Appendices to Chapter H
Noise and Vibration

Contents:

Appendix H1
Site Suitability Assessment

H1.0 Site Suitability Assessment

Introduction

The scheme description identifies the following noise sensitive land uses:

i. residential (private dwellings, extra care housing, amenity space); and

ii. educational (primary school, secondary school).

This appendix provides an appraisal of the potential impacts of the existing and future noise climate on the residential uses within the Proposed Development. The assessment is based on the results of the baseline noise survey and the potential increase in noise resulting from the future road network in the vicinity of the site.

Consideration has also been given to the interfacing of land uses within the Proposed Development.

Where necessary and feasible, mitigation measures have been identified with the aim of providing a suitable internal and external noise environment for future occupants, in accordance with the adopted criteria.

This assessment references specific land use areas within the Proposed Development, which have all been assigned a land use number. This assessment should be read in conjunction with Figure C3.2 of Chapter C, which indicates the land uses and their assigned number.

Residential Internal and External Noise Criteria

Guidance

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* and the World Health Organisation (WHO) *Guidelines for Community Noise* both provide quantitative guidance for internal noise levels in and around buildings.

BS 8233 provides appropriate criteria and limits for different situations, including the design of new buildings. The relevant noise level criteria recommended in BS 8233 for residential spaces are summarised in Table AH1-1.

Table AH1-1: Indoor Ambient Noise Levels for Dwellings, BS 8233

Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

It should also be noted that BS 8233 states that *"regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night."* However, no numerical values for internal $L_{Amax,F}$ levels in dwellings are stated within BS 8233. The ProPG: Planning and Noise – New Residential Development attempts to address this by adding the following guidance:

"In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB LAmax,F more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events."

The WHO guidelines consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic, industries, construction and public work and neighbours.

The effects of noise in dwellings are, typically, sleep disturbance, speech interference and annoyance. Relevant guideline values and the time base over which the individual guideline values apply are summarised in Table AH1-2.

Table AH1-2: WHO Guideline Values for Community Noise in Specific Environments

Specific environment	Critical health effects	$L_{Aeq,T}$	Time base (hours)*	L_{AFmax}
Outdoor living area	Serious annoyance, daytime and evening	55 dB	16	-
Sleeping (daytime resting)	Moderate annoyance, daytime and evening	50 dB	16	-
Dwellings, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35 dB	16	-
Inside bedrooms	Sleep disturbance, night-time	30 dB	8	45 dB
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45 dB	8	60 dB

Note:
* These periods are usually taken to be 07:00 – 23:00 (16-hour day) and 23:00 – 07:00 (8-hour night)

It can be seen from Tables AH1-1 and AH1-2 above that the internal $L_{Aeq,T}$ criteria for day and night-time periods in BS 8233 and the WHO Guidelines are the same, and these values have been used in this assessment.

Whilst BS 8233 does not provide a quantitative guideline value for night-time noise events, the WHO guideline value inside bedrooms is 45 dB $L_{Amax,F}$, and the ProPG suggests that this value should not be exceeded more than 10 times a night. Therefore, this criterion has been used to ensure an adequate internal night-time noise environment.

With regards to any external amenity areas, the WHO and BS 8233 guideline value of 55 dB $L_{Aeq,16h}$ has been adopted to avoid "serious annoyance" during the daytime and evening.

In summary, the adopted internal and external noise criteria are as presented in Table AH1-3 below.

Table AH1-3: Adopted Internal and External Target Noise Criteria

	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	Typical L_{AFMax}
Internal noise levels within habitable rooms	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$	45 dB L_{AFmax}
External noise levels within gardens and external amenity areas	55 dB $L_{Aeq,16h}$	-	

Educational Noise Criteria

Guidance

For the assessment of internal teaching spaces, Building Bulletin 93 – Acoustic Design of Schools: Performance Standards (BB 93) recommends internal ambient noise levels of 35 dB $L_{Aeq,30min}$ for classrooms and 40 dB $L_{Aeq30min}$ for open plan areas.

In the absence of noise measurement data over 30 minute intervals, due to the likely atypical noise conditions (as a result of COVID-19), the noise levels across the educational land uses have been predicted based on the derived daytime ambient noise level ($L_{AEQ,16h}$). Whilst it is considered that the daytime ambient noise level is a reasonable proxy in lieu of noise measurement data over 30 minute intervals, it is likely that there will be some variation in noise levels throughout the course of the school day. It is therefore recommended that a further assessment is undertaken at the detailed design stage, based upon measured noise level data, where any variation in noise level over the school day can be established.

With respect to noise levels across external areas, it is worth noting that guidance is not mandatory (i.e. there is no absolute requirement to comply with any of the recommended guideline levels). The IoA/ANC Acoustics of Schools: A Design Guide advises that:

"For new schools, 60 dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external areas used for formal and informal outdoor teaching and recreation."

"It may be possible to meet the specified indoor ambient noise levels on sites where external noise levels are as high as 70 dB $L_{Aeq,30min}$ but this will require considerable building envelope sound insulation, or screening."

and

"Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$. If this is not possible, due to a lack of suitably quiet sites, acoustic screening should be used to reduce noise levels in these areas as much as practicable, and an assessment of noise levels and options for reducing these should be carried out."

Therefore, the guidance implies that whilst external noise levels of less than 60 dB(A) are preferred, higher levels can be mitigated within internal teaching areas by the use of suitable sound insulation measures.

In summary, the adopted internal and external noise criteria are as presented in Table AH1-4 below.

Table AH1-4: Adopted Internal and External Target Noise Criteria

	Daytime (typical school hours)
	$L_{Aeq,16h}$
Internal noise levels within classrooms and open plan areas	35 dB (indoor teaching spaces) / 40 dB (open plan areas)
External noise levels	60 dB (preferred limit)

Assumptions and Limitations

General

The site suitability assessment is based upon parameter plans rather than a fixed and detailed masterplan at this stage. Consequently, the siting of buildings within the Proposed Development have yet to be determined. For the purposes of the site suitability assessment, it is assumed that such buildings would be located at the extremities of the land use areas shown in the parameter plans which presents a robust and worst-case assessment.

Assumptions which are specific to the acoustic model are presented in the Chapter H: Noise (see paragraph H4.24), along with details of the model calibration procedure (see paragraph H4.28).

The assumptions made regarding modelled road traffic noise levels have been provided below, for reference.

- As the CRTN methodology predicts noise levels in terms of the dB $L_{A10,18h}$, corrections have been applied in order to derive the daytime and night-time average equivalent noise levels in line with the BS 8233 criteria.
- To calculate the daytime (07:00 – 23:00 hours) $L_{Aeq,16h}$ 2 dB has been subtracted from the predicted dB $L_{A10,18h}$.
- TRL method 3 was used to convert the predicted dB $L_{A10,\ 18h}$ value into the night-time (23:00 – 07:00) dB $L_{Aeq,8h}$ value.
- As described between paragraphs H4.28 and H4.34 of Chapter H: Noise, a correction has been applied to the predicted night-time noise levels so that they calibrate to within 1 dB of the levels measured at LTMP1, 2 and 3, during the baseline noise survey. No correction to the predicted daytime noise levels has been deemed necessary as they calibrated to within 0.4 dB of the levels measured at LTMP1, 2 and 3, which is considered to fall within an acceptable tolerance.

The noise levels across the Proposed Development have been predicted using the traffic data for the year 2048 (i.e. the year of the Proposed Development's completion). Assuming that the scheme is developed in line with the Construction Phases Key Plan presented in Figure H3 of the Noise and Vibration Chapter, a significant proportion of the Development is likely to be brought forward prior to the year of completion (i.e. in construction phases 1 and 2). With this in mind, and on the general assumption that road traffic flows (and in turn road traffic noise) increase(s) over time, this is considered to represent a robust assessment approach. Particularly between the years 2031 and 2048, where completed areas of the Development would generally be expected to experience lower road traffic noise levels.

Residential

The range of ambient noise levels has been predicted at each of residential land use areas referenced in the Land Budget Parameter Plan provided by JTP (drawing number: 01312_LB_01 revision D15). Noise levels have been predicted during the daytime and night-time periods for comparison with the relevant target criteria.

The Building Height Parameter Plan provided by JTP (drawing number: 01312_PP_04 revision D7) indicates that the vast majority of dwellings within the Proposed Development will be 'low rise' (i.e. 2.5 storey dwellings with associated gardens, rather than high-rise apartment blocks). Consequently, noise levels during the daytime are predicted at ground floor level (i.e. where living and dining room spaces are most likely to be located), and night-time noise levels are predicted at first floor level (i.e. where bedrooms are most likely to be located). Noise levels at ground floor level are predicted at 1.5m above local ground height and at first floor level, noise levels are predicted at 4m above local ground height.

In addition to the above, it is understood that there are likely to be a comparatively small number of buildings in the residential land use areas which are up to four and six storeys in height. The illustrative masterplan indicates that these buildings are generally located inwardly rather than at the extremities of the Proposed Development. Consequently, when the development is complete, it is anticipated that the disparity in noise levels between the lower and upper storeys in these buildings may be reasonably small. On this basis, the prediction of night-time noise levels at 4m is considered to be reasonable for all buildings.

For residential land use areas at the extremities of the Proposed Development, in proximity to the existing road network, maximum noise levels from individual noise events (i.e. vehicle pass-bys) have been derived from the measured levels obtained via the baseline survey (i.e. at

measurement locations in proximity to existing roads). A distance correction from these roads has been applied to predict the maximum noise level at the boundary of the nearest land use areas.

For land use areas which are not adjacent to the existing road network, in particular, those located toward the centre of the Proposed Development, maximum noise levels from the existing road network are less likely to be of concern. This is due to noise attenuation effects over distances (also including ground absorption, air absorption) and the likely screening effect afforded by other buildings within the Proposed Development. Maximum noise events are likely, however, from the proposed road network within the Development, to which many land use areas are adjacent.

In the absence of maximum noise levels for the proposed roads within the Development, the maximum noise levels obtained via the baseline survey have been used. The choice of measured level which has been used for each of the proposed roads has been determined based on the type of road and likely vehicle speed (e.g. for the proposed primary roads, the maximum noise level measured at STMP1 has been adopted, as vehicle speeds on Newport Road are likely to be more akin to those anticipated on primary roads). As with the residential land uses in proximity to existing roads, a distance correction from the proposed roads has been applied to predict the maximum noise level at the boundary of the nearest residential land use areas.

Educational

The range of ambient noise levels for each educational land use area referenced in the Land Budget Parameter Plan provided by JTP (drawing number: 01312_LB_01 revision D15), has been predicted during the typical school hours (i.e. from 08:00 hours to 16:00 hours), based upon the daytime ambient noise level ($L_{Aeq,16h}$).

The illustrative masterplan provided by JTP indicates that there are three proposed primary schools (land use references: PS1, PS2 and PS3) and one secondary school (SS1). Noise levels for PS1 (single storey school) are predicted at a height of 1.5m above local ground level. Noise levels in PS2 (two storeys), PS3 (two storeys) and SS1 (up to three storeys) noise level predictions are at a height of 4m above local ground level.

Assessment of Residential Land Use Areas

Good Acoustic Design

In accordance with local policy, and professional guidance, it is important that the scheme design is informed at the earliest opportunity, based on an understanding of local noise constraints. The applicant has engaged with noise and vibration consultant, WSP, at the masterplanning stage and included the following design features which are shown on the illustrative masterplan:

- Residential land uses are formed in discrete blocks with private gardens located centrally. This allows some measure of protection for garden spaces from road traffic noise through screening from the associated dwellings.
- Residential land uses at the extremities of the Proposed Development are set back from key sources of road traffic noise such as the M1 and A509 to minimise potential noise impacts
- Employment sectors have been located between the more sensitive land uses (i.e. residential and educational) and the M1 to maximise the acoustic screening benefit afforded by the proposed warehouses
- Buildings within the employment sectors have been located and orientated, where possible, to minimise road traffic noise ingress toward the more sensitive land uses.

- In accordance with Milton Keynes Council's Local Plan (Plan:MK), a buffer zone has been included between land uses toward the south-western area of the Proposed Development and the M1, should these land uses (which are currently designated as flexible employment/residential) be used as residential. This buffer zone has been designated specifically for acoustic mitigation, should a bund be incorporated as the scheme evolves.

Incident External Noise Levels (Year of completion, 2048)

Table AH1-5 presents the range of predicted ambient noise levels across each of the residential areas referenced in the Land Budget Parameter Plan, provided by JTP, during the daytime and night-time periods. Also presented is the predicted maximum noise level at the worst affected boundary (i.e. the boundary which is nearest to the road) and the survey measurement position from which the maximum noise level has been derived (see Section H4 of Chapter H: Noise and Section H7-H10 of the appendices for further details). The predicted daytime and night-time ambient noise levels are also presented graphically in Figures AH1-1 and AH1-2.

Table AH1-5: Predicted noise levels across the residential land use areas in 2048

Reference from the Land Budget Parameter Plan	Day	Night		
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	L_{AFmax}	Measurement Position from which maximum level has been derived
R01	60-66	61-68	72	LTMP1
R02	59-62	60-63	64	LTMP2
R03	62-67	63-68	72	LTMP1
R04	56-60	56-58	80	LTMP2
R05a and b	54-60	54-58	80 / 63	LTMP2 (R05a) / STMP1 (R05b)
R06a and b	53-64	53-60	80	LTMP2
R07	53-63	52-60	80	LTMP2
R08	52-54	51-52	63	STMP1
R09a and b	52-56	52-56	63 / 80	STMP1 (R09a) / LTMP2 (R09b)
R10	57-64	57-61	63	STMP1
R11	57-61	57-60	80	LTMP2
R12	58-61	59-61	80	LTMP2
R13	54-60	56-59	80	LTMP2
R14	55-63	56-60	63	STMP1
R15	54-63	55-60	63	STMP1
R16a and b	52-59	53-57	63 / 80	STMP1 (R16a) / LTMP2 (R16b)
R17	56-60	56-59	80	LTMP2
R18a and b	55-62	56-60	63	STMP1
R19	57-59	57-59	80	LTMP2
R20	56-61	57-61	80	LTMP2
R21	54-59	56-59	63	STMP1
R22	53-54	56-57	63	STMP1
R23	53-54	55-56	63	STMP1
R24	52-54	55-56	63	STMP1
R25	52	55	63	STMP1

It is noted that, in some cases, the predicted night-time ambient noise levels presented in Table AH1-5, are similar to those predicted during the daytime (e.g. R19), or in fact higher (e.g. R01). This is considered atypical as traffic flows, and by extension, road traffic noise levels, would be

expected to decrease during the night-time period when compared with the daytime. The atypical relationship between the predicted daytime and night-time noise levels is attributable to the following:

- The correction which has been applied to the night-time road traffic noise levels as part of the model calibration procedure (which was not required to calibrate the daytime noise levels to the measured noise levels obtained via the baseline survey).
- The greater influence of ground absorption which is assumed in the model at 1.5m (i.e. the height at which daytime noise levels are predicted), when compared with 4m (i.e. the height at which night-time noise levels are predicted).

The result of these modelling assumptions is that night-time noise levels may be over-predicting the likely night-time noise levels in some areas of the Proposed Development. As such, this is considered to present a robust assessment case.

Residential Site Suitability Assessment

In order to determine the level of façade sound insulation required, the noise levels above have been compared with the criteria presented in Table AH1-3. This comparison is shown in the tables below along with the degree of sound reduction required to achieve an appropriate internal noise climate for future occupants of the Proposed Development.

Table AH1-6: Predicted daytime noise levels across residential areas in 2048 and sound reduction required to meet criteria

Reference from the Land Budget Parameter Plan	$L_{Aeq,16h}$, dB	Criteria, dB	Required sound reduction, dB
R01	60-66	35 (Living rooms) / 40 (Dining rooms)	25-31 / 20-26
R02	59-62		24-27 / 19-22
R03	62-67		27-32 / 22-27
R04	56-60		21-25 / 16-20
R05	54-60		19-25 / 14-20
R06	53-64		18-29 / 13-24
R07	53-63		18-28 / 13-23
R08	52-54		17-19 / 12-14
R09	52-56		17-21 / 12-16
R10	57-64		22-29 / 17-24
R11	57-61		22-26 / 17-21
R12	58-61		23-26 / 18-21
R13	54-60		19-25 / 14-20
R14	55-63		20-28 / 15-23
R15	54-63		19-28 / 14-23
R16	52-59		17-24 / 12-19
R17	56-60		21-25 / 16-20
R18	55-62		20-27 / 15-22
R19	57-59		22-24 / 17-19
R20	56-61		21-26 / 16-21
R21	54-59		19-24 / 14-19
R22	53-54		18-19 / 13-14
R23	53-54		18-19 / 13-14
R24	52-54		17-19 / 12-14
R25	52		17 / 12

Figure AH1-1: Predicted noise levels across the Proposed Development during the daytime

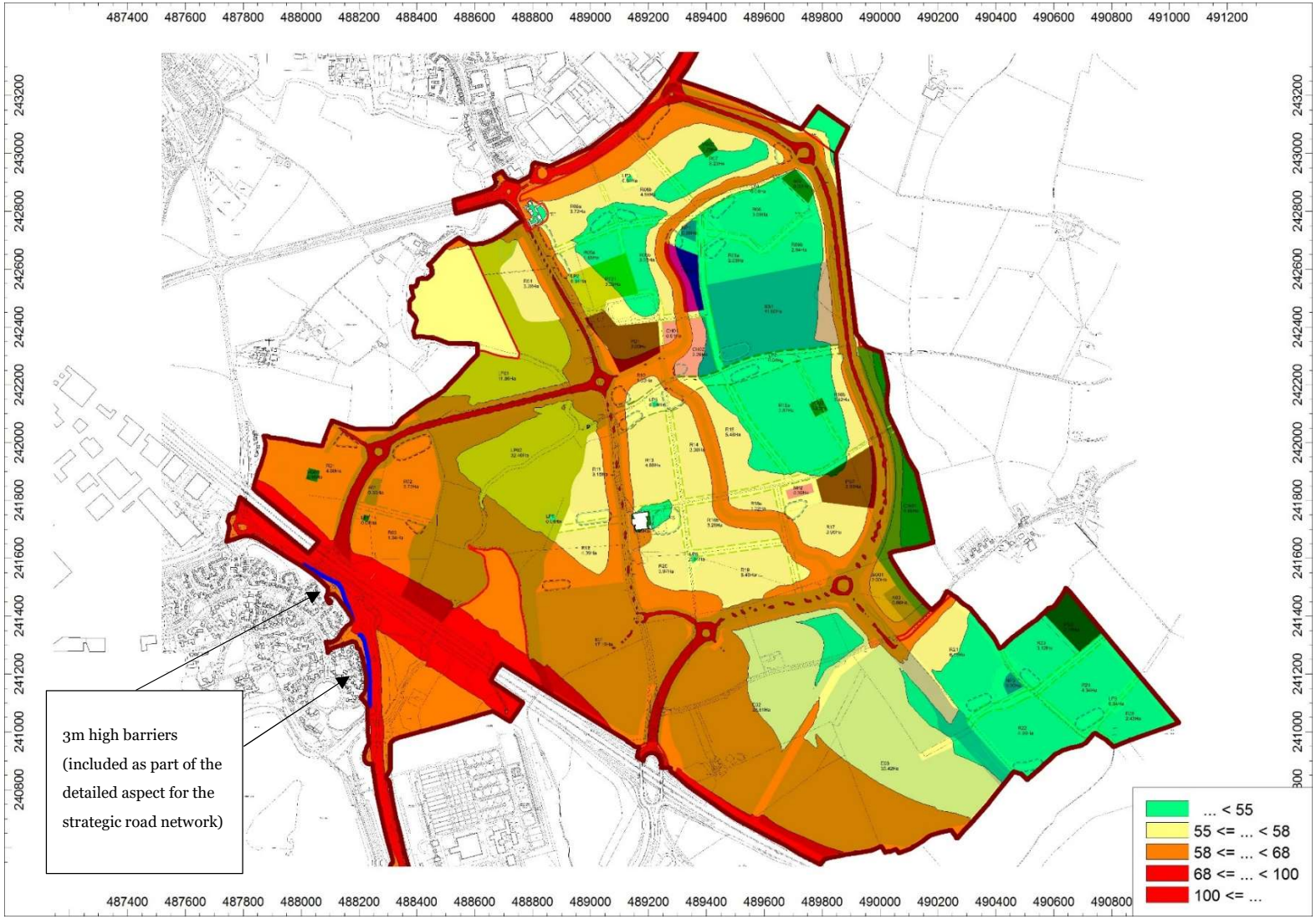


Figure AH1-2: Predicted noise levels across the Proposed Development during the night-time

