Appendix 10.3

SITE SUITABILITY

Noise & Vibration Appendix 10.3:

Site Suitability - Outline

Introduction

This appendix provides an initial assessment of the noise and vibration constraints presented by the existing environment and how these are likely to affect the sensitive uses that form part of the Proposed Development. These primarily include the schools and residential dwellings.

The dominant types of noise affecting the Site are road traffic noise from the A44, plant noise from the existing buildings at Begbroke Science Park, railway noise and some contributions from aircraft noise.

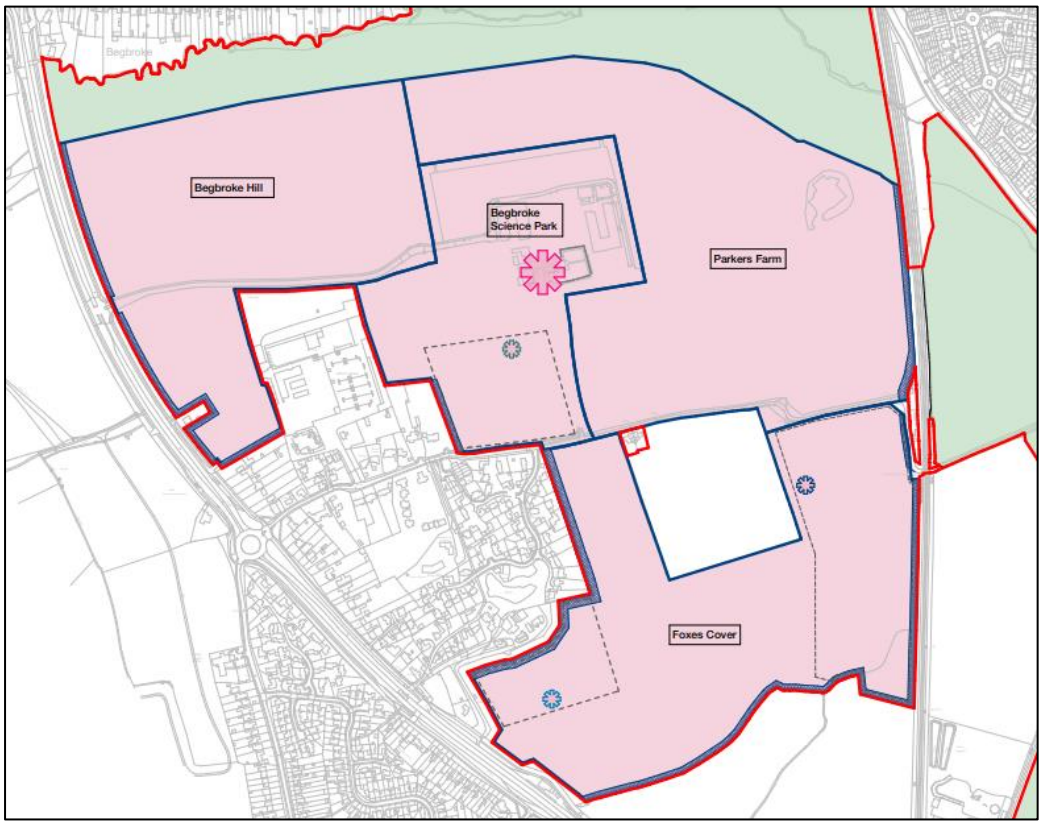
As indicated on the Land Use and Development Zones Parameter Plan (see Appendix 5.1), the Site has been split into 4 zones:

- Begbroke Hill;
- Begbroke Science Park;
- Parkers Farm; and
- Foxes Cover.

Within these development zones (identified in Figure 1), the parcels of land where the three proposed schools will be located are described as follows:

- Primary school 1 is proposed at the centre of the Site as part of the Begbroke Science Park development zone;
- Primary School 2 is proposed in the south-west part of the Site within the Foxes Cover development zone; and
- Secondary School is proposed in the south east section of the Site within the Foxes Cover development zone.

Figure 1 Development Zones



Policy and guidance

Appendix 10.2 contains a review of the relevant noise policy and some guidance including;

- National Planning Policy Framework (2021)
- Noise Policy Statement for England (2010)
- National Planning Practice Guidance (2019)
- The Cherwell Local Plan (2011-2031)
- Cherwell Local Plan 1996 Saved Policies (CLP 1996)
- Cherwell Local Plan 2011 – 2031 (Part 1) Partial Review – Oxford's Unmet Housing Need (PR2020)
- The Cherwell Planning and Noise Guidance (undated).

Please refer to Appendix 10.2 for an overview of these documents. The rest of this section provides an overview of other guidance relating to residential dwellings and schools which should be considered as part of the acoustic strategy for the Site.

Begbroke Development Specification

The Development Specification contains development principles to inform the preparation of subsequent reserved matters applications, Area Briefs and Design Guides. The principles of relevance to noise and vibration are set out in the Table below.

Table 1 Development Principles Relating to Noise

DP Number	Principles
DP5 Primary and secondary education provision	
DP5.2	School buildings and playing fields will be sited and designed to provide a suitable noise environment and will seek to allow for natural ventilation of buildings where possible.
DP18 Noise	
DP18.1	Noise attenuation in the form of acoustic fencing and/or bunding will be delivered adjacent to the A44 and the railway to achieve approximately a 10dB reduction in Site noise levels where this is needed to create an acceptable noise environment.
DP18.2	Any noise generating uses (where such noise cannot be sufficiently reduced) or uses which generate a higher degree of servicing or vehicular traffic, will be located away from uses that are considered sensitive, such as residential dwellings or social infrastructure uses.

Residential Guidance

ProPG: Planning & Noise. Professional Practice Guidance on Planning & Noise – New Residential Development[i]

The ProPG guidance was published in May 2017 and provides a recommended approach to the management of noise within the UK planning system for new residential development. The document advocates a 2-staged approach.

At stage 1, an initial noise risk assessment of the proposed development site is conducted, based on

the existing levels of noise at the site. Baseline ambient noise levels at the site are reviewed, and an assessment of the likely risk of adverse effects from noise is undertaken to indicate whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective. Table 2, as derived from the ProPG guidance document, gives indicative guidance on how various levels of ambient noise should be evaluated in terms of risk.

Table 2 Guidance for Stage 1, Initial Site Noise Risk Assessment

Period	Ambient Noise Level	Initial Risk Indication	Pre-app. Planning Advice
Day (07:00 -23:00)	< 50 dB, $L_{Aeq, 16hr}$	Negligible	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.
Night (23:00 – 07:00)	< 40 dB, $L_{Aeq, 8hr}$		
Day (07:00 -23:00)	50 – 60 dB, $L_{Aeq, 16hr}$	Low	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an Acoustic Design Statement (ADS) which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
Night (23:00 – 07:00)	40 – 50 dB, $L_{Aeq, 8hr}$		
Day (07:00 -23:00)	60 – 70 dB, $L_{Aeq, 16hr}$	Medium	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
Night (23:00 – 07:00)	50 – 60 dB, $L_{Aeq, 8hr}$		
Day (07:00 -23:00)	>70 dB, $L_{Aeq, 16hr}$	High	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.
Night (23:00 – 07:00)	>60 dB, $L_{Aeq, 8hr}$		

The ProPG guidance states that the noise levels quoted above are free-field and should be assessed without inclusion of noise mitigation measures. It is further noted that the night-time L_{Amax} façade noise levels should also be considered; where there may be more than 10 noise events at night that exceed 60 dB, $L_{Amax,F}$, the site should not be regarded as a negligible risk.

