PROFESSIONAL CONSULT

FUTURE ENVIRONMENTS

Noise Constraints Assessment

Proposed Mixed-use Development – Land at Salph End, Bedford

Client: **Manor Oak Homes Limited**

Reference: **19.059.1.R2**

Issue Date: **30/08/2019**

Report Version	Prepared by	Position	Reviewed by	Position	Issue Date
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EXECUTIVE SUMMARY

This Assessment has been undertaken to identify the key noise sources which have the potential to impact upon the proposed noise-sensitive residential development and to identify any noise impacts brought about by the development upon existing noise sensitive residential receptors surrounding the Site.

Accordingly, this Assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance. In addition, various British Standard and guidance documents exist which are applicable to the assessment of noise and these have also been adopted where appropriate.

This Assessment has recommended that good acoustic design be employed when designing the Site, particularly for the part of the Site which borders Ravensden Road in order to limit the use of any acoustic fences. Where gardens do have line of sight to Ravensden Road and they are in close proximity to this road, an acoustic fence of 1.7m will be required to control noise levels in these garden areas. Any dwellings which lie close to Ravensden Road will require alternative ventilation to opening windows for both living rooms and bedrooms.

This Assessment has set mechanical and electrical plant noise emission limits for the proposed school in order to ensure that any mechanical plant noise is suitably controlled at the closest residential receptors.

This Assessment has recommended that an acoustic fence at 1.7m in height should be installed along the boundary of the proposed access road with the garden areas of 25 and 29 Hookhams Lane in order to control the change in ambient noise level to an acceptable standard. The Assessment has also shown that maximum noise levels incident upon the dwelling facades of 25 and 29 Hookhams Lane, as a result of vehicle pass-bys at night, meet the adopted noise level criteria.

Subject to the incorporation of the specified mitigation measures, it is considered reasonable to suggest that the noise impacts upon the future amenity space of the proposed dwellings and the noise impacts upon the existing residential dwellings will accord with the ‘No Observed Effect Level’ as detailed in the PPG.

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1 INTRODUCTION

1.1 Background

1.1.1 Professional Consult Limited was instructed by Manor Oak Homes Limited to prepare a Noise Constraints Assessment ('the Assessment') for a proposed mixed-use development on a parcel of land ('the Site') at Salph End in Bedford, Bedfordshire MK41.

1.1.2 It is understood that this Assessment will accompany an outline planning application for 500 dwellings and land for a primary school. The preparation of this application accompanies the ongoing promotion of the land towards the Bedford Local Plan 2030, which is currently at examination.

1.1.3 This Assessment has been undertaken to identify the key noise sources which have the potential to impact upon the proposed noise-sensitive residential development and to identify any noise impacts brought about by the development upon existing noise sensitive residential receptors surrounding the Site.

1.1.4 Accordingly, this Assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance. In addition, various British Standard and guidance documents exist which are applicable to the assessment of noise and these are detailed in Section 2.

1.1.5 All acronyms used within this report are defined in the Glossary presented in Appendix 2.

1.2 Limitations

1.2.1 The limitations of this report are presented in Appendix 1.

1.3 Confidentiality

1.3.1 Professional Consult has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Professional Consult; a charge may be levied against such approval.

2 POLICY & GUIDANCE

2.1 National Planning Policy Framework & National Planning Practice Guidance

2.1.1 The Government published the National Planning Policy Framework (NPPF) in March 2012 and the National Planning Practice Guidance (NPPG) in March 2014. Together, the NPPF and NPPG set out what the Government expects of local authorities. The overall aim is to ensure the planning system allows land to be used for new homes and jobs, while protecting valuable natural and historic environments.

2.1.2 The NPPG adds further context to the NPPF and it is intended that the two documents should be read together.

2.1.3 Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

2.1.4 Local planning authorities' plan-making and decision making should take account of the acoustic environment and in doing so consider:

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

2.1.5 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

2.1.6 The Observed Effect Levels are as follows:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

2.1.7 Table 1 summarises the noise exposure hierarchy, based on the likely average response.

Table 1. Noise Exposure Hierarchy

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

2.1.8 The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.

2.1.9 These factors include:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day - this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise; and
- the spectral content of the noise and the general character of the noise. The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.

2.1.10 More specific factors to consider when relevant:

- where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on

windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations; and

- If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.2 Professional Practice Guidance on Planning & Noise 2017

2.2.1 Professional Practice Guidance (ProPG) on Planning and Noise has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The guidance encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. It aims to complement Government planning and noise policy and guidance. 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.

2.2.2 ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging. The two sequential stages of the overall approach are:

- Stage 1 – an initial noise risk assessment of the proposed development site

  It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced.

- Stage 2 – a systematic consideration of four key elements:

  <u>Element 1 – demonstrating a "Good Acoustic Design Process"</u>

  It is imperative that acoustic design is considered at an early stage of the development control process. A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally and externally. Good acoustic design should avoid "unreasonable" acoustic conditions and prevent "unacceptable" acoustic conditions.

Element 2 – observing internal "Noise Level Guidelines"

Table 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 show in bold)

Activity	Location	07:00 – 23:00 Hours	23:00 – 07:00 Hours
Resting	Living room	35dB LAeq,16hr	-
Dining	Dining room/area	40dB LAeq,16hr	-
Sleeping (daytime resting)	Bedroom	35dB LAeq,16hr	30dB LAeq,8hr **45dB LAmax, fast**[4]

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

*NOTE 2 The **internal L_{Aeq} target** levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a Road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the **internal L_{Aeq} target** levels recommended in the Table.*

*NOTE 3 These **internal L_{Aeq} target** levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.*

*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. **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 45dB $L_{Amax,\ F}$ 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.***

*NOTE 5 **Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.***

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

*NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal **L_{Aeq}** target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. **The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.***

Element 3 – undertaking an "External Amenity Area Noise Assessment"

Advice in BS8233:2014 provides the following:

"If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended. The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$. These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."

Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- a relatively quiet façade or a relatively quiet externally ventilated as part of their dwelling; and/or
- a relatively quiet alternative or additional external amenity space for sole use by a household; and/or
- a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or
- a relatively quiet, protected, publicly accessible, external amenity space that is nearby.

Element 4 – consideration of "Other Relevant Issues"

- compliance with relevant national and local policy;
- magnitude and extent of compliance with ProPG;
- likely occupants of the development;
- acoustic design v unintended adverse consequences; and
- acoustic design v wider planning objectives.

2.2.3 Following the above stages, including the initial site risk assessment and full assessment, a recommendation to the decision maker is determined as follows:

A. Grant without noise conditions; or
B. Grant with noise conditions; or
C. Avoid (significant adverse effects); or
D. Prevent (unacceptable adverse effects).

2.3 Local Authority Guidance and Criteria – Bedford Borough Council's Environmental Health Department

2.3.1 Professional Consult contacted Bedford Borough Council's Environmental Health Department on 11th July 2019 and the following was stated:

'Proposals include for the demolition of No.27 Hookhams Lane in order to provide access to the scheme and the client's Planning Consultant has suggested the Noise Impact Assessment needs to consider the noise impact from vehicles using the proposed access road upon the adjacent residential dwellings only, however could you please confirm whether or not you also require a road traffic noise impact assessment of Ravensden Road and the setting of mechanical plant noise emission limits associated with the proposed school?

Professional Consult will complete a Noise Survey at the Site which will comprise:

Noise Measurement Position 1: It is anticipated that peak vehicle movements will occur during the morning period between the hours of 06:00 – 09:00 and in the afternoon period between 15:00 – 18:00. As such, a road traffic noise measurement will be completed for Hookhams Lane between these periods in order to predict the existing noise climate at the existing residential dwellings adjacent to the proposed access road.
Professional Consult will complete a Noise Impact Assessment for the above noise source, comprising:

Development Access Road Traffic Noise: The existing noise climate during the peak periods at the adjacent residential dwellings will be established before the predicted noise level from vehicles using the proposed access road will be calculated. Professional Consult will undertake noise measurements of a passenger vehicle and this noise level will be combined with road traffic count data for the worst-case peak periods – the assessment will consider the change in ambient noise level over each 1-hr period. Where the change in ambient noise level is predicted to exceed 3dB, Professional Consult will specify appropriate noise mitigation measures to control the change in ambient noise level at the receptors to below 3dB. An assessment will also be completed for the maximum noise levels during the night-time period.

If you require road traffic noise from Ravensden Road to be included, then a road traffic noise measurement in line with the guidance contained in Calculation of Road Traffic Noise (CRTN) will be completed and the wider daytime and night-time noise levels will be assessed against the criteria presented in BS8233:2014. If you also require mechanical plant noise emission limits to be set for the proposed school, this will be completed following a background sound survey on the Site and the assessment will conform to the requirements of BS4142:2014+A1:2019.

2.3.2 Professional Consult received a response from the Environmental Health Department on 16th July 2019 confirming agreement with the above methodology and also for the inclusion of an assessment of road traffic noise from Ravensden Road and an assessment of mechanical plant noise emissions from the school.

2.4 BS4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

2.4.1 This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

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

2.4.2 The procedure detailed in the standard compares the measured or predicted noise level 'the specific noise level' from any of the above detailed noise sources with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is 'typical.'

2.4.3 The specific noise level also acknowledges the following reference time intervals depending upon whether the noise source operates during daytime or night-time periods:

- Daytime (07:00 - 23:00): 1 hour; and
- Night-time (23:00 - 07:00): 15 minutes.

2.4.4 There are a number of 'penalties' which can be attributed to the specific sound level, either subjectively or objectively, depending upon the 'acoustic features' of the sound level under investigation as follows. These penalties vary in their weighting depending upon the severity of the acoustic feature, as follows (with regards to the subject method):

Tonality

- +2dB: where the tonality is just perceptible;
- +4dB: where the tonality is clearly perceptible; and
- +6dB: where the tonality is highly perceptible.

Impulsivity

- +3dB: where the impulsivity is just perceptible;
- +6dB: where the impulsivity is clearly perceptible; and
- +9dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment.

2.4.5 Where the assessment is carried out using the objective method, the tonality penalty is either 0dB or 6dB and the impulsivity penalty can range from 0dB up to 9dB in increments of 1dB, depending on the level of impulsivity identified.

2.4.6 In addition to the above acoustic features, there is a penalty for 'other sound characteristics' of +3dB where a sound exhibits characteristics that are neither tonal nor impulsive, though is readily distinctive against the acoustic environment.

2.4.7 BS4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

2.4.8 Assessment of the rating level relative to the background noise level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and
- 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

2.4.9 Whilst the amended 2019 Standard does make various references to it not being intended to assess noise impacts at indoor locations, section 1.1 does state *'The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*'. Example 6 in the Standard states *'In addition to the rating/background sound level comparison shown in Table A.6, the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows. Other guidance, such as BS 8233, might also be applicable in this instance*'. Furthermore, Example 8, which considers night-time commercial noise impacts at a dwelling states *'BS 8233 indicates that 40 dBA sound level from the plant,*

equating to an internal level of around 30 dBA or possibly lower, but with some acoustically distinguishing characteristics, may not be suitable for a bedroom.'

2.4.10 With the above in mind, and for a clear need to ensure that any potential commercial or industrial noise impacts at the building façade do not give rise to internal noise level which causes sleep disturbance in bedrooms, this Assessment will ensure that the predicted rating level (specific sound level including any character corrections) does not exceed 30dB in bedrooms.

