the Radius Building	High	42	35	Negligible	Negligible
E. 458 - 466 Bury New Road Mixed Commercial	Medium	42	47	Moderate	Moderate – minor
F. Heys Road Residential	High	38	16	Negligible	Negligible
G. The Heys Residential	High	38	17	Negligible	Negligible
H. 440 - 448 Bury New Road Mixed Commercial	Medium	42	41	Negligible	Negligible
I. Prestwich Job Centre	Medium	38	25	Negligible	Negligible
J. Rectory Green Residential	High	38	31	Negligible	Negligible
K. St Mary's C of E Primary School	High	42	34	Negligible	Negligible
M. Proposed Development Phase 2	High	38	40	Moderate	Major – moderate

9.96 It can be seen from the results above the majority of receptors will experience a negligible magnitude of impact from external plant noise contributions and the significance of effect at these receptors. Therefore, the significance of effect is assessed as **Negligible** and not significant.

9.97 The exception is to receptors E and M where, prior to the implementation of further mitigation, the magnitude of plant noise impacts is expected to be Moderate. The

significance of effect based on the sensitive of these receptors is therefore assessed as **Moderate-Minor** adverse (Receptor E) to Major-Moderate adverse (Receptor M) which is significant in the absence of further mitigation.

- 9.98 The above assessment has considered plant noise emissions from Phase 1 only, including Phase 2 as a sensitive receptor. This is because there is no current design information for Phase 2 given the outline nature of this element of the application.

Operational Traffic Noise

Assessment of Phase 1 (Full Element) and Phase 2 (Outline Element)

- 9.99 Traffic flows have been assessed as a result of the combined development only, which is worst case with regards to noise impacts. See Combined Development assessment.

Assessment of Combined Development (Phase 1 and 2)

- 9.100 Changes in 18-hour traffic noise levels have been calculated using methodologies in line with CRTN guidance. Baseline and operational traffic flow data has been provided as part of the traffic assessment (refer to **Chapter 8: Transport**).
- 9.101 The following table presents the completed and operational traffic noise assessment for both phases of the development. Increases to the baseline traffic flow data considers additional movements as a result of contributions from the development only, with no strategic growth to the existing baseline flows as set out above. This has been assessed against magnitude of impact criteria for short-term operational traffic noise impacts (refer to **Table 9.5**).

Table 9.28: Road Traffic Noise Change Operational Phase

Road Link	Baseline 18-hour AADT Traffic Flow (2023)		Baseline + Development 18- hour AADT Traffic Flow (2031)		Noise Change Db	Magnitude of Impact
	Total Vehicles	%HGV	Total Vehicles	%HGV		
A56 Bury New Road, north of Fairfax Road (DfT Count point 46572)	22572	3%	22643	3%	0.0	Negligible

Road Link	Baseline 18-hour AADT Traffic Flow (2023)		Baseline + Development 18-hour AADT Traffic Flow (2031)		Noise Change Db	Magnitude of Impact
	Total Vehicles	%HGV	Total Vehicles	%HGV		
Fairfax Road at Travel Hub entrance	6955	1%	7426	1%	0.3	Negligible
M60 west of A56 (DfT Count 16051)	176465	10%	176500	10%	0.0	Negligible
A56 Bury New Road, south of Fairfax Road	14852	4%	15138	4%	0.1	Negligible
Rectory Lane – north end	2939	1%	2972	1%	0.0	Negligible
Chester Street	1570	1%	1580	1%	0.0	Negligible
Poppythorn Lane	3910	0%	3938	0%	0.0	Negligible
Heys Road	3380	1%	3411	1%	0.0	Negligible
Highfield Road	1216	0%	1243	0%	0.1	Negligible

9.102 It can be seen from the above results that assuming highly sensitive receptors on all assessed roads, then magnitude of impact for all receptors will be negligible. Therefore, the significance of effect is assessed as **Negligible** for all receptors and is therefore not significant.

9.103 Whilst a growth factor for traffic has not been applied as part of the traffic flow predictions, DMRB quotes that a rise in traffic flows of at least 25% is necessary to see a change of greater than 1 dB i.e. over the negligible magnitude of impact. Given baseline levels are not expected to grow by 2031, it follows that any expected traffic growth in 15 years will be of a much lower value than 25%. This will mean long term rises in traffic will be much less than 1 dB, and therefore long term traffic noise effects are assessed as **Negligible** and not significant.

