Land off School Road, Elmswell (Phase 2)

Noise Assessment

7th November 2023

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Version	1	2	3
Comments	Noise Assessment	Noise Assessment	Updated Plan
Date	28th November 2022	12th October 2023	7th November 2023
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Project Number	22-401	22-401	22-401

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Contents

Figures

Tables

1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to undertake an assessment of noise with regard to the proposed change of use of the Land off School Road, Elmswell for residential care home purposes.

The following technical noise assessment has been produced to provide supporting information to accompany a planning application to Mid Suffolk District Council and is based upon environmental noise measurements undertaken at the site.

This noise assessment is occasionally technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at discrete locations around the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the existing sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England: Noise [1], BS8233:2014 [2] and BS4142:2014+A1:2019[3].

[1] Department for Communities and Local Government (DCLG), 2019. National Planning Practice Guidance for England: Noise. DCLG.
[2] British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings.* BSI
[3] British Standard 4142:2014+A1:2019 *Method for rating and assessing commercial sound.* BSI

2. LEGISLATION AND POLICY FRAMEWORK

The development proposals for the Site are guided by the following policy directives and guidance:

2.1. Planning Policy

2.1.1. National Planning Policy Framework, 2023

The *National Planning Policy Framework* (NPPF)[4] sets out the UK Government's planning policies for England. Planning policy requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It sets out the Government's requirements for the planning system and how these are expected to be addressed.

Under Section 15; *Conserving and Enhancing the Natural Environment*, in Paragraph 174, the following is stated:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.".

Paragraph 185 of the document goes on to state:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason"

Paragraph 185 refers to the Noise Policy Statement for England, which is considered overleaf.

[4] Department for Levelling Up, Housing & Communities (DLUHC), September 2023. National Planning Policy Framework. HMSO. London.

2.1.2. Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in *DEFRA: 2010: Noise Policy Statement for England* (NPSE)[5]. The NPSE sets out the *"Long Term Vision"* of Government noise policy as follows:

"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development".

The NPSE outlines three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *"Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life".*

The guidance states that it is not possible to have a single objective noise-based measure that defines *"Significant Observed Adverse Effect Level (SOAEL)"* that is applicable to all sources of noise in all situations and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

2.1.3. National Planning Practice Guidance in England: Noise, 2019 (PPGNoise)

Paragraph: 002 of the PPGNoise states the following:

"Can noise override other planning concerns?

It can, where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern."

As such, Paragraph: 003 of the NPPG states that:

"Plan-making and decision making need to 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 NPSE, this would include identifying whether the overall effect of the noise exposure … is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

Consequently, the *National Planning Practice Guidance in England: Noise* (NPPG Noise)[6] summarises the noise exposure hierarchy, based on the likely average response. The following three observed effect levels are identified below, as identified in Paragraph 004:

[5] Department for Environment, Food and Rural Affairs (DEFRA), 2010. Noise Policy Statement for England. DEFRA.
[6] Department for Communities and Local Government (DCLG), 2019. National Planning Practice Guidance for England: Noise. DCLG.

- **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 Adverse Effect Level**: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Importantly, Paragraph: 004 of the PPGNoise states that:

"Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs."

Paragraph: 005 of the PPGNoise expands the significant criteria related to each of these levels, which are reproduced in Table 1, below.

TABLE 1: SIGNIFICANCE CRITERIA FROM NPPG IN ENGLAND: NOISE

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Noticeable	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Noticeable and Not Intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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	Significant Observed Adverse Effect	Avoid

Perception	Examples of Outcomes	Increasing Effect Level	Action
	of life diminished due to change in acoustic character of the area.		
Present and Very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.2. British Standards

2.2.1. BS8233:2014

BS8233:2014 draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average (L_{Aeq}) level.

The standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the guidance values, as detailed below in Table 2.

TABLE 2: BS8233:2014 AMBIENT NOISE LEVELS

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

BS8233:2014 goes on to suggest that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regard to maximum noise levels, the standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc) can cause sleep disturbance. The standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of SEL or $L_{Amax,F}$, depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

2.2.2. BS4142:2014+A1:2019

BS4142:2014+A1:2019 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014+A1:2019 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs".* An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*
- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

During the daytime, the assessment is carried out over a reference time period of 1-hour, with a referencing period of 15 minutes used during the night. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

3. Site Description

3.1. Site and Surrounding Area

The Proposed Development comprises an area of open agricultural land, to the west of the village of Elmswell, north-east of the A14 dual carriageway and south of the Great Eastern Main Line.