2.5 BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Noise Criteria Limits

2.5.1 The scope of this standard is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

2.5.2 The standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in Table 3.

Table 3. BS8233:2014 Internal Target Noise Levels

Criterion	Typical Situation	Design $L_{Aeq,t}$ (dB)
Suitable resting / sleeping conditions	Living Room	35
	Bedroom*	30
*For a Reasonable standard in bedrooms at night, individual noise evens (measured with fast time weighting) should not exceed 45dB L_{max}		

2.5.3 BS8233 goes on to recommend noise levels for gardens as follows:

> *"It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised 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 might be warranted".*

2.5.4 BS8233 goes on to say:

> *"In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited".*

Ventilation Requirements

2.5.5 Where a partially open window cannot be relied upon to provide an adequate level of facade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS8233 states:

> *"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for*

this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.

Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

Section 7.7.2 states:

"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 façade insulation or the resulting noise level."

2.6 Institute of Environmental Management & Assessment 'Guideline for Environmental Noise Impact Assessment', October 2014

2.6.1 The guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- How to scope a Noise Assessment;
- Issues to be considered when defining the baseline noise environment;
- Prediction of changes in noise levels as a result of implementing development proposals; and
- Definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within an EIA).

2.6.2 Although the guidance states that it is only applicable for use in an Environmental Impact Assessment (EIA), in the absence of any other relevant guidance for assessing changes in ambient noise levels, it is the most appropriate document for establishing significance of effect.

2.6.3 Table 4 categorises the change in noise level for a noise sensitive receptor such as a residential dwelling.

Table 4 Effect Descriptors for Residential Dwellings

Effect	Change in Ambient Noise Level (dB)
Very substantial	>10.0
Substantial	5.0 – 9.9
Moderate	3.0 – 4.9
None / not significant	<2.9

3 NOISE SURVEYS

3.1 Noise Survey Method

3.1.1 A number of noise surveys have been completed at the Site which included for:

- A 24-hr road traffic noise measurement completed on the eastern boundary of the Site with Ravensden Road. The noise levels measured will inform an assessment of any road traffic noise impacts upon any proposed residential dwellings close to This noise measurement position has also been used measure background sound levels; and

- A 24-hr road traffic noise survey completed 6m from the nearside kerbstone of Hookhams Lane. This noise survey was completed in order to complete a change in ambient noise level assessment which considers the potential noise impact of road traffic vehicles using the new access road upon the adjacent residential dwellings – numbers 25 and 29 Hookhams Lane.

3.2 Road Traffic Noise Survey – Ravensden Road

3.2.1 Professional Consult has completed a road traffic noise survey as follows:

- Noise Measurement Position 1: 11:00 Tuesday 16th July – 11:00 Wednesday 17th July 2019. The microphone of the sound level meter was located 4m from the nearside kerbstone of Ravensden Road in free-field conditions.

3.2.2 Table 4 summarises the measured noise levels.

Table 4. Summary of Measured Road Traffic Noise Levels

Road	Measurement Period	Measured Free-field Sound Pressure Level (dB)			Measurement Distance from Centre of Road (m)
		$L_{Aeq,16hr}$	$L_{Aeq,8hr}$	10th Highest $L_{Amax,fast}$	
Ravensden Road	24hr	61.3	53.9	76.8	7.5

3.3 Road Traffic Noise Survey – Hookhams Lane

3.3.1 Professional Consult has completed a road traffic noise survey as follows:

- Noise Measurement Position 2: 12:00 Tuesday 16th July – 12:00 Wednesday 17th July 2019. The microphone of the sound level meter was located 6m from the nearside kerbstone of Hookhams Lane in free-field conditions.

3.3.2 The Assessment for the change in ambient noise levels at the closest receptors to the proposed access road to the Site from Hookhams Lane will use 1-hour ambient noise levels and so these are displayed in Table 5.

Table 5. Summary of Measured Road Traffic Noise Levels

Road	Measurement Period	Measured Free-field Sound Pressure Level $L_{Aeq,1hr}$ (dB)	Measurement Distance from Centre of Road (m)
Hookhams Lane	16/07/2019 12:00	59.5	9.5
	16/07/2019 13:00	59.3	
	16/07/2019 14:00	60.4	
	16/07/2019 15:00	62.1	
	16/07/2019 16:00	61.7	
	16/07/2019 17:00	62.5	
	16/07/2019 18:00	60.1	
	16/07/2019 19:00	59.3	
	16/07/2019 20:00	56.1	
	16/07/2019 21:00	55.7	
	16/07/2019 22:00	53	
	16/07/2019 23:00	50.7	
	17/07/2019 00:00	41.9	
	17/07/2019 01:00	47.2	
	17/07/2019 02:00	41.1	
	17/07/2019 03:00	43.6	
	17/07/2019 04:00	44.8	
	17/07/2019 05:00	53.6	
	17/07/2019 06:00	57.8	
	17/07/2019 07:00	62.5	
	17/07/2019 08:00	64.4	
	17/07/2019 09:00	61.1	
	17/07/2019 10:00	59.8	
	17/07/2019 11:00	60.3	

3.4 Background Sound Survey

3.4.1 Professional Consult has completed a background sound survey as follows:

- Noise Measurement Position 1: 11:00 Tuesday 16th July – 11:00 Wednesday 17th July 2019. The microphone of the sound level meter was located 4m from the nearside kerbstone of Ravensden Road in free-field conditions.

3.4.2 As the school is only likely to operate between 07:00 – 18:00, the background sound levels during this period have been used in the Assessment. Table 6 displays the measured background sound levels.