Stage 2 of the process involves the parallel consideration of key four elements, viz:

- Demonstration of a good acoustic design process,

- Consideration of internal noise level guidelines;
- Consideration of external noise levels in amenity areas; and
- Assessment of other relevant issues

In discussing "good acoustic design", the ProPG guidance states the following:

"*A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally (inside noise-sensitive parts of the building(s)) and externally (in spaces to be used for amenity purposes).*

Good acoustic design should avoid "unreasonable" acoustic conditions and prevent "unacceptable" acoustic conditions (these terms are defined in Element 2). Good acoustic design does not mean overdesign or gold plating of all new development but seeking to deliver the optimum acoustic outcome for a particular site".

In considering internal noise levels, and external amenity, reference is made to the guideline noise levels given BS 8233 and the WHO Guidelines for Community Noise, both of which are discussed further below.

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

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings provides information on the design of buildings in order that the internal acoustic environment is appropriate to the required function(s) of the space. Section 7 of the document contains the following guidance regarding desirable internal ambient noise levels for dwellings:

Table 3 BS 8233:2014 Desirable indoor ambient noise levels for dwellings

Activity	Location	Period	
		Day (07:00-23:00)	Night (23:00-07:00)
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining Room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$
External noise	Amenity spaces	50 – 55 dB $L_{Aeq,16hr}$	

The table is appended with several notes. Most relevant are the following:

> *"NOTE 4 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. Sporadic noise events could require separate values."*

It should be noted that the consideration of night-time internal noise levels based on external L_{Amax} noise levels, which represent short noise "events", is often the primary factor in the specification of suitable façade constructions or glazing types, rather than the $L_{Aeq,8hr}$ night-time value given in Table 2 above, which can be considered similar to an average noise level over the full night-time period.

> *"NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment."*

Ventilation typically refers to whole dwelling ventilation for the supply of fresh air to habitable rooms as defined in the Building Regulations guidance document Approved Document F. It is not intended to provide purge ventilation for the removal of pollutants such as smoke, or mitigation of overheating, for which alternative means should be considered to enhance the comfort of any future occupants.

> *"NOTE 7 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."*

(The ProPG reflects the guidance given in Note 7 of BS 8233 by stating that if internal noise levels exceed the desirable indoor ambient noise levels in Table 2 by more than 5 dB, they may be considered "unreasonable".)

Section 7 also contains the following regarding design criteria for external noise:

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. 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.*
>
> *Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB LAeq,T or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."*

As stated above, the ProPG refers to BS 8233:2014 both in terms of internal and external noise criteria.

Cherwell Planning and Noise Guidance (undated) [iii]

This guidance states that any industrial or commercial development must not cause an increase in background noise levels at the nearest noise sensitive property, or at the boundary of the property.

The guidance generally recommends that noise levels within residential properties should not exceed the World Health Organisation values where practicable. It sets out the following criteria for internal and external spaces:

Table 4 Cherwell Noise Guidance

Space	Time Period	Target Level
Bedrooms	night time (23:00 to 07:00)^	30 dB LAeq
Living Rooms	day time (07:00 to 23:00)	40 dB LAeq
Gardens and Terraces	day time*(07:00 to 23:00)	55 dB LAeq
Notes: ^Individual noise events should not exceed 45dB LAMAX at night (BS 8233. 1999) *not in town centre or near main roads		

It is noted that the guidance is not dated but does refer to the previous (1999) version of BS 8233 which was subsequently updated in 2014.

WHO: Guidelines for Community Noise[iv]

The WHO Guidelines present various guideline values for community noise in specific environments. Regarding L_{AMax} noise levels, the guidelines state that, for good sleep, indoor sound pressure levels should not exceed around 45 dB LAmax more than 10–15 times during the 8-hour night-time period. This is equated to a level at the outside façade of 60 dB LAmax with a partially open window. This is consistent with ProPG.

ANC & IOA: Acoustics Ventilation and Overheating - Residential Design Guide[v]

The guidance provides useful information regarding the potential assessment of overheating, which has become increasingly important in recent years where it has been identified that guideline internal noise level criteria may only be achieved by keeping windows closed.

Building Regulations Overheating: Approved Document O (ADO)[vi]

This regulation aims to protect the health and welfare of building occupants by reducing the occurrence of high indoor temperature through limiting unwanted solar gain and provision of adequate means to remove excess heat from indoors. Target noise criteria is presented which indicates that where external noise may be an issue the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours. Windows are likely to be closed during these hours where target noise levels are exceeded:

- 40 dB LAeq, 8 hours (between 23:00 -07:00)
- 55 dB LAFmax, more than 10 times a night (between 23:00 – 07:00)

It is noted that as this is a Building Regulation it would be addressed during detailed design. It is referenced here because it is prudent for the design team to be aware at an early stage of the potential constraints that this regulation may impose.

Schools

Building Bulletin 93 – Acoustic design of schools: performance standards[vii]

Building Bulletin 93 (BB93) provides minimum performance standards for the acoustics of school

buildings, and describes the normal means of demonstrating compliance with the relevant Regulations[1] pertaining to education spaces.

Section 1 of the document sets out minimum requirements for a range of acoustic performance standards that existing and new build schools should adhere to, including appropriate indoor ambient noise levels (IANL), sound insulation, and reverberation times.

In discussing appropriate IANLs, the document presents a series of upper limits in terms of $L_{Aeq,\ 30\ mins}$, for various spaces found within schools, based on whether the building under consideration is newly built, or is a refurbishment of an existing building.

The most stringent of the IANL limits that apply to areas commonly found within schools apply to classrooms, general teaching areas, seminar rooms, tutorial rooms, and language laboratories, for which an upper limit of 35 dB $L_{Aeq,\ 30\ mins}$ is specified. If the space will be naturally ventilated, an uplift of 5 dB on the IANL requirement is applied. But if the indoor ambient noise level target is 45 dB or above, then no uplift for natural ventilation is applied.

A more onerous IANL upper limit of 30 dB $L_{Aeq,\ 30\ mins}$ is specified for specialist areas such recording studios, and teaching spaces intended specifically for students with special hearing and communication needs.

Acoustics of Schools: a design guide - Institute of Acoustics & Association of Noise Consultants – Nov 2015[viii]

The document provides good practice guidance for outdoor noise levels at schools primarily with regard to spaces used for outdoor teaching and recreation. The guidance indicates that for new schools;

- 60 dB LAeq,30 min 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.
- Where used for teaching noise levels in playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min.}$
- There should be at least one area suitable for outdoor teaching where noise levels are below 50 dB $L_{Aeq,30mins}$ Where this cannot be achieved, screening should be used to attenuate the noise levels as much as practicable.

It recognises that playgrounds, outdoor recreation areas and playing fields generally have a low sensitivity to noise and playing fields may be used as buffer zones between schools and busy roads. However, where used for teaching, external noise levels can have a detrimental effect on communication.