Operational Noise Impact on Proposed Receptors

9.104 For most façades, the weakest elements of the external elevation are the glazing and ventilation openings. The specification of these elements is therefore considered to be the primary factor in determining the internal ambient noise level within noise sensitive rooms of the Proposed Development due to noise ingress from outside.

- 9.105 In order to determine road traffic and Metrolink noise propagation across the proposed development site, a model has been produced using SoundPLAN v9.0 acoustic modelling software. This model is capable of accurately determining sound propagation by taking into account variations in topography, barrier attenuation provided by existing landscaping and buildings, and distance attenuation.
- 9.106 The daytime noise model has been calibrated based on worst case 16-hour daytime levels measured at positions MP2 and MP3, and the highest 15-minute level measured during rush-hour Metrolink measurements at position MP1.
- 9.107 The night-time noise model has been calibrated based on worst case 8 hour night-time levels measured at positions MP2 and MP3.

Assessment of Phase 1 (Full Application)

- 9.108 3D façade noise maps of the daytime and night-time L_{Aeq} noise levels incident on Plots A, B and C, are presented in **Figures 9.7** and **9.8**. Incident noise levels are presented as colours on the façades with the key providing the calculated free field dBA value. Full size versions of these maps are provided in **Appendix 9.3**.

Figure 9.7: Full Application Daytime Façade Noise Map From South West

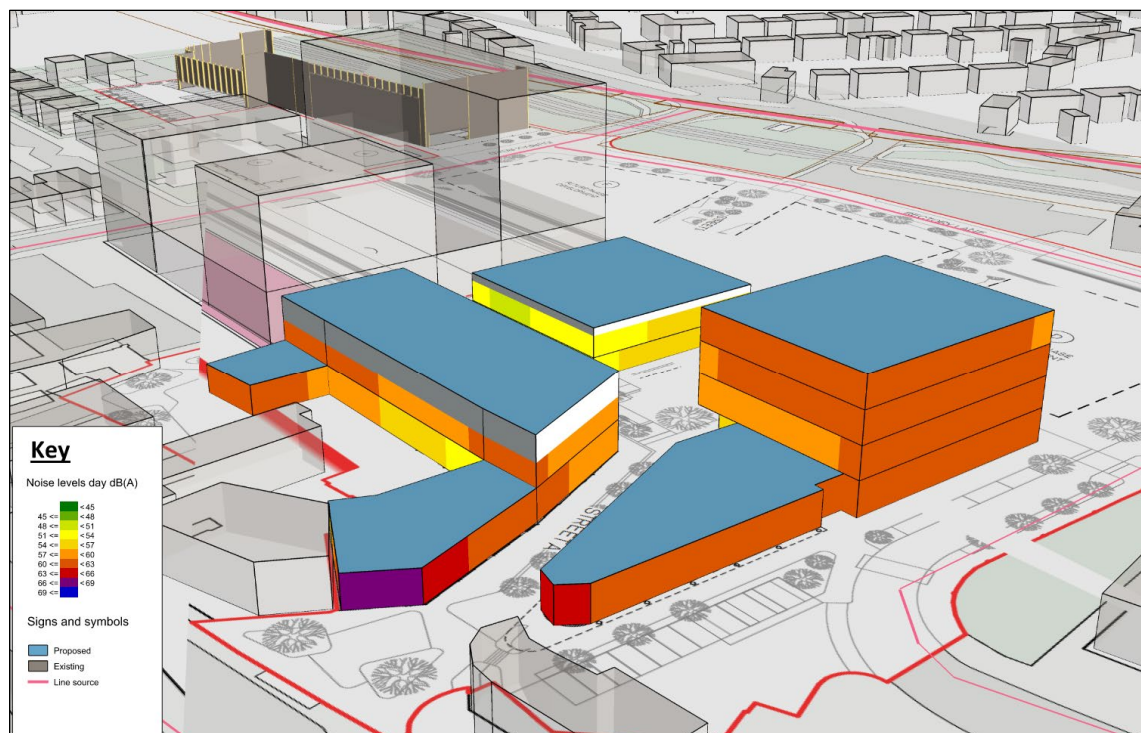
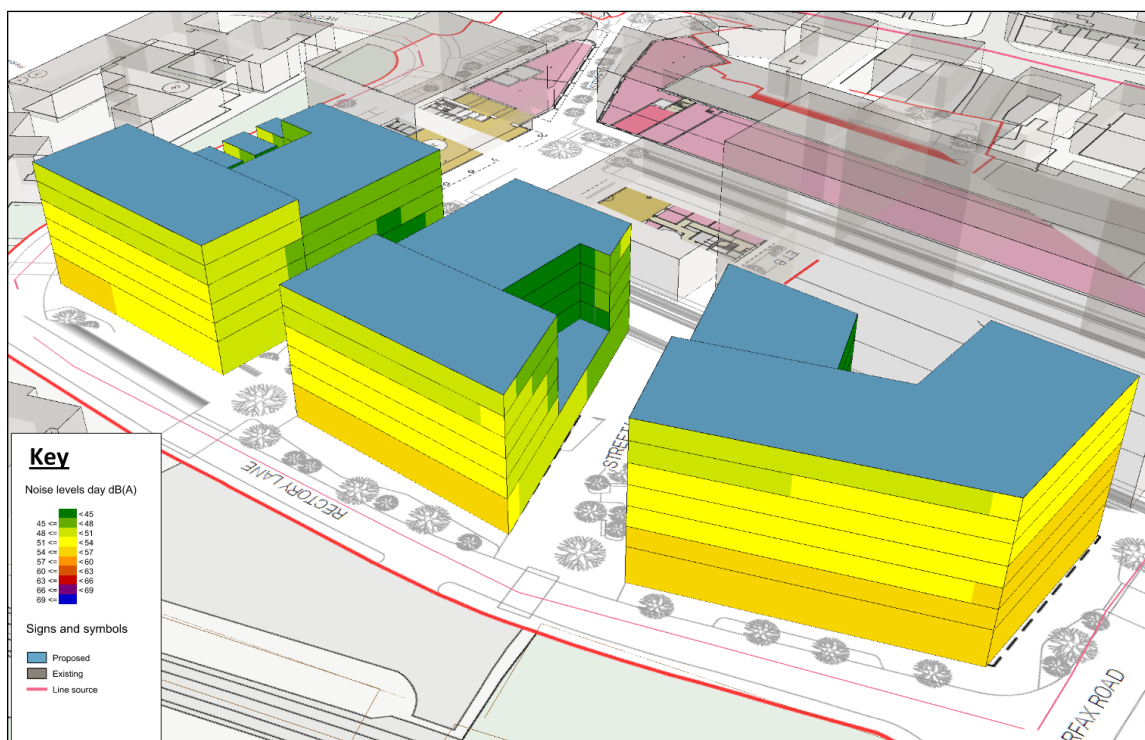


