



NOISE IMPACT ASSESSMENT TAPPERS FARM, BODICOTE, CHERWELL

REC REFERENCE: AC106181-1R0

REPORT PREPARED FOR: HOLLINS STRATEGIC LAND

DATE: 25TH SEPTEMBER 2018



National Consultancy, Locally Delivered

A CONCEPT LIFE SCIENCES COMPANY





Issue / revision	Issue 1			
Remarks	Draft for comment			
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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd has been commissioned by Hollins Strategic Land to undertake a Noise Impact Assessment for a proposed residential development on land at Tappers Farm, Bodicote, Cherwell, OX15 4BN.

Noise Survey

Environmental noise surveys have been completed to determine the impact of road traffic from both Oxford Rd and White Post Rd. Additionally, measurements have been obtained of noise from the adjacent school during the lunch hour, representing a worst-case.

Noise Impact Assessment

A noise model has been constructed including both adjacent roads as sources and with full topography.

The Noise Impact Assessment has identified that the key noise sources impacting upon the development are road traffic using the adjacent roads and the primary school.

Accordingly, appropriate consideration has been given towards the mitigation measures required to ensure a commensurate level of protection against noise for future residents.

Recommended Mitigation Measures

This assessment has recommended the following mitigation measures in order to ensure an adequate level of protection from noise within external and internal areas:

- ▶ 2.5m high fencing is recommended for certain locations;
- ▶ Alternative ventilation should be made available for specified facades;
- ▶ 2.5m partial boundary fencing is recommended to mitigate impacts due to school noise; and
- ▶ A single facade requires marginally higher specification glazing for daytime use only.

Subject to the incorporation of the identified mitigation measures, it is considered that in principle, the Site is suitable for the promotion of residential development.





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1. INTRODUCTION

Resource and Environmental Consultants (REC) Limited has been commissioned by Hollins Strategic Land to undertake a Noise Impact Assessment for a proposed residential development on land located at Tappers Farm, Bodicote, Cherwell, OX15 4BN, to be referred to hereafter as '*the Site*'.

This assessment has been undertaken to identify key noise sources in the vicinity of the Site which may have the potential to impact upon the proposed noise-sensitive residential development.

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

1.1 Site Location & Proposed Development

The site is formed of a broadly rectangular parcel of land, located as seen in Figure 2 of Appendix III. It currently comprises an open field with a scattering of trees, with a farm shop and associated buildings on the southern end.

Proposals include for an entirely residential development.

The key sources of noise impacting upon the Site are road traffic using Oxford Rd and White Post Rd, the former being much more significant due to greater traffic flow.

Additionally, the Bishop Loveday School which adjoins the site is audible during break and lunch times.

This assessment has been undertaken with due regard to the following planning drawing:

- ▶ Drawing No: 1732-URB-UD-GA-90-001 dated 170918, prepared by 'the urbanists'.

The proposed layout is shown in Figure 1 of Appendix III.

1.2 Limitations

The limitations of this report are presented in Appendix I.

1.3 Confidentiality

REC 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 REC; a charge may be levied against such approval.





2. ASSESSMENT CRITERIA

2.1 Local National Planning Practice Guidance

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.

Local planning authorities' plan-making and decision taking 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.

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.

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.

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			





Perception	Examples of Outcomes	Increasing Effect Level	Action
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

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.

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.

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 World Health Organisation's (WHO) 'Guidelines for Community Noise'

The WHO 'Guidelines for Community Noise' offers advice with regard to setting noise criteria applicable to sleep disturbance. Section 4.2.3 specifies:

'If the noise is not continuous, L_{Amax} or SEL are used to indicate the probability of noise-induced awakenings. Effects have been observed at individual L_{Amax} exposures of 45 dB or less. Consequently, it is important to limit the number of noise events with a L_{Amax} exceeding 45 dB.'

The guidelines go on to state:

'At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax} so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.'

The sound insulation performance value of 15dB for a façade containing a partially open window accords with the guidance offered in BS8233:2014.

The guidelines reference a study by Vallet & Vernet, 1991, which concluded that:

'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB $L_{AF,max}$ more than 10-15 times per night.'

Accordingly, this assessment has utilised the 10th highest measured maximum noise level from the night-time period and allows for an assessment of a typical maximum noise level in determining façade sound insulation performance.

2.3 British Standard BS8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings

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.

The standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in Table 2.





Table 2 BS8233 Recommended Internal 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 events (measured with fast time weighting) should not normally exceed 45dB L_{Amax}		

BS8233 goes on to recommend noise levels for gardens. According to BS8233;

“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”.

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”.

2.4 Institute of Environmental Management & Assessment ‘Guideline for Environmental Noise Impact Assessment’, October 2014

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).

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.

Table 3 categorises the change in noise level for a noise sensitive receptor such as a residential dwelling.





Table 3: Effect Descriptors, for Residential Dwellings

Effect	Change in Ambient Noise Level
Very substantial	>10dB
Substantial	5.0dB – 9.9dB
Moderate	3.0dB – 4.9dB
None / not significant	<2.9dB





3. NOISE SURVEYS

Noise Measurement Positions (NMPs) are shown on Figure 2 of Appendix III.

3.1 Road Traffic Noise Survey – Oxford Rd

REC has conducted a Road Traffic Noise Survey in order to measure the level of noise generated by vehicles using Oxford Rd. The Noise Survey took place over the following period:

- ▶ 11:36 until 14:36 Friday 14th September 2018.

The following location was chosen for the survey:

- ▶ Noise Monitoring Position 1 (NMP1): Located close to the eastern site boundary, in line with the inner edge of the hedge at 7m from the kerb. The microphone was located 1.5m above ground level and in free-field conditions. Noise at this location was dominated by vehicle pass-bys on Oxford Rd with no other sources being significant.

A summary of the measured sound pressure levels is presented in Table 4.