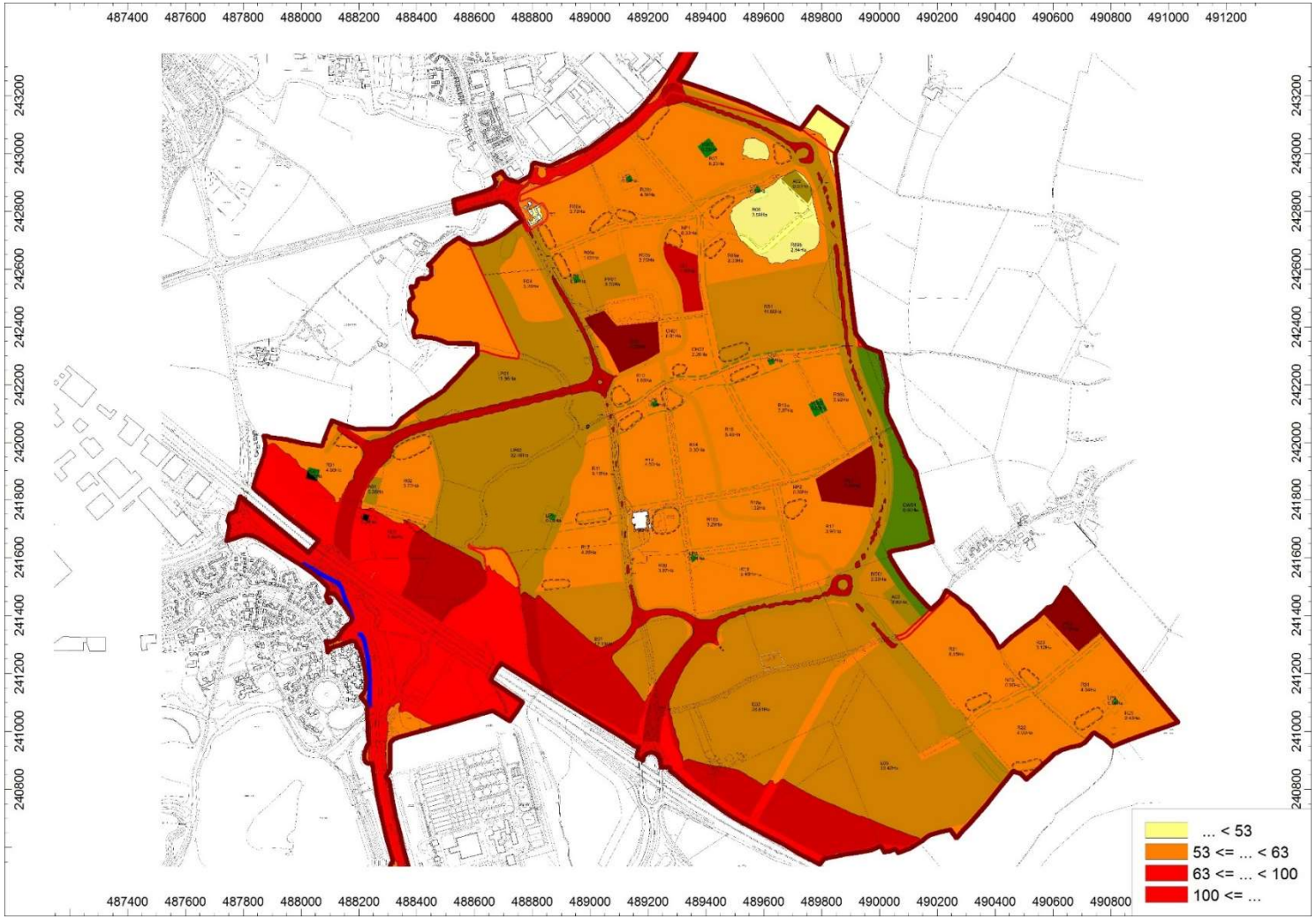


Table AH1-7: Predicted night-time noise levels across the residential land use areas in 2048 and sound reduction required to meet criteria

Reference from the Land Budget Parameter Plan	$L_{Aeq,8h}$ / L_{AFmax}, dB	Ambient / maximum noise level criteria, dB	Required sound reduction, dB
R01	61-68 / 72	30 / 45 (Bedrooms)	31-38 / 27
R02	60-63 / 64		30-33 / 19
R03	63-68 / 72		33-38 / 27
R04	56-58 / 80		26-28 / 35
R05	54-58 / 80		24-28 / 35
R06	53-60 / 80		23-30 / 35
R07	52-60 / 80		22-29 / 35
R08	51-52 / 63		21-22 / 18
R09	52-56 / 80		22-26 / 35
R10	57-61 / 63		27-31 / 18
R11	57-60 / 80		27-30 / 35
R12	59-61 / 80		29-31 / 35
R13	56-59 / 80		26-29 / 35
R14	56-60 / 63		26-30 / 18
R15	55-60 / 63		25-30 / 18
R16	53-57 / 80		23-27 / 35
R17	56-59 / 80		26-29 / 35
R18	56-60 / 63		26-30 / 18
R19	57-59 / 80		27-29 / 35
R20	57-61 / 80		27-31 / 35
R21	56-59 / 63		26-29 / 18
R22	56-57 / 63		26-27 / 18
R23	55-56 / 63		25-26 / 18
R24	55-56 / 63		25-26 / 18
R25	55 / 63		25-30 / 18

The required sound reduction can be seen to range from:

- 12 dB to 31 dB, for ambient noise levels during the daytime;
- 21 dB to 38 dB, for ambient noise levels during the night-time; and
- 18 dB to 35 dB, for maximum noise levels during the night-time.

Where the required sound reduction is above 15 dB, the internal noise targets will not be achieved with an open window.

It is noted that across the open (i.e. undeveloped) site, there are no areas where the required sound reduction range falls entirely below 15 dB, indicating that there are at least some parts of each land use area where alternative means of ventilation and cooling may be required. It is important to note, however, that this assessment considers the open land use areas which is the robust worst-case assessment. It is anticipated that once the Proposed Development is built, there will be a certain amount of acoustic screening provided by other buildings within the development, particularly towards the centre of the Proposed Development. This is likely to result in a number of dwellings meeting the necessary noise criteria with the use of open windows. This notwithstanding, it is necessary, at this preliminary stage, to consider the

provision of alternative means of ventilation and cooling. This is discussed further in the section on mitigation below.

Mitigation Measures

For residential dwellings, the building envelope will need to be designed such that the required levels of sound insulation are achieved within habitable rooms. However, as a general rule, mitigation measures should first be considered in proximity to the noise source (i.e. the surrounding road network), where feasible, followed by the noise path (i.e. the intervening space between the source and the receiver), and at the receiver (i.e. the building envelope of the dwellings) as a last resort.

With this in mind, the following mitigation measures have been modelled, with a view to minimising the predicted noise levels across the land use areas which are most exposed to noise:

- A combined bund and barrier (i.e. a barrier located on the crest of the bund) with a total height of 10m located between the M1 and land use areas R01, R02 and R03
- A 3m high noise barrier on either side of the highway entering the Proposed Development from the M1 overbridge; and
- A 3m high noise barrier between land use areas R06a, R06b, R07 and the A509

These measures are indicated on the plan in Figure AH1-3.

In addition to the above measures, the proposed buildings indicated in the employment sector of the illustrative masterplan have also been included within the model. The assumed heights are based upon the details provided in the Building Height Parameter plan, provide by JTP.

It is also important to note that residential land uses R01, R02 and R03 are currently proposed as flexible use and may be used as employment land as the scheme design evolves. This assessment considers the worst-case scenario in that it assesses the land under the assumption that it will be used for residential development. However, in the event that these land uses are adopted for employment use, it is likely that employment buildings could be located such that they would provide sufficient screening of noise from the M1 and that the proposed 10m high bund and barrier is not likely to be required.

With the inclusion of the above mentioned measures, Tables AH1-8 and AH1-9 present the predicted daytime and night-time noise levels across the residential land use areas. The predicted, post-mitigation daytime and night-time ambient noise levels are also presented graphically in Figures AH1-4 and AH1-5.

Table AH1-8: Predicted post-mitigation daytime noise levels across the residential land use areas in 2048 and sound reduction required to meet criteria

Reference from the Land Budget Parameter Plan	$L_{Aeq,16h}$, dB	Criteria, dB	Required sound reduction, dB
R01	56-60	35 (Living rooms) / 40 (Dining rooms)	21-25 / 16-20
R02	58-61		23-26 / 18-21
R03	57-60		22-25 / 17-20
R04	55-60		20-25 / 15-20
R05	53-61		18-26 / 13-21
R06	52-57		17-22 / 12-17
R07	53-62		18-27 / 13-22
R08	51-53		16-18 / 11-13
R09	51-58		16-23 / 11-18

Reference from the Land Budget Parameter Plan	$L_{Aeq,16h}$, dB	Criteria, dB	Required sound reduction, dB
R10	56-64		21-29 / 16-24
R11	55-61		20-26 / 15-21
R12	54-60		19-25 / 14-20
R13	52-60		17-25 / 12-20
R14	53-62		18-27 / 13-22
R15	52-62		17-27 / 12-22
R16	52-59		17-24 / 12-19
R17	53-59		18-24 / 13-19
R18	52-62		17-27 / 12-22
R19	53-57		18-22 / 13-17
R20	53-59		18-24 / 13-19
R21	50-58		15-23 / 10-18
R22	50-53		15-18 / 10-13
R23	50-52		15-17 / 10-12
R24	51-52		16-17 / 11-12
R25	51-52		16-17 / 11-12

Table AH1-9: Predicted post-mitigation night-time noise levels across the residential land use areas in 2048 and sound reduction required to meet criteria

Reference from the Land Budget Parameter Plan	$L_{Aeq,8h}$ / L_{AFmax}, dB	Ambient / maximum noise level criteria, dB	Required sound reduction, dB
R01	57-59 / 72	30 / 45 (Bedrooms)	27-29 / 27
R02	58-60 / 64		28-30 / 19
R03	59-60 / 72		29-30 / 27
R04	55-58 / 80		25-28 / 35
R05	53-38 / 80		23-28 / 35
R06	53-60 / 80		23-30 / 35
R07	52-60 / 80		22-30 / 35
R08	51-52 / 63		21-22 / 18
R09	51-56 / 80		21-26 / 35
R10	55-61 / 63		25-31 / 18
R11	56-59 / 80		26-29 / 35
R12	56-59 / 80		26-29 / 35
R13	53-58 / 80		23-28 / 35
R14	53-59 / 63		23-29 / 18
R15	52-59 / 63		22-29 / 18
R16	50-56 / 80		20-26 / 35
R17	52-56 / 80		22-26 / 35
R18	53-59 / 63		23-29 / 18
R19	53-56 / 80		23-26 / 35
R20	53-57 / 80		23-27 / 35
R21	52-56 / 63		22-26 / 18
R22	53-56 / 63		23-26 / 18

Reference from the Land Budget Parameter Plan	$L_{Aeq,8h}$ / L_{AFmax}, dB	Ambient / maximum noise level criteria, dB	Required sound reduction, dB
R23	53-54 / 63		23-24 / 18
R24	54-55 / 63		24-25 / 18
R25	54-55 / 63		24-25 / 18

The required sound reduction following the inclusion of mitigation measures can be seen to range from:

- 10 dB to 29 dB, for ambient noise levels during the daytime;
- 20 dB to 31 dB, for ambient noise levels during the night-time; and
- 18 dB to 35 dB, for maximum noise levels during the night-time.

Following the inclusion of the proposed mitigation measures, consideration is also given, at this stage, to appropriate building envelope design.

It is assumed that the non-glazed elements of the façades will provide sufficient sound insulation against external noise sources (i.e. in the order of R_W 45-50 dB). Therefore, as the glazing elements are likely to be the acoustic weak link, it is appropriate to explore the level of protection afforded by the glazing. Consideration is also required with respect to ventilation and this is discussed later.

Figure AH1-3: Indicative locations of proposed mitigation

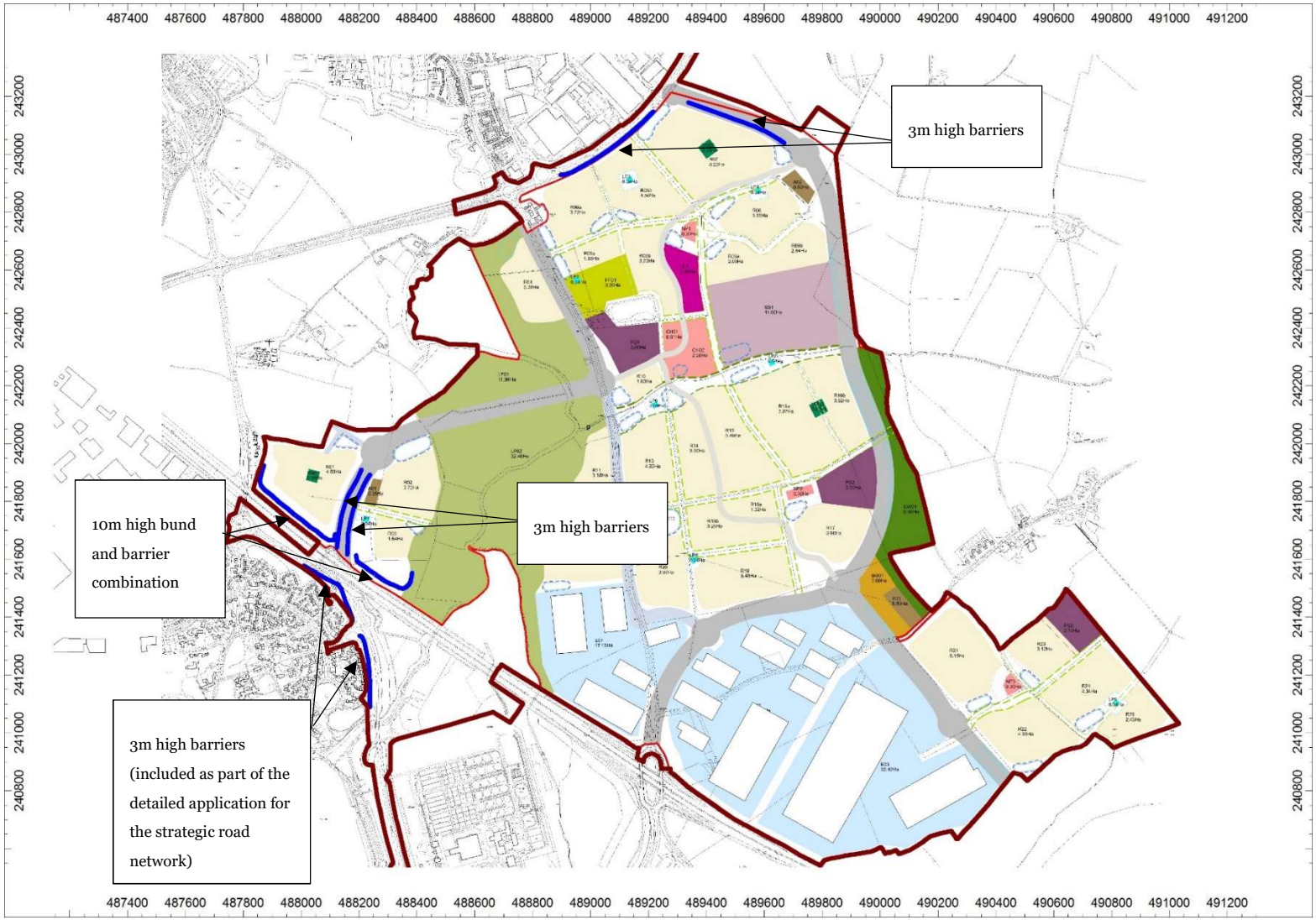


Figure AH1-4: Predicted post-mitigation noise levels across the Proposed Development during the daytime