Oxfordshire County Council (OCC) Design Guide for Primary and Secondary Schools (October 2020)[ix]

With regard to acoustics, the guide indicates that the school and playing fields needs to be situated in a quiet part of the development. The noise levels on unoccupied playing fields used for teaching sport shall not exceed 50 dB $L_{Aeq,30min}$, therefore this level is required at the boundary of the school site.

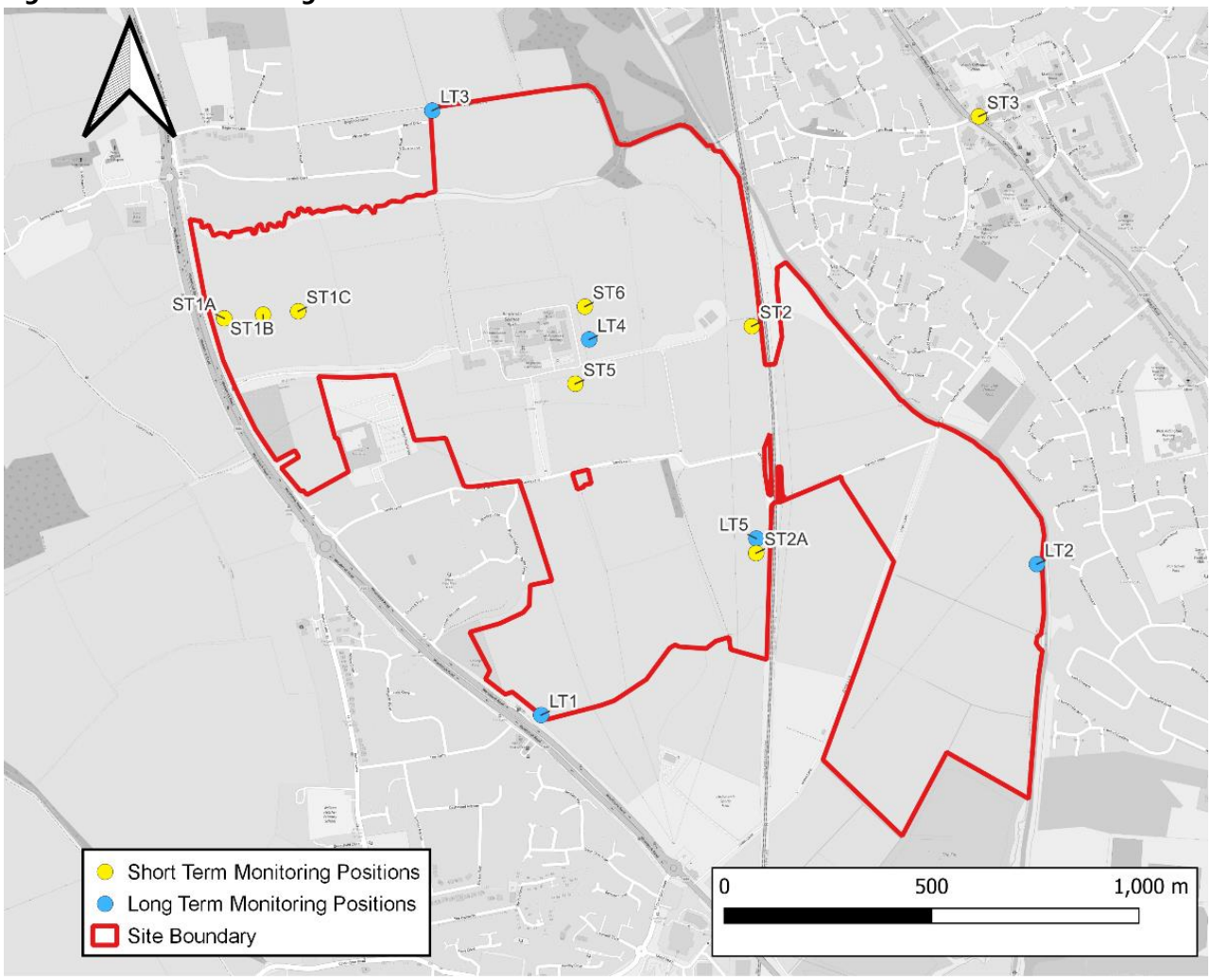
[1] Requirement E4 of The Building Regulations, the School Premises Regulations and the Independent School Standards.

BASELINE CONDITIONS & EVOLUTION

Further details of the baseline survey are contained within the Chapter and Appendix 10.4. The noise monitoring locations are identified in Figure 2. It can be seen that these broadly cover the boundaries of the Site and the plant noise sources associated with Begbroke Science Park within the Site.

It is noted that there is a Noise Action Plan Important Area on the A44 at Yarnton and three smaller areas located on the A44 north of the site access.

Figure 2 Noise Monitoring Locations



The data recorded at LT1 is generally considered to represent the noise exposure along the boundary of the Site with the A44. Position LT3 reflects the northern boundary of the Site, where the exposure to road and rail noise is generally lower. LT5 is reflective of the boundary of the Site which borders the Cherwell Valley Railway and LT4 reflects the noise emission from the existing Science Park equipment.

As the application is in outline, there is flexibility in where the residential and commercial uses on the Site may be located. Therefore, the site suitability assessment focuses on the high-level constraints at

what are considered to be the most exposed locations in terms of contributions from existing internal noise levels, and on the assumption that these could be residential receptors with the highest sensitivity.

The average ambient (LAeq,T) noise levels at each long term measurement position for the day (07:00–23:00) and night-time (23:00 – 07:00) periods are summarised in Table 5. Also included in the Table are the $L_{Amax,F}$ noise levels measured during the night time period. With regard to $L_{Amax,F}$ noise levels, these are the maximum noise level measured over a given interval period. This means they could be caused by one off events, occurring only once during the baseline survey period, and therefore the highest recorded may not be a reliable indicator of the noise risk present at the Site. As such the highest $L_{Amax,F}$ noise levels used in the assessment are the 10th highest $L_{Amax,\ 1\ minute}$ levels recorded during the night time period (23:00 – 07:00) which is considered to be more representative and is line with the WHO Guidelines and ProPG.

The short term measurements are summarised in Table 6.

Table 5 Average Levels from Longer Term Positions

Location	Time (T)	Average $L_{Aeq,T}$	Average $L_{A90,T}$ (dB)	Average $L_{A10,T}$ (dB)	Representative $L_{Amax,T}$ (dB)
LT1	Day (07:00 – 23:00)	57	49	60	N/A
	Night (23:00 – 07:00)	53	35	57	68
LT2	Day (07:00 – 23:00)	53	46	50	N/A
	Night (23:00 – 07:00)	49	39	54	69
LT3	Day (07:00 – 23:00)	51	42	52	N/A
	Night (23:00 – 07:00)	44	35	46	62
LT4	Day (07:00 – 23:00)	49	43	50	N/A
	Night (23:00 – 07:00)	46	42	45	63
LT5	Day (07:00 – 23:00)	64	48	57	N/A
	Night (23:00 – 07:00)	64	43	56	88