Table 4 Summary of Measured Road Traffic Noise Levels; NMP1

Period start time	Average Measured Sound Pressure Levels, free-field (dB)		10 th highest $L_{Amax,fast}$
	$L_{Aeq,T}$	$L_{A10,T}$	
14/09/2018 11:36	66.0	70.0	78.4
14/09/2018 12:36	65.6	69.7	
14/09/2018 13:36	65.3	69.3	
$L_{Aeq,16hr}$ as calculated from CRTN	66.7		
$L_{Aeq,8hr}$ as calculated from CRTN and TRL Document	58.0		

The L_{Amax} parameter tabulated is obtained by outputting the $L_{Amax,f}$ parameter for each 1 minute interval during the 3 hour survey. These are ordered in declining intensity and the 10th highest selected.

The weather Conditions during the Noise Surveys were conducive towards the measurement of environmental noise being fine and dry with wind speeds predominantly below 5.0m/s. The measurement location was sufficiently close to the road to be unaffected by wind direction.

The Noise Survey was completed using the following noise measurement equipment.





Table 5 Noise Measurement Equipment

Noise Survey	Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
NMP1	Sound Level Meter	01dB-Metravib Black Solo	65211	30 th March 2019
	Pre-amplifier	01dB-Metravib PRE 21 S	16831	
	Microphone	01dB Metravib MCE212	142644	
	Calibrator	01dB-Metravib CAL-21	34113643	25 th October 2018

The sound level meter was field-calibrated on Site prior to and after noise measurements were taken. No significant drift was witnessed. Calibration certificates are available upon request.

3.2 Road Traffic Noise Survey – White Post Rd

REC has conducted a Road Traffic Noise Survey in order to measure the level of noise generated by vehicles using White Post Rd. The Noise Survey took place over the following period:

- ▶ 13:30 until 16:30 Wednesday 12th September 2018.

The following location was chosen for the survey:

- ▶ Noise Monitoring Position 2 (NMP2): Located 5m from the road edge. The microphone was positioned 1.5m above ground level and in free-field conditions. Noise at this location was dominated by vehicle pass-bys on White Post Rd.

Note that L_{Amax} data from 1500-1548 were excluded due to the frequent occurrence of highly audible children close to the microphone. However it is not considered that these will have significantly influenced the L_{A10} data.

A summary of the measured sound pressure levels is presented in Table 6.

Table 6 Summary of Measured Road Traffic Noise Levels; NMP2

Period start time	Average Measured Sound Pressure Levels, free-field (dB)		10 th highest $L_{Amax,fast}$
	$L_{Aeq,T}$	$L_{A10,T}$	
12/09/2018 13:30	62.4	66.6	75.0
12/09/2018 14:30	62.1	65.6	
12/09/2018 15:30	64.4	66.7	
$L_{Aeq,16hr}$ as calculated from CRTN	63.3		





Period start time	Average Measured Sound Pressure Levels, free-field (dB)		10 th highest $L_{Amax,fast}$
	$L_{Aeq,T}$	$L_{A10,T}$	
$L_{Aeq,8hr}$ as calculated from CRTN and TRL Document	55.0		

The L_{Amax} parameter tabulated is obtained by outputting the $L_{Amax,f}$ parameter for each 1 minute interval during the survey period. These are placed in declining order and the 10th highest selected.

The weather Conditions during the Noise Surveys were conducive towards the measurement of environmental noise being fine and dry. The wind direction was in the range of acceptable speeds, containing, as required, a component from the road towards the measurement position.

The Noise Survey was completed using the noise measurement equipment as described in Table 7 below.

Table 7 Noise Measurement Equipment

Noise Survey	Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
NMP2	Sound Level Meter	01dB-Metravib Black Solo	65947	3 rd October 2018
	Pre-amplifier	01dB-Metravib PRE 21 S	16831	
	Microphone	01dB Metravib MCE212	181856	
	Calibrator	01dB-Metravib CAL-21	34744600	26 th September 2018

The sound level meter was field-calibrated on Site prior to and after noise measurements were taken. No significant drift was witnessed. Calibration certificates are available upon request.

3.3 School noise survey

REC has conducted a Noise Survey in order to quantify noise due to schoolchildren at the adjacent primary school. The Noise Survey took place over the following period, timed to coincide with the lunch-hour so as to inform a worst-case assessment, following consultation with the school:

- ▶ 12:15 until 13:15 Wednesday 12th September 2018.

The following location was chosen for the survey:

- ▶ Noise Monitoring Position 3 (NMP3): Located approximately 3 metres from the boundary fence. The microphone was positioned 1.5m above ground level and in free-field conditions. Noise at this location was dominated by the sound of school children enjoying their lunch-hour.





A summary of the measured sound pressure levels is presented in Table 8.

Table 8 Summary of Measured School Noise Levels; NMP3

Period	Measured Sound Pressure Level, free-field $L_{Aeq,T}$ (dB)
Coded while children present	62.2
Coded as ambient before/after children present	50.7

The weather Conditions during the Noise Surveys were conducive towards the measurement of environmental noise being fine and dry.

The Noise Survey was completed using the noise measurement equipment as described in Table 4 above. The sound level meter was field-calibrated on Site prior to and after noise measurements were taken. No significant drift was witnessed. Calibration certificates are available upon request.





4. NOISE IMPACT ASSESSMENT

4.1 Noise model

In order to accurately assess road traffic noise across the Site, a 3D Noise Model has been constructed using the modelling software CadnaA 2018MR1. Outputs from the model have been used to inform the noise mitigation strategy so as to satisfy criteria for interior and exterior amenity noise levels.

The following assumptions, inputs and considerations have been included in the model:

- ▶ Planning Layout received as per Section 1, and as shown in Appendix III;
- ▶ The noise model was calculated using a horizontal grid resolution of 1m;
- ▶ Site elevations have been taken as existing;
- ▶ Existing buildings that provide shielding from or reflections of any of the noise sources have been included in the model;
- ▶ A reflection order of 2 has been used in all calculations; and
- ▶ Noise levels generated using ISO 9613-1 and ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors” as incorporated into the CadnaA software.