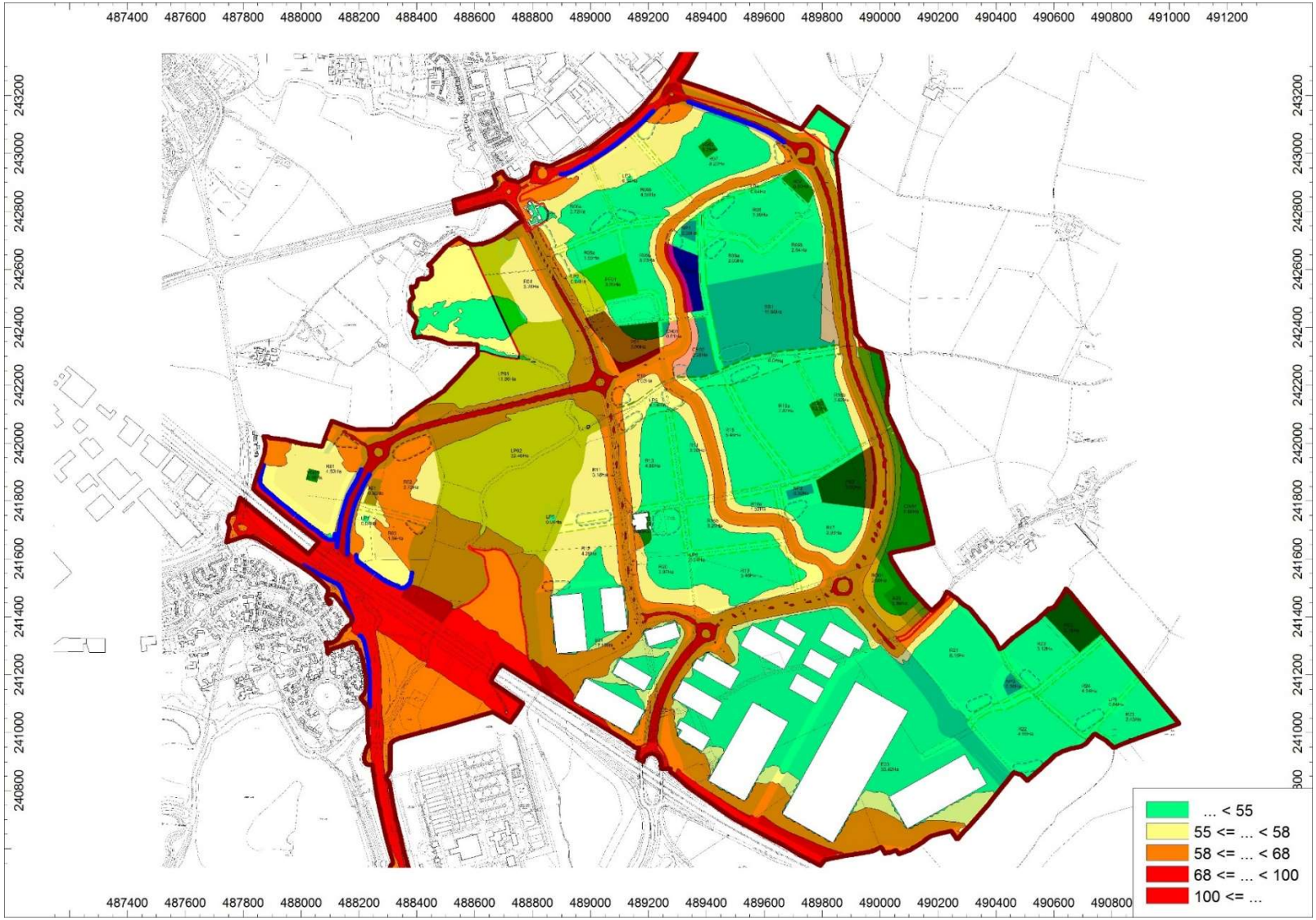
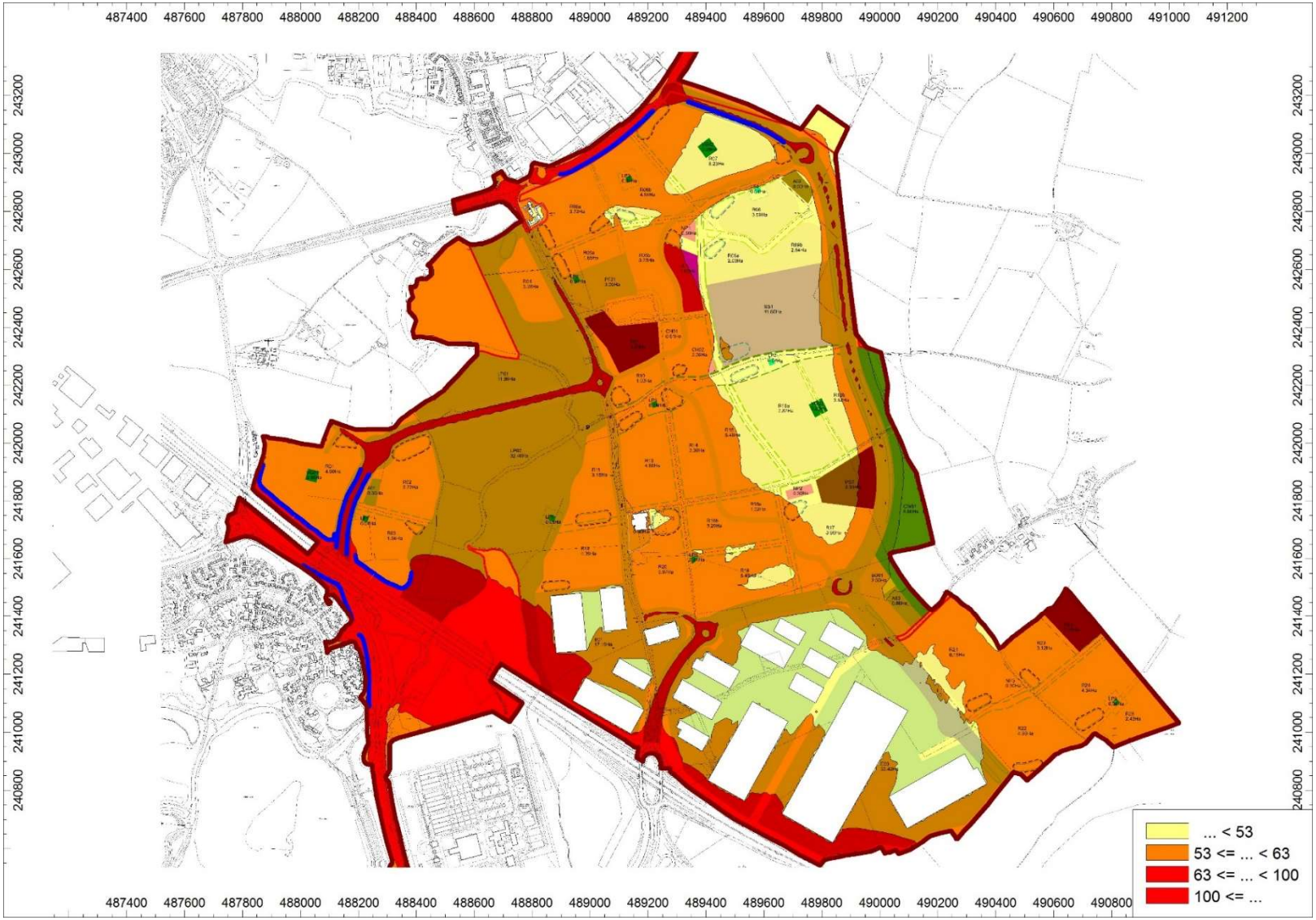


Figure AH1-5: Predicted post-mitigation noise levels across the Proposed Development during the night-time



Glazing

Based on the results presented in Tables AH1-8 and AH1-9, Table AH1-10 presents the highest of the three sound reduction values (i.e. of the daytime ambient, night-time ambient and night-time maximum) determined for each land use area.

Table AH1-10: The highest required sound reduction value determined for each land use area

Reference from the Land Budget Parameter Plan	Highest required sound reduction, dB
R01	29
R02	30
R03	30
R04	35
R05	35
R06	35
R07	35
R08	22
R09	35
R10	31
R11	35
R12	35
R13	35
R14	29
R15	29
R16	35
R17	35
R18	29
R19	35
R20	35
R21	26
R22	26
R23	24
R24	25
R25	25

The highest required sound reduction has been found to be 35 dB, as follows:

- 35 dB – L_{AFmax} (night) from road traffic, within land use areas which are near to the A509, or immediately adjacent to proposed roads within the Proposed Development.

Based on 50% glazing, therefore, this equates to a glazing performance of 32 dB R_W+C_{tr}. According to the example performances presented in BS 6262-2:2005 Glazing for buildings – Part 2: Code of practice for energy, light and sound (Ref. 7.23), this should be achieved by a double-glazed unit comprising 10 mm glass / 12 mm air gap / 6 mm glass.

Table AH1-11: Highest sound insulation performance for the glazing elements and example configuration

Room type	Minimum glazing sound reduction, $R_W + C_{tr}$	Indicative glazing configuration (glass/air gap/glass (mm))
All habitable rooms	32 [1]	10 / 12 / 6 [2]

Notes:
1 Based on the performances presented in BS 6262-2:2005 (36 dB RW, -3 dB Ctr)
2 Assuming 50% glazed area

Assuming a 10/12/6 glazed unit (or similar), internal noise levels within living areas and bedrooms are predicted to achieve the relevant internal criteria. Ultimately, the actual sound insulation requirement will depend on a number of factors, including the location and dimensions of the rooms in question, the percentage glazing, the performance of the non-glazed elements, and the frequency spectra of the external noise levels.

Ventilation

Figures AH1-4 and AH1-5 indicate that noise levels are predicted to fall below 68 dB during the daytime and 63 dB during the night-time, across all land use areas. Table AH1-5 also indicates that the highest night-time maximum noise levels are predicted to be 80 dB.

Table B3 in the Acoustics, Ventilation and Overheating Guide (AVO Guide), indicates that for noise levels below these thresholds, 'whole dwelling' ventilation can be provided through the use of a continuous mechanical extract ventilation system in accordance with ventilation 'System 3', set out in Approved Document F (ADF).

It should be noted, however, that these noise levels are predicted across the undeveloped site (i.e. the worst-case scenario). When the development is complete, it is anticipated that noise levels incident upon the façades of proposed dwellings (particularly those located away from the extremities of the Proposed Development) will be lower, due to the screening of road traffic noise from other buildings. Table B3 of the AVO Guide, indicates that if daytime noise levels are no greater than 66 dB and night-time levels no greater than 61 dB, ventilation may be suitably provided through the use of background or 'trickle' ventilation (ADF System 1), or a passive stack ventilation system (ADF System 2).

In addition to ventilation, consideration will also need to be given the risk of overheating. It is recommended that further assessment should be undertaken at the detailed design stage, once the location and layout of dwellings has been determined. However, as a general rule, sensitive spaces within dwellings with a south facing aspect, are more likely to require openable windows for natural ventilation and to help control overheating, particularly during the summer months. In such circumstances, consideration will need to be given to the balance between controlling overheating (i.e. through the use of openable windows) and noise levels incident on the facades of the proposed dwellings.

Noise Levels Across External Amenity Space

The predicted noise levels during the daytime, which are presented graphically in Figure AH1-4 indicate that noise levels are likely to fall below the 55 dB noise limit (indicated by the green contour in Figure AH1-4) across the majority of undeveloped residential land use areas. It is noted that the extremities of land use areas in proximity to proposed roads within the Development may experience noise levels in excess of 55 dB, however.

Land use areas which are most exposed to road traffic noise from the M1 (i.e. R01, R02, R03, R04, R11 and R12) are predicted to experience noise levels in excess of 55 dB throughout, with

the exception of R12 where portions of the land use area are predicted to experience noise levels below 55 dB.

Land uses which are most exposed to road traffic noise from the A509 (i.e. R06a and b and R07) are predicted to exceed the 55 dB noise limit in portions of the land use areas which are nearest to the A509, with noise levels predicted to fall below 55 dB heading in the direction away from the A509.

As stated in paragraph H1.38, once the Proposed Development is built, there will be a certain amount of acoustic screening provided by other buildings within the development, particularly towards the centre of the Proposed Development. Additionally, it is anticipated that there will be an amount of acoustic screening afforded by the inclusion of standard 1.8m high perimeter garden fencing. Consequently, it is anticipated that noise levels in the majority of private garden spaces across the Proposed Development would meet the required noise limit, save for garden spaces at the extremities of the Proposed Development, in proximity to roads. It should also be noted, however, that BS 8233 states:

"In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

Assessment of Educational Land Use Areas

Good Acoustic Design

The illustrative masterplan provided by JTP indicates that school buildings are likely to be setback from roads, to minimise the impact of road traffic noise on internal teaching spaces.

Furthermore, the masterplan indicates that for land uses SS1 and PS2, playing fields and outdoor recreational areas are located between nearby roads and the school building. This ensures that playing fields, which are generally considered to be of low sensitivity to noise, act as a buffer to minimise noise impacts at the more noise sensitive teaching spaces within the school building.

Incident External Noise Levels (Year of completion, 2048)

Table AH1-12 presents the range of predicted ambient noise levels across each of the educational land use areas, during the daytime period. These noise levels assume that the mitigation measures discussed for the site suitability assessment of residential land uses are incorporated. As stated in the assumptions in paragraph H1.30, the noise level for PS1 has been predicted at a height of 1.5m and noise levels have been predicted at 4m for PS2, PS3 and SS1. The predicted noise levels are presented graphically in Figure AH1-4 (for PS1) and AH1-6 (for PS2, PS3 and SS1).

Figure AH1-6: Predicted daytime noise levels across educational land uses areas at first floor level for PS2, PS3 and SS1

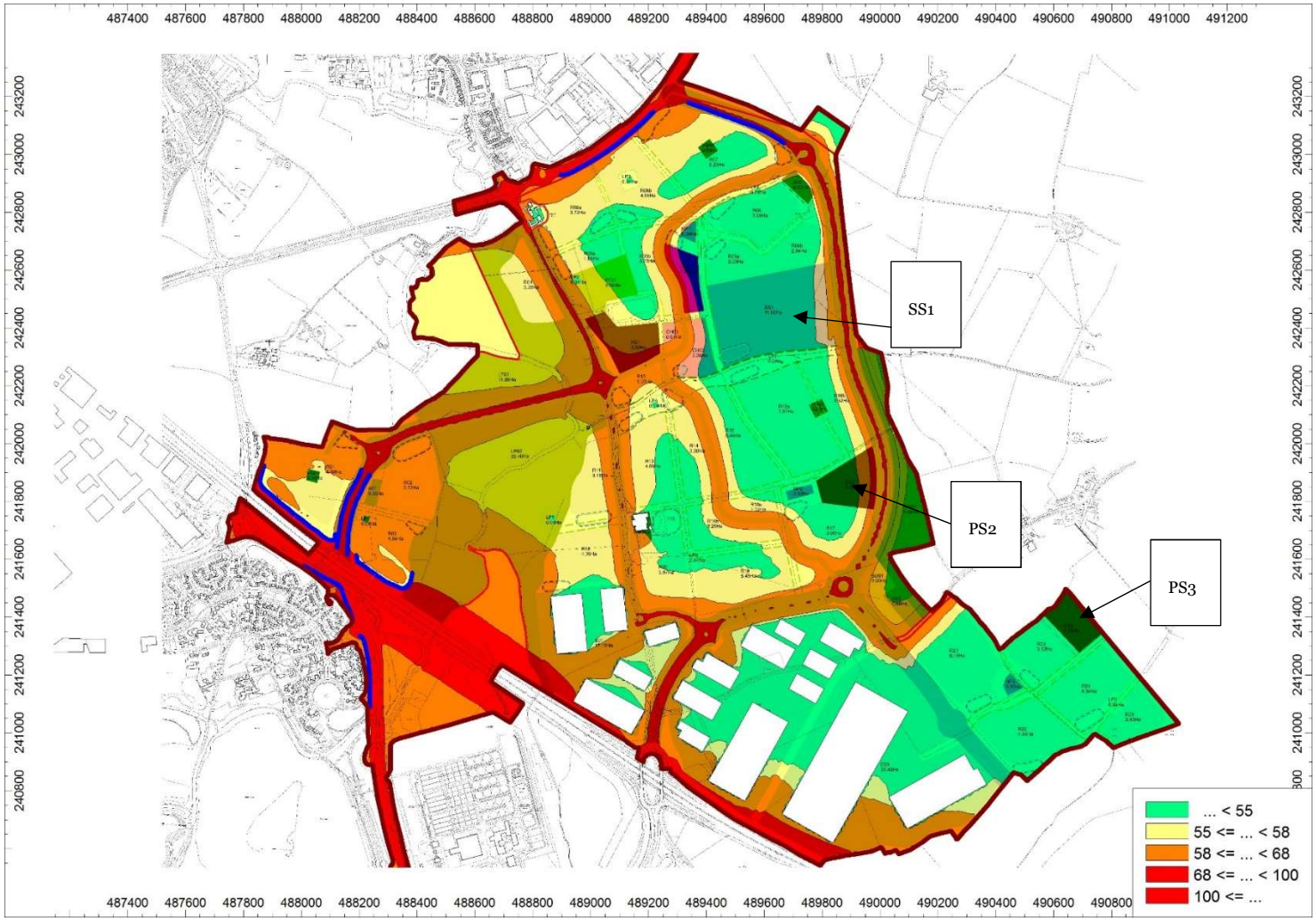


Table AH1-12: Predicted noise levels across the residential land use areas in 2048

Reference from the Land Budget Parameter Plan	Daytime noise level, dB $L_{Aeq,16h}$
PS1	54-64
PS2	53-61
PS3	51-52
SS1	52-61

Educational Site Suitability Assessment

In order to determine the level of façade sound insulation required, the noise levels above have been compared with the criteria presented in Table AH1-13. This comparison is shown in the tables below along with the degree of sound reduction required to achieve an appropriate internal noise climate for the schools.

Table AH1-13: Predicted daytime noise levels across the educational land use areas in 2048 and sound reduction required to meet criteria

Reference from the Land Budget Parameter Plan	Daytime noise level, dB $L_{Aeq,16h}$	Criteria, dB	Required sound reduction, dB
PS1	54-64	35 (indoor teaching spaces) / 40 (open plan areas)	19-29 / 14-24
PS2	53-61		18-26 / 13-21
PS3	51-52		16-17 / 11-12
SS1	52-61		17-26 / 12-21

Where the required sound reduction is above 15 dB, the internal noise targets will not be achieved with an open window.

It is noted that there are no (undeveloped) land use areas where the required sound reduction range falls entirely below 15 dB.

It should be noted, however, that the predicted noise levels presented in Figure AH1-4 (for PS1) and Figure AH1-6 (for PS2, PS3 and SS1) indicate substantial portions of the land use areas where the school buildings can be located and where noise levels are predicted to fall below 55 dB. Assuming a 15 dB sound reduction level for an open window, noise levels in these areas are anticipated to fall within 5 dB of the guideline criteria. BB93 advises that a 5 dB relaxation in these criteria is permitted in certain natural ventilation scenarios depending on ventilation rates, the number of people within the teaching space and the concentration of CO2.

This notwithstanding, it is recommended that further assessment is undertaken at the detailed design stage, once the location and layout of the school have been determined, to establish the appropriate means of ventilation which will not compromise noise levels across interval teaching spaces and open plan areas.

Glazing

Based on the results presented in Table AH1-13, Table AH1-14 presents the highest sound reduction value determined for each land use area.

Table AH1-14 -The highest required sound reduction value determined for each land use area

Reference from the Land Budget Parameter Plan	Highest required sound reduction, dB
PS1	29
PS2	26
PS3	17
SS1	26

Table AH1-15 presents the minimum glazing sound reduction and indicative glazing configurations for schools in all land use areas, based on an assumed 50% glazed façade area.

Table AH1-15 - Highest sound insulation performance for the glazing elements and example configuration

Reference	Room type	Minimum glazing sound reduction, $R_W + C_{tr}$	Indicative glazing configuration (glass/air gap/glass (mm))
PS1	Internal teaching space and open plan areas	26 [1]	6 / 12 / 6 [2]
PS2		23 [2]	4 / 12 / 4 [2]
PS3		17 [2]	4 / 12 / 4 [2]
SS1		23 [2]	4 / 12 / 4 [2]

Notes:
1 Based on the performances presented in BS 6262-2:2005 (31 dB RW,-4 dB Ctr)
2 Based on the performances presented in BS 6262-2:2005 (29 dB RW,-4 dB Ctr)
3. Assuming 50% glazed area

With the inclusion of the indicative glazing configurations presented in Table AH1-15, internal noise levels are predicted to achieve the relevant internal criteria. Ultimately, the actual sound insulation requirement will depend on a number of factors, including the location and dimensions of the rooms in question, the percentage glazing, the performance of the non-glazed elements, and the frequency spectra of the external noise levels.

Noise levels Across Outdoor Areas

Figures AH1-4 (for PS1) and AH1-6 (for PS2, Ps3 and SS1) indicate that noise levels across PS3 are predicted to fall below the 55 dB preferred limit. The highest predicted levels across PS1, PS2 and SS1 exceed the upper 60 dB limit in small portions at the extremities of the land use areas, however, there are substantial portions of the land use areas where the noise levels are predicted to fall below 55 dB.

It is recommended that areas where noise levels exceed the upper 60 dB limit should be used as ancillary space, with areas that fall below 55 dB used for recreation and outdoor teaching.

Assessment of Interfacing Land Use Areas Within the Proposed Development

At this preliminary stage, the location of buildings within the land use areas has yet to be determined. Consequently, a qualitative assessment of the potential noise impacts between interfacing land uses within the Proposed Development has been undertaken. It is recommended, however, that a further, more detailed assessment should be undertaken at the detailed design stage.