Figure 9.8: Full Application Daytime Façade Noise Map From North East

9.109 As can be seen from **Figure 9.7** and **Figure 9.8**, daytime incident noise levels are expected to be up to 68 dB L_{Aeq} . Prior to mitigation, the magnitude of change will range from negligible to major adverse depending on location with the significance of effect assessed as **Moderate-Minor** adverse, prior to mitigation. However, the adoption of a suitable façade system will achieve compliance with the relevant internal noise level targets as set out in the further mitigation section of this Chapter.

Assessment of Phase 2 (Outline Application)

9.110 3D façade noise maps of the daytime and night-time L_{Aeq} noise levels incident on Plots D, E and F, are presented in **Figures 9.9** and **9.10** based on outline massing parameters. Incident noise levels are presented as colours on the façades with the key provided indicating the free-field dBA level band corresponding to these colours. Full size versions of these maps are provided in **Appendix 9.3**.

Figure 9.9: Outline Application Daytime Façade Noise Map from North East**Figure 9.10: Outline Application Night-time façade Noise Map from North East**

9.111 As can be seen from **Figure 9.9** and **Figure 9.10**, daytime incident noise levels are expected to be up to 63 dB L_{Aeq} and night-time incident noise levels are expected to be up to 57 dB L_{Aeq} . Prior to mitigation, the magnitude of change will range from negligible to major adverse depending on location of habitable rooms along these façades with the significance of effect assessed as **Major – Moderate** adverse, prior to mitigation.