Table 6. Summary of Measured Background Sound Levels

Period	Range of Measured Background Sound Levels (dB)	Measured Median (Typical) Background Sound Level (dB)
Daytime (07:00 – 18:00)	35.4 – 41.4	36.3

3.5 Passenger Vehicle Noise Survey

3.5.1 In order to complete the assessment which considers noise generated by vehicles using the proposed access road off Hookhams Lane, Professional Consult has measured a diesel passenger vehicle travelling at 30mph at 4m and at 7.5m and the measured noise levels are detailed in Table 7.

Table 7. Measured Noise Levels from a Passenger Vehicle

Vehicle Direction	Measured Noise Level, $L_{Aeq,t}$ (dB)	Vehicle Pass-by Duration	Measurement Distance (m)	Measured Maximum Noise Level, $L_{Amax,f}$ (dB)
East	55.6	25	4	66.7
West	55.6	23	7.5	66.0

3.6 Survey Equipment

3.6.1 The following equipment was used for the Noise Surveys.

Table 8. Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No	Serial No.	Calibration Due Date
NMP1 + Passenger Vehicle Survey	Sound Level Meter	01dB Fusion	11755	16 July 2020
	Pre-amplifier	01dB PRE22	1707173	
	Microphone	GRAS 40CE	291693	
	Calibrator	01dB CAL-31	84086	13 July 2020
NMP2	Sound Level Meter	01dB Fusion	12038	26 March 2021
	Pre-amplifier	01dB PRE22	1805093	

	Microphone	GRAS 40CE	330801	
	Calibrator	01dB CAL-31	87280	06 March 2020

3.6.2 The sound level meters were field calibrated prior to and following the survey and no significant drift was identified.

3.6.3 During the noise surveys the weather conditions were conducive to the measurement of environmental noise, i.e. wind speeds of no more than 5m/s and dry conditions.

4 NOISE CONSTRAINTS ASSESSMENT

4.1 Road Traffic Noise Assessment for Ravensden Road

Professional Practice Guidance

Initial Site Noise Risk Assessment for Transportation Noise

4.1.1 The noise risk assessment should provide an indication of the likely risk of adverse effects from noise where no subsequent mitigation is to be included as part of the development proposal. It should indicate whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective. The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application. Table 9 indicates the level of risk at the various Site boundaries.

Table 9. Risk Categorisation – Site Boundary

Road	Period	Calculated / Measured Noise Level at Site Boundary (dB)	Period Risk Outcome	Overall Risk Outcome
Ravensden Road	Daytime	61.3 $L_{Aeq,16hr}$	Low / Medium	Low / Medium
	Night-time	53.9 $L_{Aeq,8hr}$	Low / Medium	
		76.8 $L_{Amax,f}$	$L_{Amax,f}$ > 60dB, so negligible not permitted	

4.1.2 Table 9 indicates that noise levels at the Site boundary with Ravensden Road falls into the low / medium risk category during the daytime and night-time periods respectively and accordingly the pre-planning advice is as follows:

Low Risk

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.

Medium Risk

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.

4.1.3 Table 10 indicates the risk categories at increasing distances from Ravensden Road.

Table 10. Risk Categorisation for Daytime Period – Increasing Distance

Road	Location	Calculated / Measured Noise Level (dB)	Period Risk Outcome
Ravensden Road	Site Boundary	61.3 $L_{Aeq,16hr}$	Low / Medium

	10m from centre-line of carriageway	60dB $L_{Aeq,16hr}$	Low Risk
	99m from centre-line of carriageway	50dB $L_{Aeq,16hr}$	Negligible Risk

4.1.4 The adopted outdoor noise criteria level for this Site is 55dB $L_{Aeq,16hr}$ and noise levels fall below criteria value at 32m from the centre of Ravensden Road.

Full Site Noise Risk Assessment for Transportation Noise

Good Acoustic Design Process

4.1.5 Good acoustic design should avoid "unreasonable" acoustic conditions and prevent "unacceptable" acoustic conditions. Good acoustic design is not just compliance with recommended internal and external noise exposure standards. Good acoustic design should provide an integrated solution whereby the optimum acoustic outcome is achieved, without design compromises that will adversely affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements.

4.1.6 In the absence of a detailed scheme masterplan, there is potential for dwellings to be located within 32m of the centre of Ravensden Road and so good acoustic design is essential in these areas. Specifically, the following will need to be considered when designing the Site and plot layouts:

- Plots bounding/closest to Ravensden Road will need to be orientated such that any garden areas are protected by the building envelope and buildings should wrap around the sides, wherever possible, to protect the gardens;
- Gaps between dwellings fronting the roads should be kept to a minimum to avoids noise break-through into the gardens behind;
- Public open space or nature corridors along the roads would be advantageous as these provide a buffer to the plots and also barriers or bunds could be incorporated into the design which can be planted with minimal visual impact; and
- Wherever possible, windows for habitable rooms should face away from the noise sources so that opening windows does not necessarily result in an exceedence of the criteria. However, where this is not possible, internal levels can be controlled by way of mitigation.

Internal Noise Level Assessment

4.1.7 In the absence of a detailed scheme masterplan, detailed assessments are not possible. Accordingly, any proposed dwellings on the Site boundary with the road are taken as being representative of a worst-case scenario. Table 11 considers internal noise levels using standard thermal double glazing and a partially open window, if a dwelling were to be built on the Site boundary. BS8233:2014 suggest that a glazing unit with configuration 6mm glass/12mm air space/6mm glass affords sound insulation performance in the order of 33dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction, has a sound insulation performance value of approximately 30dB and so this value has been used to calculate internal noise levels. It also goes on to recommend that a partially open window provides approximately 15dB attenuation.