Educational and Residential Land Uses

The land budget plan indicates that there are likely to be shared boundaries, or minimal distances between educational (i.e. primary and secondary schools) and residential (i.e.

dwellings) land uses. The land uses which share a common boundary or are in proximity to one another are presented, below.

Table AH1-16: Interfaces between educational and residential land uses

Educational land use reference	Residential land use with shared boundary or boundary nearby
PS1	R10 (approximately 20m south)
	R05b (approximately 30m north-east)
PS2	R17 (shared boundary)
	R16a (approximately 25m north)
	R16b (approximately 25m north)
PS3	R23 (shared boundary)
	R24 (approximately 25m south)
SS1	R09a (shared boundary)
	R09b (shared boundary)
	R16a (approximately 45m south at nearest point)
	R16b (approximately 35m south)

Where schools are located in proximity to dwellings, it is recommended that external play areas such as playgrounds and sports pitches and car parks or school entrances should be located away from dwellings, where possible, to minimise any potential noise effects. Unassigned or landscaped external space may be used as a buffer between the identified sources of noise and dwellings, however there may be instances were proximity between noise sources and dwellings is unavoidable. In such cases, should noise effects be anticipated, consideration may be given to the inclusion of a barrier at the shared boundary, or at the boundary of the school, where residential land uses are in proximity, but not adjacent.

Employment and Residential Land Uses

The land budget plan indicates that there are likely to be employment (use classes E, B2 and B8) and residential land uses in proximity to one another. These land uses are presented, below.

Table AH1-17: interfaces between employment and residential land uses

Employment land use reference	Residential land use reference with shared boundary or boundary nearby
E01	R12 (approximately 20m north at nearest point)
	R20 (approximately 60m east at nearest point)
E02	R19 (approximately 60m east at nearest point)
E03	R21 (approximately 60m east at nearest point)
	R22 (approximately 60m east at nearest point)
Flexible use land (in proximity to the M1 and the grid road corridor between Tongwell Street and the development)	R01 (distance to be determined)
	R02 (distance to be determined)
	R03 (distance to be determined)

It is noted that there are no common boundaries between the employment land and residential land at present, which is to the benefit of future occupants of dwellings. However, the proportion of employment and residential use within the flexible use land and the distances between uses has yet to be determined.

For employment use class 'E' (e.g. offices and retail premises), typical sources of noise would include vehicle movements within car parks and noise from building services plant, associated with employment buildings.

For employment use classes B2 and B8 (e.g. general industrial and distribution warehouses), typical sources of noise would include HGV movements, operational activity such as the loading and unloading of HGVs and noise from fixed building services plant.

For use class 'E', it is anticipated that vehicle movements within the car park would largely be confined to the daytime, during office working hours (e.g. 08:00 – 19:00), rather than the more sensitive night time period. Given that the noise climate in this area is dominated by road traffic along the M1, vehicle movements within the car park may not be perceived as a noise source 'out of character' in the area and any potential noise effects may not be pronounced.

For use classes 'B2' and 'B8', it is recommended that HGV routes within the employment area are located away from residential land uses, with HGV parking and loading/docking areas located on the opposite side of warehouses to residential land uses. Where such measures are not feasible, consideration may be given to acoustic barriers between the HGV routes and/or loading activity areas and residential land uses. Limits may also be applied to operating hours to minimise any potential noise impacts during the more noise-sensitive night-time period.

It is recommended that building services plant associated with the employment area should be located away from residential land uses, where possible, to minimise the likelihood of noise effects. This may include locating the plant at roof level and/or or on the opposite side of employment buildings to the residential land. Consideration may also need to be given to appropriate acoustic screens or enclosures for items of plant which need to be located externally. However the need for such measures can be established at the detailed design stage, once the location, operation and specification of plant items has been determined.

Conclusion

The Proposed Development is affected by road traffic noise on the existing road network (predominantly the M1 and A509) and proposed roads within the Development. The resultant noise levels have been predicted by way of 3D acoustic modelling, calibrated using baseline noise measurements.

Predicted noise levels across the undeveloped site indicate that mitigation measures are likely to be required in order to achieve habitable noise levels within dwellings and across associated external amenity spaces.

Mitigation measures which have been proposed include 3m high barriers between the A509 and residential land uses R06a and b, R07 and R08; 3m high barriers on both sides of the road entering the site from the M1 overbridge; and a 10m high bund and barrier combination between the M1 and residential land uses R01, R02 and R03.

With the inclusion of these mitigation measures, noise levels across the majority of external amenity spaces are predicted to meet the upper 55 dB limit, particularly once the site is complete and buildings within the development have been erected.

Through recommendations for suitable glazing and ventilation systems, noise levels are predicted to meet the required criteria for habitable noise levels within dwellings.

For educational land use areas, recommendations have also been made for suitable glazing systems. It is recommended that a suitable ventilation strategy is determined at the detailed design stage, once the location and layout of the school have been finalised.

Noise levels across outdoor spaces associated with schools are predicted to fall below the preferred 55 dB limit in the majority of areas, with noise levels in small portions at the

extremities of the land use areas in excess of the upper 60 dB limit. It is recommended that such areas are used as ancillary space, with outdoor teaching spaces located within the areas where noise levels are predicted to fall below 55 dB.

As the detailed design of land uses within the development is yet to be determined, a qualitative assessment of potential noise impacts has been undertaken for interfaces between residential land uses and educational and employment land. Recommendations have also been made to minimise any potential noise impacts, where anticipated.

Appendix H2
Glossary of Acoustic Terminology

H2.0 Glossary of Acoustic Terminology

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be influenced by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is commonly used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB(A) increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Table AH2-1: Terminology Relating to Noise

Terminology	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1 / s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise

Terminology	Description
	environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.

Table AH2-2: Terminology Relating to Vibration

Terminology	Description
Displacement, velocity and acceleration	Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity).
Amplification	A general term used to indicate the increase in noise or vibration, or the amount (in decibels) by which it is increased.
Transfer function	Transfer function of a vibrating system is the ratio of the output or response of the system to the input excitation, usually expressed as a complex function of frequency.
Peak Particle Velocity (PPV)	The instantaneous maximum velocity reached by a vibrating element as is oscillates about its rest position.

Appendix H3
Noise and Vibration Guidance

H3.0 Noise and Vibration Guidance

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1 Noise

This Standard provides the latest recommendations for basic methods of noise control where there is a need for the protection of persons living and working in the vicinity of, and those working on, construction and open sites.

The Standard includes guidance on assessing the significance of noise effects. In particular, Annex E provides a discussion on the different approaches to the assessment of construction noise, in doing so giving consideration to absolute noise levels (in section E2) and to two different approaches to setting criteria based on the ambient noise level ($L_{Aeq,T}$) in the absence of construction noise (in section E3).

The Standard suggests that where, in spite of the mitigation measures applied, the measured or predicted construction noise level exceeds 75 dB(A) (for a period of ten or more days of working in any fifteen consecutive days or for a total of days exceeding 40 in any six-month period), a scheme for the installation of noise insulation (or the reasonable costs thereof) will be implemented by the developer or promoter.

In sub-clause E.3 an alternative approach is described based on considering the change in the ambient noise level that the construction noise causes. This approach is used commonly in EIA. Two methods are described.

The first is the ABC method an example of which is set out in Table AH3-1 (Table E.1 in the Standard). Three categories, A, B and C are described in terms of threshold noise levels for a daytime (07:00 to 19:00 weekdays, 07:00 to 13:00 Saturday), evening and weekend, and finally a night-time period (23:00 to 07:00). If the combined ambient noise and construction noise exceed the relevant threshold level this is deemed a 'significant effect'.

Table AH3-1: Example Thresholds of Potential Significant Effects at Dwellings

Assessment category and threshold value period	Threshold value, in decibels, dB $L_{Aeq,T}$		
	Category A (A)	Category B (B)	Category C (C)
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends (D)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Notes: [1] A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. 2] If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. [3] Applied to residential receptors only.			
(A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. (B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. (C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. (D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.			

The second method states that:

"Noise levels generated by site activities are deemed to be potentially significant if the construction noise level exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$ from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact."

These criteria may be applied not just to residential buildings, but also to hotels and hostels and buildings in religious, educational and health/community use.

The +5 dB criterion for a period of one month or more, might also be deemed to cause significant effects in public open space. However, the extent of the area impacted relative to the total available are also needs to be taken into account.

Annex F of the Standard provides guidance on estimating noise from construction sites. The estimation procedures described in this Annex take into account the more significant factors:

- The sound power outputs of processes and plant
- The periods of operation of processes and plant
- The distances from source to receiver
- The presence of screening by barriers
- The reflections of sound
- Additional attenuation from absorbent ground

Four discrete prediction methods are described, two for stationary plant – the activity $L_{Aeq,T}$ method and the plant sound power method – and two for mobile plant – the method for mobile plant in a defined area and the method for haul roads.

BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 2 Vibration

The Standard provides the latest recommendations for basic methods of vibration control where there is a need for the protection of persons living and working in the vicinity of, and those working on, construction and open sites.

With respect to human exposure to building vibration, Table B1 of Annex B to BS 5228-2 provides guidance on the effects of vibration levels on human beings. This is reproduced in Table AH3-2.

Table AH3-2: BS 5228-2 Guidance on Effects of Vibration Levels

Vibration level	Effect
0.14 $mm \cdot s^{-1}$	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.
0.3 $mm \cdot s^{-1}$	Vibration might be just perceptible in residential environments.
1.0 $mm \cdot s^{-1}$	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.
10 $mm \cdot s^{-1}$	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Guide values for cosmetic damage to buildings are given in Table B.2 of the Standard, and this is reproduced as Table AH3-3.

Table AH3-3: BS 5228-2 Guidance on Transient Vibration Guide Values for Cosmetic Damage

Line (see Figure B1)	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm·s^{-1} at 4 Hz and above	50 mm·s^{-1} at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mm·s^{-1} at 4 Hz increasing to 20 mm·s^{-1} at 15 Hz	20 mm·s^{-1} at 15 Hz increasing to 50 mm·s^{-1} at 40 Hz and above
Notes: [1] Values referred to are at the base of the building. [2] For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.			

It should be noted that the above guidance is for transient vibration. For continuous vibration, such as may occur during the use of vibratory equipment, the guidance in the Standard is that the levels in the Table above

Design Manual for Roads and Bridges (DMRB) LA 111 Noise and vibration, Revision 2 (May 2020)

DMRB LA 111 Noise and vibration provides guidance on the assessment of road traffic noise and vibration from new road projects.

Operational Noise Scenarios

For the assessment of permanent noise and vibration impacts, consideration is given to the noise level changes that will arise both in the short-term and the long-term.

The short-term scheme impacts are derived by comparing the 'Do Minimum' scenario (i.e. without the Proposed Development) in the 'opening year', with the 'Do Something' scenario (i.e. with the Proposed Development) in the same year. The long-term impacts are derived by comparing 'Do Minimum' scenario in the opening year with the 'Do Something' scenario in the 'future year'. The design year is typically taken as the 15th year after opening, although this may be different, if for example higher traffic flows are expected in an earlier year.

Operational Noise Impact Criteria

To assist in determining the likely effects of a scheme DMRB LA 111 presents the magnitude of impact tables duplicated below. The tables make an important distinction between short term and long-term impacts. In the long-term, the impact of an equivalent change in noise level is considered to be reduced in magnitude compared with the short-term.

Table AH3-4: DMRB LA 111 Criteria for Magnitude of Operational Road Traffic Noise Change in the Short-term

Short-term magnitude	Noise change ($L_{A10,18h}$ or L_{night}), dB
Major	≥ 5.0
Moderate	3.0 – 4.9

Short-term magnitude	Noise change ($L_{A10,18h}$ or L_{night}), dB
Minor	1.0 – 2.9
Negligible	< 1.0

Table AH3-5: DMRB LA 111 Criteria for Magnitude of Operational Road Traffic Noise Change in the Long-term

Long-term magnitude	Noise change ($L_{A10,18h}$ or L_{night}), dB
Major	≥ 10.0
Moderate	5.0 – 9.9
Minor	3.0 – 4.9
Negligible	< 3.0

When looking at potential significance, DMRB LA 111 advises that, subject to consideration of contextual factors such as absolute noise level and long-term noise level change, a short-term noise level change of moderate or major magnitude is likely to be significant and a change of negligible or minor magnitude is unlikely to be significant.

Calculation of Road Traffic Noise (CRTN), 1988

CRTN provides a calculation methodology for using road traffic flow data to calculate road traffic noise levels.

The factors which may influence road traffic noise levels at source can be divided into two groups:

- Road related factors - gradient and surface type
- Traffic related factors - flow, speed and the proportion of heavy-duty vehicles

The propagation of noise, taking into account factors such as the distance from a source to a receptor, ground cover and screening, is also covered in CRTN and can influence the noise levels at receptor locations.

TRL Project Report PR/SE/451/02, 2002

Converting the UK traffic noise index $L_{A10, 18h}$ to EU noise indices for noise mapping

The CRTN prediction method produces noise levels in terms of LA10, either over a 1-hour or an 18-hour period. The Transport Research Laboratory (TRL) report identifies a number of methods for converting the LA10, 18hr to LAeq, 16hr and LAeq, 8hr (for the daytime and night-time respectively) parameters which are more commonly used in the assessment of the suitability of a site for residential use.

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

BS 4142 provides guidance for assessing noise emissions from new items of building services plant against the existing background noise level.

A summary of the recommended approach within BS 4142 is set out below:

- establish the specific sound level of the source(s);
- measure the representative background sound level, typically by measurement close to the current or proposed sensitive receptor location;

- rate the specific sound level to account for any distinguishing characteristics (see below);
- estimate the impact by subtracting the background sound level from the rating level; and,
- consider the initial estimate of impact of the specific sound, as determined above, whilst also considering the context in which the sound occurs.

The specific sound level is rated to account for distinguishing characteristics by using the penalties below:

- Tonality up to 6 dB
- Impulsivity up to 9 dB
- Other sound characteristics 3 dB
- Intermittency 3 dB

An initial estimate of the impact of the specific sound is obtained by subtracting the background sound level from the rating level. Using this approach, BS 4142 states:

- *"Typically, the greater this difference, the greater the magnitude of impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *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."*

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

BS 8223:2014 provides guidance for the control of noise in and around buildings. It is intended to guide the design of new buildings, or refurbishment of existing buildings undergoing a change of use, by specifying appropriate criteria pertaining to the control of noise from outside the building; noise from plant and services within it; and internal acoustics. The noise level criteria recommended by BS 8223 for residential spaces are summarised below in Table AH3-6.

Table AH3-6: Indoor Ambient Noise Levels in Spaces

Activity	Location	Daytime (07:00-23:00 hours)	Night-time (23:00-07:00 hours)
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

Note 7 to this table states that:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

BS 8233 recommends that "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." The Standard also states that these guideline values are not always achievable in all circumstances and therefore a compromise between elevated noise levels and the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, the Standard states that development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

World Health Organisation, Guidelines for Community Noise, 1999

The World Health Organisation's (WHO) 'Guidelines for Community Noise' consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic, industries, construction and public work and neighbours.

The effects of noise in dwellings are, typically, sleep disturbance, speech interference and annoyance. Relevant guideline values and the time base over which the individual guideline values apply are summarised in Table AH3-7.

Table AH3-7: WHO Guideline Values for Community Noise in Specific Environments

Specific environment	Critical health effects	$L_{Aeq,T}$, dB	Time base, T (hours)*	L_{AFmax}, dB
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
Note: * These periods are usually taken to be 07:00-23:00 hours (16-hour day) and 23:00-07:00 hours (8-hour night).				

ProPG: Planning and Noise – New Residential Development, May 2017

The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

The scope of the ProPG is limited to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources.

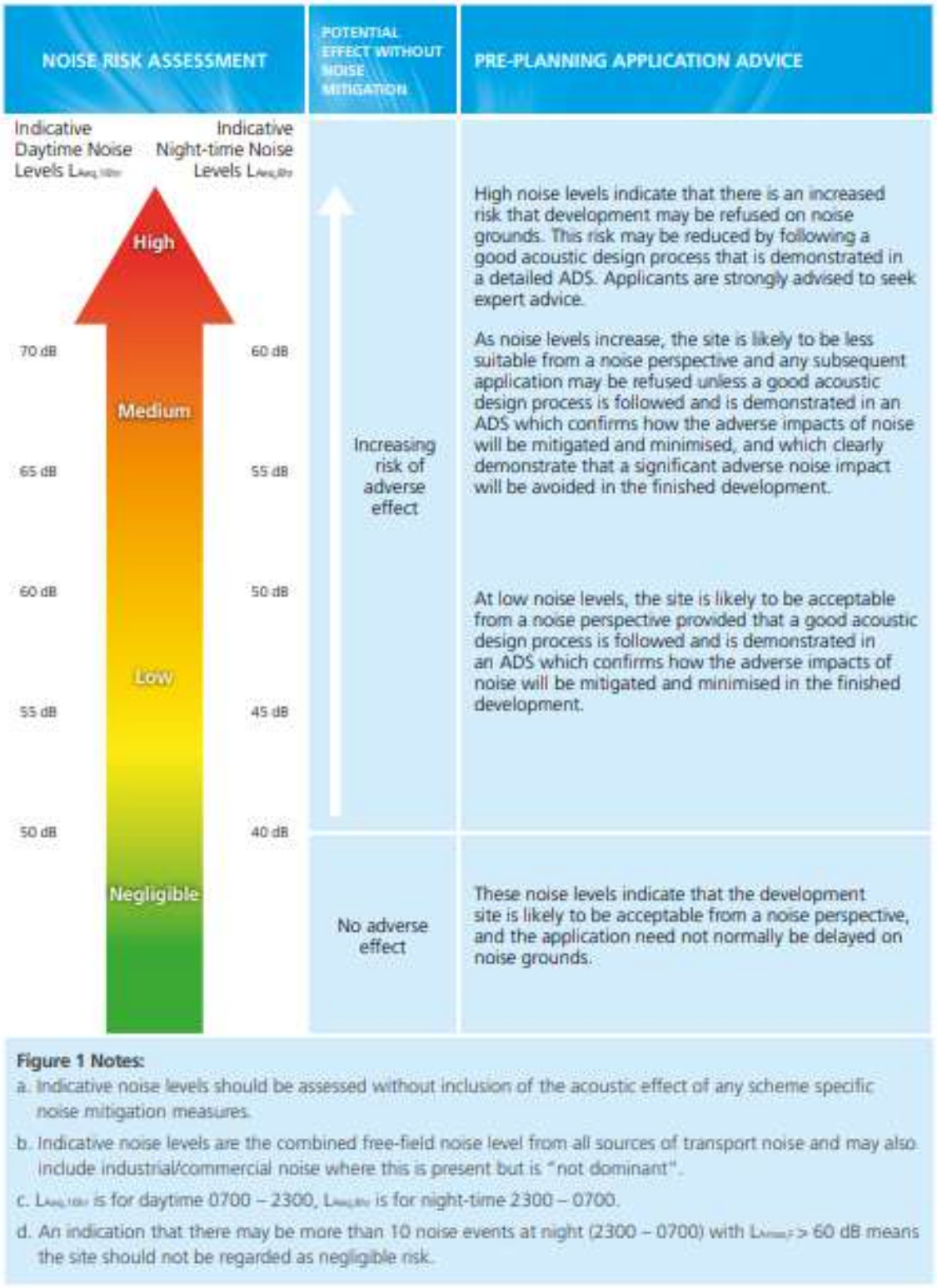
The ProPG aims to complement Government planning and noise policy and guidance, and in particular it strives to:

- *"advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;*
- *encourage the process of good acoustic design in and around new residential developments;*

- *outline what should be taken into account in deciding planning applications for new noise-sensitive developments;*
- *improve understanding of how to determine the extent of potential noise impact and effect; and*
- *assist the delivery of sustainable development."*

The ProPG provides the following Figure to assist with the undertaking of initial site risk assessments for Proposed Development sites. The Figure provides a scale of daytime and night-time noise levels for negligible, low, medium and high risk categories for application sites with guidance as to how noise levels may need to be mitigated.