The Proposed Development area, in the context of its surroundings, can be seen in Figure 1.

The sound environment across the site is primarily influenced by road traffic noise arising from vehicles on the A14 and passing trains on the Great Eastern Main Line, with some audible construction activity arising from works within the new housing development to the north-east of Parnell Lane.

Figure 1: Proposed Development Site and Surrounding Area

3.2. Proposed Development Overview

The Proposed Development comprises the construction of a 66-bed residential care home, an admin/management building, a club house/communal area and 40 assisted living dwellings, as shown in Figure 2.

FIGURE 2: PROPOSED DEVELOPMENT LAYOUT

– Figure 8: Illustrative Landscape Masteplan

4. Measurement Methodology

4.1. General

The prevailing noise conditions at the site have been determined by an environmental noise survey conducted between Tuesday 15th and Wednesday 16th November 2022.

4.2. Noise Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[7].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[8]. A full inventory of this equipment is shown in Table 3 below.

Table 3: Inventory of Sound Measurement Equipment

Measurement Position	Make, Model & Description	Serial Number
MP1	Svantek 957 Sound Level Meter	21890
	Svantek SV 12L Preamplifier	24215
	ACO 7052E Microphone	58524
MP2	NTi Audio XL2 Sound Level Meter	A2A-14510-EO
	NTi Audio Preamplifier	A21028
	NTi Audio MA220 Microphone	7614
All	Cirrus CR:515 Acoustic Calibrator	80029

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.1 dB in the field calibration was found to have occurred on the sound level meters.

The weather conditions during the survey were conducive to noise measurement, it being dry, with low wind speeds.

[7] British Standard 7445: 2003: Description and measurement of environmental noise. BSI
[8] British Standard 61672: 2013: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

The microphones were fitted with protective windshields for the measurements, which are described in Table 4, with an aerial photograph indicating their respective locations shown in Figure 3.

TABLE 4: MEASUREMENT POSITION DESCRIPTIONS

Measurement Position	Description
MP1	A largely unattended measurement of sound at the northern boundary of the site, at a height of 1.5m above local ground level, under free-field conditions. This position was intended to provide a source noise level for the railway, being at the closest point of the site to that source; however, the sound environment was primarily influenced by road traffic noise arising from vehicles on the A14, with only occasional influence arising from rail traffic. Construction work to the east of Parnell Lane was just audible at this location, but at a level that did not influence the measures sound levels.
MP2	A largely unattended measurement of sound at the north-western edge of the proposed build area of the site, at a height of 1.5m above local ground level, under free-field conditions. The sound environment at this position was primarily influenced by road traffic noise arising from vehicles on the A14, with only occasional influence arising from rail traffic. Construction work to the east of Parnell Lane was just audible at this location, but at a level that did not influence the measures sound levels.

FIGURE 3: MEASUREMENT POSITIONS

4.3. Summary Results

The summarised results of the environmental noise measurements are presented in Table 5, below, with full time histories and statistical analysis set out under Appendix B.

TABLE 5: SUMMARY OF NOISE MEASUREMENT RESULTS

Period	dB(A)	Octave Band (Hz) Sound Level (dB)							
		63	125	250	500	1000	2000	4000	8000
MP1									
$L_{eq,T}$									
Day	54.9	62.8	54.3	51.7	50.8	51.8	46.7	41.6	36.1
Night	54.3	58.3	53.5	51.0	51.1	51.2	45.1	40.9	34.7
L_{FMax}									
Night	71.3	85.5	80.5	73.3	67.6	67.1	66.8	57.8	49.7
MP2									
$L_{eq,T}$									
Day	54.9	62.8	52.5	46.7	51.9	52.5	44.9	35.9	26.5
Night	52.4	54.3	49.1	43.9	50.6	49.6	42.0	34.0	24.4
L_{FMax}									
Night	63.2	65.7	65.4	56.7	63.1	59.6	57.7	53.3	39.7
Modal L_{A90} Values (Background Sound)									
Day	53	-	-	-	-	-	-	-	-
Night	44	-	-	-	-	-	-	-	-

4.4. Discussion of Results

The data set out in Table 5 identifies that the L_{Aeq} is reasonably steady across the site during the day, but does reduce slightly with distance from the railway line at night, as do the L_{Amax} statistics, which are evidently governed by rail traffic.