Table 11. Calculation of Internal Noise Level with Standard Thermal Glazing & Open Window

Room / Period	Windows Closed / Open	Noise Level at Dwelling Façade (Free-field) (dB)	Attenuation Afforded (dB)	Calculated Internal Noise Level (dB)	Internal Noise Criteria Level (dB)	Difference +/- (dB)
Living Room (Daytime)	Closed	61.3 $L_{Aeq,16hr}$	30	31.3	35	-3.7
Bedroom (Night-time)		53.9 $L_{Aeq,8hr}$	30	23.9	30	-6.1
		76.8 $L_{Amax,f}$	33	43.8	45	-1.2
Living Room (Daytime)	Open	61.3 $L_{Aeq,16hr}$	15	46.3	35	**+11.3**
Bedroom (Night-time)		53.9 $L_{Aeq,8hr}$	15	38.9	30	**+8.9**
		76.8 $L_{Amax,f}$	15	61.8	45	**+16.8**

4.1.8 Table 11 indicates that during the daytime and night-time periods with standard thermal double glazing, the internal noise criteria limits as detailed in BS8233:2014 and ProPG, are achieved however with a partially open window the criteria noise levels are exceeded for both living rooms and bedrooms, should either of these habitable rooms face Ravensden Road, and so a scheme of alternative ventilation will be required.

4.1.9 At the detailed stage when the precise location of dwellings are known, it is recommended that noise modelling software is used in order to accurately determine which dwellings require alternative ventilation and which do not.

External Amenity Area Noise Level Assessment

4.1.10 Any dwelling garden located within 32m of Ravensden Road will experience road traffic noise levels which exceed the adopted 55dB $L_{Aeq,16hr}$ criteria and so it has already been established that good acoustic design should be employed, wherever practically possible, with dwelling orientation in order to ensure that the criteria noise level is not exceeded. Nevertheless, it is expected that not all dwellings may be able to benefit from garden areas facing away from Ravensden Road. In a situation where a garden area lies close to the Site boundary with Ravensden Road, an acoustic grade fence will be required for that garden area and Table 12 calculates the height of the fence.

Table 12. Calculation of Garden Fence Height – Worst Case

Measured Noise Level on Boundary $L_{Aeq,16hr}$ (dB)	Adopted Criteria for Gardens (dB)	Exceedence +/- (dB)	Required Barrier Path Difference (m)	Calculated Fence Height (m)
61.3	55	+6.3	0.03	1.7

Note: Barrier path difference calculation assumes the source is at 0.5m height, the receiver at 1.8m height, a distance of 7.5m from the carriageway centre to the acoustic fence and a distance of 5m from the acoustic fence to the receiver.

4.1.11 Table 12 indicates that a fence height of 1.7m will be required in order to reduce road traffic noise levels to 55dB. As garden fences are generally 1.8m in height, a 1.8m high acoustic fence would afford a marginal over-performance. An acoustic fence should have a minimum mass of 15kg/m^2 and be free from any holes or gaps. As an alternative to an acoustic fence, an earth bund of the same height would also act as a satisfactory noise barrier.

4.1.12 At the detailed stage when the precise location of dwellings are known, it is recommended that noise modelling software is used in order to accurately determine which dwellings will require acoustic fences and associated heights.

Other Relevant Issues

4.1.13 ProPG primarily seeks to encourage a good acoustic design process for new residential development. It is recognised that it may not always be possible to achieve the internal noise level guidelines in all rooms within noise sensitive developments. Where it is not possible to achieve the recommended standards in every respect, regard should be had to the number of dwellings and number of habitable rooms in each of the dwellings where the recommended standard cannot be achieved. Similarly, regard should be had to the extent to which the guidance on the external amenity area noise assessment has been followed, including whether access to quiet or relatively quiet external amenity areas is considered necessary, and the extent of any adverse impacts on external amenity areas that are an intrinsic part of the overall design.

4.2 Proposed Access Road Assessment for 25 & 29 Hookhams Lane

4.2.1 The most robust assessment method in considering any potential road traffic noise impacts, brought about by the introduction of a new vehicle access road from Hookhams Lane, is to consider any change in ambient noise level in the rear garden areas of 25 and 29 Hookhams Lane – the two dwellings which lie closest to the proposed access road. In order to complete this assessment, the following has been obtained:

- Road traffic movement data from the Transport Consultant Martin Andrews Consulting Limited. Traffic movement data has been supplied as two-way traffic prediction for vehicles using the proposed access road off Hookhams Lane. The traffic has been supplied for the hours 07:00 – 19:00;
- A noise measurement of a diesel passenger vehicle has been obtained under controlled conditions at a speed of 30mph at 4m and at 7.5m measurement distance on a normal road. It is anticipated that vehicles using the access road will not be travelling a speed greater than 30mph; and
- A road traffic noise survey for Hookhams Land has been completed to over a full 24-hr period and to cover the times of the provided traffic data. The road traffic survey has measured each 1-hour period at a distance of 9.5m from the centre of Hookhams Lane and the measured noise levels have been distance corrected to the rear gardens of 25 and 29 Hookhams Lane and allowing for screening afforded by the dwellings.

4.2.2 The measured passenger vehicle noise levels have been converted to an average sound exposure level (SEL) as detailed in Table 13.

Table 13. Calculation of Average Sound Exposure Level & 1hr L_{Aeq}

Vehicle Direction	Measured Noise Level, $L_{Aeq,t}$ (dB)	Vehicle Pass-by Duration	Calculated SEL (dB)	Average SEL for Both Pass-bys (dB)	Calculated Noise Level for 1 Vehicle over 1-Hour, $L_{Aeq,1hr}$ (dB)
East	55.6	25	69.6	69.4	33.8
West	55.6	23	69.2		

4.2.3 Table 14 calculates the existing ambient noise climate in the rear gardens of 25 Hookhams Lane from road traffic using Hookhams Lane for each 1-hour period from 07:00 – 19:00.