However, the adoption of a suitable façade system will achieve compliance with the relevant internal noise level targets as set out in the further mitigation section of this Chapter.

Assessment of Combined Development (Phases 1 and 2)

- 9.112 The noise modelling undertaken with regards to the completion of Phase 1 does not consider screening of noise from the Metrolink Line from Phase 2 and can therefore be considered worst case, as façade noise levels facing the Metrolink line will reduce following the completion of Phase 2. The modelling undertaken with regards to the completion of Phase 2 already considers the construction of Phase 1 as part of the surrounding built environment, i.e. Phase 2 modelling is representative of the completed development.

Further Mitigation / Enhancement Measures and Residual Effects

Demolition and Construction Noise and Vibration

Assessment of Phase 1 (Full Element)

- 9.113 Further mitigation to be provided as part of a detailed CEMP pertains to all phases of the development and is therefore summarised in the Combined Development Section below.

Assessment of Phase 2 (Outline Element)

- 9.114 Further mitigation to be provided as part of a detailed CEMP pertains to all phases of the development and is therefore summarised in the Combined Development Section below.

Assessment of Combined Development (Phases 1 and 2)

- 9.115 The above numerical assessments based on BS 5228 for noise and vibration levels do not account for mitigation measures as presented in the Framework CEMP, as a detailed CEMP is required to highlight measures to reduce impacts as pertaining to this specific site. Further mitigation measures will therefore be implemented as part of this detailed CEMP. Considering the above, the magnitude of impact associated with groundworks and construction noise and vibration can be suitably controlled via the detailed CEMP and the magnitude of impact would be considered minor. Noise and vibration effects, as a result of demolition and construction, are therefore predicted to be **Negligible to Moderate-Minor** Adverse and therefore not significant. Effects will also be temporary, as they will only occur during the demolition and construction phases of the Proposed Development.
- 9.116 All mitigation measures for the demolition and construction phase are applicable via the CEMP and no further additional mitigation measures are required.

The Completed and Operational Development Phase

Operational Plant Noise - Assessment of Phase 1 (Full Element) and Phase 2 (Outline Element)

- 9.117 Further mitigation to ensure plant noise limits are complied with at nearby noise sensitive receptors must consider cumulative noise impacts from operational building services plant associated with both phases of the development. See Combined Development assessment.

Operational Plant Noise - Assessment of Combined Development (Phases 1 and 2)

- 9.118 Methods to ensure that the plant noise limits are met will include:

- Selection of quieter items of plant and equipment;
- Re-locating plant and equipment away from sensitive receptors;
- Utilising specially designed atmosphere-side attenuation and/or acoustic enclosures for noisy items of plant;
- Locating plant in positions which maximise available noise screening from existing and proposed structures in and around the site; and
- Switching plant off or reducing operating levels (and subsequent noise output) when not required (e.g. at night).

- 9.119 The above methods for ensuring plant noise are complied with will be confirmed prior to the commencement of development. The resultant magnitude of impact is therefore expected to be reduced to Minor at worst case, resulting in **Moderate-Minor** significance of effects as a worst case, and therefore not significant.

Operational Noise Effects on Proposed Development – Phase 1 (Full Application)

- 9.120 Based on meeting the most onerous requirements with regard to the difference between calculated external noise and internal noise criterion in each Plot (derived from **Tables 9.10 – 9.12** and results of the noise modelling presented in **Figures 9.7 and 9.8**), the minimum façade sound reduction requirements identified for worst case façades are presented below.

Table 9.29: Minimum Required Façade Sound Reduction Index Values (Phase 1 – Full Application)

Plot	Predicted façade noise level	Most onerous IANL criterion		Minimum required facade sound reduction index $R_w + C_{tr}$ (dB)
Plot A	$L_{Aeq,T}$ 68 dB	Library	$L_{Aeq,T}$ 40 dB	27
	$L_{A01,15min}$ 85 dB	Training Room	$L_{A01,1hour}$ 50 dB	35
Plot B	$L_{Aeq,T}$ 63 dB	Gymnasium	$L_{Aeq,T}$ 40 dB	23
Plot C	$L_{Aeq,T}$ 55 dB	Offices	$L_{Aeq,T}$ 40 dB	15
	$L_{A01,15min}$ 73 dB	Offices	$L_{A01,1hour}$ 50 dB	23

9.121 The following table presents a glazing configuration capable of achieving the maximum required facade sound reduction index values detailed above.