Table 6 Summary of Short Term Positions

Location	Date	Time (T)	Duration	Average $L_{Aeq,T}$ (dB)	Average $L_{A90,T,\ 15\ mins}$ (dB)	Average $L_{A10,T}$ (dB)	Maximum $LA_{max,T}$(dB)
ST1A	21/09/22	11:51-12:06	15:00	59	49	59	69
	22/09/22	14:03-14:18	15:00	65	53	64	76
ST1B	21/09/22	12:07-12:22	15:00	57	46	57	68
	22/09/22	14:20-14:35	15:00	64	52	62	75
ST1C	21/09/22	12:26-12:41	15:00	60	47	58	75
	22/09/22	14:36-14:51	15:00	61	52	59	75
ST2	21/09/22	09:07-10:16	69:00	73	45	55	101
	21/09/22	10:17-11:03	46:00	51	37	49	70
ST2a	02/02/23	12:30–12:45	15:00	61	53	65	74
	02/02/23	12:45–13:00	15:00	66	50	62	89
	02/02/23	13:00–13:15	15:00	69	52	66	91

Location	Date	Time (T)	Duration	Average $L_{Aeq,T}$ (dB)	Average $L_{A90,T,\ 15\ mins}$ (dB)	Average $L_{A10,T}$ (dB)	Maximum $LA_{max,T}$(dB)
	02/02/23	13:15–13:30	15:00	63	52	64	89
	02/02/23	13:30–13:45	15:00	58	50	61	70
	02/02/23	13:45–14:00	15:00	68	50	61	89
	02/02/23	14:00–14:15	15:00	64	48	57	88
	02/02/23	14:15–14:30	15:00	70	49	60	93
	02/02/23	14:30–14:45	15:00	68	50	62	92
ST3	21/09/22	14:32-14:47	15:00	69	54	69	77
	22/09/22	10:09-10:24	15:00	73	54	69	90
	22/09/22	12:14-12:29	15:00	77	55	69	97
	22/09/22	15:59-16:14	15:00	68	55	68	80
ST4	21/09/22	13:51-14:06	15:00	81	66	78	93
	22/09/22	10:43-10:58	15:00	81	67	78	91
	22/09/22	11:32-11:47	15:00	82	66	78	93
	22/09/22	15:20-15:35	15:00	82	67	79	91
ST5	20/09/22	16:09-16:26	15:00	51	49	51	57
ST6	20/09/22	16:34-16:49^	15:00	52	45	54	56
	22/09/22	09:32-09:47*	15:00	63	59	61	78
Notes: ^ plant off, *plant on							

AIRCRAFT NOISE

As discussed in the chapter, the Site is affected by aircraft noise from Oxford Airport located approximately 1km north of the Site with runways that run south towards the Site. Publicly available data suggests the airport typically has around 11 arrivals and 12 departures on an average weekday[x].

The Section 106 Agreement between the airport and CDC requires that:

- No movements between midnight and 06:00 unless for emergencies;
- No training circuits before 07:00 hours and after 23:00 on any day;
- No more than 160,000 movements per year (excluding emergency flights); and
- Restrictions on location of, time and duration static engine testing for jet aircraft (no more than 6 hours at weekend and 3 hours at weekends and not before 07:00 or after 19:00 on any day).

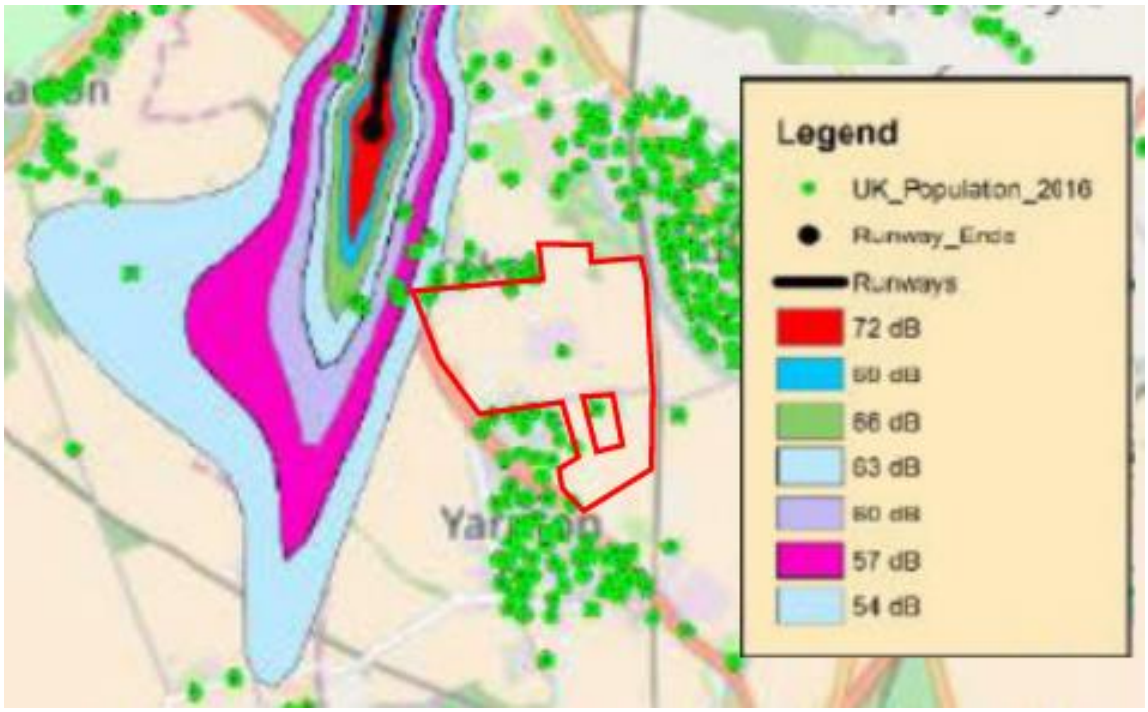
Therefore, whilst some aircraft activity prior to 07:00 hours is permitted, this is restricted to a 1-hour window between 06:00 – 07:00. Looking at the aircraft patterns[2] this appears to be no more than 2 aircraft (one arrival and one departure), on around two days each week.

The aircraft contours available in the public domain together with the approximate boundary of the residential elements of the development Site are presented in Figure 3. A relatively small area of the north west corner of the Site is anticipated to fall within the 54 dB $L_{Aeq,16\ hour}$ contour. When factoring in that a landscaping zone has been allowed for along the northern boundary of the Site, it could be that

[2] available https://www.flightradar24.com/

any dwellings would fall outside of this contour.

Figure 3 Oxford Airport Aircraft Contours and indicative boundary of residential uses



EVOLUTION OF BASELINE NOISE ENVIRONMENT

The future baseline is discussed in the Chapter and the relevant points are summarised here;

Aircraft Noise: it is estimated that the level of growth between 2022 and 2040 is likely to be 21% as a worst-case scenario. On this basis it is not expected that the growth in aviation would materially change the baseline noise conditions from those measured during the surveys, especially given the sectors drive towards more environmentally friendly and quieter aircraft engines and the replacement of older noisier aircraft with newer quieter counterparts.

Rail Noise: as part of the emerging proposals for National Rail upgrades to line, information provided to the traffic consultant by Network Rail has indicated the number of train paths per hour could double. At this stage, it is unclear whether this is likely to be the case for every hour, however this has been assumed as a robust worst-case scenario. Therefore a 3 dB uplift in railway noise compared to the levels measured during the baseline noise survey has been assumed.

