REC
Resource & Environmental Consultants Ltd

Noise Impact Assessment

Land South of Radwinter Road
Saffron Walden
Essex CB10

REC Report: 90397r1
Issued: 20th December 2013

Prepared for:

manor oak HOMES
building for the future environment

REC Acoustics

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EXECUTIVE SUMMARY

Noise Surveys

A series of Noise Surveys have been completed in order to measure the impact of road traffic and commercial noise upon the proposed outline application for a residential-led mixed-use development.

Noise Impact Assessment

The Noise Impact Assessment has been completed with due regard to the requirements of Uttlesford District Council's Environmental Health Department.

The Noise Impact Assessment has identified that the key noise sources impacting upon the development are from road traffic using Radwinter Road and, to a lesser degree, various commercial noise sources around the Site. Accordingly appropriate mitigation has been specified in order to reduce these impacts for internal habitable areas.

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Limited have been commissioned by Manor Oak Homes to complete a Noise Impact Assessment in support of an outline planning application for a proposed residential-led mixed-use development on a parcel of land located off Radwinter Road in Saffron Walden, CB10 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 elements of the development.

This Noise Impact Assessment has been completed with due regard to the requirements of Uttlesford District Council's Environmental Health Department.

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

1.2 Site Location & Proposed Development

The Site lies approximately 1.4km to the east of Saffron Walden town centre in Essex, CB10. The Site comprises a parcel of land bordered by the Tesco Saffron Walden Superstore to the north, a farm dwelling and associated farmland to the east and open farmland to the south. To the west lies the Shire Hill Industrial Estate.

Proposals include for the construction of residential dwellings, B1 office space and a retirement village. As an option, there is a proposal for a School.

The proposals are detailed on the following Site plans which can be found in Figures 1 and 2 of Appendix 3:

- Draft Masterplan, dated 20th December 2013 (Ref. 57183-SK06 B) – without School; and,
- Draft Masterplan, dated 6th December 2013 (Ref. 57183-SK07 A) – with School.

1.3 Limitations

The limitations of this report are presented in Appendix I.

1.4 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.

2.0 ASSESSMENT CRITERIA

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) provides very brief guidance on planning and noise. The NPPF replaces the now revoked Planning Policy Guidance (PPG) Note 24. Paragraph 123 of the NPPF document states that planning policies and decisions should aim to:

- '*avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and,*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*.'

This has been considered throughout the assessment where applicable.

No further guidance is given as to what a 'significant' impact would entail. It is therefore considered that meeting the criteria outlined in BS 8233 and recommendations contained within the World Health Organisation guidelines, "significant adverse impacts" on health and quality of life associated with noise would be avoided.

2.2 Local Authority Guidance and Criteria – Uttlesford District Council's Environmental Health Department

REC have contacted Janet O'Boyle, Environmental Health Officer at Uttlesford District Council in order to agree the methodology for the noise survey and the appropriate noise criteria for this assessment which are as follows:

Noise Survey

The Noise Survey will pay due regard to the following:

- Any noise associated with operation of the Tesco Delivery Yard, which is located to the north of the Tesco Store;
- Any noise associated with roof-mounted air conditioning equipment, or any other fixed plant, located on the Tesco Store;
- Any noise associated with the Recycling Centre, Bottle Bank and Hand Car Wash located in the grounds of the Tesco Store;
- The noise impact from Radwinter Road upon the residential elements of the proposed development;

- Any noise generated by the commercial units on Shire Hill Industrial Estate, including the following specific noise sources identified by Uttlesford District Council:

    1. The dust extraction system operated by Zig-Zag Joinery at 2 The Shires;
    2. Early morning activity (06:00 – 07:00) at the Council Depot.

Noise Impact Assessment Criteria

The Noise Impact Assessment will adhere to the following agreed criteria:

- The maximum permissible average noise level in garden areas shall not exceed 55dB $L_{Aeq,16hr}$;
- The maximum permissible average noise level in living rooms shall not exceed 35dB $L_{Aeq,16hr}$;
- The maximum permissible average noise level in bedrooms shall not exceed the BS8233 internal target 'good' criteria which is 30dB $L_{Aeq,8hr}$;
- The maximum permissible instantaneous noise level in bedrooms shall not exceed 45dB $L_{Amax,fast}$ criteria; and,
- The noise rating level from any fixed plant or other industrial noise sources shall not exceed 5dB below the existing background noise level.

2.3 British Standard BS 8233:1999: Sound Insulation and Noise Reduction for Buildings – Code of Practice

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 plots, as shown in Table 2.1.

Table 2.1: BS 8233 Recommended Internal Target Noise Levels

Criterion	Typical Situation	Design Range $L_{Aeq,T}$ dB	
		Good	Reasonable
Suitable resting / sleeping conditions	Living Room	30	40
	Bedroom	30	35
For a reasonable standard in bedrooms at night, individual noise events (measured with fast time weighting) should not normally exceed 45dB L_{Amax}			

BS 8233 goes on to recommend noise levels for gardens. According to BS 8233, it is desirable that the steady noise level does not exceed $L_{Aeq,T}$ 50dB, and 55dB should be regarded as the upper limit.

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

The WHO gives guidance on desirable levels of environmental noise. The levels presented in the WHO Community Guidelines are those at which adverse effects become measurable. The 1980 WHO document suggested that "*general daytime outdoor noise levels of less than 55dB(A) $L_{eq,16hr}$ are desirable to prevent any significant community annoyance*" This level is an external free-field noise level. The 1980 document also stated in relation to internal levels "*that night-time noise levels of 35dB(A) $L_{eq,8hr}$ or less will not interfere with the restorative process of sleep*".

A report was submitted to the WHO in 1995 for consideration as a revision to the 1980 document and revised community guidelines were issued in 2000. In the 2000 guidelines, it is considered that the sleep disturbance criteria should be taken as an internal noise level of 30dB $L_{Aeq,8hr}$ or an external level of 45dB $L_{Aeq,8hr}$. It also recommends that internal L_{Amax} levels of 45dB and external L_{Amax} levels of 60dB should be limited where possible.

The 2000 WHO document also states that "*To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55dB $L_{Aeq,16hr}$ for a steady continuous noise*." i.e. the daytime levels effectively remain unchanged.

2.5 British Standard BS 4142: 1997: Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

This standard is intended to be used to assess where noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises is likely to give rise to complaints from people residing in nearby dwellings.

The procedure contained in BS 4142 for assessing the likelihood of complaints is to compare the measured or predicted noise level from the source in question, the 'specific noise level' immediately outside the dwelling, with the background noise level. Where the noise contains a 'distinguishable discrete continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks, clatters or thumps), or if the noise is irregular enough to attract attention' then a correction of +5dB is added to the specific noise level to obtain the 'rating level'.