The measured noise levels at the site aren't high and are at a level not considered to represent a constraint to the proposed uses at the site.

5. Noise Assessment

5.1. Façade Requirements

In order to achieve appropriate noise levels within internal living spaces, in those areas where such levels will not be achieved with open windows, the dwellings themselves need to be considered with regard to the level of façade mitigation required in order to achieve internal noise levels of $L_{Aeq,16\text{-hour}}$ <35 dB in habitable rooms during the day; $L_{Aeq,8\text{-hour}}$ <30 dB and typical L_{AFMax} levels of <45 dB during the night.

The glazing and ventilation elements are typically the weakest acoustic link in the construction of a building facade. Therefore, in order to assess the acoustic performance of the proposed dwellings, it is appropriate in the first instance to explore the level of protection that will be afforded by the performance of the glazing elements.

Windows do not reduce noise equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window and by extension, the resulting noise levels within the receiving room.

Many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a very useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates. This performance index is known as the R_{TRA}, or $R_w + C_{tr}$.

The Building Regulations recommend on ventilation that habitable rooms in dwellings have background ventilation. Internal noise levels should be considered in the context of room ventilation requirements. In this instance, the target internal noise levels will only be achieved in the majority of dwellings when windows are closed. An alternative means of ventilation will therefore be required to comply with the requirements of the Building Regulations Approved Document F.

In order to achieve the target daytime and night-time internal noise levels, it is necessary to determine the minimum acoustic performance requirements of each façade component. It is typically assumed that the default choice of glazing for the habitable rooms of the proposed development will be thermal double glazing and the default choice for ventilation will be a hit and miss, window-mounted trickle vent system.

As already stated; in order to provide a robust assessment and a high-quality living environment for future residents, providing internal noise levels of <35 dB $L_{Aeq,16\text{-hour}}$ by day and <30 dB $L_{Aeq,8\text{-hour}}$ by night, as well as <45 dB typical L_{AFMax} by night, as defined in BS 8233 has been adopted as the design target for the proposed development.

To determine the glazing and ventilation requirements in order to provide an adequate level of protection against external noise intrusion, $L_{Aeq,16hour}$ daytime, $L_{Aeq,8hour}$ and typical L_{AFMax} night-time noise levels have been determined based upon the measurement data from within the intended build area (MP2).

Accordingly, the required sound level difference from outside to inside for the unscreened building facades of the development, to provide appropriate internal noise levels during both daytime and night-time periods, are set out in Table 6.

TABLE 6: REQUIRED SOUND LEVEL DIFFERENCE OUTSIDE TO INSIDE, DB

Index	Free-field Noise Level at Facade, dB		Target Internal Noise Level - dB		Required Sound Level Difference, dB
	Day	Night	Day	Night	
$L_{Aeq,T}$	55	53	35	30	23
L_{AFMax}	-	63	-	45	18

Table 6 identifies that the sound reduction requirements for the proposed development are driven by meeting the adopted target $L_{Aeq,8\text{-hour}}$ night-time criteria. Additionally, the façade requirements within the range typically achieved by non-acoustically uprated, thermally insulated façade constructions, meaning that noise-related factors will not necessarily steer the design of the scheme or specification of the external building fabric.

The site area will be suitable for ventilation via openable windows during the day with compliance with BS8233:2014 internal noise criteria with the 5 dB relaxation, for natural ventilation, where development is necessary or desirable. Night-time noise levels will require windows to be closed, in order to achieve strict BS8233:2014 compliance, with measured noise levels being 3 dB above that threshold value.

It should be noted that the sound reduction detailed in Table 6 apply to habitable rooms such as living rooms, dining rooms and bedrooms only. For non-habitable rooms such as kitchens, bathrooms, stairways, halls, landings, lower performance standards would be permissible.