Table 9.30: Minimum Glazing Sound Insulation Performance Requirements (Phase 1 – Full Application)

Plot	Minimum required glazing sound reduction index - $R_w + C_{tr}$ (dB)	Example suitable glazing specification
Plot A	≥ 35	6 mm pane 6 to 20 mm airgap 10.8 mm laminated pane Rated at $R_w + C_{tr}$ 35 dB*
Plot B	≥ 23	4 mm pane 6 to 20 mm airgap 4 mm pane Rated at $R_w + C_{tr}$ 25 dB**
Plot C	≥ 23	4 mm pane 6 to 20 mm airgap 4 mm pane Rated at $R_w + C_{tr}$ 25 dB**
*Based on values given by Pilkington with Pilkington Optiphon 10.8mm laminated glass **Based on values given in 'BS EN 12354-3: 2000 Building acoustics: Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound'		

- 9.122 To control noise break-in from outside, the external wall construction shall provide a sound reduction at least 10 dB above that of the minimum glazing requirement, i.e. maximum of $\geq 45 \text{ dB } R_w + C_{tr}$ (Plot A).
- 9.123 The proposed ventilation strategy for each Plot is set out in **Table 9.31** below.

Table 9.31 Ventilation Strategies (Phase 1 – Full Application)

Plot	Proposed Ventilation Strategy
Plot A	Mixed Mode Ventilation
Plot B	Mechanical Ventilation
Plot C	Back of House Landlord areas: Heat Recovery Ventilation Units (HRVUs) Front of House Landlord areas: Natural ventilation via Roof Openings

- 9.124 Where mechanical ventilation systems are proposed, break in through other façade elements will dominate the internal acoustic environment and so the minimum façade sound insulation specification is driven by glazed elements.
- 9.125 However, where passive ventilation openings are required during mixed mode open window ventilation or via roof openings, noise break in through these openings will likely become dominant, regardless of the performance of the façade and glazed elements.
- 9.126 Achieving set noise limits when passive forms of ventilation are to be used for thermal comfort reasons is not a mandatory requirement for the development uses associated with Phase 1. However, a more detailed assessment of the likely internal acoustic environment where open windows are relied upon will be undertaken prior to the commencement of development if required.

Operational Noise Impact on Proposed Development – Phase 2 (Outline Application)

- 9.127 The requirements for internal noise levels in BS 8233 in terms of the indicative minimum façade sound reduction requirements identified for façades are presented below. This has been based on the relevant worst case noise levels calculated at a height of 1.5 m. The values below are high level calculations only, as more detailed calculation procedures in line with BS 8233 require detailed design inputs, such as room and façade element dimensions. An Acoustic Design Statement will be prepared at Reserved Matters stage for each of these Plots and prior to commencement of development to establish the acoustic performance requirements of the various building elements. The minimum

requirements are set out in **Table 9.32** below and will inform the preparation of an Acoustic Design Statement, subject to more detailed calculations based on room volume and glazing dimensions.

Table 9.32: Minimum Required Façade Sound Reduction Index Values (Phase 2 – Outline Application)

Plot	Time Period	Worst case predicted noise level	IANL criterion	Minimum required facade sound reduction index $R_w + C_{tr}$ (dB)
Plot D	Daytime	$L_{Aeq,T}$ 61 dB	$L_{Aeq,T}$ 35 dB	26
	Night-time	$L_{Aeq,T}$ 55 dB	$L_{Aeq,T}$ 35 dB	20
Plot E	Daytime	$L_{Aeq,T}$ 62 dB	$L_{Aeq,T}$ 35 dB	27
	Night-time	$L_{Aeq,T}$ 55 dB	$L_{Aeq,T}$ 35 dB	20
Plot F	Daytime	$L_{Aeq,T}$ 63 dB	$L_{Aeq,T}$ 35 dB	28
	Night-time	$L_{Aeq,T}$ 56 dB	$L_{Aeq,T}$ 35 dB	21

9.128 The following table presents a glazing configuration capable of achieving the maximum required facade sound reduction index values detailed above.