The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS 4142 states:

> *"A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely."*

For the daytime, this assessment is carried out over a 1-hour period, and over a 5-minute period at night. The day and night-time periods are not defined in the Standard but it states that night should cover the times when the general adult population are preparing for sleep or are actually sleeping. For the purposes of this assessment it is assumed that the day and night periods reflect those stated in the now revoked Planning Policy Guidance Note 24 (PPG24), i.e. day is 07:00 to 23:00 hours and night 23:00 to 07:00 hours.

2.6 IEMA/IOA Draft Guidelines for Noise Impact Assessment, 2002

Although the Institute of Environmental Management Assessment (IEMA)/Institute of Acoustics (IOA) Working Party Guidelines (IEMA/IOA, 2002) are still only a consultation draft at this stage, they are of some assistance in this exercise. The Working Party provides an example of how changes in noise level can be categorised by significance as detailed in Table 2.2.

Table 2.2: Example of Categorising the Ambient Noise Change

Noise Change (dB)	Category
0	No Impact
0.1 – 2.9	Slight Impact
3.0 – 4.9	Moderate Impact
5.0 – 9.9	Substantial Impact
10.0+	Severe Impact

2.7 Building Bulletin 93: The Acoustic Design of Schools – A Design Guide (BB93)

Building Bulletin 93 (BB93) stipulates maximum indoor ambient noise levels in critical spaces, internal partition sound insulation and reverberation time limits in rooms. The latter of these only become critical at the design stage. However, at the planning stage it is prudent to take account of indoor ambient noise levels as they, together with existing external noise levels, determine the building envelope and required means of ventilation.

BB93 outlines maximum indoor ambient noise levels in teaching spaces, expressed in terms of $L_{Aeq,30mins}$ (dB) which is the average 30-minute L_{Aeq} as detailed below.

Table 2.3: Indoor Ambient Noise Levels by Room Type

Type of Room	Activity Noise (Source Room)	Noise Tolerance (Receiving Room)	Upper Limit for the Indoor Ambient Noise Level $L_{Aeq, 30min}$ (dB)
Nursery School playrooms	High	Low	35[1]
Nursery School quiet rooms	Low	Low	35[1]
Primary School: classrooms, class bases, general teaching areas, small group rooms	Average	Low	35[1]
Secondary School: classrooms, general teaching areas, seminar rooms, tutorial rooms, language laboratories	Average	Low	35[1]
Open-plan[2]			
Teaching areas	Average	Medium	40[1]
Resource areas	Average	Medium	40[1]

Music			
Music classroom	Very High	Low	35[1]
Small practice/group room	Very High	Low	35[1]
Ensemble room	Very High	Very Low	30[1]
Performance/recital room	Very High	Very Low	30[1]
Recording studio[3]	Very High	Very Low	30[1]
Control room for recording	High	Low	35[1]
Lecture Rooms			
Small (fewer than 50 people)	Average	Low	35[1]
Large (fewer than 50 people)	Average	Very Low	30[1]
Classrooms designed specifically for use by hearing Impaired students (including speech therapy rooms)	Average	Very Low	30[1]
Study room (individual study, withdrawal, remedial work, teacher preparation)	Low	Low	35[1]
Libraries			
Quiet study areas	Low	Low	35[1]
Resource areas	Average	Medium	40
Science laboratories	Average	Medium	40
Drama studios	High	Very Low	30[1]
Design and Technology			
Resistant materials, CADCAM areas	High	High	40
Electronics/control, textiles, food, graphics, design/resource areas	Average	Medium	40
Art rooms	Average	Medium	40
Assembly halls[4], multi-purpose halls[4] (drama, PE, audio/visual presentations, assembly, occasional music)	High	Low	35[1]
Audio-visual, video conference rooms	Average	Low	35[1]
Atria, circulation spaces used by students	Average	Medium	45
Indoor sports hall	High	Medium	40
Dance studio	High	Medium	40
Gymnasium	High	Medium	40
Swimming Pool	High	High	50
Interviewing/counselling rooms, medical rooms	Low	Low	35[1]
Dining rooms	High	High	45

Ancillary Spaces			
Kitchens	High	High	50
Offices, staff rooms	Average	Medium	40
Corridors, stairwells	Average – high	High	45
Coats and changing areas	High	High	45
Toilets	Average	High	50

NOTES
1 Research indicates that teaching can be disrupted by individual noisy events such as aircraft flyovers, even where the noise level is below the limits in the above table. For rooms identified above having limits of 35dB or less, the noise level should not regularly exceed 55dB $L_{A1,\ 30min}$.
2 Acoustic considerations of open-plan areas are complex and are discussed in the BB93 section of Assessment Criteria in Section 2.
3 Studios require specialised acoustic environments and the noise limits for these will vary with the size, intended use and type of room. In some cases noise limits below 30 dB L_{Aeq} may be required, and separate limits for different types of noise may be appropriate; specialist advice should be sought.
4 Halls are often multi-functional spaces (especially in primary schools) used for activities such as dining, PE, drama, music and assembly, and performing plays and concerts. In such multi-functional spaces the designer should design to the lowest indoor ambient noise level for which the space is likely to be used for. For large halls used for formal drama and music performance lower noise levels than those above are preferable, and levels of 25 dB $L_{Aeq\ 30min}$ may be appropriate.

For new schools, BB93 recommends that 60dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching, and recreational areas. However, under some circumstances it is possible to meet the specified indoor ambient noise levels on Sites where external noise levels are as high as 70dB $L_{Aeq,30min}$, but this will require considerable building envelope sound insulation, screening or barriers.

BB93 recommends that noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50dB $L_{Aeq,30min}$. If this is not possible due to a lack of suitably quiet Sites, acoustic screening should be used to reduce noise levels in these areas as much as practicable, and an assessment of predicted noise levels and of options for reducing these should be carried out.

Playgrounds, outdoor recreation areas and playing fields are generally considered to be of relatively low sensitivity to noise, and indeed playing fields may be used as buffer zones to separate school buildings from busy roads where necessary.

3.0 NOISE SURVEYS

REC has conducted a comprehensive Noise Survey around the Site in order to accurately measure the noise sources identified previously.

3.1 Road Traffic Noise Survey

REC has conducted a Road Traffic Noise Survey in order to measure the level of noise generated by vehicles using Radwinter Road. The survey was carried out over the following time period:

- Tuesday 8th October 2013 between 11:20 and 14:20.

The following noise measurement position was chosen for the Road Traffic Noise Survey:

- Noise Measurement Position 1 (NMP1): Located on the northern site boundary, 4m from the nearside kerbstone of Radwinter Road. The microphone was located 1.8m above ground level and in free-field conditions. Noise sources at this location consisted predominately of vehicle pass-bys on Radwinter Road.