4.2 Road traffic noise assessment

4.2.1 External Noise Impact in Garden Areas for Proposed Dwellings

In order to assess noise levels in external amenity areas across the Site, a grid noise map has been calculated in the model at a height of 1.5m above ground level, using the proposed site layout and standard garden fencing, and is shown in Figure 3 of Appendix III.

BS8233:2014 does not offer a single criterion for external amenity noise levels ($L_{Aeq,16hr}$) and no criterion has been agreed with the LPA. Figure 3 of Appendix III shows baseline external amenity levels without mitigation.

In general, plots show levels of 41-50 dBA, satisfying the lowest criterion of BS8233:2014. The following table lists those plots with areas (ie not necessarily the entire plot) above 50 dBA.

Table 9 Plots with external amenity levels including areas above 50 dBA

Plot	Comment
45	46 to 55 dBA. Centre level 51 dBA.
35	40 to 51 dBA. Centre level 45 dBA. Considered to meet 50 dBA criterion.
33	48 to 53 dBA. Centre level 51 dBA.
34	52 to 58 dBA. Centre level 55 dBA.

It should be borne in mind that BS8233:2014 states the following:





“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”.

Therefore, if the proximity to Oxford Rd is considered, the use of the upper value of 55dBA allows all gardens to meet this criterion. Nonetheless, mitigation is discussed in Section 5 for plots 33, 34 and 45 in order to achieve 50dBA.

Without any mitigation in place, it is considered that the Lowest Observed Adverse Effect Level (LOAEL), described as ‘Noticeable and intrusive’, would be achieved in the noted gardens above resulting in:

“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.”

4.2.2 Internal Noise Impact for Proposed Dwellings

In order to accurately determine the noise level within habitable rooms, external noise levels immediately outside the façades have been derived in the noise model for the proposed layout with no additional mitigation besides 1.8m fencing.

BS8233:2014 suggests that a Saint Gobain standard double-glazing unit with configuration 6mm glass/12mm air space/6mm glass affords sound insulation performance of the order of 33dB; this 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 of approximately 30dB and this value has been used to calculate internal noise levels. BS8233:2014 also goes on to recommend that a partially open window provides approximately 15dB attenuation, and this value is also used here.

Note that the following assessment does not apply to use for non-sensitive uses such as kitchens/bathrooms.

With regard to any requirement for glazing, Figures 5 and 6 show external noise maps at the ground and first floors. Results for interior amenity noise levels are therefore:

- ▶ Daytime: Figures 5 (Ground) and 6 (First floor). The upper floor of the NW facing façade of plot 34 marginally exceeds the 65 dBA criterion (35 dBA internal) by 1 dBA during daytime. Therefore this one façade will require marginally higher specification glazing.
- ▶ Night-time: Figure 4 (First floor). No exceedances are found for night-time, with no facades exceeding the 60 dBA criterion.

Regarding any requirement for alternative ventilation:

- ▶ Daytime: Figures 5 (Ground) and 6 (First floor). The internal criterion of 35 dBA yields an external criterion of 50 dBA, which is exceeded for a number of facades.
- ▶ Night-time: Figure 4 (First floor). The internal criterion of 30 dBA yields an external criterion





of 45 dBA, which is exceeded for a number of facades.

Section 5 considers appropriate alternative ventilation to meet the above criteria.

Without mitigation in place, the LOAEL is achieved which would be noticeable and intrusive resulting in the following:

“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.”

4.3 School noise assessment

Table 10 below enumerates the noise levels determined for the closest planned residential properties. It is appropriate to evaluate the change in level due to school noise in these locations in line with IOA/IEMA methodology.

The worst case hourly period is used, and in this case the lunch hour period is clearly the most suitable. The table below illustrates the data and calculation method.

Table 10 Measured Noise Levels at NMP3

Step	Period	L _{Aeq,1hr}
(1)	Ambient level determined during survey	50.7
(2)	Hourly level at Lunch-hour	62.2 dB
(3)	Change in Level; (2) minus (1)	11.5 dB

The resultant level difference, 11.5 dBA, would be classified as ‘Very substantial’ in terms of significance of effect according to the methodology with criteria summarised in Section 2.

Mitigation is discussed in Section 5.





5. MITIGATION

5.1 External Amenity Areas

As noted in Section 4, a small number of plots exhibit daytime exterior amenity noise levels exceeding the lower 50 dBA criterion. It is proposed therefore to use 2.5m fencing around a section of the boundaries of these plots, where they are oriented towards the Oxford Rd.

The result of this mitigation strategy is shown in Figure 5. Typical levels over the garden areas which displayed exceedances without mitigation are listed below.

Table 11 Plots with external amenity levels including areas above 50 dBA

Plot	Levels before mitigation	Levels following mitigation
45	46 to 55 dBA. Centre level 51 dBA.	45 to 51 dBA. Centre level 48 dBA.
33	48 to 53 dBA. Centre level 51 dBA.	47 to 51 dBA. Centre level 50 dBA.
34	52 to 58 dBA. Centre level 55 dBA.	51 to 54 dBA. Centre level 53 dBA.

All except plot 34 can be seen to meet the lowest criterion of BS8233:2014. Due to the proximity of Oxford Rd, BS8233:2014 permits the upper criterion of 55dBA for this plot, allowing it to satisfy the criterion.

While higher fencing would further reduce the noise levels in these gardens, this may not be acceptable for other design reasons, and therefore these levels are considered the best practicable.

5.2 Internal Amenity Areas

5.2.1 Glazing requirements

For the upper floor of the NW facing façade of plot 34, it is found that standard double glazing provides insufficient attenuation to meet **daytime internal** L_{Aeq} level criteria. The exceedance is 1 dBA.

While this can be mitigated by using these facades for less noise sensitive rooms such as kitchens and bathrooms, greater flexibility in interior design can be obtained by using slightly higher specification glazing.