For completeness, the acoustic performances for typical, thermally insulating façade components are presented in Table 7.

TABLE 7: RECOMMENDED ACOUSTIC PERFORMANCES FOR GLAZING AND VENTILATION

Example Glazing	Octave Band (Hz) Sound Level (dB)							
	63	125	250	500	1000	2000	4000	R_w
	Sound Reduction Performance, R dB							
4/12/4 Double Glazing	20	24	20	25	35	38	35	31
Example Ventilation	**Octave Band (Hz) Sound Level (dB)**							
	63	125	250	500	1000	2000	4000	$D_{n,e,w}$
	Element Normalised Level Difference (D,n,e) dB							
Trickle Vent with Direct Air Path	28	32	32	31	33	31	31	32
Example Walls	**Octave Band (Hz) Sound Level (dB)**							
	63	125	250	500	1000	2000	4000	R_w
	Sound Reduction Performance, R dB							
Lightweight Wall	17	22	38	53	58	57	59	46

As previously stated, the above façade components are conducive with those typically required for thermal insulation and represent no uplift in design beyond that required to achieve the required thermal standards.

Other units may be suitable and it is the responsibility of the glazing manufacturer to recommend and provide appropriate systems. The above analysis is provided to demonstrate that a design solution is feasible at the site for the purposes of a planning application and not necessarily for the purposes of detailed design or glazing procurement.

The detailed design of the proposed properties may affect both the required sound reduction performance and the appropriate selection of glazing units. The aspects of the detailed design that are important are the room dimensions, room finishes, window dimensions and the sound reduction performance of non-glazing elements.

5.2. Discussion

It should be noted that the above represents a closed window scenario, with background ventilation provision via a window-mounted trickle passive ventilation system for the night-time. In the event of windows being opened for periods of purge or comfort cooling ventilation provision, the internal noise level criteria will be marginally exceeded during this period.

Consequently, the need for any additional ventilation requirements should be advised via an overheating assessment, in accordance with Approved Document O of the Building Regulations in England.

5.3. External Amenity

In the absence of any acoustic screening benefits afforded by the built form of the development, daytime $L_{Aeq,16\text{-}hour}$ noise levels across the site are measured to be marginally below the 55 dB threshold value, set out in BS8233:2014 for external amenity spaces.

Consequently, no acoustically specific mitigation measures are required to achieve the relevant external amenity requirements, which are anticipated to reduce further, once the built form of the development is introduced to the site.

6. Operational Noise Limits

The exact details of any static plant to be installed as part of the development are not currently known, therefore, for the purposes of this noise assessment, it is considered appropriate to set noise emission limits in accordance with the requirements of BS4142:2014+A1:2019, which can be conditioned and discharged at a later date.

Consequently, the noise limits set out in Table 8 have been derived for the daytime and night-time periods, at the closest noise-sensitive receptors to the Proposed Development, which equate to a level of no greater than the prevailing background sound level, as measured at MP2.

Table 8: Proposed Static Plant/Commercial Noise Emission Limits – Residential Receptors

Period	Proposed Plant 'Rating Noise Level' at the Nearest Residential Receptor – dB(A)
Day (07:00-23:00)	53
Night (23:00-07:00)	44

The above limits would apply to the total noise emission level from all plant within the Proposed Development. Individual plant items may need to be designed to a lower limit such that the overall total achieves the stated criteria above.

Compliance with the above criteria would ensure that any plant noise impacts are Negligible.

7. CONSTRUCTION

The precise construction method and phasing have not yet been determined; however, a Construction Environmental Management Plan (CEMP) will be prepared and submitted in due course to the Local Planning Authority for approval, which will be steered by the criteria set out in BS 5228: 2009+A: 2014[9].

With regard to vibration, the document sets a ground vibration limit, in terms of Peak Particle Velocity (PPV) of 1 mm per second at any occupied residential property and 3 mm per second at any other property in any orthogonal direction.

It is anticipated that construction hours will be limited by condition, agreed with the Local Planning Authority.