A summary of the measured sound pressure levels from the Road Traffic Noise Survey are presented in Table 3.1.

Table 3.1: Summary of Measured Noise Levels for NMP1

Measurement Position	Period	Measured Sound Pressure Level, free-field (dB)			
		$L_{Aeq,T}$	$L_{Amax,fast}$ [1]	$L_{A90,T}$	$L_{A10,T}$
NMP1	Thursday 26th September 2013 11:20 – 12:20	63.8	82.5	43.6	68.7
	Thursday 26th September 2013 12:20 – 13:20	65.2		44.1	69.3
	Thursday 26th September 2013 13:20 – 14:20	64.2		44.4	69.0

3.2 Tesco Superstore - Delivery Yard Noise Survey

Due to the layout of the delivery yard, it is not possible to observe when deliveries are taking place from any location on the Site. Accordingly, one sound level meter was installed on the Site boundary and left to run continuously whilst observations were made, close to the delivery yard entrance of delivery types, durations and activity. From this, the sound level 'trace' from the sound level meter has been retrospectively code' to identify the varying scenarios.

In total, measurements of two separate HGV's were obtained.

The measured delivery scenarios included:

- Tesco branded HGV accessing and manoeuvring upto the dock loader;
- Loading and unloading activities, including the loading of empty cage trolleys into the HGV trailer;

- Tesco HGV egressing delivery yard;
- Unbranded HGV enters yard;
- Cage trolleys being loaded into back of HGV; and,
- HGV Starts and exits yard.

Noise measurements of the delivery yard were made over the following period.

- Tuesday 19th November 2013 between 11:13 – 12:38.

The following noise measurement position was chosen for this Noise Survey:

- Noise Measurement Position 2 (NMP2): The microphone of the sound level meter was located on the Site boundary, close to the rear of the delivery yard in a free-field position. The microphone was located approximately 25m from the centre of the delivery yard.

A summary of the measured noise levels are presented in Table 3.2.

Table 3.2: Summary of Measured Noise Levels for NMP2

Event Description	Scenario	Time	Measured Sound Pressure Level $L_{Aeq,t}$ (dB)	Duration Audible (mm:ss)
Tesco-branded HGV	HGV enters delivery yard and reverse manoeuvres up to dock-loader (includes reversing alarms). Engine turned off.	11:13 – 11:14	50.7	00:60
	Cage trolleys being unloaded / loaded from HGV trailer	11:14 – 11:36	49.5	00:10*
	HGV starts, idles, exits yard	11:36 – 11:38	49.6	01:30
Un-branded HGV	HGV enters delivery yard and reverse manoeuvres up to dock-loader (includes reversing alarms). Engine turned off.	11:39 – 11:42	48.1	03:00
	Cage trolleys being unloaded / loaded from HGV trailer	12:15 – 12:22	51.6	06:10
	HGV starts, idles, exits yard	12:36 – 12:37	50.1	00:60

*The total delivery period was 22minutes however noise was only audible over a period of 10 seconds.

3.3 Tesco Superstore – Mechanical Plant

During the noise survey there was no audible noise from any roof-mounted mechanical plant. There was however noise generated by an extract flue located on the western façade of the Store which generated steady-state noise. The noise was continuous over the full daytime and night-time periods. Accordingly a short term noise measurement was taken and can be considered representative of the wider period.

Noise measurements of the extract flue were made over the following period.

- Thursday 19th November 2013 between 10:37 – 10:39.

The following noise measurement position was chosen for this Noise Survey:

- Noise Measurement Position 3 (NMP3): The microphone of the sound level meter was located 4m from the extract flue in free-field conditions.

A summary of the measured noise level is presented in Table 3.3.

Table 3.3: Summary of Measured Noise Level for NMP3

Measurement	Measured Sound Pressure Level (dB)		Measurement Distance (m)
	$L_{Aeq,t}$	$L_{Amax,fast}$	
Extract Flue	57.6	64.6	4

3.4 Tesco Superstore – Recycling Centre, Bottle Bank & Hand Car Wash

The Recycling Centre and Bottle Bank are located adjacent to the Petrol Filling Station on the Store access road. The Recycling Centre comprises of several automated refuse machines for various wastes and the bottle bank is a standard unit.

The Hand Car Wash is located in south-eastern corner of the Store's car park and comprises approximately six staff operating hand-held pressure washes and a covered valet prep-area.

Noise measurements of the Recycling Centre were made over the following period.

- Thursday 19th November 2013 between 13:36 – 14:36.

The following noise measurement position was chosen for this Noise Survey:

- Noise Measurement Position 4 (NMP4): The microphone of the sound level meter was located 1m from the Recycling Centre and 2m from the Bottle Bank.

Noise measurements of the Hand Car Wash were made over the following period.

- Thursday 19th November 2013 between 14:37 – 15:37.

The following noise measurement position was chosen for this Noise Survey:

- Noise Measurement Position 5 (NMP5): The microphone of the sound level meter was located 8m from the pressure washing area of the car wash as this was considered to be the loudest part of the car washing process.

A summary of the measured noise level is presented in Table 3.4.

Table 3.4: Summary of Measured Noise Level for NMP3

Measurement	Measured Sound Pressure Level (dB)		Measurement Duration (mm:ss)
	$L_{Aeq,t}$	$L_{Amax,fast}$	
Recycling Centre	68.5	72.5	01:49
Bottle Bank	72.8	80.6	00:29
Hand Car Wash	61.6	-	27:37

*L_{Amax} not reported as the Hand Car Wash does not operate at night

3.5 Commercial Noise from Shire Hill Industrial Estate

REC have considered the following noise sources on the Sire Hill Industrial Estate:

- Noise generated by the dust extract system at ZigZag Joinery;
- Noise generated by early morning activity associated with the council depot, particularly between the hours of 06:00 – 07:00;
- Noise generated by any other commercial activity on the Shire Hill Industrial Estate which as the potential to impact on the Site.

During the noise surveys on Shire Hill Industrial Estate, the duct extract system at ZigZag Joinery was inactive and hence no noise was audible. It is understood that this system has given rise to noise complaints in the past and so it is possible that its use is now restricted and only temporarily operational.

Noise from the council depot yard was also inaudible; however there was a significant quantity of traffic departing the depot from 06:27 onwards. The traffic comprised of HGV bin lorries and small street sweepers.

Noise generated by other commercial activity comprised mainly of noise breakout from Tredfirst Tyre and Exhaust Limited which lies approximately 20m to the west of the Site boundary. Treadfirst provide maintenance and servicing for vehicles and comprises of a number of service bays housed in a metal-clad building. Noise breakout from the service bays is at 90 degrees to the Site however noise is audible on the Site boundary. Due to the high level of activity at Treadfirst, two separate noise surveys were conducted during a morning period and an evening period.