A specification of R_w+C_{tr} of 31 dBA will be sufficient; a typical specification meeting this requirement is 4mm glass, 12 air gap, 8mm glass.

5.2.2 Ventilation requirements

It is found that daytime and night-time internal L_{Aeq} noise limits are exceeded for a number of facades where windows are open.

Accordingly, it is necessary to consider an alternative ventilation scheme which does not require the





opening of windows to provide fresh air flow and background ventilation, *for all rooms to be used for daytime and night-time amenity only*. Affected facades are marked up on figures 7,8 and 9.

This might take the form of a through-frame window mounted trickle ventilator incorporated into the glazing unit of such habitable rooms so that fresh air can enter the room without having to open windows and provide background ventilation.

The exact requirement for alternative ventilation ultimately falls to the developer and, from an acoustics perspective, needs to ensure that fresh air flow can be achieved without the need for opening windows. It is necessary to meet the requirements given in BS8233:2014, Section 8.4.5.4, which states that:

“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) 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.”

In general, wherever possible habitable rooms should be located away from the noise source with less noise-sensitive rooms facing the noise source.

5.3 School noise

Section 4 found that the change in noise level during school break times is categorised as ‘very substantial’.

Higher fencing could be used to reduce the impact of this noise in ground floor and garden areas, though impracticable heights would be required in order to greatly reduce the significance of effect for all upper floors of dwellings. However, it is unlikely that these rooms would be used during the daytime to any great extent, and so the external amenity areas should be primarily considered.

It is found that increasing the height of the fencing along the boundary between the school and the gardens (ie plots 14-22) from 1.8m to 2.5m reduces the noise level by 2.4 dBA, to 9.1 dBA. This moves the category downward to ‘Substantial’.

Higher fencing would further reduce noise levels, but this may not be considered acceptable in terms of other planning considerations.

It should be noted that this exceedance is limited to the lunch hour and short break periods only, while the inoffensive character of the noise (children playing) would be expected to make it less disruptive than other less tolerated sounds.





Therefore it may be considered that the combination of the above, the short duration of these sounds and the limitation to school hours only would substantially lessen the impact.





6. CONCLUSION

REC Ltd has been commissioned by Hollins Strategic Land to undertake a Noise Impact Assessment for a proposed residential development on land located at Tappers Farm, Bodicote, Cherwell.

Noise Surveys have been completed in order to measure the impact of road traffic noise, the key noise source impacting upon the development, from the adjacent roads upon the proposed residential development. These surveys have been used to develop a 3D computer model of noise propagation across the site, and to inform a scheme of mitigation measures required to ensure a commensurate level of protection against noise for future occupants.

The assessment concludes that the proposed mitigation strategy, including 2.5m high fencing, satisfies BS8233:2014's lowest criterion of 50 dBA for daytime exterior amenity noise levels in all plots except 34, where the upper criterion of 55 dBA is met. Overall it is considered that the proposed mitigation affords for the lowest practicable amenity levels given the location.

The Noise Impact Assessment has recommended alternative ventilation for habitable rooms on specified noise-sensitive facades as an alternative to opening windows. For these dwellings, it is desirable to locate noise sensitive rooms on relatively quiet facades of the dwellings.

Noise impacts due to school noise can be partially mitigated with higher fencing along the boundary. Residual impacts are found to be 'substantial' but very limited in duration and time of day.

A single facade of one plot requires slightly above standard specification glazing.

Subject to the incorporation of the identified mitigation measures, it is considered that in principle, the Site is suitable for the promotion of residential development.





APPENDIX I LIMITATIONS





1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Limited and the Client as indicated in Section 1.2.
2. 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.
3. REC cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.
4. Where a noise survey is required to inform the assessment, REC will endeavour to ensure that all noise measurements taken are robust, representative and reliable in order to inform an accurate noise impact assessment. Where limitations or constraints exist which prevent a suitable noise survey being completed, REC will take all reasonable steps to make the client fully aware of any such limitations or constraints with a view to achieving the best possible outcome for the client. Where additional sound surveys are required, over and above those specified in our scope of works, then REC reserves the right to charge additional fees.
5. Where mitigation measures are specified in our report, it should be noted that these measures are relative to a specific sound source, both in terms of the measured sound pressure level and the character of the source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, REC cannot be held responsible for any subsequent variations in the proposed mitigation performance.





APPENDIX II GLOSSARY OF ACOUSTICAL TERMINOLOGY





Noise

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 A1 Typical Sound Pressure Levels

Sound Pressure Level dB(A)	Location
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 A2 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 ⁻⁵ Pa).
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 L _{eq} 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	A 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 III FIGURES





Table A1 **Summary of Figures**

Figure	Day/Night	Height	Comments
1	-	-	Layout
2	-	-	Noise Measurement Positions
Baseline - L_{Aeq} noise maps:			
3	Day	1.5m	L _{Aeq} . Baseline – 1.8m fencing only
4	Night	4m	L _{Aeq} . Baseline – 1.8m fencing only
Mitigation - L_{Aeq} noise maps; fencing and glazing requirements:			
5	Day	1.5m	L _{Aeq} . Standard 1.8m fencing with marked 2.5m fencing
6	Day	4.0m	L _{Aeq} . Standard 1.8m fencing with marked 2.5m fencing & glazing
Mitigation - L_{Aeq} noise maps; alternative ventilation requirements:			
7	Day	1.5m	L _{Aeq} . Facades requiring alternative ventilation marked up.
8	Night	4.0m	L _{Aeq} . Facades requiring alternative ventilation marked up.