Table 14. Calculation of Existing Ambient Noise Levels in Garden Areas of 25 & 29 Hookhams Lane

Period start	Measured 1hr Road Traffic Noise Level, $L_{Aeq,1hr}$ (dB)	Measurement Distance to Centre of Road (m)	Distance from Centre of Road to Garden Area (m)	Calculated 1-hr Noise Level in Garden, $L_{Aeq,1hr}$ (dB)*
16/07/2019 12:00	59.5	9.5	36	43.7
16/07/2019 13:00	59.3	9.5	36	43.5
16/07/2019 14:00	60.4	9.5	36	44.6
16/07/2019 15:00	62.1	9.5	36	46.3
16/07/2019 16:00	61.7	9.5	36	45.9
16/07/2019 17:00	62.5	9.5	36	46.7
16/07/2019 18:00	60.1	9.5	36	44.3
17/07/2019 07:00	62.5	9.5	36	46.7
17/07/2019 08:00	64.4	9.5	36	48.6
17/07/2019 09:00	61.1	9.5	36	45.3
17/07/2019 10:00	59.8	9.5	36	44.0
17/07/2019 11:00	60.3	9.5	36	44.5
16/07/2019 12:00	59.5	9.5	36	43.7
16/07/2019 13:00	59.3	9.5	36	43.5
16/07/2019 14:00	60.4	9.5	36	44.6
16/07/2019 15:00	62.1	9.5	36	46.3
16/07/2019 16:00	61.7	9.5	36	45.9
16/07/2019 17:00	62.5	9.5	36	46.7
16/07/2019 18:00	60.1	9.5	36	44.3
17/07/2019 07:00	62.5	9.5	36	46.7
17/07/2019 08:00	64.4	9.5	36	48.6
17/07/2019 09:00	61.1	9.5	36	45.3
17/07/2019 10:00	59.8	9.5	36	44.0
17/07/2019 11:00	60.3	9.5	36	44.5

*Includes 10dB line of sight removal afforded by dwelling

4.2.4 Table 15 calculates the noise level, for each 1-hour period, from vehicles using the proposed access road in the garden area of 25 Hookhams and assesses the change in ambient noise level.

Table 15. Calculation of Change in Ambient Noise Level in Garden of 25 Hookhams Lane

Period start	Calculated 1-hr Noise Level for 1 Car (dB)	Two-way Quantity of Vehicles Using Access Rd	Quantity Corrected Noise Level at 7.5m (dB)	Distance from Centre of Access Road to Garden (m)	Existing Ambient + Access Road Noise Level (dB)	Change in Ambient Noise Level (dB)	Maximum Allowable Change in Ambient Noise Level (dB)	Exceedence +/- (dB)
16/07/2019 12:00	33.8	148	55.6	25.0	50.6	+6.9	+2.9	+4.0
16/07/2019 13:00	33.8	154	55.7	25.0	50.7	+7.2	+2.9	+4.3
16/07/2019 14:00	33.8	166	56.0	25.0	51.1	+6.5	+2.9	+3.6
16/07/2019 15:00	33.8	258	58.0	25.0	53.0	+6.7	+2.9	+3.8
16/07/2019 16:00	33.8	250	57.8	25.0	52.9	+6.9	+2.9	+4.0
16/07/2019 17:00	33.8	257	57.9	25.0	53.0	+6.3	+2.9	+3.4
16/07/2019 18:00	33.8	235	57.6	25.0	52.5	+8.2	+2.9	+5.3
17/07/2019 07:00	33.8	184	56.5	25.0	51.7	+5.0	+2.9	+2.1
17/07/2019 08:00	33.8	292	58.5	25.0	53.7	+5.1	+2.9	+2.2
17/07/2019 09:00	33.8	153	55.7	25.0	50.8	+5.5	+2.9	+2.6
17/07/2019 10:00	33.8	140	55.3	25.0	50.4	+6.4	+2.9	+3.5
17/07/2019 11:00	33.8	138	55.2	25.0	50.4	+5.8	+2.9	+2.9

4.2.5 Table 15 indicates that the change in ambient noise level in the garden area of 25 Hookhams varies between +2.1dB and +5.3dB. As such, the following section will consider appropriate noise mitigation to reduce the worst-case change in noise level so no exceedance occurs.

4.2.6 Table 16 calculates the noise level, for each 1-hour period, from vehicles using the proposed access road in the garden area of 29 Hookhams and assesses the change in ambient noise level.

Table 16. Calculation of Change in Ambient Noise Level in Garden of 29 Hookhams Lane

Period start	Calculated 1-hr Noise Level for 1 Car (dB)	Two-way Quantity of Vehicles Using Access Rd	Quantity Corrected Noise Level at 7.5m (dB)	Distance from Centre of Access Road to Garden (m)	Existing Ambient + Access Road Noise Level (dB)	Change in Ambient Noise Level (dB)	Maximum Allowable Change in Ambient Noise Level (dB)	Exceedence +/- (dB)
16/07/2019 12:00	33.8	148	55.6	27.0	50.3	+5.8	+2.9	+2.9
16/07/2019 13:00	33.8	154	55.7	27.0	50.5	+6.2	+2.9	+3.3
16/07/2019 14:00	33.8	166	56.0	27.0	50.8	+5.4	+2.9	+2.5
16/07/2019 15:00	33.8	258	58.0	27.0	52.7	+5.6	+2.9	+2.7

16/07/2019 16:00	33.8	250	57.8	27.0	52.6	+5.9	+2.9	+3.0
16/07/2019 17:00	33.8	257	57.9	27.0	52.7	+5.2	+2.9	+2.3
16/07/2019 18:00	33.8	235	57.6	27.0	52.2	+7.1	+2.9	+4.2
17/07/2019 07:00	33.8	184	56.5	27.0	51.4	+3.9	+2.9	+1.0
17/07/2019 08:00	33.8	292	58.5	27.0	53.4	+4.0	+2.9	+1.1
17/07/2019 09:00	33.8	153	55.7	27.0	50.6	+4.5	+2.9	+1.6
17/07/2019 10:00	33.8	140	55.3	27.0	50.1	+5.3	+2.9	+2.4
17/07/2019 11:00	33.8	138	55.2	27.0	50.1	+4.8	+2.9	+1.9

4.2.7 Table 16 indicates that the change in ambient noise level in the garden area of 29 Hookhams varies between +1.1dB and +4.2dB. As such, the following section will consider appropriate noise mitigation to reduce the worst-case change in noise level so no exceedance occurs.