Although not considered a commercial noise element, there was a number of delivery HGV's and LGV's using the access roads on Shire Hill Industrial Estate close to the Site.

Noise measurements of the council depot were taken over the following period:

- Friday 20th November 2013 between 06:27 – 07:29.

The following noise measurement position was chosen for this Noise Survey:

- Noise Measurement Position 6 (NMP6): The microphone of the sound level meter was located at the entrance to the Council Depot.

Measurements of noise breakout from the servicing bays at Treadfirst were taken over the following periods.

- Morning Period - Thursday 19th November 2013 between 07:01 – 10:26; and,
- Afternoon Period - Thursday 19th November 2013 between 15:47 – 17:07

It should be noted that no noise was audible from Treadfirst during the afternoon period.

The following noise measurement position was chosen for this Noise Survey:

- Noise Measurement Position 7 (NMP7): The microphone of the sound level meter was located 18m from Treadfirst.

A summary of the measured noise level is presented in Table 3.5.

Table 3.5: Summary of Measured Noise Levels

Measurement	Measured Sound Pressure Level (dB)		Measurement Duration (mm:ss)
	$L_{Aeq,t}$	$L_{Amax,fast}$	
Council Depot – Bin lorries & Street-sweepers*	62.7	72.3	02:43
Treadfirst – morning period	54.6	64.7	02:25
Treadfirst – evening period	-	-	-
HGV / LGV Movement on Road	64.8	82.9	20:15

*Council vehicles did not begin departing the Site until 06:27.

3.6 Background & Ambient Noise Survey

A Background and Ambient Noise Survey has been conducted in order to measure the existing background and ambient noise level in the absence of any commercial noise.

The Background and Ambient Noise Survey was completed over the following period:

- 14:44 Monday 18th November 2013 to and 07:00 Wednesday 20th November 2013.

The duration of the Background Noise Survey has allowed for the measurement of the lowest daytime and night-time background noise levels found during a typical weekday period. The following noise measurement position was chosen for the survey:

- Noise Measurement Position 8 (NMP8): Located towards the south eastern corner of the Site, sufficiently far enough away from any commercial noise. The microphone of the sound level meter was positioned at a height of 1.8m above ground level in free-field conditions.

A summary of the lowest measured 1-hour background noise level for the daytime and night-time periods are presented in Table 3.6.

Table 3.6: Summary of Lowest Measured 1-hour Background Noise Levels for NMP8

Measurement Position	Measured Period	Lowest Measured Background Noise Level $L_{A90,1hr}$ (dB)
NMP8	Daytime	33.0
	Night-time	27.5

Table 3.7: Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
NMP1 – 3, 4, 5, 6 & 7	Sound Level Meter	01dB-Metravib Black Solo	65629	19 November 2014
	Pre-amplifier	01dB-Metravib PRE 21 S	166569	
	Microphone	01dB Metravib MCE212	16255	
	Calibrator	01dB-Metravib CAL-21	24924066	25 November 2014
NMP2	Sound Level Meter	01dB-Metravib Black Solo	65211	24th April 2015
	Pre-amplifier	01dB-Metravib PRE 21 S	15667	
	Microphone	01dB Metravib MCE212	103328	
	Calibrator	01dB-Metravib CAL-21	34113643	23rd March 2014
NMP8	Sound Level Meter	CEL-633C	1539299	April 12th 2015
	Pre-amplifier	CEL-495	1801	
	Microphone	CEL-251	2400	
	Calibrator	CEL-120	1695	April 12th 2014

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

The weather conditions during the Noise Surveys were conducive towards the measurement of environmental noise, being fine and dry with wind speeds of less than 5.0m/s.

4.0 NOISE IMPACT ASSESSMENT

This section will consider the following assessments:

- Noise Impact Assessment for Radwinter Road;
- Noise Impact Assessment for the Tesco Delivery Yard;
- Noise Impact Assessment for the Tesco Superstore, to include:
  - Tesco Delivery Yard;
  - Fixed Mechanical Plant;
  - Recycling Centre;
  - Bottle Bank; and,
  - Hand Car Wash.
- Noise Impact Assessment for Shire Hill Industrial Estate;
- Future Mechanical Plant associated with the proposed office space and optional School;
- Noise Impact Assessment for any Sports Pitch associated with the optional School.

4.1 Road Traffic Noise from Radwinter Road

The closest proposed noise sensitive dwelling to Radwinter Road is the Retirement Village.

For the purposes of this assessment, the daytime and night-time average ($L_{eq,T}$) noise levels have been calculated based on the shortened measurement procedure detailed in CRTN. The respective daytime and night-time noise levels have been derived using the following calculations:

1. Calculation of the $L_{A10,18hr}$ noise level by using the following formula:

$$L_{10,18hr} = L_{10,3hr} - 1dB$$

2. Calculation of the $L_{Aeq,16hr}$ noise level by using the following formula:

$$L_{eq,16hr} = L_{10,18hr} - 2dB$$

3. Calculation of the night-time $L_{Aeq,8hr}$ noise level by using the following formula:

$$L_{night}\ (L_{eq,8hr}) = 0.90 \times L_{10,18hr} - 3.77dB$$

Table 4.1 displays the calculated daytime average and night-time average and maximum noise levels.

Table 4.1: Calculation of Daytime and Night-time Road Traffic Noise Levels

Measurement Position	Period	Calculated L_{Aeq} (dB)	10th Highest Measured $L_{Amax,fast}$ (dB)	Measurement Distance from Centre of Radwinter Road (m)
NMP1	Daytime (07:00 – 23:00)	66.0	N/A	7.5

	Night-time (23:00 – 07:00)	57.4	82.5	

In determining the level of noise impact at the various dwellings, the following equation has been used to determine the resulting noise level from the daytime and night-time 'average' noise levels:

$$L_{Aeq,2} = L_{Aeq,1} - (10 \times \log (D_2/D_1))$$

Where $L_{Aeq,2}$ = noise level under investigation
$L_{Aeq,1}$ = measured noise level
D_2 = distance under investigation
D_1 = measurement distance

The following equation has been used to determine the resulting noise level from the night-time measured maximum noise level:

$$L_{Amax,fast,2} = L_{Amax,fast,1} - (20 \times \log (D_2/D_1))$$

Where $L_{Amax,fast,2}$ = noise level under investigation
$L_{Amax,fast,1}$ = measured noise level
D_2 = distance under investigation
D_1 = measurement distance

Finally, Line of Sight Removal has been applied to garden areas that have partial or full line of sight removal from Radwinter Road in the form of 5dB and 10dB attenuation respectively.

4.1.1 External Amenity Areas

Analysis of the supplied masterplan indicates that the primary amenity areas are enclosed by the building envelopes. As full line of sight from Radwinter Road can be expected, a minimum of 10dB attenuation in noise levels should be achieved.