Figure AH1: Stage 1 – Initial Site Noise Risk Assessment (from ProPG, Figure 1, page 09)



The ProPG also states that:

"In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night."

The guidance discusses in detail how the 45 dB $L_{Amax,F}$ value was derived and provides a rationale for adopting the 10th highest L_{AFmax} maximum event level during the night-time period as the 'typical' level.

Building Bulletin 93 – Acoustic Design of Schools: Performance Standards – February 2015

The objective of Building Bulletin 93 (BB 93) is to ensure that the design and construction of school buildings provide acoustic conditions that enable effective teaching and learning. To this end BB 93 sets out minimum performance standards for the acoustics of school buildings, including maximum limits for indoor ambient noise levels (IANLs) for various rooms and spaces within schools; these levels specifically exclude noise from teaching activities within the school premises.

The Development includes provision for a primary and secondary school on the Site. For the main teaching spaces in primary schools (classrooms and open plan areas) the criteria are 35 dB LAeq,30min for classrooms and 40 dB LAeq30min for open plan areas. A 5 dB relaxation in these criteria is permitted in certain natural ventilation scenarios depending on ventilation rates, the number of people within the teaching space and the concentration of CO2.

Acoustics of Schools: A Design Guide, 2015

The current version of BB 93 does not present specific guidance on ambient noise levels for external teaching areas, hence the guidance on this aspect has been taken from Acoustics of Schools: a design guide, a document published by the Institute of Acoustics (IoA) and the Association of Noise Consultants (ANC) to accompany BB93. It is worth noting that guidance on external levels is not mandatory (i.e. there is no absolute requirement to comply with any of the recommended guideline levels). With respect to external noise levels, the IoA/ANC design guide advises that:

"For new schools, 60 dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external areas used for formal and informal outdoor teaching and recreation."

"It may be possible to meet the specified indoor ambient noise levels on sites where external noise levels are as high as 70 dB $L_{Aeq,30min}$ but this will require considerable building envelope sound insulation, or screening."

and

"Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$. If this is not possible, due to a lack of suitably quiet sites, acoustic screening should be used to reduce noise levels in these areas as much as practicable, and an assessment of noise levels and options for reducing these should be carried out."

Therefore, the guidance implies that whilst external noise levels of less than 60 dB(A) are preferred, higher levels can be mitigated within internal teaching areas by the use of suitable sound insulation measures.

Appendix H4
Noise Monitoring Equipment

H4.0 Noise Monitoring Equipment

Table AH4-1: Details of Equipment Used for Attended and Unattended Noise Monitoring

Equipment description	Manufacturer and type number	Serial number
Equipment used for attended noise monitoring		
Sound Level Meter	01dB-METRAVIB Solo Master	61332
Pre-amplifier	01dB-Stell PRE 21 S	12495
Microphone	Microtech Gefell GmbH MCE212	67311
Calibrator	Norsonic 1251	31462
Sound Level Meter	01dB-METRAVIB Solo Master	61331
Pre-amplifier	01dB-Stell PRE 21 S	14575
Microphone	Microtech Gefell GmbH MCE212	92344
Calibrator	Norsonic 1251	31460
Equipment used for unattended noise monitoring		
Sound Level Meter	01 dB-Metravib Fusion	10796
Pre-amplifier	01dB PRE22	10882
Microphone	GRAS 40CD	207588
Calibrator	01 dB-Stell CAL 21	34254632
Sound Level Meter	01dB-METRAVIB Solo Master	65773
Pre-amplifier	01dB-Stell PRE 21 S	16554
Microphone	Microtech Gefell GmbH MCE212	65593
Calibrator	01dB-Metravib Cal 21	34134165
Sound Level Meter	01dB-Stell Solo Master	10705
Pre-amplifier	01dB-Stell PRE 21 S	16860
Microphone	Microtech Gefell GmbH MCE212	181885
Calibrator	01dB-Stell Cal 21	35293350
Sound Level Meter	01dB-Stell Solo Master	11810
Pre-amplifier	01dB-Stell PRE 21 S	12495
Microphone	Microtech Gefell GmbH MCE212	67311
Calibrator	01dB-Stell Cal 21	34323996
Sound Level Meter	Rion NL52	510145
Pre-amplifier	NH-25	10138
Microphone	UC-59	2850
Calibrator	NC74	34615220

Appendix H5
Baseline Noise Survey – Key Noise Sources

H5.0 Baseline Noise Survey – Key Noise Sources

Unattended Monitoring

LTMP1

Road traffic noise from M1 is the dominant noise source during the day and night-time periods. Little of any other noise perceptible.

LTMP2

Road traffic noise from A509 is the dominant noise source during the day and night-time periods. Distant road traffic noise perceptible from the M1 during the night-time and occasional HGV movements noted in the distance from Interchange Park, but these movements ere infrequent and barely perceptible.

LTMP3

Road traffic noise from the nearby road network (i.e. A422 and A509 – London Road) is the dominant source of noise during the day and night-time periods. As road traffic subsides during the night-time, distant road traffic noise from the M1 becomes increasingly perceptible.

LTMP4

Road traffic noise from A509 London Road is the dominant noise source during the day and night-time periods. Distant road traffic noise from the M1 also perceptible in between vehicle pass-bys on A509 London Road.

LTMP6

Distant road traffic noise from M1 perceptible during the day and night-time periods. Occasional HGV noise barely perceptible from the construction compound located approximately 700m south-east of the site

Attended Monitoring

STMP1

Road traffic noise from Newport Road is the dominant noise source during the day and night-time periods, however vehicle movements are infrequent. Distant road traffic noise from the M1 also perceptible.

STMP2

Road traffic noise from A509 London Road is the dominant noise source during the day and night-time periods. Road traffic noise from the M1 perceptible during the night-time.

STMP3

Road traffic noise from Tongwell Street is the dominant noise source during the day and night-time periods. Road traffic noise from the M1 also clearly perceptible during the day and night-time.

STMP4

Road traffic noise from Willen Road is the dominant noise source during the day and night-time periods. Road traffic noise from the M1 also clearly perceptible during the day and night-time. Occasional impulsive banging noise barely perceptible in the distance from the nearby quarry during the daytime.

Appendix H6
Meteorological Conditions

H6.0 Meteorological Conditions

Table AH6-1: Meteorological Conditions at Cranfield between Monday 02 and Tuesday 10 November 2020

	Mon 02, Nov 20	Tue 03, Nov 20	Wed 04, Nov 20	Thu 05, Nov 20	Fri 06, Nov 20	Sat 07, Nov 20	Sun 08, Nov 20	Mon 09, Nov 20	Tue 10, Nov 20
Time	***00:00***	***00:00***	***00:00***	***00:00***	***00:00***	***00:00***	***00:00***	***00:00***	***00:00***
Temp	17 °c	6 °c	4 °c	5 °c	5 °c	6 °c	8 °c	10 °c	12 °c
Wind	45 km/h, SW	23 km/h, WSW	11 km/h, W	3 km/h, N	5 km/h, SE	8 km/h, ESE	10 km/h, ESE	8 km/h, SSW	12 km/h, SSE
Rain	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.5 mm	0.4 mm
Pressure	998 mb	1016 mb	1026 mb	1039 mb	1036 mb	1024 mb	1020 mb	1019 mb	1020 mb
Time	***03:00***	***03:00***	***03:00***	***03:00***	***03:00***	***03:00***	***03:00***	***03:00***	***03:00***
Temp	17 °c	6 °c	4 °c	5 °c	5 °c	6 °c	9 °c	10 °c	11 °c
Wind	48 km/h, SSW	16 km/h, SSW	11 km/h, W	3 km/h, WNW	5 km/h, SE	9 km/h, SE	8 km/h, ESE	8 km/h, S	10 km/h, SSE
Rain	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.8 mm
Pressure	997 mb	1017 mb	1028 mb	1038 mb	1034 mb	1022 mb	1019 mb	1019 mb	1020 mb
Time	***06:00***	***06:00***	***06:00***	***06:00***	***06:00***	***06:00***	***06:00***	***06:00***	***06:00***
Temp	17 °c	6 °c	3 °c	4 °c	4 °c	5 °c	9 °c	10 °c	10 °c
Wind	46 km/h, SSW	13 km/h, SW	10 km/h, W	5 km/h, W	6 km/h, E	6 km/h, E	9 km/h, ESE	10 km/h, SE	9 km/h, S
Rain	0.0 mm	0.1 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.4 mm
Pressure	996 mb	1016 mb	1030 mb	1039 mb	1032 mb	1022 mb	1019 mb	1019 mb	1020 mb
Time	***09:00***	***09:00***	***09:00***	***09:00***	***09:00***	***09:00***	***09:00***	***09:00***	***09:00***
Temp	15 °c	5 °c	5 °c	7 °c	6 °c	7 °c	11 °c	12 °c	12 °c
Wind	50 km/h, SW	4 km/h, SSE	13 km/h, WNW	4 km/h, WSW	12 km/h, E	8 km/h, ESE	6 km/h, ESE	13 km/h, SE	9 km/h, SSW
Rain	0.2 mm	8.5 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.5 mm	0.0 mm
Pressure	995 mb	1015 mb	1032 mb	1039 mb	1032 mb	1022 mb	1019 mb	1020 mb	1021 mb
Time	***12:00***	***12:00***	***12:00***	***12:00***	***12:00***	***12:00***	***12:00***	***12:00***	***12:00***
Temp	12 °c	8 °c	9 °c	11 °c	10 °c	11 °c	12 °c	14 °c	14 °c
Wind	45 km/h, WSW	31 km/h, W	14 km/h, NW	3 km/h, WNW	17 km/h, ESE	9 km/h, ESE	6 km/h, ESE	14 km/h, SSE	11 km/h, SSW
Rain	0.0 mm	8.2 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm
Pressure	1001 mb	1016 mb	1034 mb	1038 mb	1030 mb	1021 mb	1019 mb	1019 mb	1021 mb
Time	***15:00***	***15:00***	***15:00***	***15:00***	***15:00***	***15:00***	***15:00***	***15:00***	***15:00***
Temp	11 °c	8 °c	9 °c	10 °c	10 °c	12 °c	11 °c	14 °c	14 °c
Wind	40 km/h, WSW	22 km/h, W	10 km/h, NW	1 km/h, W	14 km/h, E	7 km/h, E	2 km/h, SSW	13 km/h, SE	9 km/h, SW
Rain	0.1 mm	0.1 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.1 mm	0.1 mm	0.2 mm
Pressure	1004 mb	1019 mb	1034 mb	1036 mb	1027 mb	1020 mb	1019 mb	1019 mb	1022 mb
Time	***18:00***	***18:00***	***18:00***	***18:00***	***18:00***	***18:00***	***18:00***	***18:00***	***18:00***
Temp	9 °c	6 °c	7 °c	7 °c	6 °c	9 °c	11 °c	12 °c	11 °c
Wind	34 km/h, SW	19 km/h, W	7 km/h, NNW	1 km/h, SE	13 km/h, E	11 km/h, E	4 km/h, S	14 km/h, SE	9 km/h, SW
Rain	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.2 mm
Pressure	1007 mb	1022 mb	1036 mb	1036 mb	1025 mb	1020 mb	1019 mb	1019 mb	1022 mb
Time	***21:00***	***21:00***	***21:00***	***21:00***	***21:00***	***21:00***	***21:00***	***21:00***	***21:00***
Temp	8 °c	4 °c	6 °c	6 °c	5 °c	9 °c	5 °c	11 °c	10 °c
Wind	41 km/h, SW	15 km/h, WSW	4 km/h, NNE	4 km/h, SE	10 km/h, ESE	10 km/h, E	8 km/h, S	13 km/h, SSE	9 km/h, SW
Rain	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.0 mm	0.5 mm	0.4 mm	0.0 mm
Pressure	1009 mb	1025 mb	1038 mb	1036 mb	1024 mb	1020 mb	1019 mb	1020 mb	1023 mb

Appendix H7
Attended Noise Survey Results

H7.0 Attended Noise Survey Results

STMP1 (Newport Road)

Night-time

Table AH7-1: Noise Survey Results – STMP1 (Newport Road) – Night-time

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 00:15	49.7	48.6	50.3	53.7
03/11/2020 00:16	51.2	49.8	52.3	55.4
03/11/2020 00:17	61.8	50.3	61.1	77.6
03/11/2020 00:18	51.9	50.6	53.0	54.5
03/11/2020 00:19	52.6	50.8	53.7	58.5
03/11/2020 00:20	51.5	50.1	52.9	55.2
03/11/2020 00:21	51.0	50.0	52.0	54.5
03/11/2020 00:22	50.4	49.0	51.4	53.1
03/11/2020 00:23	50.4	49.3	51.3	53.3
03/11/2020 00:24	50.2	48.8	51.0	53.6
03/11/2020 00:25	51.4	50.3	52.2	54.2
03/11/2020 00:26	51.5	49.7	52.4	54.4
03/11/2020 00:27	50.6	49.3	51.8	54.4
03/11/2020 00:28	50.7	49.5	51.7	53.9
03/11/2020 00:29	51.5	50.5	52.3	54.1

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 01:22	53.0	51.8	53.7	55.2
03/11/2020 01:23	53.2	52.1	54.3	56.2
03/11/2020 01:24	53.2	52.2	54.1	58.9
03/11/2020 01:25	53.0	51.9	53.8	55.7
03/11/2020 01:26	52.7	51.4	53.6	54.9
03/11/2020 01:27	52.7	51.7	53.6	56.5
03/11/2020 01:28	52.9	52.0	53.7	55.1
03/11/2020 01:29	53.2	52.1	54.1	55.1
03/11/2020 01:30	53.5	52.5	54.2	58.0
03/11/2020 01:31	53.0	51.4	54.5	56.7
03/11/2020 01:32	51.7	50.5	52.3	55.4
03/11/2020 01:33	51.6	50.1	53.0	56.0
03/11/2020 01:34	52.1	50.7	53.0	55.2
03/11/2020 01:35	53.5	52.3	54.6	55.8
03/11/2020 01:36	52.8	51.2	54.1	58.8

Daytime

Table AH7-2: Noise Survey Results – STMP1 (Newport Road) – Daytime

Period start	Noise level (dB)			
	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax,5min}$
04/11/2020 11:44	60.5	46.4	64.6	77.5
04/11/2020 11:49	58.7	44.5	63.3	74.4
04/11/2020 11:54	58.9	45.9	63.7	73.4
04/11/2020 11:59	57.2	45.3	60.1	74.5
04/11/2020 12:04	61.0	46.3	63.5	83.6
04/11/2020 12:09	57.9	45.6	62.8	70.8
04/11/2020 12:14	52.9	45.0	53.7	68.2
04/11/2020 12:19	58.6	46.3	62.1	74.0
04/11/2020 12:24	58.0	45.7	62.2	72.6
04/11/2020 12:29	59.0	44.0	62.7	74.8
04/11/2020 12:34	58.2	45.2	62.8	73.7
04/11/2020 12:39	59.8	45.9	63.6	76.5

Period start	Noise level (dB)			
	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax,5min}$
04/11/2020 13:56	57.9	46.4	62.6	71.2
04/11/2020 14:01	59.8	45.7	64.3	72.0
04/11/2020 14:06	57.6	45.3	62.3	73.1
04/11/2020 14:11	57.9	45.3	61.8	73.7
04/11/2020 14:16	60.4	45.9	64.9	73.8
04/11/2020 14:21	58.0	45.0	62.0	73.3
04/11/2020 14:26	58.4	46.1	63.8	70.2
04/11/2020 14:31	59.8	46.1	63.1	75.4
04/11/2020 14:36	58.0	46.5	63.0	73.8
04/11/2020 14:41	59.9	48.4	65.0	73.6
04/11/2020 14:46	59.4	47.0	62.8	84.3
04/11/2020 14:51	58.8	47.7	62.7	74.4

STMP2 (A509)

Night-time

Table AH7-3: Noise Survey Results – STMP2 (A509) – Night-time

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 00:12	59.8	53.4	64.4	67.8
03/11/2020 00:13	56.9	51.8	62.6	66.9
03/11/2020 00:14	56.5	50.3	61.9	65.5
03/11/2020 00:15	54.9	51.0	59.9	63.3
03/11/2020 00:16	56.6	52.0	55.2	68.1
03/11/2020 00:17	57.7	52.3	58.5	68.6
03/11/2020 00:18	57.5	52.4	63.9	66.1
03/11/2020 00:19	56.7	51.4	61.9	66.7
03/11/2020 00:20	57.1	51.6	60.0	67.3
03/11/2020 00:21	52.1	50.9	53.0	54.9
03/11/2020 00:22	58.1	49.8	64.4	68.3
03/11/2020 00:23	52.6	49.7	57.1	59.0
03/11/2020 00:24	58.3	51.1	62.2	65.0
03/11/2020 00:25	58.8	50.0	64.8	67.7
03/11/2020 00:26	54.3	50.0	59.0	62.3

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 01:28	58.0	51.8	62.8	67.0
03/11/2020 01:29	53.5	50.8	56.9	61.5
03/11/2020 01:30	50.3	49.3	51.0	52.8
03/11/2020 01:31	59.1	51.7	64.3	66.6
03/11/2020 01:32	57.7	51.1	63.0	66.8
03/11/2020 01:33	60.0	51.2	66.2	70.2
03/11/2020 01:34	58.9	52.4	62.7	69.4
03/11/2020 01:35	56.1	52.0	58.4	65.9
03/11/2020 01:36	52.3	50.7	53.8	55.3
03/11/2020 01:37	57.4	52.1	61.6	67.1
03/11/2020 01:38	53.5	51.7	54.6	61.9
03/11/2020 01:39	58.4	51.1	63.7	69.3
03/11/2020 01:40	54.9	51.6	54.8	66.5
03/11/2020 01:41	54.6	51.4	54.3	66.0
03/11/2020 01:42	57.8	52.6	62.9	67.5

Daytime

Table AH7-4: Noise Survey Results – STMP2 (A509) – Daytime

Period start	Noise level (dB)			
	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax,5min}$
04/11/2020 10:37	56.1	52.7	58.5	68.3
04/11/2020 10:42	56.7	52.5	58.9	62.8
04/11/2020 10:47	55.9	50.4	58.7	62.8
04/11/2020 10:52	55.7	50.5	58.2	60.3
04/11/2020 10:57	55.7	50.2	58.2	62.4
04/11/2020 11:02	56.7	51.2	58.7	72.4
04/11/2020 11:07	56.4	51.1	58.7	62.9
04/11/2020 11:12	55.8	50.5	58.6	62.4
04/11/2020 11:17	56.4	51.0	59.1	62.3
04/11/2020 11:22	56.1	50.5	58.7	61.4
04/11/2020 11:27	57.4	53.2	60.1	62.8
04/11/2020 11:32	57.5	51.3	60.2	66.1