FIGURE 1 – PROPOSED SITE LAYOUT





FIGURE 2 – NOISE MEASUREMENT POSITIONS

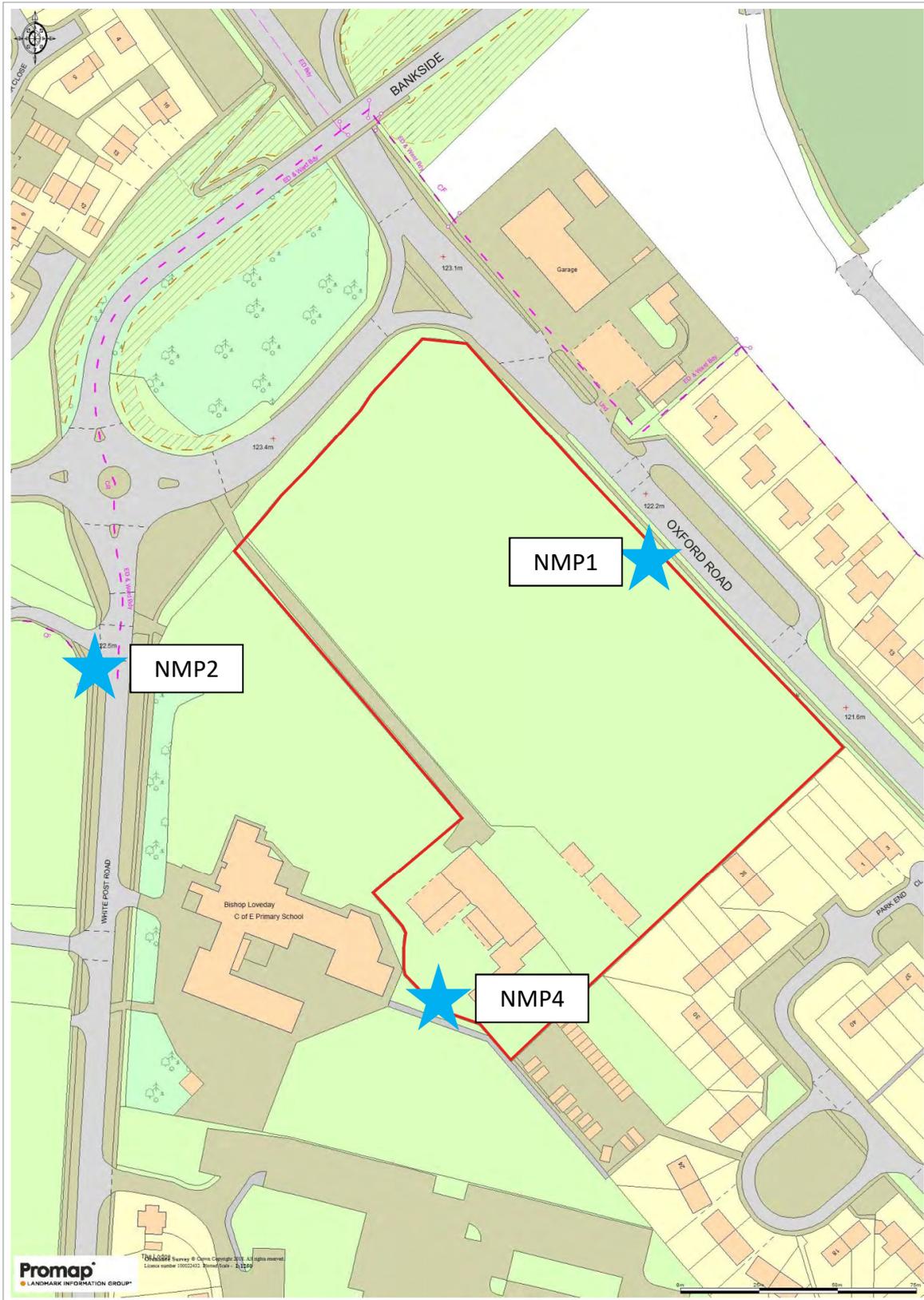




FIGURE 3 – Daytime Baseline at 1.5m