Table 4.2: Calculation of Daytime Outdoor Garden Noise Levels

Dwelling	Calculated Daytime $L_{Aeq,16hr}$ (dB)	Distance to Garden (m)	Line of Sight Removal (dB)	Calculated Noise Level in Garden (dB)	Noise Criteria Level (dB)	Difference +/- (dB)
Retirement Village	66.0	73.2	-10	46.1	55	-8.9

Table 4.2 indicates that the daytime noise level from road traffic in the centre of the garden area falls below the agreed criteria noise level.

4.1.2 Internal Amenity Areas

The three facades of the Retirement Village impacted by noise from Radwinter Road are as follows:

- North façade;
- East façade; and;
- West façade.

Table 4.3 details the calculated noise levels for the above facades of the dwellings that have line of sight to Radwinter Road.

Table 4.3: Calculation of Noise Levels at the Facade

Façade	Period	Measured Noise Level (dB)	Distance to Façade (m)	Angle of View Correction (dB)	Calculated External Noise Level at Façade (dB)
North	Daytime	66.0 $L_{Aeq,16hr}$	18.3	0	62.1
	Night-time	57.4 $L_{Aeq,8hr}$			53.6
		82.5 $L_{Amax,fast}$			74.8
East	Daytime	66.0 $L_{Aeq,16hr}$	43.9	-3	55.3
	Night-time	57.4 $L_{Aeq,8hr}$			46.7
		82.5 $L_{Amax,fast}$			64.1
West	Daytime	66.0 $L_{Aeq,16hr}$	54.9	-3	54.3
	Night-time	57.4 $L_{Aeq,8hr}$			45.8
		82.5 $L_{Amax,fast}$			62.2

The now revoked PPG24 suggests that the sound reduction index afforded by such glazing set in a standard brick block wall will reduce road traffic external to internal noise levels by approximately 33dB. Table 4.4 calculates the internal noise level using standard thermal double glazing.

Table 4.4: Calculation of Internal Noise Levels with Standard Thermal Double Glazing

Dwelling	Period	Calculated External Noise Level at Façade (dB)	Attenuation Afforded by Standard Thermal Double Glazing (dB)	Calculated Internal Noise Level (dB)	Criteria Noise Level (dB)	Difference +/- (dB)
North	Daytime	62.1 $L_{Aeq,16hr}$	33	29.1	35	-5.9
	Night-time	53.6 $L_{Aeq,8hr}$	33	20.6	30	-9.4
		74.8 $L_{Amax,fast}$	33	41.8	45	-3.2
East	Daytime	55.3 $L_{Aeq,16hr}$	33	22.3	35	-12.7
	Night-time	46.7 $L_{Aeq,8hr}$	33	13.7	30	-16.3
		64.1 $L_{Amax,fast}$	33	31.1	45	-13.9

West	Daytime	54.3 $L_{Aeq,16hr}$	33	21.3	35	-13.7
	Night-time	45.8 $L_{Aeq,8hr}$	33	12.8	30	-17.2
		62.2 $L_{Amax,fast}$	33	29.2	45	-15.8

Table 4.4 indicates that standard thermal double glazing will be sufficient for all three facades of the Retirement Village. During summer months it may be necessary to open windows in order to provide a supply of fresh air to cool the habitable rooms. Table 4.5 determines the internal noise levels within the habitable rooms. BS8233 suggests that the sound reduction index of a partially open window will attenuate noise by approximately 10dB – 15dB and so this assessment has adopted 12dB.

Table 4.5: Calculation of Internal Noise Levels with a Partially Open Window

Dwelling	Period	Calculated External Noise Level at Façade (dB)	Attenuation Afforded a Partially Open Window (dB)	Calculated Internal Noise Level (dB)	Criteria Noise Level (dB)	Difference +/- (dB)
North	Daytime	62.1	12.0	50.1	35	+15.1
	Night-time	53.6	12.0	41.6	30	+11.6
		74.8	12.0	62.8	45	+17.8
East	Daytime	55.3	12.0	43.3	35	+8.3
	Night-time	46.7	12.0	34.7	30	+4.7
		64.1	12.0	52.1	45	+7.1
West	Daytime	54.3	12.0	42.3	35	+7.3
	Night-time	45.8	12.0	33.8	30	+3.8
		62.2	12.0	50.2	45	+5.2

Table 4.5 indicates that the internal target noise levels will be exceeded for all habitable rooms in proposed dwellings which have line of sight to Radwinter Road with a partially open window and so the following section considers alternative ventilation to opening windows.

4.2 Tesco Superstore – Extract Flue

The lowest measured background noise level measured at NMP8 was 27.8dB $L_{A90,t}$ which falls outside the scope of BS4142:1997. In this situation, it is appropriate to set the criteria noise limit at 35dB $L_{A,r}$ which is the lowest permissible noise rating level in BS4142. A noise rating level of 35dB is sufficiently low to enough to protect residential amenity without the need for unduly onerous noise mitigation.

The extract flue operates continuously and so the measured noise level has been taken as the equivalent 1-hour daytime and 5-minute night-time noise level.

Table 4.6 details the corrected measured specific noise level before calculation of the noise rating level.

Table 4.6: Calculation of Noise Rating Level

Measured Specific (dB)	Residual Noise Level (dB)	Corrected Specific (dB)	Acoustic Feature Correction (dB)	Noise Rating Level $L_{A,r}$ (dB)	Measurement Distance (m)
57.6	48	57.1	5	62.1	4

Table 4.7 calculates the noise rating level at the closest residential receptor.

Table 4.7: BS4142 Assessment

Distance to Closest Receptor (m)	Noise Rating Level at Closest Receptor $L_{A,r}$ (dB)	Adopted Criteria (dB)	Difference + / - (dB)
124	32.3	35	-2.7

Table 4.7 indicates that the predicted noise rating level at the closest proposed receptor falls below the adopted criteria.

4.3 Tesco Superstore – Delivery Yard

It is not appropriate to assess noise levels generated by operations in the delivery yard in accordance with BS4142 as this standard is more applicable to fixed commercial noise sources. Accordingly this assessment will consider the change in ambient noise levels brought about by delivery yard activity.

The measured Specific Noise Levels for each source were converted to 1-hour daytime noise levels using the following formulas:

Day-time Assessment Level = Measured L_{Aeq} - 10 x log (3600 / T)

Where 3600 = number of seconds in a 1 hour period
T = measurement time in seconds

The total calculated 1-hour noise level from both HGV's is calculated to be 40.3dB and the 1 hour ambient noise level, measured at NMP8 from 12noon to 1pm, was 48.0dB.