With respect to the minimisation of acoustic disruption arising from construction activity, the following techniques will be employed:

- effective co-ordination and time management of construction operations would be important in avoiding noise and vibration nuisance to surrounding uses. Early and helpful communications with the surrounding receptors would assist reducing potential for and in managing any complaints arising during the demolition and construction works of the Proposed Development; and
- contractors would be required to ensure that works are carried out in accordance with Best Practice Measures (BPM) as stipulated in the Control of Pollution Act 1974. A full explanation of measures to control construction noise would be incorporated within the CEMP and detailed in all construction method statements.

The Proposed Development in regards to general noise mitigation would be in accordance with Best Practicable Means (BPM) as specified in BS 5228 and would comprise the following, where possible:

- using 'silenced' plant and equipment;
- switching off engines where vehicles are standing for a significant period of time;
- fitting of acoustic enclosures to suppress noisy equipment;
- operating plant at low speeds and incorporating of automatic low speed idling;
- selecting electrically driven equipment in preference to internal combustion powered, hydraulic power in preference to pneumatic and wheeled in lieu of tracked plant;
- properly maintaining all plant (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
- considering the use of temporary screening or enclosures for static noisy plant to reduce noise emissions;
- certifying plant to meet any relevant EC Directive standards; and
- undertaking awareness training of all contractors in regards to BS5228 (Parts 1 and 2) which would form a prerequisite of their appointment.

Typically, adopting BPM would reduce overall construction noise levels by approximately 5 dB.

Should any non-routine activities be identified that would make it impracticable to work to the adopted target criterion, provisions would be set out in advance and with the agreement of the Local Planning Authority, to reduce and control the effect. It is recommended that noise monitoring is carried out during particularly noisy phases of work close to the site boundary so that such situations can be actively managed in accordance with the CEMP.

[9] British Standard BS 5228: 2009+A: 2014 Code of practice for noise and vibration control on construction and open sites. BSI

For any proposed construction works to be undertaken outside of the permitted working day, particularly at night, prior consent would be sought from the Local Planning Authority. Dispensation procedures for works would be agreed in advance and included within Construction Method Statements and a CEMP.

Deliveries and removal of material off-site, would be subject to the following controls;

- ensuring that construction traffic is parked off the public highway;
- controlling the discharge of trucks from Site to avoid congestion; and
- implementing traffic management systems at the entrance to the site at all times to control the traffic into the site.

By implementing the aforementioned measures, it is anticipated that any noise impacts to nearby sensitive receptors during the demolition and construction works will be minimised.

8. Conclusion

inacoustic has been commissioned to undertake an assessment of noise with regard to the proposed change of use of the Land off School Road, Elmswell for residential care home purposes.

This technical noise assessment has been produced to provide supporting information to accompany a planning application to Mid Suffolk District Council and is based upon environmental noise measurements undertaken at the site.

The suitability of the site for residential care home development has been assessed, based on the measured sound levels. These levels indicate that noise is not a determining factor in the granting of planning permission, with no mitigation measures required to ensure that satisfactory acoustic conditions are met, in accordance with the steering principles of BS8233.

The potential construction effects of the scheme have not been considered in detail; however, a suite of mitigation measures have been suggested, which can be incorporated into a Construction Environmental Management Plan, that should be prepared by the Principal Contractor for the construction of the scheme.

In light of the above, which demonstrates that the site is predicted to meet the requirements of the relevant British Standard and planning guidance, it is considered that noise is not a significant factor at the site and therefore does not present a constraint to the proposed development of the Site.

9. APPENDICES

9.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 9: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