Road Traffic Noise: The screening exercise undertaken for operational road traffic indicated that, where increases in road traffic noise were predicted as a result of the Proposed Development and reassignment of traffic on the network, these would be so negligible that a detailed assessment of road traffic was not required. This is primarily due to OCC's transport strategy promoting sustainable methods of transport at preventing growth in background traffic. On this basis is it not anticipated that there would be any material increase in traffic noise on the surrounding road network in the future. On some links a decrease is predicted, however as a worst-case scenario it will be assumed that the existing level of traffic noise

prevails.

Overall, in terms of site suitability and how the noise environment could evolve the following assumptions have been made;

- Aircraft noise – no material change from that recorded during baseline survey;
- Rail noise – worst case assumptions that paths double every hour and therefore 3 dB uplift assumed; and
- Road traffic noise on surrounding road network – no material change from that recorded during baseline survey.

VIBRATION

To characterise and quantify the existing levels of vibration resulting from the Cherwell Valley Rail Line which is frequently used by both passenger and freight trains, Vibration Dose Value (VDV) measurements of train passes were undertaken at ST2a (shown on **Error! Reference source not found.**). The measurements were carried out following the principles of BS 6472-1:2008[3].

Measurements were undertaken using a transducer mounted on top of a ground spike which was pushed into soft ground approximately 15 m from the railway line.

A measurement was started as a train approached the monitoring position and was stopped as it moved away. The measurements indicated that the weighted acceleration in the vertical axis was the dominant direction of vibration. In accordance with BS 6472-1:2008, only this axis has been considered further.

The number and type of measured train passes together with the average and maximum VDV_b results for each train type are summarised in Table 7.

Table 7: Summary of Measured Vibration Dose Values for train passes

Train Type	No of passes	Average VDV_b $m{\cdot}s^{-1.75}$ (z axis)	Max VDV_b $m{\cdot}s^{-1.75}$ (z axis)
Passenger	6	0.014	0.020
Freight	4	0.021	0.022

The observation of the surveyors was that vibration from the trains was not perceptible at the measurement locations. The relatively low levels of recorded vibration support this observation.

IMPACT AT RESIDENTIAL DWELLINGS

INITIAL RISK ASSESSMENT

The guidance given in ProPG is intended for use by practitioners on a recommended approach to the management of noise for new residential developments. The following sections assess the residential aspects of the development, following the principles given in that guidance document. Since school buildings are outside the scope of the ProPG guidance, the school plot has been assessed separately.

[3] BS6472-1:2008 Guidance to evaluation of human exposure to vibration in buildings. Part 1:Vibration sources other than blasting.

An initial risk assessment of the three residential plots has undertaken in reference to guideline levels given in Table 2 of this document, as derived from the ProPG guidance. Table 8 presents the outcome of the assessment, based on measured ambient noise levels.

Table 8 – Initial risk assessment based on ambient noise levels

Location	Period, T	Ambient Noise Level, dB $L_{Aeq,T}$	Initial Risk Indication	ProPG Pre-app. Planning Advice*
LT1	Day (07:00 -23:00)	57	Low 50 - 60 dB, $L_{Aeq, 16hr}$	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an Acoustic Design Statement (ADS) which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
	Night (23:00 - 07:00)	53	Medium 50 - 60 dB, $L_{Aeq, 8hr}$	
LT3	Day (07:00 -23:00)	51	Low 50 - 60 dB, $L_{Aeq, 16hr}$	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
	Night (23:00 - 07:00)	44	Low 40 - 50 dB, $L_{Aeq, 8hr}$	
LT4	Day (07:00 -23:00)	49	Negligible < 50 dB, $L_{Aeq, 16hr}$	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
	Night (23:00 - 07:00)	46	Low 40 - 50 dB, $L_{Aeq, 8hr}$	
LT5	Day (07:00 -23:00)	67^	Medium 60 - 70 dB, $L_{Aeq, 16hr}$	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.
	Night (23:00 - 07:00)	67^	High >60 dB, $L_{Aeq, 8hr}$	

Notes:
^ This includes the 3 dB uplift for doubling the number of train pass bys in line with information received from Network Rail.
*where initial risk indication is different for day and night – the advice presented is for the highest level of risk that is identified.

The initial risk assessment carried out in relation to the Site, based on ambient noise levels indicates that the monitoring positions are generally low risk during both day and night-time periods, with the exception of LT5 which is adjacent to the rail line. At this location the ambient noise levels would be considered in the "high" risk category at night and "medium" risk during the day. Although the Site layout is unconfirmed, properties set back further back from the railway are likely to be at least partially screened from rail noise by intervening buildings.

As noted in ProPG, in reality the defined risk categories are essentially a sliding scale with risk increasing with the noise level. Table 5 indicates the ranges of each category, so for example LT1 during the day

is approaching the upper end of the low risk range and is classified as medium at night and LT 4 is only just within the negligible banding during the day time period.

Finally, the initial risk assessment has considered the maximum noise levels arising from single events which affect the monitoring positions, as presented in Table 9.

Table 9 – Initial review of LAmax Levels

Monitoring Location	Equivalent Façade Level for Representative $L_{Amax,T}$ (dB)	Comparison to Target Criterion (60 dB L_{Amax} at the Façade)
LT1	71	+11
LT3	65	+5
LT4	66	+6
LT5	88	+28

At LT3 and LT4 the representative LAmax's are 5 to 6 dB above the 60 dBA criteria recommended in the WHO's Guidelines for Community Noise. The levels at LT1 exceed the threshold by 11 dB due to road traffic sources and those at LT5 exceed the threshold by 28 dB due to the impact from train passes at this location.

The impact of traffic noise from vehicles travelling along Begbroke Hill and other internal site access roads will need to be considered as the detailed design progresses and information becomes available about the level of traffic which would travel along each link within the red line boundary. The traffic data supplied to date indicates that the total flow of vehicles entering and exiting Begbroke Hill with the proposed development would result in noise levels of 67 dB LA10 18 hour during the day at 10m from the road centreline (equating to an LAeq,16 hours of around 65 dB). It is noted that the level of noise at the same distance from the centreline of the A44 would be 7dB higher (74 dB LA10, 18 hours).

In summary, generally the initial risk assessment indicates that the majority of the Site would fall in the low risk category, indicating that the Site is likely to be considered suitable for residential development from noise perspective, provided that a good acoustic design process is demonstrated to ensure any adverse impacts of noise are properly mitigated. As would be expected the parts of the Site that would be most affected by high noise levels are LT1 close to the A44 and LT5 adjacent to the rail line. Good acoustic design principles should be followed to minimise the exposure to high noise levels.

INTERNAL NOISE LEVELS

When considering noise break in from the external environment, there are two main elements to consider from an acoustic perspective:

- The internal ambient noise level requirements for the day and night-time period in accordance with the guidance in BS 8233:2014; and
- The maximum (LAmax) noise levels at night (23:00 – 07:00) and what effect these might have on sleep in accordance with the World Health Organisation Guidelines for Community Noise.

In addition to this, there is also the need to achieve required ventilation rates as set out in Part F of the Building Regulations and the requirements of Approved Document O under the overheating condition. This will need to be confirmed during detailed design.