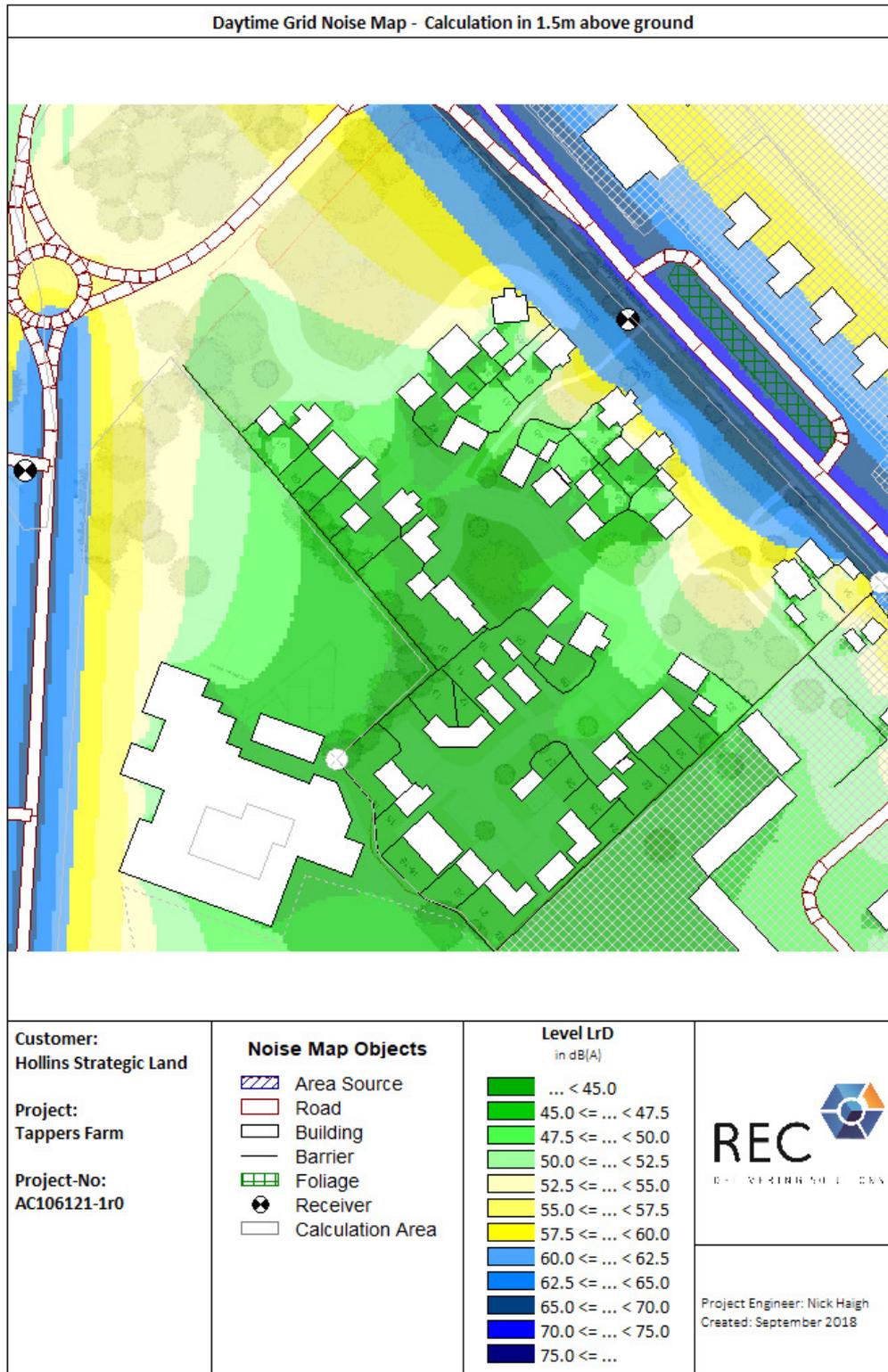




FIGURE 4 –Night-time at 4m

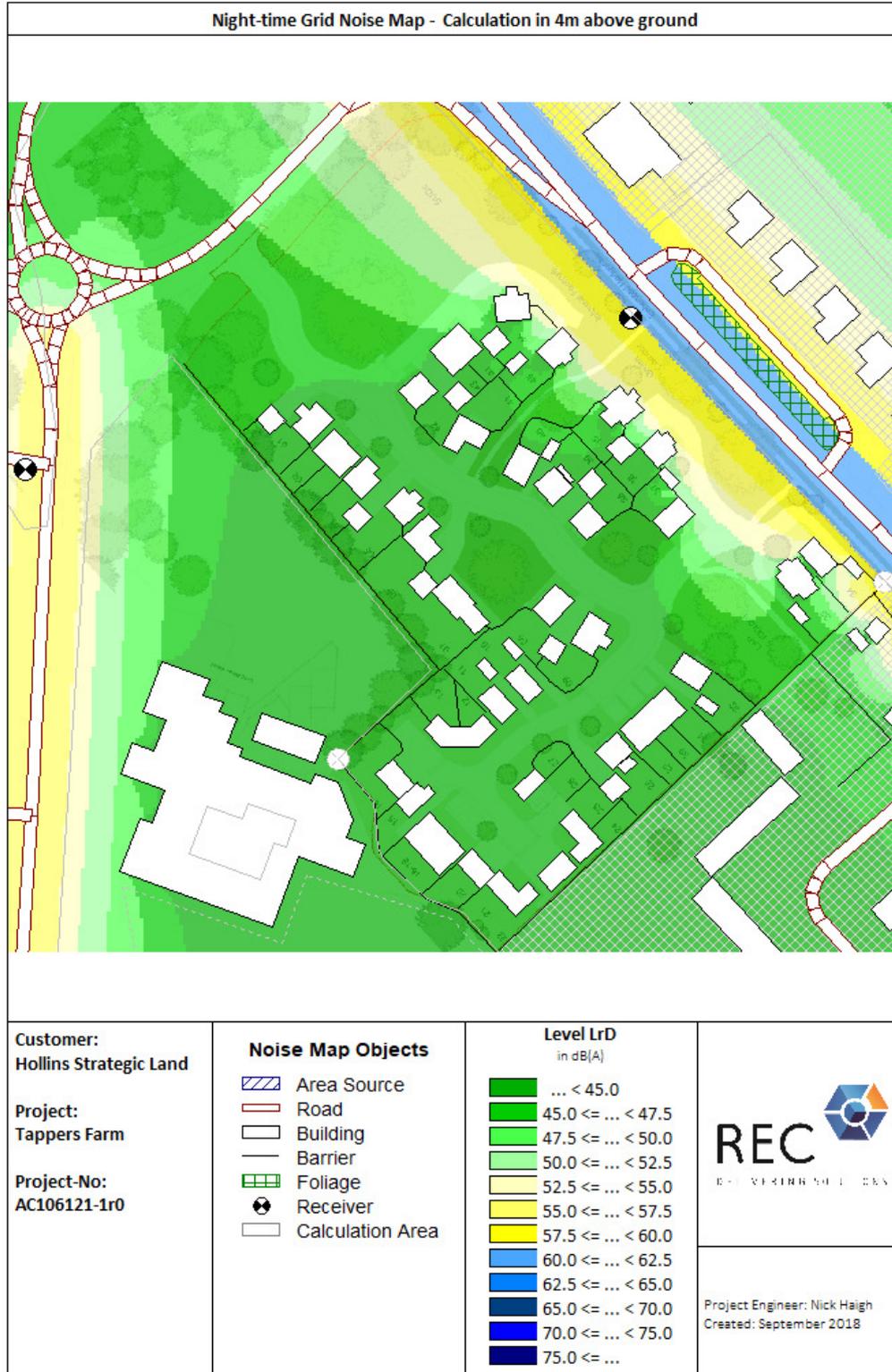