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

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

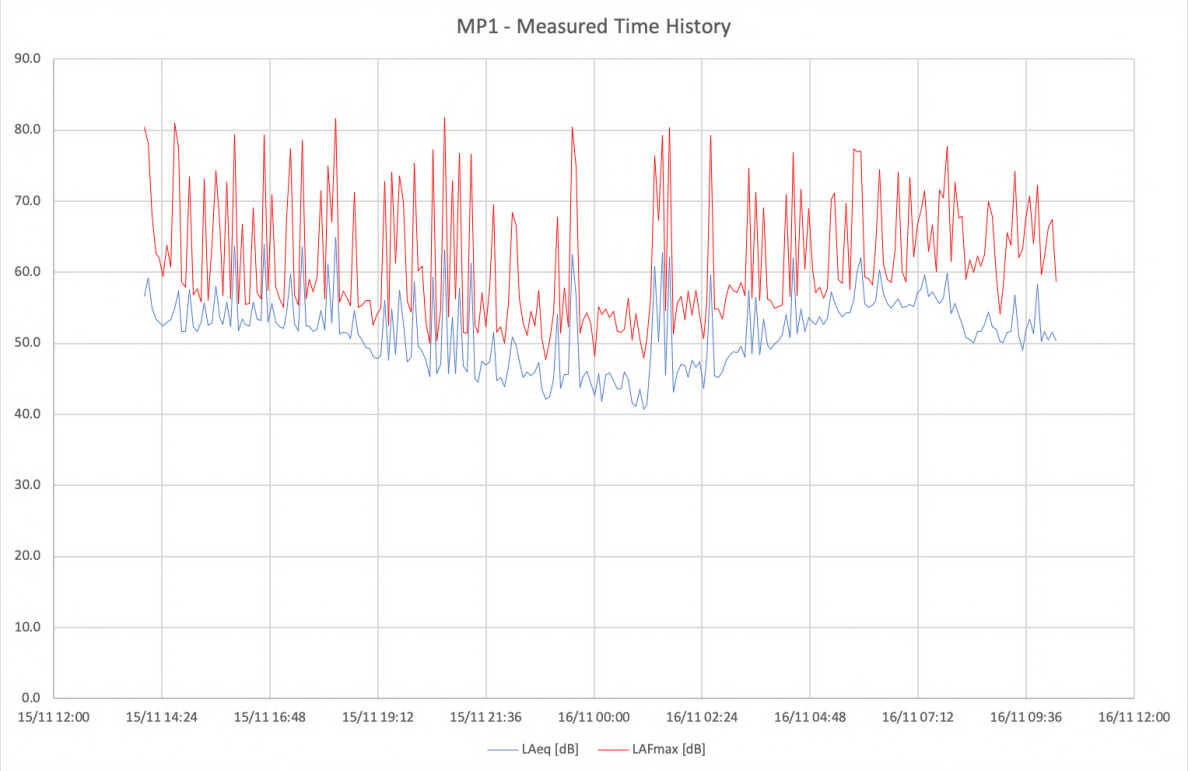
For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

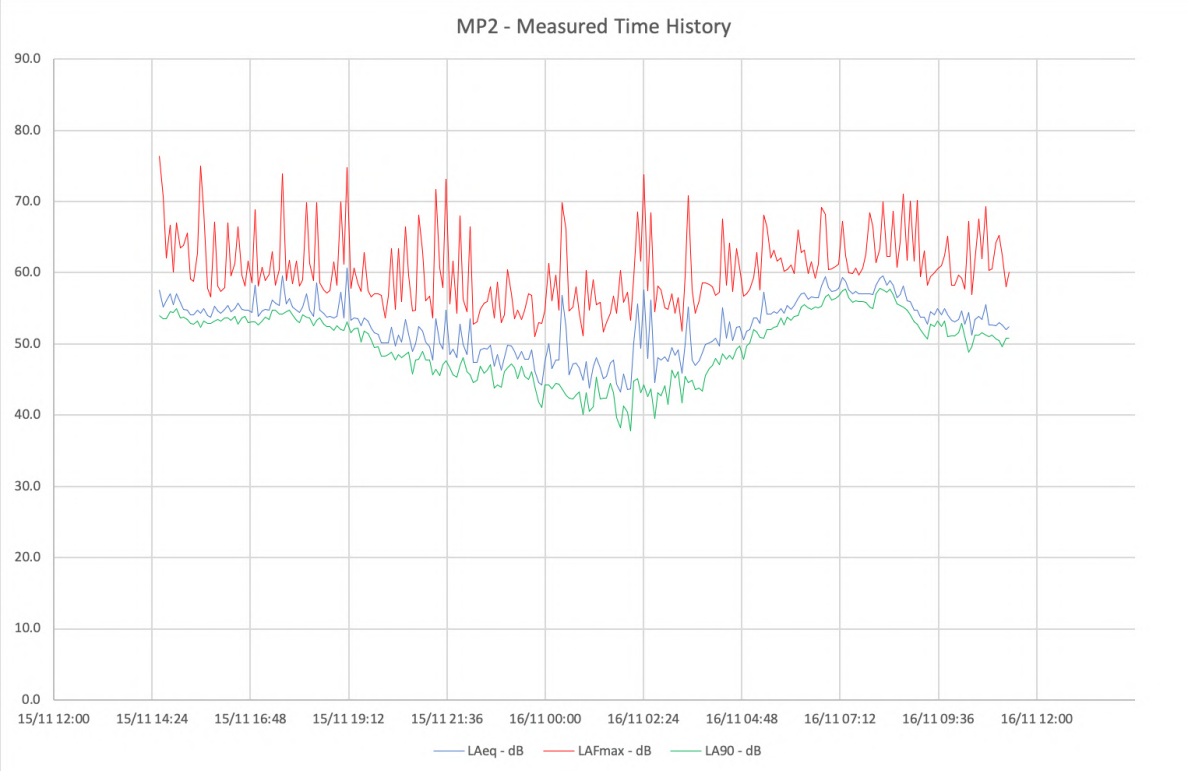
This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