Table 4.8: Calculation of Change in Ambient Noise Level

Total Specific 1-hr Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Specific Noise Level (dB)	Ambient $L_{Aeq,1hr}$ Prior to Delivery Yard Noise	Total Combined Noise Level (dB)	Difference + / - (dB)
40.3	25.6	139	25.6	48	48.0	0.0

Table 4.8 indicates that there will be no change in the ambient noise level as a result of operation of the delivery yard.

4.4 Tesco Superstore – Recycling Centre inc. Bottle Bank

Observations made during the noise surveys suggests that the Recycling Centre and Bottle Bank could potentially operate 24 hours per

The lowest measured background noise level measured at NMP8 was 27.8dB $L_{A90,t}$ which falls outside the scope of BS4142:1997. In this situation, it is appropriate to set the criteria noise limit at 35dB $L_{A,r}$ which is the lowest permissible noise rating level in BS4142. A noise rating level of 35dB is sufficiently low to enough to protect residential amenity without the need for unduly onerous noise mitigation.

The measured Specific Noise Levels for each source were converted to 1-hour daytime noise levels using the following formulas:

Day-time Assessment Level = Measured L_{Aeq} - 10 x log (3600 / T)

Where 3600 = number of seconds in a 1 hour period
T = measurement time in seconds

Night-time Assessment Level = Measured L_{Aeq} - 10 x log (300 / T)

Where 3600 = number of seconds in a 5-minute period
T = measurement time in seconds

Table 4.9 details the corrected measured specific noise level before calculation of the noise rating level.

Table 4.9: Calculation of Time and Distance Corrected Specific Noise Level – Recycling Centre (Daytime)

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	On-time (seconds)	1-hr Assessment Period (seconds)	Time-corrected Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Noise Level (dB)
68.5	109	3600	53.3	1	58.5	18.0

Table 4.10 details the BS4142 Assessment for the daytime period.

Table 4.10: BS4142 Assessment – Daytime Period

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	Acoustic Feature Correction (dB)	Noise Rating Level $L_{A,r}$ (dB)	Criteria (dB)	Difference + / - (dB)
18.0	+5	23.0	35	-12.0

For the daytime period, the use of the Recycling Centre generates a noise rating level which falls below the criteria noise level.

Table 4.11 details the BS4142 Assessment for the night-time period

Table 4.11: Calculation of Time and Distance Corrected Specific Noise Level – Recycling Centre (Daytime)

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	On-time (seconds)	5 minute Assessment Period (seconds)	Time-corrected Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Noise Level (dB)
68.5	109	300	64.1	1	58.5	28.8

Table 4.12 details the BS4142 Assessment for the night-time period.

Table 4.12: BS4142 Assessment – Night-time Period

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	Acoustic Feature Correction (dB)	Noise Rating Level $L_{A,r}$ (dB)	Criteria (dB)	Difference + / - (dB)
28.8	+5	33.8	35.0	-1.2

For the night-time period, the use of the Recycling Centre generates a noise rating level which falls below the criteria noise level.

Table 4.13 calculates the distance corrected noise level for the use of the bottle-bank.

Table 4.13: Calculation of Time and Distance Corrected Specific Noise Level – Bottle Bank (Daytime)

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	On-time (seconds)	1-hr Assessment Period (seconds)	Time-corrected Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Noise Level (dB)
72.8	29	3600	51.9	2	58.5	22.5

Table 4.14 details the BS4142 Assessment for the daytime period.

Table 4.14: BS4142 Assessment – Daytime Period

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	Acoustic Feature Correction (dB)	Noise Rating Level $L_{A,r}$ (dB)	Criteria (dB)	Difference + / - (dB)
22.5	+5	27.5	35	-7.5

For the daytime period, the use of the Bottle Bank generates a noise rating level which falls below the criteria noise level.

Table 4.15 details the BS4142 Assessment for the night-time period

Table 4.15: Calculation of Time and Distance Corrected Specific Noise Level – Bottle Bank (Night-time)

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	On-time (seconds)	5 minute Assessment Period (seconds)	Time-corrected Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Noise Level (dB)
72.8	29	300	62.7	2	58.5	33.3

Table 4.16 details the BS4142 Assessment for the night-time period.

Table 4.16: BS4142 Assessment – Night-time Period

Measured Specific Noise Level $L_{Aeq,t}$ (dB)	Acoustic Feature Correction (dB)	Noise Rating Level $L_{A,r}$ (dB)	Criteria (dB)	Difference + / - (dB)
33.3	+5	38.3	35.0	+3.3

For the night-time period, the use of the Bottle Bank generates a noise rating level which exceeds the criteria noise level. Nevertheless, BS4142 is applicable for use in calculating noise levels externally and it is expected that people will not use their gardens areas during the night-time period. Accordingly, the exceedence of 3.3dB is not considered to present a problem, however it is necessary to consider internal noise levels within any bedrooms which face the Tesco Superstore for the maximum noise level generated by the Bottle Bank. Potentially high maximum noise levels can give rise to sleep disturbance. In the interests of informing a worst-case assessment, calculation has accounted for a partially open window which will afford approximately 12dB of attenuation.

Table 4.17: Calculation of Maximum Internal Noise Levels

Period	Measured Noise Level ($L_{Amax,fast}$) (dB)	Distance to Receptor (dB)	Calculated Noise Level at Receptor (dB)	Calculated Internal Noise Level with Partially Open Window (dB)	Criteria (dB)	Difference + / - (dB)
23:00 – 07:00	80.6	58.5	51.3	39.3	45	-5.7

Table 4.17 indicates that the internal target noise criteria for any bedrooms which face the Tesco Superstore is not exceeded with a partially open window.

4.5 Tesco Superstore – Hand Car Wash

The Hand Car Wash only operates for a limited period during the daytime period. Observations made during the noise survey indicate that operations do not commence until 08:00 and so the existing ambient noise level, for the period 07:00 – 08:00 as measured at NMP8, has been used in this assessment.

The measured Specific Noise Levels for each source were converted to 1-hour daytime noise levels using the following formulas:

Day-time Assessment Level = Measured L_{Aeq} - 10 x log (3600 / T)

Where 3600 = number of seconds in a 1 hour period
T = measurement time in seconds

Table 4.18: Calculation of Time & Distance Corrected Noise Level at Closest Receptor

Measured Noise Level (dB)	On-time	Assessment period	Time-corrected Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Noise Level (dB)
61.6	00:27:37	1hr	58.2	8	51.2	42.1

Table 4.19 calculates the change in ambient noise level at the closest receptor.

Table 4.19: Calculation of Change in Ambient Noise Levels

Distance Corrected Noise Level (dB)	1hr Ambient Prior to Operation of Car Wash (dB)	Combined Noise Level (dB)	Difference + / - (dB)
42.1	45.4	47.1	+1.7

Comparison of the calculated change in ambient noise level with the IOA/IEMA guidance indicates that a change in ambient noise level of 1.7dB yields a 'slight' impact. Accordingly the consideration of mitigation measures is not warranted.