Period start	Noise level (dB)			
	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax,5min}$
04/11/2020 12:50	56.5	52.2	59.3	67.2
04/11/2020 12:55	55.7	51.5	58.1	61.2
04/11/2020 13:00	57.4	52.6	59.6	66.3
04/11/2020 13:05	56.1	51.5	58.4	68.1
04/11/2020 13:10	56.4	52.2	58.7	68.2
04/11/2020 13:15	56.0	51.2	58.1	61.8
04/11/2020 13:20	56.7	52.6	59.0	67.2
04/11/2020 13:25	56.7	51.2	59.0	67.8
04/11/2020 13:30	56.5	52.2	58.9	70.7
04/11/2020 13:35	55.7	50.8	58.1	70.8
04/11/2020 13:40	55.7	51.4	57.9	68.4
04/11/2020 13:45	55.2	50.2	57.4	67.8

STMP3 (Tongwell Street)

Night-time

Table AH7-5: Noise Survey Results – STMP3 (Tongwell Street) – Night-time

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 00:38	49.7	48.0	51.3	53.8
03/11/2020 00:39	49.2	46.1	51.6	53.3
03/11/2020 00:40	49.4	48.0	51.0	52.8
03/11/2020 00:41	48.6	46.3	49.9	52.8
03/11/2020 00:42	48.9	47.5	50.6	51.9
03/11/2020 00:43	49.0	46.3	50.7	52.3
03/11/2020 00:44	51.1	46.7	53.9	62.6
03/11/2020 00:45	67.9	46.6	58.9	86.1
03/11/2020 00:46	50.0	48.6	51.3	52.5
03/11/2020 00:47	46.7	44.9	48.7	52.5
03/11/2020 00:48	48.6	46.7	50.4	52.4
03/11/2020 00:49	48.0	46.2	49.9	51.8
03/11/2020 00:50	73.8	49.0	72.3	90.0
03/11/2020 00:51	47.5	46.3	48.6	51.9
03/11/2020 00:52	49.4	47.4	51.4	53.3

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 01:00	49.3	47.4	51.5	53.3
03/11/2020 01:01	70.5	47.4	63.4	88.3
03/11/2020 01:02	50.1	48.1	52.6	54.2
03/11/2020 01:03	50.3	48.1	52.0	55.4
03/11/2020 01:04	69.5	48.6	65.0	86.4
03/11/2020 01:05	48.3	46.8	49.5	51.0
03/11/2020 01:06	49.3	47.4	51.0	52.9
03/11/2020 01:07	48.3	46.0	49.3	52.4
03/11/2020 01:08	49.7	48.2	50.9	54.0
03/11/2020 01:09	47.9	46.2	49.4	53.8
03/11/2020 01:10	50.1	48.2	50.9	53.7
03/11/2020 01:11	50.7	49.5	51.7	53.3
03/11/2020 01:12	51.2	47.9	53.6	55.9
03/11/2020 01:13	48.9	47.5	49.9	52.4
03/11/2020 01:14	49.7	47.7	50.9	54.0

Daytime

Table AH7-6: Noise Survey Results – STMP3 (Tongwell Street) – Daytime

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
03/11/2020 11:04	66.9	56.9	70.7	78.1
03/11/2020 11:19	66.7	56.9	70.4	77.9
03/11/2020 11:34	67.2	57.9	70.9	77.6
03/11/2020 11:49	67.1	58.4	70.8	79.5
03/11/2020 12:04	67.6	59.5	71.1	77.2
03/11/2020 12:19	67.5	58.7	70.9	77.7
03/11/2020 12:34	67.4	58.0	71.0	79.0
03/11/2020 12:49	67.3	58.0	71.1	76.6
03/11/2020 13:04	67.5	58.9	70.9	76.7
03/11/2020 13:19	67.6	59.1	71.1	76.4
03/11/2020 13:34	67.7	57.8	71.2	79.1
03/11/2020 13:49	67.7	58.6	71.2	77.5
03/11/2020 14:04	67.5	58.4	71.0	78.4

STMP4 (Willen Road)

Night-time

Table AH7-7: Noise Survey Results – STMP4 (Willen Road) – Night-time

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 00:37	55.2	52.3	57.5	63.0
03/11/2020 00:38	53.9	51.9	55.4	57.6
03/11/2020 00:39	56.0	54.7	56.9	59.6
03/11/2020 00:40	55.8	53.7	56.7	71.3
03/11/2020 00:41	65.5	54.5	69.4	79.2
03/11/2020 00:42	55.2	52.7	57.0	59.3
03/11/2020 00:43	54.2	52.3	56.0	58.0
03/11/2020 00:44	58.1	53.6	57.4	72.6
03/11/2020 00:45	58.7	52.1	55.9	75.2
03/11/2020 00:46	62.6	53.4	60.9	80.0
03/11/2020 00:47	56.9	55.5	58.2	60.2
03/11/2020 00:48	55.8	53.4	58.0	60.5
03/11/2020 00:49	58.1	52.4	58.5	71.0
03/11/2020 00:50	54.3	52.7	55.8	58.4
03/11/2020 00:51	55.6	53.3	57.1	58.7

Period start	Noise level (dB)			
	$L_{Aeq,1min}$	$L_{A90,1min}$	$L_{A10,1min}$	$L_{Amax,1min}$
03/11/2020 01:02	56.3	51.8	57.7	73.5
03/11/2020 01:03	56.7	54.4	58.3	60.0
03/11/2020 01:04	57.8	55.4	59.3	61.2
03/11/2020 01:05	56.7	54.3	58.3	61.1
03/11/2020 01:06	54.7	52.2	56.8	60.2
03/11/2020 01:07	61.6	53.5	60.7	75.8
03/11/2020 01:08	55.1	53.8	56.0	58.7
03/11/2020 01:09	62.8	54.2	60.2	80.7
03/11/2020 01:10	56.5	54.6	58.0	60.3
03/11/2020 01:11	56.3	54.3	58.0	60.2
03/11/2020 01:12	56.5	54.7	57.5	59.6
03/11/2020 01:13	56.6	55.0	58.0	60.1
03/11/2020 01:14	56.0	53.9	57.7	59.8
03/11/2020 01:15	55.1	53.5	56.6	61.7
03/11/2020 01:16	65.1	55.7	60.4	82.9

Daytime

Table AH7-8: Noise Survey Results – STMP4 (Willen Road) – Daytime

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
03/11/2020 11:15	76.9	64.2	81.0	88.8
03/11/2020 11:30	77.0	63.9	81.3	88.3
03/11/2020 11:45	76.7	64.2	81.0	91.1
03/11/2020 12:00	77.3	63.8	81.6	88.1
03/11/2020 12:15	77.3	64.0	81.8	89.9
03/11/2020 12:30	77.5	63.4	81.8	89.2
03/11/2020 12:45	77.3	63.3	81.8	87.7
03/11/2020 13:00	76.9	62.5	81.2	87.5
03/11/2020 13:15	77.5	63.1	81.8	90.1
03/11/2020 13:30	77.0	63.2	81.3	100.1
03/11/2020 13:45	77.6	63.2	81.7	89.0
03/11/2020 14:00	77.2	62.8	81.5	88.7

Appendix H8
Unattended Noise Survey Results

H8.0 Unattended Noise Survey Results

LTMP1

Table AH8-1: Noise Survey Results – LTMP1 – 1-hour Noise Levels

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
02/11/2020 14:00	79.7	74.6	82.3	88.3
02/11/2020 15:00	79.7	74.2	82.3	87.3
02/11/2020 16:00	79.3	73.9	82.0	86.2
02/11/2020 17:00	78.9	73.7	81.5	85.5
02/11/2020 18:00	78.5	72.5	81.3	86.1
02/11/2020 19:00	77.7	70.0	81.0	85.0
02/11/2020 20:00	77.5	69.5	81.0	85.8
02/11/2020 21:00	76.7	68.0	80.7	84.8
02/11/2020 22:00	74.3	64.3	78.6	85.6
02/11/2020 23:00	75.6	64.5	80.2	84.6
03/11/2020 00:00	74.4	61.3	79.6	84.5
03/11/2020 01:00	74.9	61.5	80.1	85.3
03/11/2020 02:00	74.7	60.9	80.2	87.0
03/11/2020 03:00	74.9	61.1	80.1	85.2
03/11/2020 04:00	73.8	61.2	78.9	84.1
03/11/2020 05:00	80.7	68.3	84.8	88.7
03/11/2020 06:00	82.9	78.8	85.1	88.2
03/11/2020 07:00	82.3	78.4	84.4	87.8
03/11/2020 08:00	81.7	76.5	84.1	87.5
03/11/2020 09:00	81.6	76.3	84.1	89.4
03/11/2020 10:00	81.5	76.5	83.8	87.7
03/11/2020 11:00	81.2	76.1	83.6	87.2
03/11/2020 12:00	80.7	75.2	83.1	90.1
03/11/2020 13:00	80.4	75.0	82.9	87.0
03/11/2020 14:00	76.5	69.1	80.9	86.2
03/11/2020 15:00	79.7	73.7	82.3	86.6
03/11/2020 16:00	79.2	72.4	81.9	85.9
03/11/2020 17:00	79.0	73.0	81.7	85.2
03/11/2020 18:00	78.9	72.8	81.7	89.7
03/11/2020 19:00	78.2	70.8	81.4	84.9
03/11/2020 20:00	77.8	70.0	81.3	85.5
03/11/2020 21:00	77.3	68.3	81.1	86.3
03/11/2020 22:00	76.5	64.7	80.7	84.6
03/11/2020 23:00	75.8	60.1	80.5	84.9
04/11/2020 00:00	75.4	58.6	80.5	84.8
04/11/2020 01:00	75.6	59.1	80.7	85.5
04/11/2020 02:00	76.2	60.5	81.2	85.4
04/11/2020 03:00	76.3	60.9	81.3	86.7

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
04/11/2020 04:00	77.7	65.5	81.8	85.9
04/11/2020 05:00	79.2	70.4	82.5	86.3
04/11/2020 06:00	80.1	74.5	82.6	87.3
04/11/2020 07:00	79.6	74.4	82.0	85.6
04/11/2020 08:00	79.9	75.4	82.1	89.2
04/11/2020 09:00	79.6	74.3	82.1	87.4
04/11/2020 10:00	79.1	73.0	81.9	85.2
04/11/2020 11:00	79.2	73.3	81.8	86.0
04/11/2020 12:00	79.2	73.0	81.8	85.4
04/11/2020 13:00	79.1	73.4	81.7	88.7
04/11/2020 14:00	79.0	73.0	81.7	85.8
04/11/2020 15:00	79.0	73.9	81.6	87.9
04/11/2020 16:00	78.8	74.0	81.3	87.5
04/11/2020 17:00	78.8	74.0	81.3	87.5
04/11/2020 18:00	78.2	72.7	81.0	84.5
04/11/2020 19:00	78.0	70.2	81.2	85.7
04/11/2020 20:00	77.6	68.1	81.1	86.5
04/11/2020 21:00	77.3	68.7	80.8	87.5
04/11/2020 22:00	76.4	63.5	80.5	85.7
04/11/2020 23:00	75.7	62.0	80.2	85.5
05/11/2020 00:00	75.2	59.1	80.2	85.7
05/11/2020 01:00	75.3	58.3	80.6	85.0
05/11/2020 02:00	76.2	59.6	81.2	85.7
05/11/2020 03:00	76.0	59.7	81.1	85.4
05/11/2020 04:00	77.5	63.4	81.7	90.0
05/11/2020 05:00	79.1	70.5	82.3	85.7
05/11/2020 06:00	79.9	74.6	82.4	86.0
05/11/2020 07:00	80.3	76.2	82.4	92.8
05/11/2020 08:00	79.8	74.3	82.2	86.3
05/11/2020 09:00	79.5	73.4	82.2	86.0
05/11/2020 10:00	79.1	72.3	81.9	87.5
05/11/2020 11:00	78.9	71.6	81.9	87.5
05/11/2020 12:00	78.8	72.0	81.8	85.5
05/11/2020 13:00	78.8	72.0	81.7	86.2
05/11/2020 14:00	78.8	71.7	81.7	86.6
05/11/2020 15:00	78.3	70.9	81.4	87.1
05/11/2020 16:00	78.2	71.2	81.2	85.8
05/11/2020 17:00	78.1	71.5	81.1	91.7
05/11/2020 18:00	77.6	69.7	80.9	84.6
05/11/2020 19:00	77.1	69.1	80.8	84.7
05/11/2020 20:00	76.6	67.9	80.6	84.9
05/11/2020 21:00	76.3	63.9	80.5	85.7
05/11/2020 22:00	75.3	59.2	80.1	84.7
05/11/2020 23:00	74.8	58.0	80.1	85.8

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
06/11/2020 00:00	75.1	57.3	80.4	98.1
06/11/2020 01:00	74.7	57.1	80.1	85.1
06/11/2020 02:00	75.5	57.6	80.6	84.9
06/11/2020 03:00	75.7	58.1	80.8	85.3
06/11/2020 04:00	76.7	59.7	81.4	85.8
06/11/2020 05:00	78.6	68.9	82.1	86.7
06/11/2020 06:00	79.5	73.1	82.1	95.6
06/11/2020 07:00	79.8	75.3	82.1	86.3
06/11/2020 08:00	79.3	72.9	82.0	86.3
06/11/2020 09:00	78.4	71.2	81.6	91.1
06/11/2020 10:00	78.3	70.5	81.5	88.1
06/11/2020 11:00	78.4	71.0	81.4	88.9
06/11/2020 12:00	78.2	70.7	81.4	84.8
06/11/2020 13:00	78.3	71.2	81.3	86.5
06/11/2020 14:00	78.4	71.6	81.4	86.1
06/11/2020 15:00	78.1	70.7	81.1	87.3
06/11/2020 16:00	77.8	70.7	80.9	85.8
06/11/2020 17:00	77.4	70.1	80.4	84.8
06/11/2020 18:00	77.2	69.4	80.5	84.5
06/11/2020 19:00	76.8	68.2	80.4	84.6
06/11/2020 20:00	76.6	67.9	80.4	92.5
06/11/2020 21:00	75.5	64.9	79.9	84.1
06/11/2020 22:00	74.7	57.5	79.6	83.8
06/11/2020 23:00	74.1	57.1	79.2	84.4
07/11/2020 00:00	74.2	54.5	79.7	85.5
07/11/2020 01:00	74.2	54.9	79.8	85.0
07/11/2020 02:00	75.0	57.6	80.2	86.1
07/11/2020 03:00	74.8	56.2	80.3	84.8
07/11/2020 04:00	75.9	60.2	80.8	85.5
07/11/2020 05:00	76.3	63.5	81.0	87.5
07/11/2020 06:00	76.4	66.1	80.5	86.2
07/11/2020 07:00	76.7	66.6	80.6	86.0
07/11/2020 08:00	76.8	67.6	80.6	86.1
07/11/2020 09:00	76.4	66.4	80.3	84.9
07/11/2020 10:00	76.2	66.7	80.0	84.7
07/11/2020 11:00	75.9	66.1	79.5	84.7
07/11/2020 12:00	75.8	66.5	79.4	84.3
07/11/2020 13:00	75.8	66.5	79.2	83.8
07/11/2020 14:00	75.7	66.1	79.2	94.3
07/11/2020 15:00	75.7	66.3	79.1	84.4
07/11/2020 16:00	75.5	66.5	78.9	85.0
07/11/2020 17:00	75.3	65.8	78.7	87.4
07/11/2020 18:00	74.8	64.2	78.6	84.3
07/11/2020 19:00	74.0	63.1	77.9	83.9

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
07/11/2020 20:00	73.9	63.2	77.7	84.1
07/11/2020 21:00	73.0	60.3	77.3	86.3
07/11/2020 22:00	72.3	57.3	76.8	84.9
07/11/2020 23:00	71.6	55.6	76.3	84.4
08/11/2020 00:00	70.4	53.8	75.3	83.5
08/11/2020 01:00	70.6	49.2	75.9	84.1
08/11/2020 02:00	70.1	49.8	75.2	83.3
08/11/2020 03:00	70.3	49.6	75.5	84.3
08/11/2020 04:00	71.7	54.1	77.0	84.2
08/11/2020 05:00	72.4	56.3	77.2	84.1
08/11/2020 06:00	73.3	59.4	77.7	84.4
08/11/2020 07:00	73.8	61.4	78.1	84.1
08/11/2020 08:00	73.9	61.4	78.3	84.7
08/11/2020 09:00	74.1	62.2	78.3	85.4
08/11/2020 10:00	74.9	64.6	78.7	85.4
08/11/2020 11:00	75.7	66.1	79.5	85.2
08/11/2020 12:00	75.7	66.7	79.4	85.1
08/11/2020 13:00	75.9	66.8	79.3	84.2
08/11/2020 14:00	76.1	67.7	79.6	84.4
08/11/2020 15:00	76.1	67.7	79.5	84.5
08/11/2020 16:00	76.4	67.8	79.7	94.7
08/11/2020 17:00	76.1	67.5	79.4	84.3
08/11/2020 18:00	75.8	66.9	79.1	84.8
08/11/2020 19:00	75.8	67.0	79.0	84.8
08/11/2020 20:00	77.4	67.9	81.1	86.2
08/11/2020 21:00	77.4	67.5	81.4	86.4
08/11/2020 22:00	77.4	66.8	81.9	87.4
08/11/2020 23:00	76.2	63.0	81.2	86.7
09/11/2020 00:00	75.6	62.0	80.9	86.2
09/11/2020 01:00	75.4	60.5	80.8	87.1
09/11/2020 02:00	75.6	59.9	81.1	87.5
09/11/2020 03:00	76.8	62.9	82.2	87.6
09/11/2020 04:00	78.0	66.6	82.6	87.0
09/11/2020 05:00	80.4	72.7	83.6	88.6
09/11/2020 06:00	81.5	77.2	83.7	87.8
09/11/2020 07:00	81.5	78.3	83.4	87.7
09/11/2020 08:00	80.3	74.7	82.9	86.5
09/11/2020 09:00	80.4	75.5	82.9	86.3
09/11/2020 10:00	80.0	73.7	82.7	87.4
09/11/2020 11:00	79.8	73.5	82.5	86.8
09/11/2020 12:00	79.8	73.5	82.4	87.4
09/11/2020 13:00	79.6	73.6	82.4	87.0
09/11/2020 14:00	79.2	72.7	82.1	86.0
09/11/2020 15:00	79.0	72.3	81.9	87.2

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
09/11/2020 16:00	78.8	72.1	81.6	87.4
09/11/2020 17:00	78.7	72.1	81.6	86.5
09/11/2020 18:00	78.4	71.5	81.4	85.2
09/11/2020 19:00	77.7	69.7	81.3	86.0
09/11/2020 20:00	77.2	68.6	81.1	85.2
09/11/2020 21:00	76.5	67.1	80.6	85.3
09/11/2020 22:00	75.9	65.2	80.2	85.8
09/11/2020 23:00	75.5	63.4	80.2	85.5
10/11/2020 00:00	74.2	63.6	78.6	92.8
10/11/2020 01:00	71.9	63.2	75.5	92.0
10/11/2020 02:00	71.0	62.3	75.1	83.7
10/11/2020 03:00	71.4	63.5	75.5	80.2
10/11/2020 04:00	72.5	66.1	76.0	80.6
10/11/2020 05:00	74.2	69.7	76.9	81.1
10/11/2020 06:00	75.8	72.8	77.6	81.3
10/11/2020 07:00	75.6	73.0	77.4	80.7
10/11/2020 08:00	75.4	72.4	77.4	83.0
10/11/2020 09:00	74.8	71.5	76.9	81.4
10/11/2020 10:00	74.4	70.7	76.8	80.4