4.2.8 In addition to the consideration of maximum noise levels, it is also necessary to consider the noise impact of maximum noise levels produced by road traffic using the proposed access road during the night-time period for both 25 and 29 Hookhams Lane. Table 17 calculates the maximum noise level at both dwellings. In the interests of a worst-case assessment, the absolute highest maximum noise levels from the passenger vehicle noise survey have been used.

Table 17. Calculation of Maximum Noise Level at Dwellings

Receptor	Measured Maximum Noise Level, $L_{Amax,f}$ (dB)	Measurement Distance (m)	Distance to Receptor Façade (m)	Calculated Maximum Noise Level at Receptor (m)	External Criteria (dB)	Difference +/- (dB)
25 Hookhams Lane	66.7	4	15	55.2	60	-4.8
	66.0	7.5	15	60.0	60	0.0
29 Hookhams Lane	66.7	4	17	54.1	60	-5.9
	66.0	7.5	17	58.9	60	-1.1

4.2.9 Table 17 indicates that the external maximum noise level will not exceed 60dB at the dwelling facades and so allowing 15dB for a partially open window, the maximum internal noise level will not exceed 45dB $L_{Amax,f}$.

4.3 Mechanical Plant Noise Emission Limits for Proposed School

4.3.1 There are no details available in order to complete a formal assessment of the potential noise impact from any mechanical plant associated with the proposed school. As such this assessment has set mechanical plant noise emission limits based on the measured typical background sound level and the criteria provided in BS4142:2014+A1:2019.

Table 18. Calculation of Mechanical Plant Noise Emission Limits

Period	Measured Median (Typical) Background Sound Level (dB)	Criteria (dB)	Maximum Permissible Rated Noise Level at Closest Residential Receptor (dB)
Daytime (07:00 – 18:00)	36.3	$L_{A,r} = L_{A90,t}$	36.3

4.3.2 The maximum overall rated level of noise produced by all mechanical and electrical plant at the school shall not exceed 36.3dB. It is recommended that when precise details of the school are known, a noise impact assessment is completed in order to ensure that this noise criteria limit is not exceeded at the closest residential dwelling.

5 MITIGATION

5.1 Road Traffic Noise – Ravensden Road

5.1.1 The previous section has identified that, if dwellings were to be built on the Site boundary, then standard thermal double glazing will afford sufficient noise attenuation to control internal noise levels during both daytime and night-time periods, however with windows open for a habitable room facing Ravensedn Road, the criteria will be exceeded. As such, dwellings with habitable rooms close to Ravensden Road will require alternative ventilation and this can take the form of an acoustic trickle ventilator in order to permit background ventilation which accords with the Building Regulations. Such a trickle ventilator is as follows:

- Greenwoods EAR42W (affords up to 42dB $D_{n,e,w}+C_{tr}$).

5.1.2 It should be noted that windows remain openable at the occupant's discretion and to afford purge ventilation.

5.1.3 With regards to noise levels in garden areas, the previous section has shown that where gardens are close to the Site boundary with Ravensden Road, then an acoustic fence at 1.7m in height will be sufficient in controlling noise levels in these garden areas to meet the 55dB criteria. However, allowing for good acoustic design, the following should be considered when designing the Site and plot layouts:

- Plots bounding/closest to Ravensden Road will need to be orientated such that any garden areas are protected by the building envelope and buildings should wrap around the sides, wherever possible, to protect the gardens; and

- Gaps between dwellings fronting the roads should be kept to a minimum to avoids noise break-through into the gardens behind.

5.2 Road Traffic Noise from Proposed Access Road Upon 25 & 29 Hookhams Lane

5.2.1 The previous section has shown that an exceedance of the change in ambient noise level criteria exists for 25 Hookhams Lane in the order of 5.3dB and 4.2dB for 29 Hookhams Lane respectively. As such in order to reduce these exceedences to 0dB, calculation indicates that an acoustic fence should be installed along the boundary of 25 and 29 Hookhams Lane at a height of 1.7m. The acoustic fence should have a minimum mass of 15kg/m^2 and be free from holes.

6 CONCLUSION

6.1.1 Professional Consult Limited was instructed by Manor Oak Homes Limited to prepare a Noise Constraints Assessment for a proposed mixed-use development on a parcel of land at Salph End in Bedford, Bedfordshire MK41.

6.1.2 It is understood that this Assessment will accompany an outline planning application for 500 dwellings and land for a primary school. The preparation of this application accompanies the ongoing promotion of the land towards the Bedford Local Plan 2030, which is currently at examination.

6.1.3 This Assessment has been undertaken to identify the key noise sources which have the potential to impact upon the proposed noise-sensitive residential development and to identify any noise impacts brought about by the development upon existing noise sensitive residential receptors surrounding the Site.

6.1.4 Accordingly, this Assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance. In addition, various British Standard and guidance documents exist which are applicable to the assessment of noise and these have also been adopted where appropriate.