Table 9.33: Minimum Glazing Sound Insulation Performance Requirements (Phase 2 – Outline Application)

Plot	Minimum required glazing sound reduction index - $R_w + C_{tr}$ (dB)	Example suitable glazing specification
Plot D	≥ 26	6 mm pane 6 to 20 mm airgap 4 mm pane Rated at $R_w + C_{tr}$ 28 dB*
Plot E	≥ 27	6 mm pane 6 to 20 mm airgap 4 mm pane Rated at $R_w + C_{tr}$ 28 dB*
Plot F	≥ 28	6 mm pane 6 to 20 mm airgap 4 mm pane Rated at $R_w + C_{tr}$ 28 dB*

Plot	Minimum required glazing sound reduction index - R_w + C_{tr} (dB)	Example suitable glazing specification
*Based on values given in 'BS EN 12354-3: 2000 Building acoustics: Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound'		

9.129 To control noise break-in from outside, it is considered good practice for the external wall construction to provide a sound reduction at least 10 dB above that of the minimum glazing requirement, i.e. maximum of ≥ 38 dB $R_w + C_{tr}$ (Plot F).

9.130 Approved Document O (ADO) covers the control of overheating and suitable mitigation for new residential buildings. With regard to noise, Section 3 of ADO discusses limitations to ensure the overheating strategy is useable and states:

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- 55 dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).

9.131 Approved Document O describes two methods to control overheating: the simplified method, and dynamic thermal modelling.

9.132 For the simplified method, different approaches apply depending on whether the location is a 'High Risk' or 'Moderate Risk' location, where the higher risk category has a greater chance of overheating, and therefore requires a greater degree of cooling. The relevant parameter that states the amount a window should be opened in the simplified method is expressed as a free area of 4% of the floor area for high-risk locations, and 4% for moderate risk locations.

9.133 A joint publication from the Association of Noise Consultants and Institute of Acoustics (Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O - July 2022) has analysed these open window areas based on typical bedroom sizes and has found that having windows open by these amounts means that to meet internal noise targets, external levels must be no higher than those presented in the following table.

Table 9.34 –ADO 'Simplified Method' Guideline Noise Limits for Moderate Risk Locations

Parameter	High Risk Locations	Moderate Risk Locations
L _{Aeq,T} , averaged over 8 hours (between 11pm and 7am)	44 dB	49 dB
L _{AFmax} , more than 10 times a night (between 11pm and 7am)	59 dB	64 dB

9.134 If it is determined that the Plots require partially open windows to provide ventilative cooling, mitigation measures will be incorporated into the design at the detailed design stage. Examples of appropriate measures include:

- Minimise the period of time open windows are required to provide relief from overheating:
 - Providing thermally rated glazing to minimise solar gains;
 - Upgraded mechanical ventilation with summer bypass / boost facilities;
 - Building design to place non-sensitive rooms (kitchens, bathrooms, corridors etc) on the noisiest façade.
- Reduce internal noise levels when windows are open to provide relief from overheating:
 - Thermally rated glazing;
 - Fenestration design to provide additional screening;
 - Orientation of window opening away from primary noise sources;
 - Upgraded mechanical ventilation with summer bypass / boost facilities;
 - Building design to incorporate fixed glazing, where there is openable glazing in the same room on a quieter façade;
 - Building design to place non-sensitive rooms (kitchens, bathrooms, corridors etc) on the noisiest façade.

9.135 It is considered that the requirement to comply with Building Regulations will mean the above targets must be achieved as part of the preparation of an Acoustic Design Statement for each Plot at the detailed design phase. The resultant magnitude of impact

will therefore be negligible, resulting in a **Negligible** significance of effect, therefore not significant.