LTMP2

Table AH8-2: Noise Survey Results – LTMP2 – 1-hour Noise Levels

	Noise level (dB)			
Period start	**$L_{Aeq,15min}$**	**$L_{A90,15min}$**	**$L_{A10,15min}$**	**$L_{Amax,15min}$**
02/11/2020 13:00	69.0	58.7	73.2	81.9
02/11/2020 14:00	69.1	59.1	73.0	91.6
02/11/2020 15:00	69.0	59.7	73.2	83.0
02/11/2020 16:00	69.6	61.8	73.5	81.6
02/11/2020 17:00	69.0	61.1	73.0	83.2
02/11/2020 18:00	67.6	56.6	71.9	84.4
02/11/2020 19:00	66.0	53.0	70.5	85.1
02/11/2020 20:00	64.1	50.6	67.4	81.2
02/11/2020 21:00	63.6	49.4	66.3	88.4
02/11/2020 22:00	61.9	46.9	63.9	87.5
02/11/2020 23:00	58.8	46.1	60.7	81.4
03/11/2020 00:00	56.2	44.8	57.8	79.5
03/11/2020 01:00	56.3	46.1	55.6	79.8
03/11/2020 02:00	55.9	46.1	54.0	78.0
03/11/2020 03:00	57.2	45.7	56.1	79.5
03/11/2020 04:00	59.6	44.4	58.9	80.9
03/11/2020 05:00	69.0	48.4	74.3	83.1
03/11/2020 06:00	71.1	56.2	76.1	82.6
03/11/2020 07:00	73.7	64.0	77.2	85.1
03/11/2020 08:00	73.6	63.2	77.3	83.9
03/11/2020 09:00	72.7	61.9	76.5	85.4
03/11/2020 10:00	71.3	59.1	75.7	85.2
03/11/2020 11:00	70.5	58.9	74.9	83.2
03/11/2020 12:00	70.1	59.9	74.4	88.5
03/11/2020 13:00	69.0	58.3	73.3	81.7
03/11/2020 14:00	68.9	59.2	73.1	83.8
03/11/2020 15:00	69.1	59.5	73.1	84.7
03/11/2020 16:00	69.8	61.2	73.7	87.7
03/11/2020 17:00	69.2	61.0	73.2	81.6
03/11/2020 18:00	68.4	58.4	72.7	89.7
03/11/2020 19:00	66.8	55.1	71.5	85.5
03/11/2020 20:00	64.7	52.6	68.7	79.9
03/11/2020 21:00	64.3	51.4	67.4	85.9
03/11/2020 22:00	63.7	49.7	66.2	86.8
03/11/2020 23:00	61.2	46.8	63.5	79.0
04/11/2020 00:00	58.5	44.4	60.0	81.8
04/11/2020 01:00	58.0	44.2	59.6	80.4
04/11/2020 02:00	57.5	43.6	59.3	82.3
04/11/2020 03:00	58.8	43.1	60.2	80.6
04/11/2020 04:00	60.5	45.1	60.3	79.8
04/11/2020 05:00	65.8	48.9	71.2	82.9

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
04/11/2020 06:00	68.9	53.8	73.7	85.7
04/11/2020 07:00	71.5	61.8	74.9	87.4
04/11/2020 08:00	71.1	60.4	74.8	83.3
04/11/2020 09:00	70.0	58.2	74.0	82.0
04/11/2020 10:00	68.0	55.2	72.5	80.6
04/11/2020 11:00	68.0	54.7	72.4	85.3
04/11/2020 12:00	67.9	55.4	72.4	84.0
04/11/2020 13:00	68.1	57.2	72.4	84.8
04/11/2020 14:00	68.4	58.2	72.5	87.5
04/11/2020 15:00	68.9	58.5	72.9	91.2
04/11/2020 16:00	69.5	60.8	73.4	85.0
04/11/2020 17:00	69.5	61.3	73.3	86.7
04/11/2020 18:00	68.5	58.3	73.0	83.1
04/11/2020 19:00	67.5	56.1	72.3	84.9
04/11/2020 20:00	66.7	52.1	71.6	87.1
04/11/2020 21:00	65.3	52.4	69.6	86.6
04/11/2020 22:00	64.5	52.3	67.5	86.1
04/11/2020 23:00	61.6	48.0	64.2	78.9
05/11/2020 00:00	59.1	43.4	61.3	81.1
05/11/2020 01:00	57.4	42.4	58.4	79.6
05/11/2020 02:00	56.8	43.8	57.7	79.2
05/11/2020 03:00	58.5	43.6	58.9	79.2
05/11/2020 04:00	60.8	43.1	61.0	82.2
05/11/2020 05:00	64.8	46.4	69.9	79.9
05/11/2020 06:00	68.4	52.8	73.4	86.7
05/11/2020 07:00	70.4	58.6	74.3	85.0
05/11/2020 08:00	69.4	56.9	73.9	83.1
05/11/2020 09:00	67.7	52.1	72.6	85.3
05/11/2020 10:00	66.0	49.9	71.3	81.7
05/11/2020 11:00	66.5	50.7	71.5	83.0
05/11/2020 12:00	66.2	50.4	70.9	83.0
05/11/2020 13:00	66.1	50.9	71.1	82.4
05/11/2020 14:00	66.7	53.6	71.4	83.5
05/11/2020 15:00	67.0	54.5	71.7	83.9
05/11/2020 16:00	68.1	58.0	72.5	84.4
05/11/2020 17:00	67.9	57.8	72.3	80.2
05/11/2020 18:00	66.2	54.4	70.8	83.9
05/11/2020 19:00	64.4	50.6	68.1	87.4
05/11/2020 20:00	62.1	48.5	63.6	81.5
05/11/2020 21:00	62.4	47.9	64.8	79.5
05/11/2020 22:00	61.4	46.5	63.1	88.0
05/11/2020 23:00	58.8	45.6	61.0	80.0
06/11/2020 00:00	55.4	44.1	57.8	75.9
06/11/2020 01:00	56.7	44.7	57.3	78.6

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
06/11/2020 02:00	58.1	43.8	58.4	81.0
06/11/2020 03:00	58.4	46.1	58.5	79.5
06/11/2020 04:00	59.8	46.6	60.0	81.2
06/11/2020 05:00	65.6	49.6	70.8	81.3
06/11/2020 06:00	68.2	53.1	73.3	86.3
06/11/2020 07:00	70.0	58.4	73.9	84.5
06/11/2020 08:00	69.4	57.0	73.8	83.7
06/11/2020 09:00	68.4	54.1	73.3	82.9
06/11/2020 10:00	67.2	53.9	72.2	84.4
06/11/2020 11:00	66.9	52.6	71.9	82.1
06/11/2020 12:00	67.2	52.8	72.3	80.3
06/11/2020 13:00	67.4	52.3	72.2	85.6
06/11/2020 14:00	67.6	53.7	72.4	84.4
06/11/2020 15:00	67.9	55.5	72.2	93.4
06/11/2020 16:00	68.2	57.9	72.9	81.0
06/11/2020 17:00	67.7	57.6	72.2	86.0
06/11/2020 18:00	66.1	53.3	71.1	80.3
06/11/2020 19:00	63.9	49.4	67.8	80.2
06/11/2020 20:00	62.4	48.2	65.0	79.7
06/11/2020 21:00	62.3	48.1	64.5	80.7
06/11/2020 22:00	61.4	47.9	62.6	86.7
06/11/2020 23:00	57.7	45.2	60.1	81.2
07/11/2020 00:00	56.8	44.9	58.5	80.8
07/11/2020 01:00	57.6	44.9	58.2	81.4
07/11/2020 02:00	56.4	44.8	56.7	80.6
07/11/2020 03:00	56.3	44.6	56.4	81.2
07/11/2020 04:00	57.2	45.9	56.5	80.3
07/11/2020 05:00	62.2	47.4	64.3	82.1
07/11/2020 06:00	63.2	47.8	65.8	80.1
07/11/2020 07:00	65.2	50.7	69.8	81.8
07/11/2020 08:00	65.7	50.2	70.5	84.2
07/11/2020 09:00	65.7	49.8	70.9	80.3
07/11/2020 10:00	65.6	48.7	70.9	80.1
07/11/2020 11:00	66.3	50.1	71.2	88.7
07/11/2020 12:00	67.0	51.3	72.0	91.6
07/11/2020 13:00	66.9	51.4	71.9	86.0
07/11/2020 14:00	66.2	50.4	71.2	84.3
07/11/2020 15:00	66.8	51.3	71.3	88.0
07/11/2020 16:00	66.0	51.9	70.7	94.4
07/11/2020 17:00	66.1	51.8	70.3	96.2
07/11/2020 18:00	63.6	48.2	66.8	83.3
07/11/2020 19:00	62.5	46.4	64.9	79.4
07/11/2020 20:00	61.5	43.5	63.2	80.2
07/11/2020 21:00	60.3	41.1	60.8	86.4

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
07/11/2020 22:00	58.3	38.7	58.8	77.9
07/11/2020 23:00	56.2	37.0	57.0	77.5
08/11/2020 00:00	55.3	37.7	54.7	79.7
08/11/2020 01:00	53.2	37.0	51.2	76.6
08/11/2020 02:00	51.9	37.9	48.4	77.7
08/11/2020 03:00	50.2	40.5	47.6	73.7
08/11/2020 04:00	54.4	39.8	51.3	78.2
08/11/2020 05:00	60.3	40.4	60.7	80.6
08/11/2020 06:00	61.3	43.5	62.7	79.3
08/11/2020 07:00	61.8	42.7	62.9	80.3
08/11/2020 08:00	61.6	41.5	63.1	78.9
08/11/2020 09:00	63.7	43.2	67.0	80.3
08/11/2020 10:00	65.5	45.3	70.8	83.9
08/11/2020 11:00	65.9	46.9	71.4	80.3
08/11/2020 12:00	66.0	49.0	71.5	81.2
08/11/2020 13:00	65.9	48.1	71.1	94.1
08/11/2020 14:00	65.7	49.5	70.9	81.4
08/11/2020 15:00	65.7	50.1	70.6	81.7
08/11/2020 16:00	65.1	49.0	69.9	83.2
08/11/2020 17:00	64.6	48.6	69.0	90.3
08/11/2020 18:00	63.2	47.5	67.2	81.9
08/11/2020 19:00	63.0	46.5	66.1	84.8
08/11/2020 20:00	64.3	46.7	67.1	82.2
08/11/2020 21:00	63.5	45.4	65.3	83.5
08/11/2020 22:00	61.8	43.6	63.1	81.0
08/11/2020 23:00	57.8	40.9	58.3	81.1
09/11/2020 00:00	57.4	40.6	55.3	83.0
09/11/2020 01:00	56.2	40.2	53.9	81.2
09/11/2020 02:00	57.9	39.4	54.7	82.8
09/11/2020 03:00	57.5	41.1	56.4	79.9
09/11/2020 04:00	61.3	44.3	60.8	80.8
09/11/2020 05:00	67.6	48.9	72.9	81.7
09/11/2020 06:00	70.4	55.7	75.2	85.1
09/11/2020 07:00	72.8	61.7	76.6	86.3
09/11/2020 08:00	72.0	60.1	76.2	84.5
09/11/2020 09:00	70.3	56.9	75.1	85.3
09/11/2020 10:00	69.1	53.0	74.0	83.5
09/11/2020 11:00	68.6	53.4	73.6	84.0
09/11/2020 12:00	68.4	52.5	73.7	85.4
09/11/2020 13:00	69.1	55.8	73.7	84.2
09/11/2020 14:00	68.8	54.6	73.8	83.5
09/11/2020 15:00	69.4	58.1	74.2	84.2
09/11/2020 16:00	69.8	59.0	74.5	84.3
09/11/2020 17:00	69.3	58.2	74.1	81.6

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
09/11/2020 18:00	67.8	54.8	72.7	82.1
09/11/2020 19:00	65.9	49.5	69.6	89.2
09/11/2020 20:00	63.5	46.5	65.6	82.2
09/11/2020 21:00	62.8	45.1	64.7	80.9
09/11/2020 22:00	62.2	44.1	62.9	87.0
09/11/2020 23:00	58.3	41.6	58.1	82.8
10/11/2020 00:00	55.8	41.6	56.1	79.7
10/11/2020 01:00	56.0	42.7	55.5	79.3
10/11/2020 02:00	56.6	42.7	55.6	80.5
10/11/2020 03:00	58.8	43.4	58.5	81.0
10/11/2020 04:00	61.7	45.4	61.7	82.6
10/11/2020 05:00	67.2	48.8	72.4	82.1
10/11/2020 06:00	70.8	55.8	75.6	85.3
10/11/2020 07:00	73.1	63.5	76.8	83.8
10/11/2020 08:00	72.2	60.7	76.3	82.8
10/11/2020 09:00	70.6	57.5	75.1	86.3

LTMP3

Table AH8-3: Noise Survey Results – LTMP3 – 1-hour Noise Levels

	Noise level (dB)			
Period start	**$L_{Aeq,15min}$**	**$L_{A90,15min}$**	**$L_{A10,15min}$**	**$L_{Amax,15min}$**
02/11/2020 12:00	59.6	56.4	61.7	72.1
02/11/2020 13:00	61.1	57.3	63.4	73.5
02/11/2020 14:00	62.3	57.6	65.0	73.9
02/11/2020 15:00	60.2	57.1	61.9	73.4
02/11/2020 16:00	60.6	57.8	62.4	73.9
02/11/2020 17:00	60.2	57.3	62.1	73.8
02/11/2020 18:00	57.9	55.8	59.3	77.6
02/11/2020 19:00	56.1	53.7	57.6	73.3
02/11/2020 20:00	55.3	53.0	57.0	69.1
02/11/2020 21:00	53.7	51.8	55.2	61.3
02/11/2020 22:00	52.3	50.1	54.0	62.7
02/11/2020 23:00	52.2	50.5	53.4	59.6
03/11/2020 00:00	50.7	48.6	52.3	59.3
03/11/2020 01:00	51.2	48.8	52.9	57.6
03/11/2020 02:00	50.5	48.2	52.1	59.3
03/11/2020 03:00	50.0	47.0	52.2	58.6
03/11/2020 04:00	51.0	46.2	53.9	62.1
03/11/2020 05:00	55.1	51.1	56.8	70.5
03/11/2020 06:00	58.3	55.7	60.0	71.4
03/11/2020 07:00	59.8	55.4	59.2	84.9
03/11/2020 08:00	61.4	57.8	63.4	70.5
03/11/2020 09:00	58.7	55.2	60.8	72.1
03/11/2020 10:00	56.7	54.4	58.2	65.4
03/11/2020 11:00	57.6	55.5	59.0	70.8
03/11/2020 12:00	57.3	55.2	58.8	71.6
03/11/2020 13:00	58.2	55.4	60.0	69.2
03/11/2020 14:00	58.3	55.6	60.2	76.6
03/11/2020 15:00	58.5	55.9	60.3	71.1
03/11/2020 16:00	58.9	56.8	60.1	69.3
03/11/2020 17:00	58.5	56.9	59.5	72.9
03/11/2020 18:00	58.1	55.8	59.4	71.6
03/11/2020 19:00	56.5	54.5	57.9	71.2
03/11/2020 20:00	55.8	54.1	57.0	63.1
03/11/2020 21:00	55.5	53.6	56.9	62.0
03/11/2020 22:00	54.0	51.3	55.8	61.9
03/11/2020 23:00	53.2	49.4	55.5	63.4
04/11/2020 00:00	52.1	48.0	54.6	61.6
04/11/2020 01:00	53.0	48.1	55.9	63.5
04/11/2020 02:00	53.1	48.3	56.0	63.9
04/11/2020 03:00	52.5	47.9	55.3	63.1
04/11/2020 04:00	54.1	51.1	56.0	66.7

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
04/11/2020 05:00	57.6	54.1	59.6	70.6
04/11/2020 06:00	59.9	57.2	61.5	68.0
04/11/2020 07:00	61.7	60.0	62.7	69.4
04/11/2020 08:00	58.4	55.1	60.4	71.3
04/11/2020 09:00	54.8	52.6	56.2	69.8
04/11/2020 10:00	53.8	51.5	55.5	65.0
04/11/2020 11:00	54.9	52.0	56.4	73.5
04/11/2020 12:00	55.9	52.4	57.7	75.4
04/11/2020 13:00	56.2	52.6	58.1	70.7
04/11/2020 14:00	57.8	54.5	59.7	69.7
04/11/2020 15:00	57.6	54.8	59.0	77.2
04/11/2020 16:00	58.3	55.9	59.7	80.0
04/11/2020 17:00	59.6	57.5	61.2	72.9
04/11/2020 18:00	59.6	56.9	60.5	81.7
04/11/2020 19:00	58.4	55.6	59.9	72.9
04/11/2020 20:00	58.4	55.3	59.5	80.0
04/11/2020 21:00	57.6	55.3	59.0	76.5
04/11/2020 22:00	57.6	55.1	59.1	72.4
04/11/2020 23:00	56.8	52.5	59.2	73.2
05/11/2020 00:00	53.2	47.9	55.9	67.8
05/11/2020 01:00	52.1	46.7	55.0	67.3
05/11/2020 02:00	52.1	48.5	54.3	62.4
05/11/2020 03:00	52.3	47.2	54.9	64.4
05/11/2020 04:00	49.1	46.2	51.1	57.0
05/11/2020 05:00	51.9	49.0	53.9	57.5
05/11/2020 06:00	56.2	54.0	57.2	76.6
05/11/2020 07:00	58.0	55.2	58.1	76.7
05/11/2020 08:00	54.6	52.8	55.8	66.3
05/11/2020 09:00	51.8	49.8	53.0	78.2
05/11/2020 10:00	50.5	48.4	51.7	63.1
05/11/2020 11:00	51.0	47.7	52.4	72.2
05/11/2020 12:00	51.6	48.6	53.4	68.6
05/11/2020 13:00	51.9	48.8	53.7	67.8
05/11/2020 14:00	53.8	50.5	55.8	63.3
05/11/2020 15:00	55.3	52.8	57.0	63.5
05/11/2020 16:00	57.6	53.9	59.6	74.1
05/11/2020 17:00	57.9	55.7	59.3	73.6
05/11/2020 18:00	57.7	54.9	58.7	77.2
05/11/2020 19:00	57.5	53.9	58.6	78.3
05/11/2020 20:00	55.2	52.5	56.9	75.6
05/11/2020 21:00	55.2	52.6	56.9	66.1
05/11/2020 22:00	54.8	49.6	57.0	64.5
05/11/2020 23:00	52.0	47.4	54.7	60.8
06/11/2020 00:00	50.3	45.7	53.2	60.4