4.6 Shire Hill Industrial Estate

This assessment considers the noise impact from the three significant noise sources at Shire Hill Industrial Estate:

- Noise from Treadfirst;
- Noise from HGV vehicles accessing and egressing the Council Depot; and,
- Noise from HGV's and LGV's operating on Shire Hill

4.6.1 Noise from Treadfirst

Observations made during the noise surveys indicate that Treadfirst does not operate during the night-time period. Indeed, Treadfirst was noted to open at 08:00 and close at 18:00.

The lowest measured background noise level measured at NMP8 was 27.8dB $L_{A90,t}$ which falls outside the scope of BS4142:1997. In this situation, it is appropriate to set the criteria noise limit at 35dB $L_{A,r}$ which is the lowest permissible noise rating level in BS4142. A noise rating level of 35dB is sufficiently low to enough to protect residential amenity without the need for unduly onerous noise mitigation.

The measured Specific Noise Levels for each source were converted to 1-hour daytime noise levels using the following formulas:

Day-time Assessment Level = Measured L_{Aeq} - 10 x log (3600 / T)

Where 3600 = number of seconds in a 1 hour period
T = measurement time in seconds

Table 4.20 details the corrected measured specific noise level before calculation of the noise rating level.

Table 4.20: Calculation of Time and Distance Corrected Specific Noise Level – Treadfirst

Measured Noise Level (dB)	On-time (hh:mm:ss)	Assess period	Time-corrected Specific Noise Level (dB)	Acoustic Feature Correction (dB)	Noise Rating Level $L_{A,r}$ (dB)	Measurement Distance (m)
54.6	00:02:25	01:00:00	40.7	+5	45.7	18.2

Table 4.21 details the BS4142 Assessment for the daytime period.

Table 4.21: BS4142 Assessment – Daytime Period

Distance to Closest Receptor (m)	Noise Rating Level at Closest Receptor $L_{A,r}$ (dB)	Measured Background Noise Level 07:00 – 08:00 (dB)	Criteria ($L_{A90,t}$ +5dB)	Difference + / - (dB)
91.4	31.6	44.2	49.2	-17.6

For the daytime period, Treadfirst generates a noise rating level which falls below the criteria noise level.

4.6.2 Noise from HGV's Accessing and Egressing Council Depot

The measured Specific Noise Levels for each of the HGV bin lorries and street-sweepers were converted to a 1-hour noise level using the following formulas:

Measured L_{Aeq} - 10 x log (3600 / T)

Where 3600 = number of seconds in a 1 hour period
T = measurement time in seconds

Table 4.22: Calculation of Time & Distance Corrected Noise Level at Closest Receptor

Measured Noise Level (dB)	On-time (hh:mm:ss)	Assessment period	Time-corrected Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Noise Level (dB)
64.4	00:01:40	3600	48.8	6	51.2	30.2

Table 4.23 calculates the change in ambient noise level at the closest receptor.

Table 4.23: Calculation of Change in Ambient Noise Levels

Distance Corrected Noise Level (dB)	1hr Ambient Prior to Council Depot Starting (dB)	Combined Noise Level (dB)	Difference + / - (dB)
30.2	45.4	45.5	+0.1

Comparison of the calculated change in ambient noise level with the IOA/IEMA guidance indicates that a change in ambient noise level of 0.1dB yields a 'slight' impact. Accordingly the consideration of mitigation measures is not warranted.

As the depot can operate during the night-time period, it is necessary to assess the maximum noise levels generated by vehicles accessing and egressing the council depot and the impact within bedrooms facing the depot.

Table 4.24: Calculation of Maximum Internal Noise Levels

Measured Noise Level $L_{Amax,fast}$ (dB)	Measurement Distance (m)	Distance to Receptor (m)	Maximum Noise Level at Receptor $L_{Amax,fast}$ (dB)	Calculated Maximum Noise Level with a Partially Open Window $L_{Amax,fast}$ (dB)	Criteria (dB)	Difference + / - (dB)
72.3	6	58.5	52.5	40.5	45	-4.5

Table 4.24 indicates that the maximum internal target noise level will not be exceeded from council vehicles accessing and egressing the depot.

4.6.3 Noise from HGV's Using Shire Hill

The measured Specific Noise Levels for each of the HGV's were converted to a 1-hour noise level using the following formulas:

Measured L_{Aeq} - 10 x log (3600 / T)

Where 3600 = number of seconds in a 1 hour period
T = measurement time in seconds

Table 4.25: Calculation of Time & Distance Corrected Noise Level at Closest Receptor

Measured Noise Level (dB)	On-time (hh:mm:ss)	Assessment period	Time-corrected Noise Level (dB)	Measurement Distance (m)	Distance to Closest Receptor (m)	Distance Corrected Noise Level (dB)
62.3	00:12:15	01:00:00	55.4	6	32.9	48.0

Table 4.26 calculates the change in ambient noise level at the closest receptor.

Table 4.26: Calculation of Change in Ambient Noise Levels

Distance Corrected Noise Level (dB)	1hr Ambient Prior to Council Depot Starting (dB)	Combined Noise Level (dB)	Difference + / - (dB)
48.0	48.1	51.1	+3.0

Comparison of the calculated change in ambient noise level with the IOA/IEMA guidance indicates that a change in ambient noise level of +3.0dB yields a 'moderate' impact. A change of 3dB is only just perceptible to the human ear and as such, the consideration of mitigation measures is not warranted.

4.7 Plant Noise Emission Limits Assessment

As the development is mixed-use, which includes for a commercial area in the north west parcel of the Site and an option for a school which may include for mechanical plant, it is

necessary to set plant noise emission limits based on the existing measured background noise climate and the criteria specified by the Uttlesford District Council.

Table 4.27 specifies plant noise emission limits for both daytime and night-time periods based on the background noise levels measured at NMP8.

Table 4.27: Calculation of Time & Distance Corrected Noise Level at Closest Receptor

Period	Lowest Measured Background Noise Level $L_{A90,t}$ (dB)	Criteria (dB)	Calculated Plant Noise Emission Limit $L_{A,r}$ (dB)
Daytime	33	$L_{Ar} = L_{A90}$ -5dB	28.0
Night-time	27.5		22.5

Table 4.27 indicates that the calculated plant noise emission limits for the daytime and night-time periods. The advice contained in BS4142:1997 suggests that noise rating level below about 35dB fall outside the scope of the standard and so it is considered reasonable to adopt 35dB as the maximum combined noise rating level at the closest residential receptor to the office development.

4.8 Noise Impact Assessment for any Sports Pitch associated with the optional School

REC has measured the noise level generated by an existing Sports Pitch in Salford at a distance of 30m to the centre of the pitch. This assessment will compare the lowest measured 1-hour ambient noise level with the equivalent 1-hour noise level generated by an existing Sports Pitch. The measured 5-a-side football match lasted for a period of 20 minutes and so this has been taken as a longer 1-hour football match noise level.