It is generally accepted that for a room in which the window is open, the internal noise level would be

around 12 dB lower than the simultaneously occurring level outside of the window. Therefore, in Table 8 consideration has been given to the internal noise levels based on this level of reduction through a partially open window.

Table 10 – Internal Ambient and LAmax Levels based on partially open window

Location	Period, T	Internal Ambient Level dB $L_{Aeq,T}$	Internal LAmax level dB
LT1	Day (07:00 -23:00)	45	-
	Night (23:00 - 07:00)	41	56
LT3	Day (07:00 -23:00)	39	-
	Night (23:00 - 07:00)	32	50
LT4	Day (07:00 -23:00)	37	-
	Night (23:00 - 07:00)	34	51
LT5	Day (07:00 -23:00)	55	-
	Night (23:00 - 07:00)	55	73

Given the outline nature of the application, the levels presented in Table 10 represent a "worst-case", since they assume that all proposed dwellings will be directly exposed to the local noise sources (predominantly that from the local road and rail networks). In reality, when the development buildings are in place, a substantial number of the façades will be at least partially screened from road and rail noise. The following discussion is therefore likely to relate primarily to those properties on the outer extents of the respective plots, which face toward the road. It is noted that one of the sources affecting the Site, more so during the daytime period, is aircraft noise associated with the operation of Oxford Airport which would not benefit from any screening from intervening buildings.

It can be seen from Table 10 that the external ambient levels indicate that at every monitoring position the internal ambient levels exceed the relevant criteria. In the case of LT3 and LT4, this exceedance is relatively small. However, it shows that at these most exposed properties, mitigation would still be required in order to achieve the required internal levels. The types of mitigation this would involve would typically be acoustic trickle vent or attenuated window openings. The approach would be finalised as part of the detailed design process confirming that appropriate ventilation rates could be achieved within the dwellings.

For locations LT5 and LT1 and any residential development located along Begbroke Hill, the higher noise levels from the Cherwell Valley Railway, the A44 and Begbroke Hill result in elevated levels and therefore a greater level of mitigation will be needed to meet the target noise levels. It is likely that a natural ventilation strategy will not be feasible if dwellings are constructed close to these sources. Good acoustic design principles should be followed across the Site to maximise the acoustic benefits, including location of non-habitable rooms on elevations overlooking the primary sources of noise, and using screening that can be provided by the development itself.

It is recommended that as part of the detailed design development of the Site, careful consideration is given to the layout of the proposed development buildings with a view to maximising the number of

properties where internal ambient and maximum noise levels can be achieved without additional mitigation measures. It is also recommended that attended measurements are undertaken at LT3 and LT4 to confirm the source of the LAmax levels, i.e., whether they are due to aircraft noise or road/rail sources which would be mitigated by intervening buildings. It should also be established if any of the mechanical plant associated with the science park has been replaced and corrections for acoustic features, where these would be present at the dwellings.

PREDICTED NOISE LEVELS IN EXTERNAL AMENITY AREAS

Based on the measurements for the 16-hour daytime period (Table 5), the external noise levels do not exceed the upper threshold of the BS 8233 desirable guideline values for amenity spaces of 50 -55 dB $L_{Aeq,T}$ at LT3 or LT2. At LT1 the threshold upper threshold is exceeded by 2 dB; however, this monitoring location is in proximity to the road so if good acoustic design principles were followed and there was some screening via a boundary fence, the noise levels in amenity spaces on the vicinity of the monitoring position would feasibly be able to reduce to 55 dB $L_{Aeq,T}$.

It is also noted that CDC's guidance advocates levels of 55 dB but indicates that this is not applicable in Town Centres and near busy roads. It is therefore considered that, for the great majority of the Site, the acoustic environment is conducive to provide suitable levels of amenity in outdoor spaces (private gardens), and in some areas with exposure to higher noise sources like the A44 some additional mitigation may be required, but typically this could be achieved through boundary fencing.

The area of the Site which is most challenging in the context of amenity spaces is in proximity to LT5, adjacent to the railway, where the ambient noise levels are substantially above the 55 dB $L_{Aeq,T}$ upper threshold. From a good acoustic design perspective, these parts of the Site would be most suited to less sensitive uses such as the proposed commercial uses. Therefore, if dwellings and associated amenity spaces are located in proximity to the railway, a greater level of mitigation would be required to achieve reasonable levels in these spaces.

However, a 12 dB reduction (from 67 dB) to get down to levels of 55 dB in amenity spaces is feasible with a combination of distance, fencing and good acoustic design. For example, either fencing could be used to provide the reduction, or the dwellings could be designed with the fronts of the houses facing the railway line and the amenity space at the rear so the garden benefits from screening provided by the building. Beyond the first row of houses between the rail and the amenity spaces it is unlikely much mitigation would be required to achieve levels of 55 dB or below. It is also recognised that the CDC guidance indicates that higher levels may be acceptable in noisier environments which is consistent with the guidance in BS 8233:2014.

OTHER RELEVANT ISSUES - SCHOOL PLAYGROUNDS AND RECREATIONAL SPORTS PITCHES

The areas where the schools are located are likely to be bordered by new residential dwellings which will experience noise from the school playground and pitches. Whilst the Site layout is not fixed, indicative predictions undertaken for the ES indicate that new receptors in proximity to the schools could experience noise levels from these sources exceeding the recommended guideline values of 50 – 55 dB. Given that the character of the noise is also likely to cause some disturbance (compared against to the character of the existing noise environment), appropriate mitigation of the school Site and surrounding residents will be required. It is anticipated that this could be achieved through barriers along the boundary of the school or at the receptors. As the detailed design progresses, there should be careful consideration of noise from these sources in the design, orientation and layout of the school,

sports pitches and closest introduced receptors. There should be sufficient opportunity to ensure reasonable acoustic conditions can be achieved.

Use of both the school and the sports pitches will be limited to the daytime period, and so potential for adverse effects is largely limited to loss of amenity in garden areas.

VIBRATION AT PROPOSED DWELLINGS

The measurements undertaken at a position 15m from the railway indicate that the levels of vibration are quite low. Taking the highest recorded vibration level (from a freight train pass by) and multiplying it up by the number of train passes expected from the timetable (138 trains during the day and 59 at night) the estimated vibration dose value (VDV), over a full 16 hour day and 8 hour night time period is presented in Table 9 below. This has been calculated using the methodology set out in BS 6472-1:2008.

Table 9 – Estimated VDV based on measured vibration levels

Time Period	Existing Estimated VDV m·s-1.75 [1]	Future Estimated VDV m·s-1.75 [2]	Probability of adverse comment
Day	0.07	0.09	Below the level at which a low probability of adverse comment would be expected (0.2 to 0.4 m·s-1.75).
Night	0.06	0.07	Below the level at which a low probability of adverse comment would be expected (0.1 to 0.2 m·s-1.75).

Notes:

[1] This is based on current levels of rail traffic identified from timetabling information.

[2] This is based on future levels of rail traffic assuming that the number of train paths per hour is doubled and there are twice the number of events during the day and night time periods compared to the existing situation.

It can be seen from the table that both the estimated existing and future vibration levels are below the level at which a low probability of adverse comment would be expected. This is based on measurements taken near the rail line; it is expected that at greater distances from the line, lower levels would be expected. It is therefore anticipated that there would be no material effects from vibration and no mitigation measures are required.