6.1.5 This Assessment has recommended that good acoustic design be employed when designing the Site, particularly for the part of the Site which borders Ravensden Road in order to limit the use of any acoustic fences. Where gardens do have line of sight to Ravensden Road and they are in close proximity to this road, an acoustic fence of 1.7m will be required to control noise levels in these garden areas. Any dwellings which lie close to Ravensden Road will require alternative ventilation to opening windows for both living rooms and bedrooms.

6.1.6 This Assessment has set mechanical and electrical plant noise emission limits for the proposed school in order to ensure that any mechanical plant noise is suitably controlled at the closest residential receptors.

6.1.7 This Assessment has recommended that an acoustic fence at 1.7m in height should be installed along the boundary of the proposed access road with the garden areas of 25 and 29 Hookhams Lane in order to control the change in ambient noise level to an acceptable standard. The Assessment has also shown that maximum noise levels incident upon the dwelling facades of 25 and 29 Hookhams Lane, as a result of vehicle pass-bys at night, meet the adopted noise level criteria.

6.1.8 Subject to the incorporation of the specified mitigation measures, it is considered reasonable to suggest that the noise impacts upon the future amenity space of the proposed dwellings and the noise impacts upon the existing residential dwellings will accord with the ‘No Observed Effect Level’ as detailed in the PPG.

APPENDIX 1: LIMITATIONS

This report and its findings should be considered in relation to the terms of reference and objectives agreed between Professional Consult Limited and the Client.

The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

APPENDIX 2: 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 determined 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 widely 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 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.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 1: Typical Sound Pressure Levels

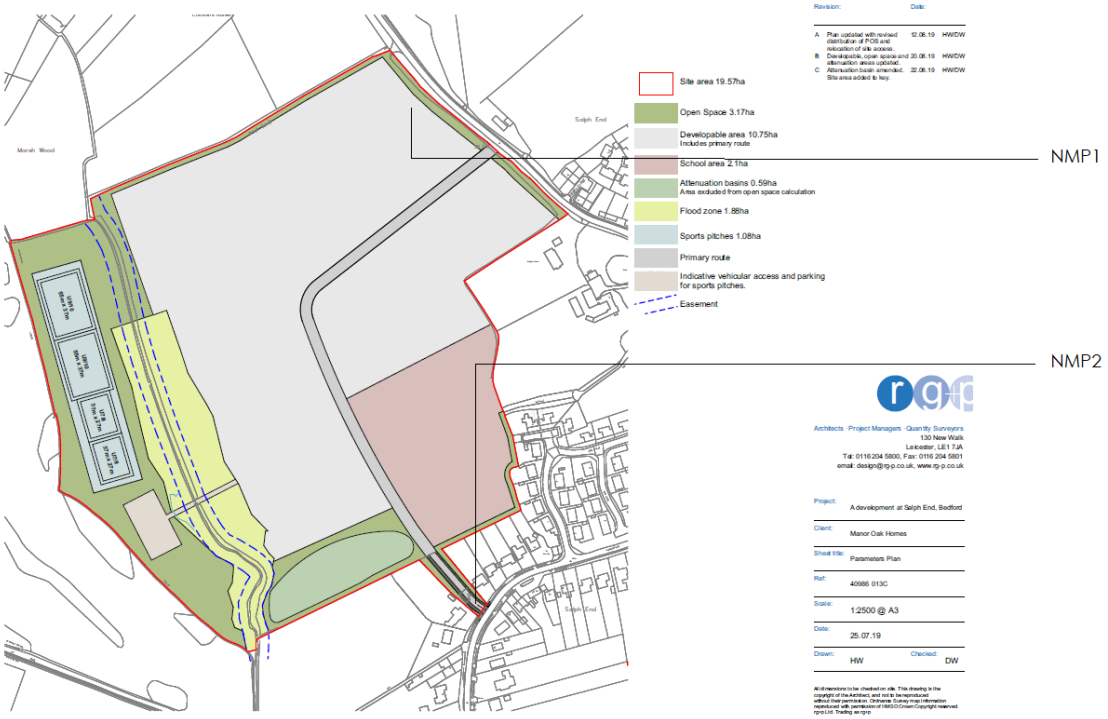
Sound Pressure Level (dB)	Location/Example
0	Threshold of hearing
20 - 30	Quiet bedroom at night
30 - 40	Living room during the day
40 - 50	Typical office
50 - 60	Inside a car
60 - 70	Typical high street
70 - 90	Inside factory
100 - 110	Burglar alarm at 1m away
110 - 130	Jet aircraft on take off
140	Threshold of pain

Table 2: Terminology

Descriptor	Explanation
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} & L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	2A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.

APPENDIX 3: SITE LOCATION PLAN & NOISE MEASUREMENT POSITIONS

Figure 1: Noise Measurement Positions



APPENDIX 4: MEASURED BACKGROUND SOUND LEVEL DATA

Period start	**Measured Background Sound Level, $L_{A90,1hr}$ (dB)**
16/07/2019 11:00	35.4
16/07/2019 12:00	37
16/07/2019 13:00	36.3
16/07/2019 14:00	36.3
16/07/2019 15:00	35.7
16/07/2019 16:00	40.4
16/07/2019 17:00	41.4
16/07/2019 18:00	35.9
16/07/2019 19:00	32.8
16/07/2019 20:00	29.8
16/07/2019 21:00	27.6
16/07/2019 22:00	28.7
16/07/2019 23:00	28
17/07/2019 00:00	27.1
17/07/2019 01:00	24.4
17/07/2019 02:00	20.2
17/07/2019 03:00	20.7
17/07/2019 04:00	25.8
17/07/2019 05:00	32.8
17/07/2019 06:00	36.2
17/07/2019 07:00	37.2
17/07/2019 08:00	40.3
17/07/2019 09:00	36.3
17/07/2019 10:00	36.1