Precise details of any Sports Pitch are unknown and so the following has been assumed:

- In the interests of informing a worst-case assessment, it has been assumed that the Sport's Pitch will be located close to the Site boundary with the residential dwellings on Upshers; and,
- The operational times of the Sports Pitch will be between 09:00 – 15:00.

Table 4.28 compares the calculated 1-hour noise level with the lowest measured existing ambient noise level.

Table 4.28: Calculation of Change in Ambient Noise Level at Closest Receptor

Distance to Receptor from Centre of Proposed AWP (m)	1-Hour Football Noise Level at Receptor (dB)	Lowest Daytime Ambient Noise Level Between 09:00 – 15:00 (dB)	Combined Football Noise Level & Existing Ambient Noise Level (dB)	Difference +/- (dB)
48	48.6	44.7*	49.0	+4.3

*Ambient noise level taken from NMP8

Table 4.28 indicates that the combined ambient noise level exceeds the existing ambient noise level by 4.3dB. Comparing this noise level increase with the guidance stated in Table

2.2 determines a classification of 'moderate impact'. This increase in ambient noise level is considered too high and so the following section considers appropriate mitigation.

5.0 MITIGATION

5.1 Road Traffic Noise

The previous section indicated that with a partially open window, the internal noise levels for any habitable rooms which have line of sight to Radwinter Road will exceed the internal target criteria. Accordingly, It is recommended that a through-frame window mounted trickle ventilator is incorporated into the glazing unit of the habitable rooms so that fresh air can enter the room without having to open windows. One such acoustic trickle ventilator is as follows:

- Greenwoods EAR42W Trickle Ventilator, which provides acoustic attenuation of up to 42 dB $D_{n,e,w} + C_{tr}$ in its open position.

The trickle ventilator should be combined with a suitable extraction ventilator such as:

- Mechanical Extract Ventilation (MEV) system;
- Passive Extract Ventilation (PEV) system;
- Mechanical Ventilation Heat Recovery (MVHR) system; or
- Positive Input Ventilation (PIV) system.

Wherever possible habitable rooms should be located away from the noise source with less noise-sensitive rooms facing the noise source which would negate the need for alternative ventilation.

5.2 Sports Pitch associated with the optional School

The previous section has determined that, if the Sports Pitch is located close to the dwellings on Upshers, then a change in ambient noise level of +4.3dB is predicted which is above the generally accepted 3dB change. The most appropriate method for controlling noise in this situation is by installation of an acoustic barrier along the Site boundary with the dwellings. It is recommended that the acoustic barrier removes partial line of sight to the dwellings on Upshers. Table 5.1 calculates the change in ambient noise level at the dwellings following installation of an acoustic barrier.

Table 5.1: Calculation of Change in Ambient Noise Level at Closest Receptor

1-Hour Football Noise Level at Receptor (dB)	Expected Barrier Attenuation Afforded by a 1.8m high Barrier	Mitigated 1-Hour Football Noise Level at Receptor (dB)	Lowest Daytime Ambient Noise Level Between 09:00 – 15:00 (dB)	Combined Football Noise Level & Existing Ambient Noise Level (dB)	Difference +/- (dB)
48.6	-5	43.6	44.7*	47.2	+2.5

Table 5.1 indicates that the change in ambient noise level following installation of an acoustic barrier will be 2.5dB which, according to Table 2.2, corresponds to a minor magnitude of impact. A noise level change below 3dB is considered imperceptible to the human ear and as such the consideration of further mitigation measures is not warranted.

It should be noted that the assessment of noise from the Sports Pitch is based on the assumption that it will be located close to the existing dwellings on Upshers. If the option for a School is desired and an associated Sports Pitch is required, then it is recommend that it is located as far from the dwellings on Upshers as practically possible.

6.0 CONCLUSION

REC Limited have been commissioned by Manor Oak Homes to complete a Noise Impact Assessment in support of a proposed mixed-use development on a parcel of land located off Radwinter Road in Saffron Walden, CB10 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 elements of the development.

This Noise Impact Assessment has been completed with due regard to the requirements of Uttlesford District Council's Environmental Health Department.

The Noise Impact Assessment has identified that the key noise sources impacting upon the development is from road traffic using Radwinter Road and certain commercial sources surrounding the Site.

It should be noted that all of the calculations performed in this assessment are based on worst-case assumptions and so the actual level of noise within external amenity areas and internal habitable rooms is likely to be lower than the calculated noise levels.

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

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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

Acoustic Terminology

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 (2x10-5Pa).
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	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

REC
Resource & Environmental Consultants

Figure 1

Layout, without optional School

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Figure 2

Noise Measurement Positions

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Figure 3

Layout, with optional School

REC are a multi-disciplinary health, safety, environmental and energy consultancy. Our national coverage enables our local experts to provide cost effective and pragmatic consultancy services in an efficient and sustainable manner.

REC Environmental Management

- Environmental Management
- Divestment Services
- Environmental Management Systems
- CDM Co-Ordination
- Environment Permit Application

REC Renewable Energy

- Feasibility Studies
- Ground Source Heat Pumps Installation
- Air Source Heat Pump Installation
- System Design and Maintenance
- Solar Photovoltaic (PV) Systems
- Combined Heat and Power Systems

REC Acoustics

- Sound Insulation Testing
- Noise at Work Assessment
- Development Related Noise
- Environmental Noise

REC Geoenvironmental

- Geotechnical Investigation & Assessment
- Contaminated Land Investigation & Assessment
- Waste Management
- Groundwater Testing
- Environmental Impact Assessment

REC Asbestos & Legionella

- Asbestos Management Surveys
- Demolition/Refurbishment Surveys
- Analysis of Asbestos in Soils and Bulk Samples
- Air Testing for Clearances and Reassurance
- Legionella Risk Assessment

REC Air Quality

- Air Quality Impact
- Odour Assessment
- Dispersion Modelling
- Stack Emission Testing
- Pollution Monitoring

REC Flood Risk

- Flood Risk & Consequence Assessment
- Strategic Flood Risk Assessment (SFRA)
- EIA Technical Chapters
- Assessment of Flood Levels
- Hydrology & Hydrogeology
- Flood Defence Structures
- Drainage Systems (SUDS) Design
- Mitigation Measures
- Soakaway Tests

REC Ecology

- Phase 1 Habitat Surveys
- Invasive Species
- Legally Protected Species Surveys
- Mitigation Schemes
- Ecological Impact Assessment (EcIA)
- BREEAM & Code 4 Sustainable Homes
- Habitat Management Plans
- Management planning and targeted Biodiversity Action Plan survey
- Environmental Impact Assessment