SCHOOLS

The proposed locations of the two primary schools and one secondary school which are intended to form part of the development are illustrated Figure 1. The figure identifies the plots where it is anticipated each school will be located. There is not yet a fixed location for the school buildings and their associated playgrounds/pitches. However, Development Principle 'DP5.2' from the development Specification indicates that *'school buildings and playing fields will be sited and designed to provide a suitable noise environment and will seek to allow for natural ventilation of buildings where possible'*. Initial discussions have been held with OCC and some outline assumptions have been made to look at the suitability of these Sites.

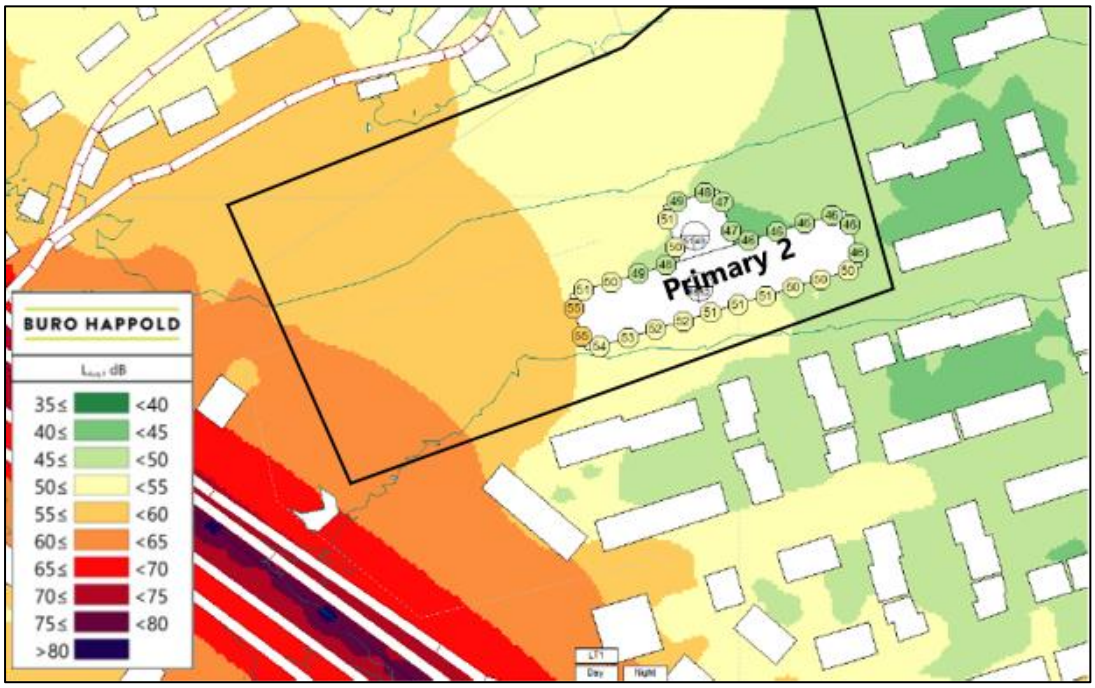
Primary School 1

Given the location of this plot within the centre of the Site and the screening from the main noise sources, it is not anticipated that there would be any challenges with achieving the recommended ambient levels in playgrounds, recreation areas and outdoor spaces used for teaching in the Acoustics of Schools Design Guide and it is likely that the OCC criteria of 50 dB $L_{Aeq,30\ minutes}$ would also be met. These relatively low noise levels would also indicate that from an acoustic perspective the school could be naturally ventilated.

Primary School 2

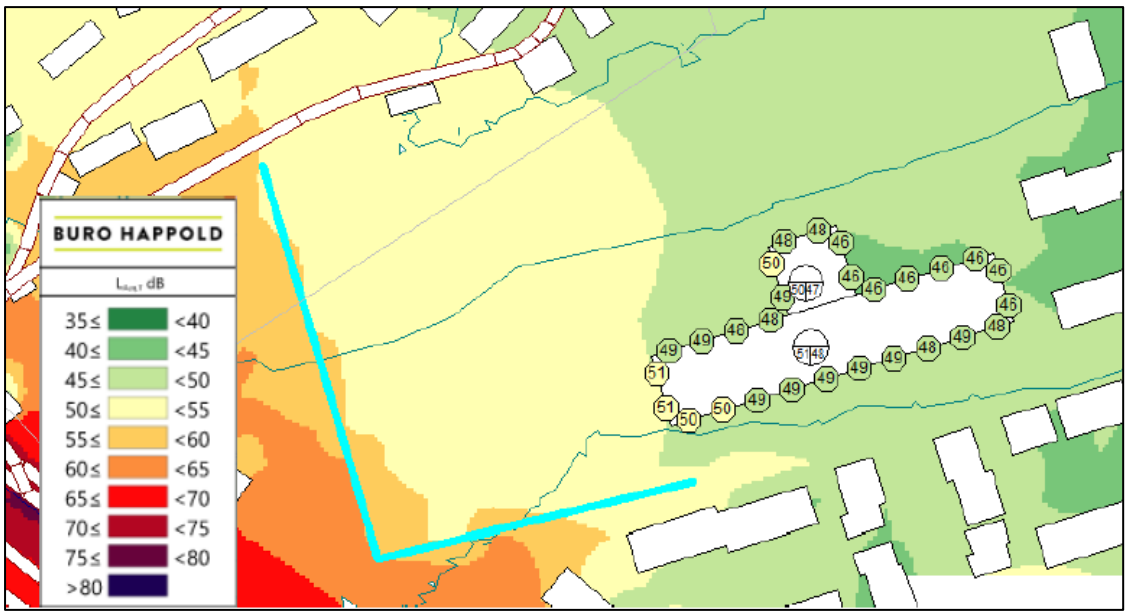
Figure 4 shows the indicative noise contours for the 16 hour day in proximity to Primary School 2, with the dominant noise source being the A44. It is noted that without mitigation, most of the external areas of the school would experience noise levels of below 60 dB $L_{Aeq,T,}$ and some areas to the east would be in the range of 45 – 50 dB $L_{Aeq,T.}$ Therefore, the school would comply with the outdoor levels recommended in the Acoustics of Schools Design Guide but would not comply with the OCC guidance without additional mitigation. Generally, from an acoustic perspective the school could be naturally ventilated.

Figure 4 – Primary 2 - No mitigation



Mitigation in the form of a 2m high barrier as shown in blue in Figure 5 would reduce the noise levels in the majority of the outdoor spaces to the east to below 50 dB $L_{Aeq,T}$ and the area to the west of school building would be anticipated to be between 50 – 55 dB $L_{Aeq,T}$. This would mean that approximately 50 % of the outdoor space complies with the requirements of OCC, but the rest does not. While increasing the barrier height to 4m does slightly increase the area to the west which is bellow 50 – 55 dB contour, it does not mean that all of the space is compliant and is not considered to have sufficient benefit to outweigh the economic and sustainability implications. It is considered that with the proposed 2m high barrier mitigation, the levels in external spaces would be within the Acoustics of Schools Design Guide recommendations for external play areas and thus would provide a suitable external environment.