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
06/11/2020 01:00	50.5	46.2	53.1	61.6
06/11/2020 02:00	52.6	47.2	55.8	62.0
06/11/2020 03:00	53.3	48.6	56.0	62.3
06/11/2020 04:00	53.6	50.1	55.8	60.9
06/11/2020 05:00	57.1	53.3	59.5	65.9
06/11/2020 06:00	58.6	56.4	59.8	73.0
06/11/2020 07:00	59.1	57.0	60.4	74.1
06/11/2020 08:00	57.9	56.2	59.0	71.4
06/11/2020 09:00	56.0	54.3	57.1	68.7
06/11/2020 10:00	58.2	55.4	60.1	72.3
06/11/2020 11:00	56.7	53.9	58.4	76.4
06/11/2020 12:00	58.0	54.8	59.5	81.1
06/11/2020 13:00	57.6	55.0	59.3	74.3
06/11/2020 14:00	58.3	55.6	59.7	77.4
06/11/2020 15:00	57.9	55.6	59.4	71.3
06/11/2020 16:00	60.4	57.9	62.0	76.4
06/11/2020 17:00	60.7	58.3	62.1	79.4
06/11/2020 18:00	58.4	54.7	60.8	76.9
06/11/2020 19:00	55.7	52.8	57.4	67.0
06/11/2020 20:00	55.4	51.3	57.8	66.3
06/11/2020 21:00	53.8	50.3	56.0	68.2
06/11/2020 22:00	54.8	51.3	57.0	70.8
06/11/2020 23:00	52.3	47.4	55.3	69.7
07/11/2020 00:00	51.1	46.0	53.8	61.0
07/11/2020 01:00	51.8	46.3	54.7	66.2
07/11/2020 02:00	51.3	46.8	54.1	61.8
07/11/2020 03:00	51.9	46.5	55.0	61.4
07/11/2020 04:00	51.7	48.1	53.9	66.8
07/11/2020 05:00	53.8	50.3	56.2	63.0
07/11/2020 06:00	56.0	52.8	57.6	72.1
07/11/2020 07:00	56.8	53.4	59.0	77.3
07/11/2020 08:00	55.3	52.0	57.1	63.7
07/11/2020 09:00	52.2	50.1	53.4	73.8
07/11/2020 10:00	51.6	48.9	53.2	73.6
07/11/2020 11:00	53.2	50.5	55.0	65.9
07/11/2020 12:00	58.4	52.0	58.0	85.5
07/11/2020 13:00	56.5	51.8	58.4	73.8
07/11/2020 14:00	55.7	52.2	57.6	72.3
07/11/2020 15:00	55.7	52.1	57.6	69.5
07/11/2020 16:00	56.9	53.2	58.0	85.5
07/11/2020 17:00	57.3	53.1	57.1	90.6
07/11/2020 18:00	56.4	52.0	57.8	80.2
07/11/2020 19:00	55.6	50.9	58.0	76.8
07/11/2020 20:00	53.2	48.2	55.8	68.6

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
07/11/2020 21:00	51.4	45.8	54.3	64.5
07/11/2020 22:00	49.3	42.4	52.3	64.9
07/11/2020 23:00	46.6	38.9	50.2	60.0
08/11/2020 00:00	46.2	38.1	49.9	60.8
08/11/2020 01:00	45.6	37.2	49.0	67.9
08/11/2020 02:00	42.5	37.1	45.7	58.3
08/11/2020 03:00	43.9	38.3	46.9	58.2
08/11/2020 04:00	46.9	38.8	50.5	61.8
08/11/2020 05:00	50.2	43.1	53.4	61.8
08/11/2020 06:00	51.9	46.2	54.5	70.1
08/11/2020 07:00	51.2	46.4	54.0	62.7
08/11/2020 08:00	48.8	44.3	51.5	61.7
08/11/2020 09:00	52.3	48.2	54.6	65.8
08/11/2020 10:00	52.6	49.1	54.4	70.7
08/11/2020 11:00	51.4	47.4	53.2	67.8
08/11/2020 12:00	50.1	46.6	51.7	68.8
08/11/2020 13:00	48.5	45.6	50.1	64.3
08/11/2020 14:00	51.2	48.4	52.7	74.0
08/11/2020 15:00	53.1	50.0	54.2	79.2
08/11/2020 16:00	54.6	51.0	56.1	75.7
08/11/2020 17:00	54.4	51.5	56.2	62.9
08/11/2020 18:00	53.2	49.9	54.9	72.7
08/11/2020 19:00	52.2	49.5	53.9	61.4
08/11/2020 20:00	50.9	49.1	52.2	59.0
08/11/2020 21:00	50.9	49.0	52.1	69.7
08/11/2020 22:00	49.3	46.8	50.7	69.5
08/11/2020 23:00	48.2	44.6	50.5	60.6
09/11/2020 00:00	47.9	44.0	50.4	59.2
09/11/2020 01:00	48.5	42.8	51.6	62.0
09/11/2020 02:00	47.3	42.6	50.2	60.6
09/11/2020 03:00	48.5	44.9	50.8	56.6
09/11/2020 04:00	50.9	47.0	53.3	59.8
09/11/2020 05:00	56.0	52.4	58.1	62.3
09/11/2020 06:00	57.7	55.0	59.2	74.6
09/11/2020 07:00	59.8	57.7	61.1	73.2
09/11/2020 08:00	60.8	57.3	61.2	84.7
09/11/2020 09:00	58.0	54.8	58.7	76.3
09/11/2020 10:00	55.3	52.4	56.8	76.3
09/11/2020 11:00	54.4	51.9	56.0	64.9
09/11/2020 12:00	55.4	52.3	56.1	78.2
09/11/2020 13:00	54.9	52.7	56.4	64.8
09/11/2020 14:00	55.5	53.5	56.8	63.4
09/11/2020 15:00	57.2	54.8	58.5	69.6
09/11/2020 16:00	57.7	55.5	59.0	72.1

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
09/11/2020 17:00	57.4	55.2	58.8	62.9
09/11/2020 18:00	55.1	52.5	56.7	61.0

LTMP4

Table AH8-4: Noise Survey Results – LTMP4 – 15-minute Noise Levels

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
02/11/2020 11:30	74.7	65.5	77.7	84.5
02/11/2020 11:45	74.1	63.2	77.4	83.8
02/11/2020 12:00	74.6	65.1	78.0	83.2
02/11/2020 12:15	74.6	63.4	77.9	89.4
02/11/2020 12:30	74.1	62.5	77.4	83.9
02/11/2020 12:45	74.2	61.0	77.7	85.1
02/11/2020 13:00	75.1	62.9	78.4	84.1
02/11/2020 13:15	74.2	62.0	77.4	84.0
02/11/2020 13:30	75.4	64.9	78.7	84.4
02/11/2020 13:45	74.9	63.4	78.0	87.5
02/11/2020 14:00	74.5	61.4	77.8	83.2
02/11/2020 14:15	74.7	62.6	78.0	85.7
02/11/2020 14:30	75.2	64.5	78.5	84.2
02/11/2020 14:45	76.0	67.7	78.9	83.5
02/11/2020 15:00	75.4	65.0	79.0	83.5
02/11/2020 15:15	75.8	65.3	79.0	86.0
02/11/2020 15:30	75.2	65.4	78.3	84.2
02/11/2020 15:45	76.0	66.8	79.0	86.0
02/11/2020 16:00	76.1	69.3	78.6	83.8
02/11/2020 16:15	76.1	68.1	78.8	84.8
02/11/2020 16:30	76.0	68.6	78.4	84.2
02/11/2020 16:45	75.6	66.7	78.3	83.7
02/11/2020 17:00	75.7	66.3	78.6	85.6
02/11/2020 17:15	75.6	68.0	78.2	84.3
02/11/2020 17:30	75.5	68.2	78.2	85.5
02/11/2020 17:45	75.1	66.0	77.9	84.0
02/11/2020 18:00	74.7	65.4	77.9	83.0
02/11/2020 18:15	74.8	65.9	77.8	83.3
02/11/2020 18:30	74.6	64.1	77.9	83.8
02/11/2020 18:45	74.3	62.4	77.5	84.3
02/11/2020 19:00	73.6	61.4	77.4	82.8
02/11/2020 19:15	73.1	55.6	77.1	82.0
02/11/2020 19:30	73.0	58.9	76.9	83.8
02/11/2020 19:45	72.3	58.2	76.3	82.6
02/11/2020 20:00	72.1	55.6	76.1	91.5
02/11/2020 20:15	71.9	58.2	76.2	81.6
02/11/2020 20:30	71.2	56.1	75.6	82.0
02/11/2020 20:45	71.1	54.7	75.5	83.9
02/11/2020 21:00	70.7	54.6	75.4	84.4
02/11/2020 21:15	70.4	55.5	75.2	83.5
02/11/2020 21:30	70.5	54.6	75.0	84.4

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
02/11/2020 21:45	70.3	54.7	75.1	83.9
02/11/2020 22:00	70.1	52.7	75.0	82.8
02/11/2020 22:15	68.9	51.9	74.5	82.0
02/11/2020 22:30	66.6	50.2	71.7	82.2
02/11/2020 22:45	68.0	51.1	72.3	85.0
02/11/2020 23:00	66.1	50.6	70.4	84.6
02/11/2020 23:15	67.0	51.6	71.2	81.5
02/11/2020 23:30	67.5	51.8	70.8	84.5
02/11/2020 23:45	65.2	51.3	67.8	82.3
03/11/2020 00:00	66.1	50.6	68.3	83.7
03/11/2020 00:15	64.5	49.7	66.0	81.5
03/11/2020 00:30	64.0	49.2	64.7	83.2
03/11/2020 00:45	64.2	48.7	63.6	82.7
03/11/2020 01:00	61.3	47.8	56.8	81.7
03/11/2020 01:15	64.4	50.0	65.2	81.9
03/11/2020 01:30	64.6	50.5	62.4	83.1
03/11/2020 01:45	62.6	49.1	59.2	82.6
03/11/2020 02:00	63.3	48.1	57.4	82.3
03/11/2020 02:15	62.7	48.6	59.5	81.7
03/11/2020 02:30	63.2	48.8	59.2	84.0

LTMP6

Table AH8-5: Noise Survey Results – LTMP6 – 15-minute Noise Levels

	Noise level (dB)			
Period start	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
02/11/2020 16:45	68.5	55.9	67.5	93.6
02/11/2020 17:00	61.0	56.0	64.3	70.3
02/11/2020 17:15	59.7	55.9	62.0	74.0
02/11/2020 17:30	60.3	56.2	63.2	72.6
02/11/2020 17:45	59.4	56.3	62.0	70.2
02/11/2020 18:00	59.3	56.0	62.1	70.5
02/11/2020 18:15	60.8	56.5	63.6	71.9
02/11/2020 18:30	58.6	55.4	61.2	69.0
02/11/2020 18:45	57.3	54.5	59.4	68.9
02/11/2020 19:00	57.8	54.2	60.7	67.6
02/11/2020 19:15	56.9	54.5	58.8	65.7
02/11/2020 19:30	56.5	53.7	58.4	68.3
02/11/2020 19:45	56.3	53.6	58.4	66.8
02/11/2020 20:00	56.9	53.7	59.3	66.0
02/11/2020 20:15	54.6	52.5	56.6	63.9
02/11/2020 20:30	54.6	52.8	55.9	65.5
02/11/2020 20:45	54.0	52.5	55.3	62.0
02/11/2020 21:00	55.7	53.1	57.8	66.1
02/11/2020 21:15	56.0	53.4	57.9	67.5
02/11/2020 21:30	55.2	52.8	57.2	63.1
02/11/2020 21:45	54.5	51.7	56.7	62.1
02/11/2020 22:00	53.0	51.4	54.5	59.9
02/11/2020 22:15	52.7	51.4	54.0	57.9
02/11/2020 22:30	52.8	51.6	54.0	57.8
02/11/2020 22:45	51.6	50.6	52.7	56.3
02/11/2020 23:00	51.8	50.6	52.9	57.9
02/11/2020 23:15	51.0	49.1	52.7	55.3
02/11/2020 23:30	50.6	49.3	51.6	66.5
02/11/2020 23:45	50.9	49.6	52.1	56.9
03/11/2020 00:00	51.2	49.6	52.6	57.7
03/11/2020 00:15	51.2	49.9	52.3	56.7
03/11/2020 00:30	51.9	50.6	53.2	58.9
03/11/2020 00:45	51.3	49.7	52.6	56.6
03/11/2020 01:00	51.2	49.6	52.9	56.2
03/11/2020 01:15	50.1	48.6	51.4	58.3
03/11/2020 01:30	50.6	49.1	52.0	55.0
03/11/2020 01:45	50.3	48.9	51.6	55.8
03/11/2020 02:00	50.8	48.7	52.4	56.6
03/11/2020 02:15	52.0	50.8	53.1	58.1
03/11/2020 02:30	51.6	50.0	52.9	57.1
03/11/2020 02:45	50.6	49.0	51.9	58.7

Period start	Noise level (dB)			
	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{A10,15min}$	$L_{Amax,15min}$
03/11/2020 03:00	50.2	48.6	51.6	57.0
03/11/2020 03:15	51.4	50.0	52.7	56.8
03/11/2020 03:30	50.8	49.5	52.0	55.2
03/11/2020 03:45	50.6	48.9	52.1	56.8
03/11/2020 04:00	49.6	48.2	50.8	54.7
03/11/2020 04:15	49.5	48.1	50.6	55.5
03/11/2020 04:30	47.2	45.7	48.5	51.7
03/11/2020 04:45	46.8	44.8	48.7	52.5
03/11/2020 05:00	46.4	45.1	47.6	51.2
03/11/2020 05:15	44.8	43.4	46.2	52.2
03/11/2020 05:30	45.3	44.0	46.5	51.8
03/11/2020 05:45	44.3	42.6	45.8	49.4
03/11/2020 06:00	49.0	46.8	50.9	54.5
03/11/2020 06:15	52.6	50.2	54.2	57.7
03/11/2020 06:30	52.8	51.4	54.1	55.9
03/11/2020 06:45	53.9	52.9	55.0	57.7
03/11/2020 07:00	54.4	53.4	55.2	57.2
03/11/2020 07:15	51.5	50.2	52.6	61.8
03/11/2020 07:30	58.5	50.9	60.1	76.6
03/11/2020 07:45	50.2	49.2	51.2	65.2
03/11/2020 08:00	49.6	48.3	50.7	53.3
03/11/2020 08:15	50.3	48.8	51.6	55.1
03/11/2020 08:30	50.6	49.3	51.4	68.8
03/11/2020 08:45	50.9	49.3	51.7	72.6
03/11/2020 09:00	61.0	50.1	58.4	77.2
03/11/2020 09:15	56.5	52.1	54.8	76.2
03/11/2020 09:30	56.0	51.9	54.8	75.6
03/11/2020 09:45	54.3	52.5	55.2	76.3
03/11/2020 10:00	54.9	52.8	56.0	76.2
03/11/2020 10:15	54.6	53.4	55.7	60.2
03/11/2020 10:30	54.4	52.7	55.1	73.8
03/11/2020 10:45	53.1	51.5	54.4	57.8
03/11/2020 11:00	53.8	52.5	55.1	64.8
03/11/2020 11:15	58.0	52.3	55.5	77.3
03/11/2020 11:30	54.5	52.9	55.3	78.9
03/11/2020 11:45	55.2	54.0	56.3	59.4
03/11/2020 12:00	55.3	53.7	56.6	61.3
03/11/2020 12:15	56.3	54.4	57.5	68.2
03/11/2020 12:30	56.4	54.4	58.3	63.0
03/11/2020 12:45	56.8	54.3	58.9	67.8
03/11/2020 13:00	57.2	53.9	57.3	71.6
03/11/2020 13:15	57.6	54.1	57.3	74.0
03/11/2020 13:30	55.2	53.9	56.3	62.9
03/11/2020 13:45	55.9	53.7	56.1	71.2

Appendix H9
Construction Plant List and Information

H9.0 Construction Plant List and Information

Table AH9-1: Construction Plant List

Stage	Plant Item	BS 5228 Reference	Sound Pressure Level at 10m, dBA
Strategic Highway Network	Tracked excavator	C.5 #18	80
	Articulated dump truck (tipping fill)	C.2 #32	74
	Asphalt paver (+ tipper lorry)	C.5 #31	77
	Vibratory roller	C.5 #26	77
	Road planer	C.5 #7	82
	Dozer	C.5 #12	77
Bridge Construction	Tracked excavator	C.5 #18	80
	Articulated dump truck (tipping fill)	C.2 #32	74
	Asphalt paver (+ tipper lorry)	C.5 #31	77
	Vibratory roller	C.5 #26	77
	Road planer	C.5 #7	82
	Continuous flight auger crawler mounted rig	C.3 #21	79
	Backhoe mounted hydraulic breaker	C.5 #1	88
	Tower crane	C.4 #48	76
Site Clearance	Tracked excavator	C.2 #16	75
	Articulated dump truck (tipping fill)	C.2 #32	74
	Dozer	C.2 #11	79
	Wheeled backhoe loader	C.2 #8	68
	Wheeled loader	C.2 #26	79
	Dump truck	C.2 #30	79
Building Construction	Cement mixer truck	C.4 #18	75
	Mobile telescopic crane	C.4 #41	71
	Dump truck	C.2 #30	79
	Diesel generator	C.4 #80	60
	Handheld cordless nail gun	C.4 #95	73
	Hand-held circular saw	C.4 #72	79
	Tower crane	C.4 #48	76

Table AH9-2: Distance between construction works of the Proposed Development and sensitive receptors, metres

Receptor location	Phase 1						Phase 2				Phase 3			
	Highway and bridge construction		Site set-up and earthworks		Building construction		Site set-up and earthworks		Building construction		Site set-up and earthworks		Building construction	
	Worst case	Ave case	Worst case	Ave case	Worst case	Ave case	Worst case	Ave case	Worst case	Ave case	Worst case	Ave case	Worst case	Ave case
Pyms Stables/northern end of A509 London Road	20	100	130	-	130	-	20	150	20	150	-	-	-	-
Holiday Inn Milton Keynes M1 East	20	100	-	-	-	-	-	-	-	-	20	150	20	150
Carteret Close	55	100	-	-	-	-	-	-	-	-	130	-	130	-
Tuffnell Close	55	100	-	-	-	-	-	-	-	-	130	-	130	-
Chillery Leys	45	100	-	-	-	-	-	-	-	-	-	-	-	-
Ivernia Avenue, Buccaneer and Maritime Way	-	-	140	-	140	-	-	-	-	-	-	-	-	-
Caldecote Lane (including Caldecote Mill, Caldecote Cottage, Moat Cottage and an unnamed dwelling)	-	-	-	-	-	-	160	-	160	-	-	-	-	-
Newport Road	-	-	-	-	-	-	-	-	-	-	120	-	120	-
Willen Road traveller's settlement	-	-	-	-	-	-	-	-	-	-	20	150	20	150
Phase 1 of Proposed Development	-	-	-	-	-	-	20	150	20	150	20	150	20	150
Phase 2 of Proposed Development	-	-	-	-	-	-	-	-	-	-	20	150	20	150
Bloor Homes development	-	-	-	-	-	-	-	-	-	-	20	150	20	150

Note: where cells have a "-", the distance between the construction works on the Proposed Development and the receptor are greater than 300m and therefore fall outside of the construction noise assessment study area

A typical twin-drum vibratory roller has been used to inform the construction vibration assessment. The vibratory roller details pertinent to the calculation of the peak particle velocity at nearby sensitive receptors are as follows:

i Twin smooth drum roller (typical small JCB size)

ii The drum width is taken to be 1.4m

iii The drum vibration amplitude is taken to be 0.59 mm