Residual Effects Summary

9.136 The table below summarises the residual effects assessed as part of this assessment.

Table 9.35: Residual Effects Summary

Description of Effect	Embedded Mitigation	Potential Effect	Additional Mitigation / Enhancement Measures	How are Mitigation / Enhancement Measures secured?	Residual Effect
Enabling, Demolition and Construction – Phase 1 (Full Application)					
Demolition and Construction Noise	Best Practicable Means to minimise noise and vibration via CEMP	Major (Significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Moderate-minor (Not Significant)
Demolition and Construction Traffic Noise	Best Practicable Means to minimise noise and vibration via CEMP	Negligible (Not significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Negligible (Not Significant)
Demolition and Construction Vibration	Best Practicable Means to minimise noise and vibration via CEMP	Major (Significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Moderate-minor (Not Significant)
Enabling, Demolition and Construction – Phase 2 (Outline Application)					
Demolition and Construction Noise	Best Practicable Means to minimise noise and vibration via Framework CEMP	Major (Significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Moderate-minor (Not Significant)
Demolition and Construction Traffic Noise	Best Practicable Means to minimise noise and vibration via Framework CEMP	Negligible (Not Significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Negligible (Not Significant)
Demolition and Construction Vibration	Best Practicable Means to minimise noise and vibration via Framework CEMP	Major (Significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Moderate-minor (Not Significant)
Enabling, Demolition and Construction – Combined Development					
Demolition and Construction Noise	Best Practicable Means to minimise noise and vibration via CEMP	Major (Significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Moderate-minor (Not Significant)
Demolition and Construction Traffic Noise	Best Practicable Means to minimise noise and vibration via CEMP	Negligible (Not Significant)	Best Practicable Means to minimise noise and	Condition	Negligible (Not Significant)

Description of Effect	Embedded Mitigation	Potential Effect	Additional Mitigation / Enhancement Measures	How are Mitigation / Enhancement Measures secured?	Residual Effect
			vibration via Detailed CEMP		
Demolition and Construction Vibration	Best Practicable Means to minimise noise and vibration via CEMP	Major (Significant)	Best Practicable Means to minimise noise and vibration via Detailed CEMP	Condition	Moderate-minor (Not Significant)
Completed and Operational – Phase 1 (Full Application)					
Operational Industrial / Commercial Noise	Compliance with policy and guidance	Negligible to Major-moderate (Significant)	Suitable design to reduce plant noise emissions	Condition	Moderate-minor (Not Significant)
Operational Traffic Noise	None	Negligible (Not Significant)	None	N/A	Negligible (Not Significant)
Noise Impacts on Proposed Development	Compliance with policy and guidance	Negligible to Major (Significant)	Suitable façade sound insulation Specification	Condition	Negligible (Not Significant)
Completed and Operational – Phase 2 (Outline Application)					
Operational Industrial / Commercial Noise	Compliance with policy and guidance	Negligible to Major-moderate (Significant)	Suitable design to reduce plant noise emissions secured by an Acoustic Design Statement	Condition	Moderate-minor (Not Significant)
Operational Traffic Noise	None	Negligible (Not Significant)	None	N/A	Negligible (Not Significant)
Noise Impacts on Proposed Development	Compliance with policy and guidance	Negligible to Major (Significant)	Suitable façade sound insulation Specification secured by an Acoustic Design Statement	Condition	Negligible (Not Significant)
Completed and Operational – Combined Development					
Operational Industrial / Commercial Noise	Compliance with policy and guidance	Negligible to Major-moderate (Significant)	Suitable design to reduce plant noise emissions	Condition	Moderate-minor (Not Significant)
Operational Traffic Noise	None	Negligible (Not Significant)	None	N/A	Negligible (Not Significant)

Description of Effect	Embedded Mitigation	Potential Effect	Additional Mitigation / Enhancement Measures	How are Mitigation / Enhancement Measures secured?	Residual Effect
Noise Impacts on Proposed Development	Compliance with policy and guidance	Negligible to Major (Significant)	Suitable façade sound insulation Specification	Condition	Negligible (Not Significant)

Summary of Residual Effects and Mitigation Measures

- 9.137 For the construction phase, all residual effects have considered the potential effects in conjunction with Best Practicable Means outlined within a CEMP, to be secured by a suitably worded planning condition. The assessment concludes no significant residual effects.
- 9.138 For the operational phase, all residual effects have considered the potential effects in conjunction with compliance with policy and guidance, and complying with these through design such as suitable glazing specification. For the outline element of the application, it is recommended that an Acoustic Design Statement at the detailed design stage to be secured by a suitably worded planning condition. The assessment concludes no significant residual effects.