Figure 5 – Primary School 2 with mitigation (2m high barrier shown in blue)



Secondary School

Figure 6 shows the indicative noise contours for the 16 hour day in proximity to the proposed Secondary School, with the dominant noise source being the Cherwell Valley Railway. The majority of the playing fields are generally between 50-60 dB $L_{Aeq,T}$. A natural ventilation strategy is likely to be feasible due to distance from rail to the proposed buildings.

Mitigation in the form of a 2.5m high barrier as shown in blue in Figure 7 would reduce the noise levels in the majority of the outdoor spaces to below 55 dB $L_{Aeq,T}$ and increase the extent of the school grounds that falls within the 45-50 dB $L_{Aeq,T}$ contour. This would mean that whilst some of the outdoor space would not comply with the requirements of OCC, these spaces would still be within the Acoustics of Schools Design Guide recommendations for external play areas and thus would provide a suitable external environment. While increasing the barrier height to 4m does slightly increase the area which is in the 45-50 dB $L_{Aeq,T}$ contour, it does not mean that all of the space is compliant and is not considered to have sufficient benefit to outweigh the economic and sustainability implications. It is considered that with the proposed 2.5m high barrier mitigation, the levels in external spaces would be within the Acoustics of Schools Design Guide recommendations for external play areas and thus would provide a suitable external environment.

Figure 6 – Proposed Secondary School with no mitigation

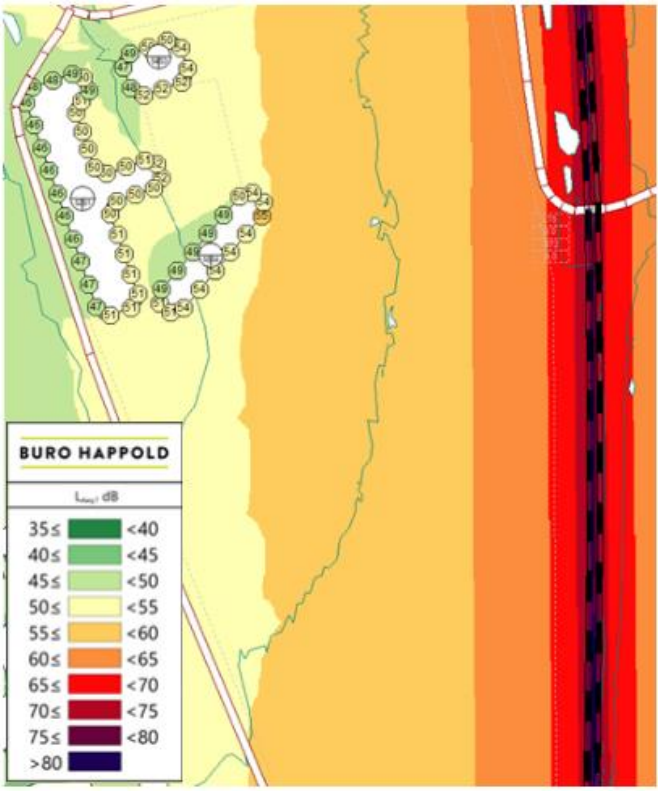
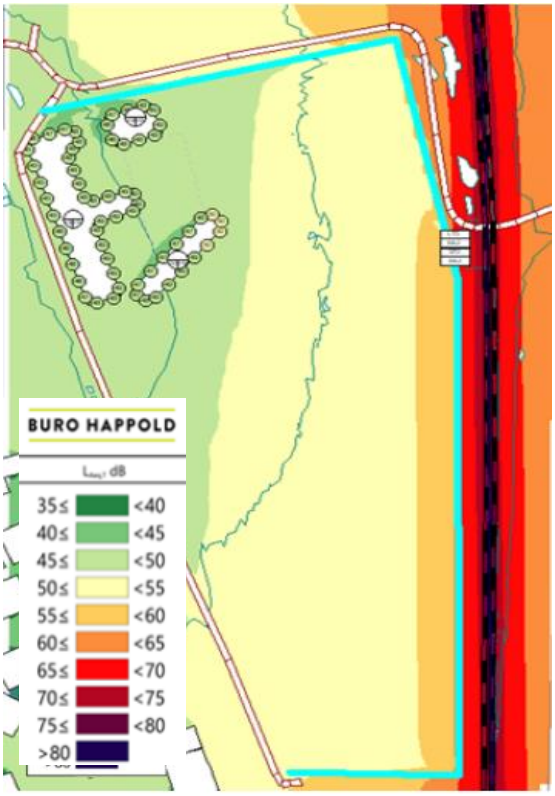


Figure 7 – Proposed Secondary School with mitigation (2.5m high barrier shown in blue)



SUMMARY OF FINDINGS

Following a review of the noise levels affecting the development Site, it is considered that the Site is suitable for residential development from a noise and vibration perspective. The parts of the Site bordering the A44 and the rail line are affected by higher noise levels and will require more substantive mitigation, which is likely to include alternative forms of ventilation. The acoustic performance requirements of the dwellings and layout of the Site should continue to be reviewed as the design of the scheme developments. It is also recommended that additional measurements are undertaken to determine the source of the L_{Amax} levels at positions away from the dominant sources on the ground (i.e., away from the railway and roads).

The levels of vibration recorded in proximity to the railway indicates that when factored for the number of trains during the day and the night, and the likely future growth, the resultant estimated vibration is below the level at which a low probability of adverse comment would be expected.

With regard to the schools, a natural ventilation strategy should be feasible for all three schools from an acoustic perspective. Primary school 1 is located in an area of low noise exposure in the middle of the Site. Primary School 2 and the Secondary School would experience higher levels of noise exposure, due to the A44 and the Cherwell Valley Rail Line. However, the modelling demonstrates that with appropriate mitigation, the levels in outdoor spaces at the school can be reduced such that a good proportion of the space is below the 50 dB $L_{Aeq,T}$ recommended by OCC at the boundary of school sites, but some of the outdoor space will exceed this level. However, the higher residual levels are generally

between 50 – 55 dB $L_{Aeq,T}$ and therefore to a level which complies with the Acoustics of Schools Design Guide recommendations and would be suitable for outdoor teaching.

---

[i] ANC, IoA, CIEH (2017) Professional Planning Practice Guidance on Planning and Noise (ProPG) New Residential Development

[ii] British Standards Institution. (2014). BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings.

[iii]Cherwell District Council (undated), Planning and noise guidance, https://www.cherwell.gov.uk/info/69/pollution/480/planning-and-noise-guidance/2

[iv] Guidelines for Community Noise. World Health Organisation. 1999

[v] Acoustics Ventilation and Overheating - Residential Design Guide, Association of Noise Consultants. 2020

[vi] HM Government, (2021) Building Regulations 2010 Approved Document O, 2021 Edition ADO Overheating

[vii] Building Bulletin 93 - Acoustic design of schools: performance standards. UK Department for Education. 2015.

[viii] Institute of Acoustics and Association of Noise Consultants (2015), Acoustics of Schools: a design guide

[ix] Oxfordshire County Council (2020) Key Design Criteria for Primary School Sites, and Oxfordshire County Council (2020) Key Design Criteria for Secondary School Sites.

x Taken from arrival and departure information for 16th and 17th November 2022