FIGURE 5 – Daytime with Mitigation at 1.5m

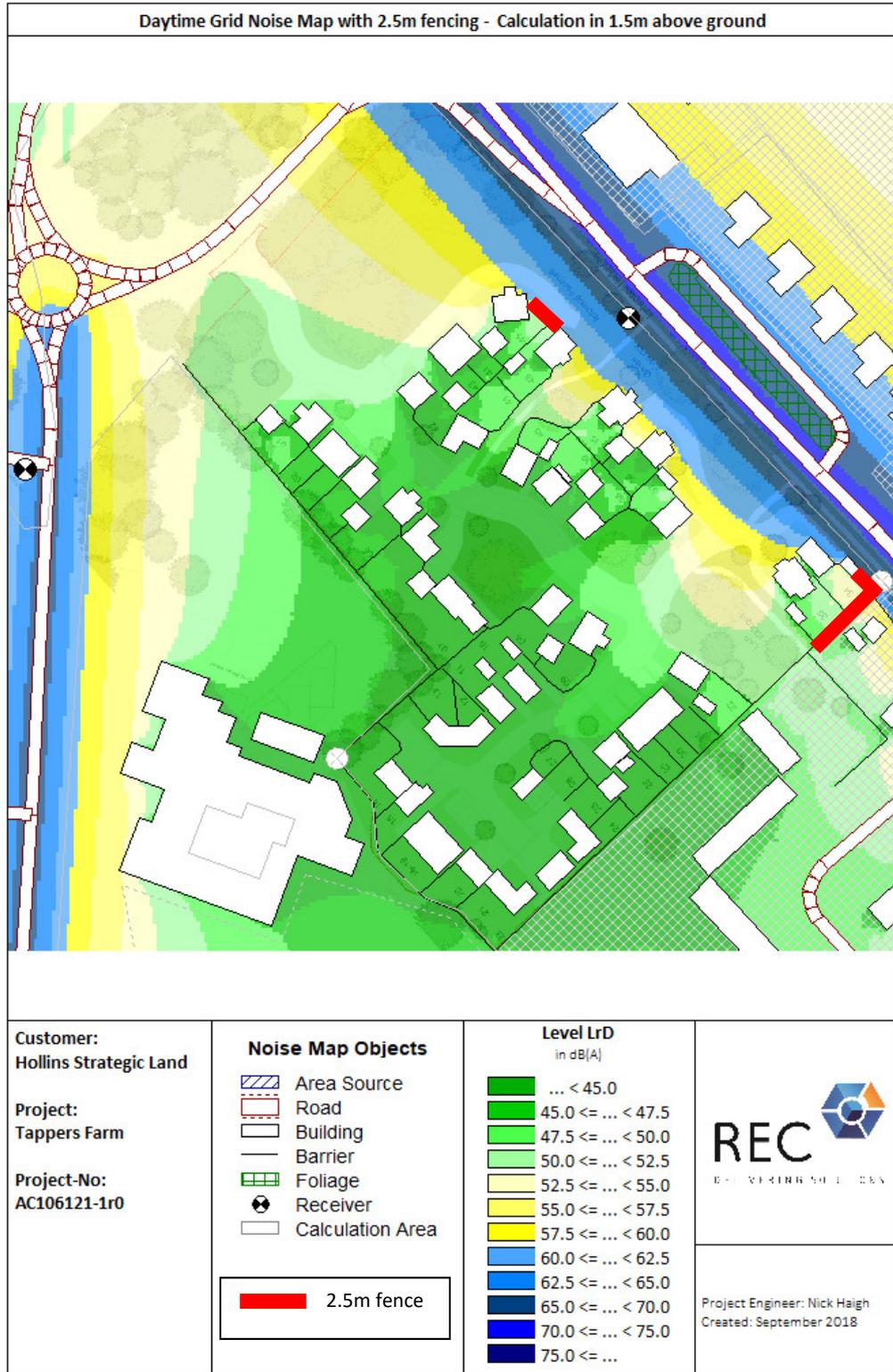




FIGURE 6 – Daytime with mitigation at 4m

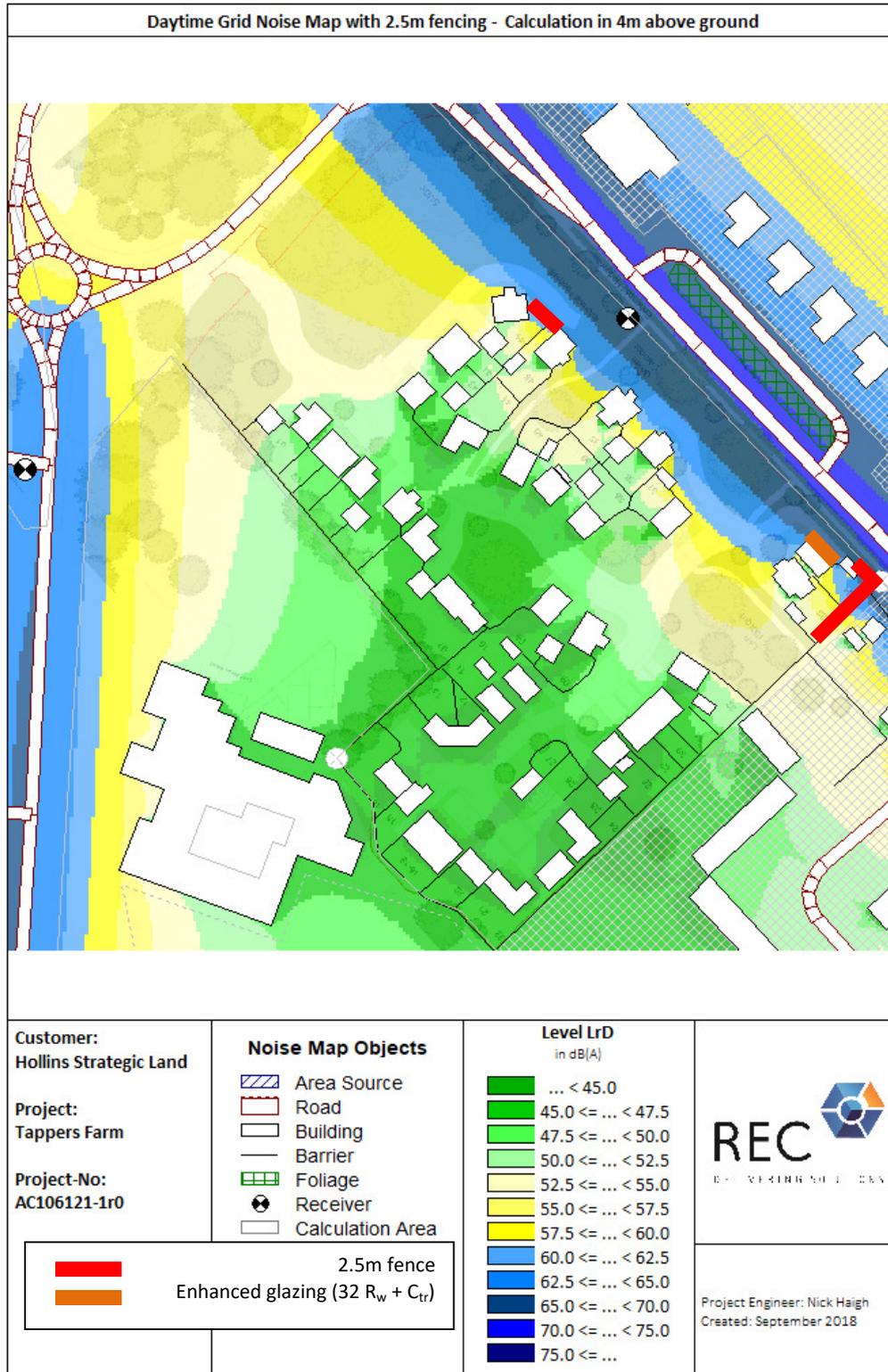