Assessment of Cumulative Effects

- 9.139 An assessment of cumulative effects has been scoped out as agreed at the Scoping stage.

Assessment of Significance Summary and Conclusions

- 9.140 The noise assessment has considered the potential for likely significant effects as a result of the Proposed Development during its construction and operation. The assessment has been informed by environmental surveys, noise assessment predictions and calculations.

Summary of Baseline Conditions

- 9.141 Nearby noise and vibration sensitive receptors have been identified, including residential properties and existing commercial receptors. Baseline sound levels have been measured using a combination of attended and unattended measurements at locations representative of the identified receptors. The main sources of noise on the site and surrounding receptors are road noise sources from on Bury New Road and tram noise from the Metrolink line.

Summary of Likely Significant Effects

Enabling, Demolition and construction Phase

- 9.142 The impact of noise during the enabling, demolition and construction of the Proposed Development has been predicted and assessed in accordance with BS 5228 guidance. Impacts from demolition and construction activities are predicted at the closest noise sensitive receptors, with temporary negligible to major adverse effects anticipated to

arise, prior to mitigation. Taking into account the implementation of Best Practicable Means (BPM) to be secured by a detailed Construction Environmental Management Plan (CEMP) and the temporary nature of the works, the resulting residual effect is considered to range from Negligible to Moderate-minor, which is not significant.

- 9.143 Based on a reasonable worst-case scenarios of predicted increases in HGV traffic flows during the enabling, demolition and construction phase, the noise change at identified receptors would be <1dB for HGVs only for all demolition and construction phases of the development, with the overall increase in traffic in proportion to all vehicle movements being lower than this still. The magnitude of impact would therefore be negligible for the highest sensitivity of receptor. Therefore, the significance of effect, due to construction traffic noise, is assessed as Negligible and therefore not significant.
- 9.144 The impact of vibration during demolition and construction of the Proposed Development has been predicted and assessed in line with BS 5228 guidance. For plan distances of <20m between the piling vibration source and human receptors, there is the potential that construction vibration sources may result in a moderate to major magnitude of impact. Construction vibration levels at the most exposed sensitive receptors will be mitigated by careful phasing of the construction works as well as controlling the operation time and duration of each activity to reduce the impact at the receptor in line with the detailed CEMP. As such vibration impacts are assessed to result in a temporary short-term effect which is assessed as Moderate-minor adverse, which is not significant.

The Completed and Operational Phase

- 9.145 During the operation of the Proposed Development, complying with plant noise limits in line with guidance provided in BS 4142 as agreed with the Local Authority is assessed as Negligible effect on the nearest noise-sensitive receptors and therefore not significant.
- 9.146 Based on predicted traffic flows, the magnitude of impact as calculated in accordance with CRTN and DMRB for all receptors is assessed as negligible in terms of both short and long term traffic changes. This will result in a Negligible effect for all receptors and is therefore not significant.
- 9.147 A noise model has been used to predict traffic and tram noise levels at the façade of the Proposed Development. Internal noise levels will adhere to BS 8233 through selection of appropriate façade design mitigation. As such, the residual effect is assessed as Negligible and therefore not significant.

Summary of Mitigation and Enhancement Measures

Demolition, Enabling and Construction Phase

- 9.148 Site-specific mitigation was recommended and with the implementation of this mitigation, which will be included within the CEMP, the residual effects from construction activities are considered not significant.
- 9.149 Construction traffic noise effects are considered not significant; hence, no mitigation measures to control this impact were required.

The Completed and Operational Phase

- 9.150 For the operational phase, all residual effects have considered the potential effects in conjunction with compliance with policy and guidance, and complying with these through design such as suitable glazing specification. For the outline element of the application, it is recommended that an Acoustic Design Statement at the detailed design stage. The assessment concludes no significant residual effects.
- 9.151 Operational traffic noise effects are considered not significant; hence, no mitigation measures to control this impact were required.

Conclusion

- 9.152 It is considered that the Proposed Development adheres to policy and guidance and that there would be no significant noise effects during construction or operation.

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