FIGURE 7 –Ventilation Requirements: Ground floor

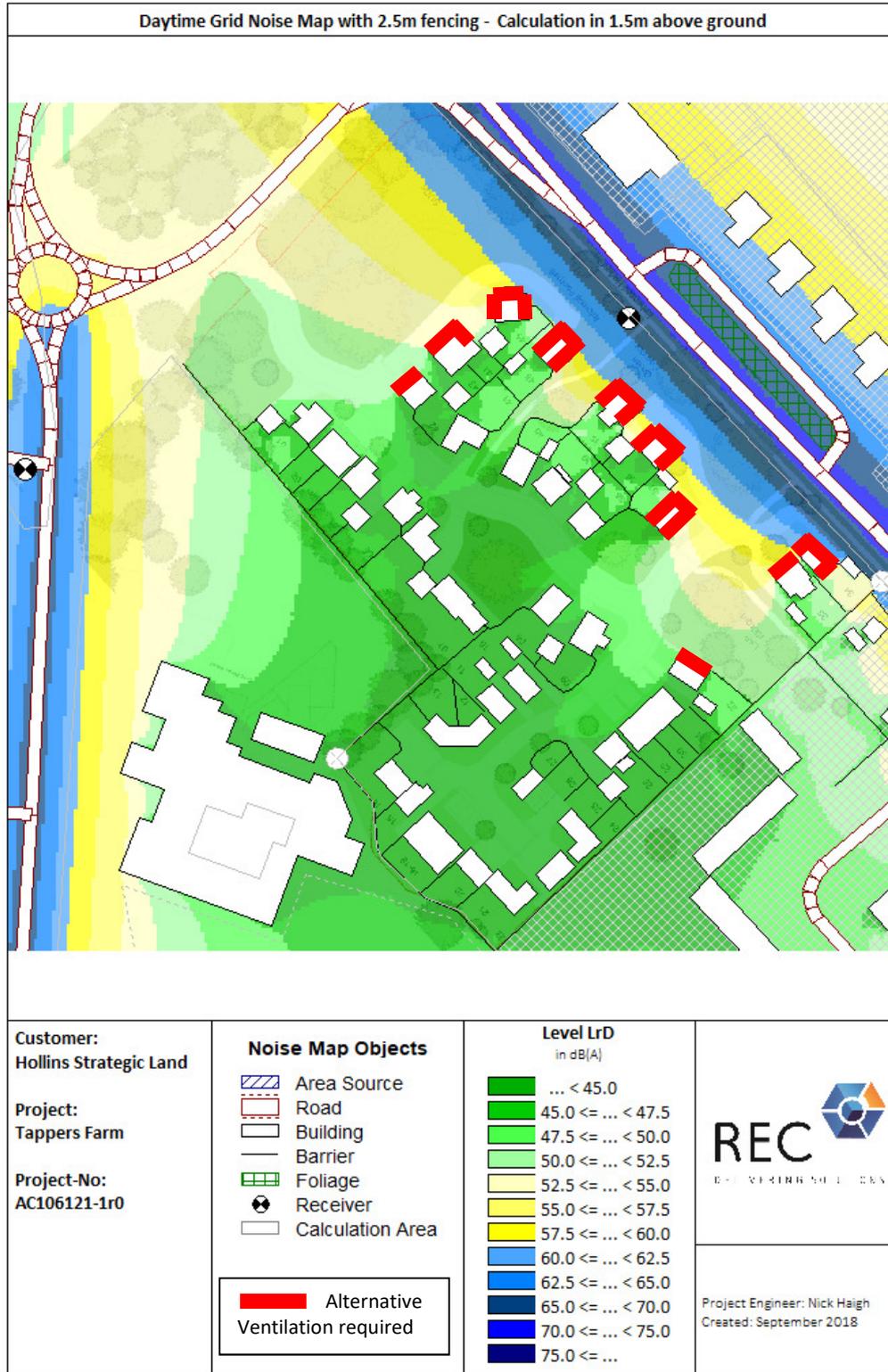




FIGURE 8 –Ventilation Requirements: First floor