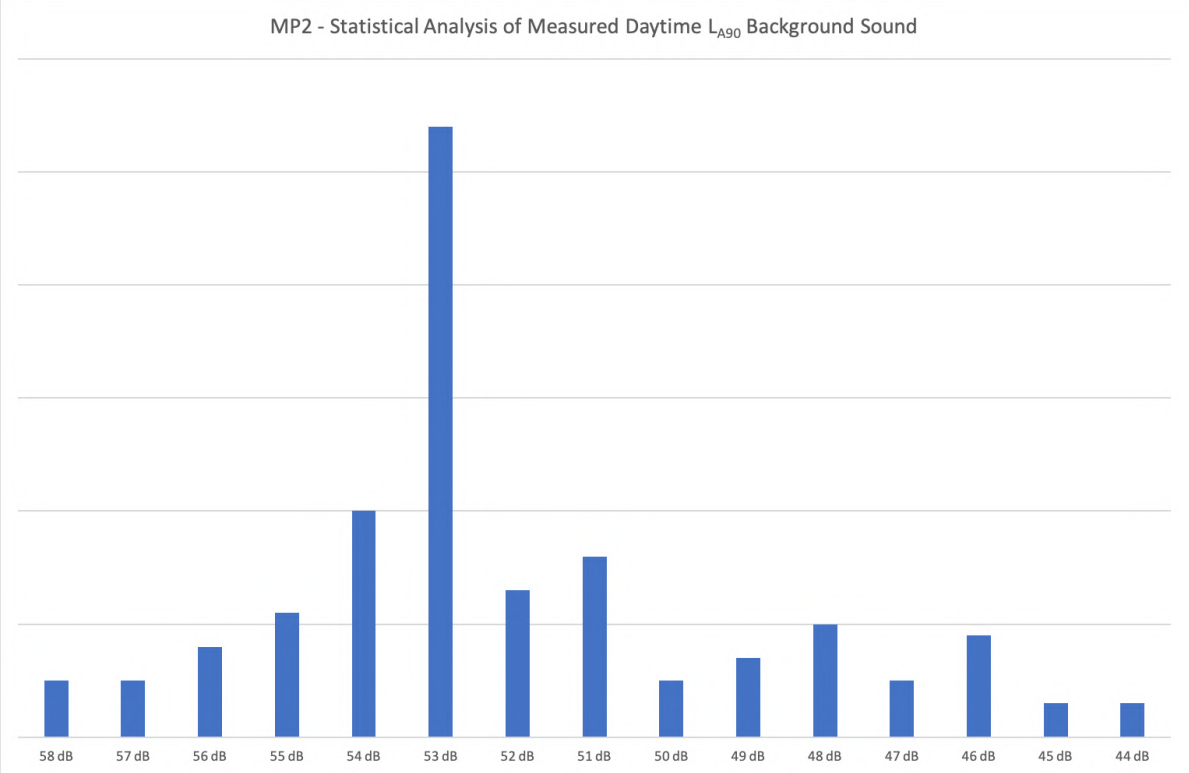
To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

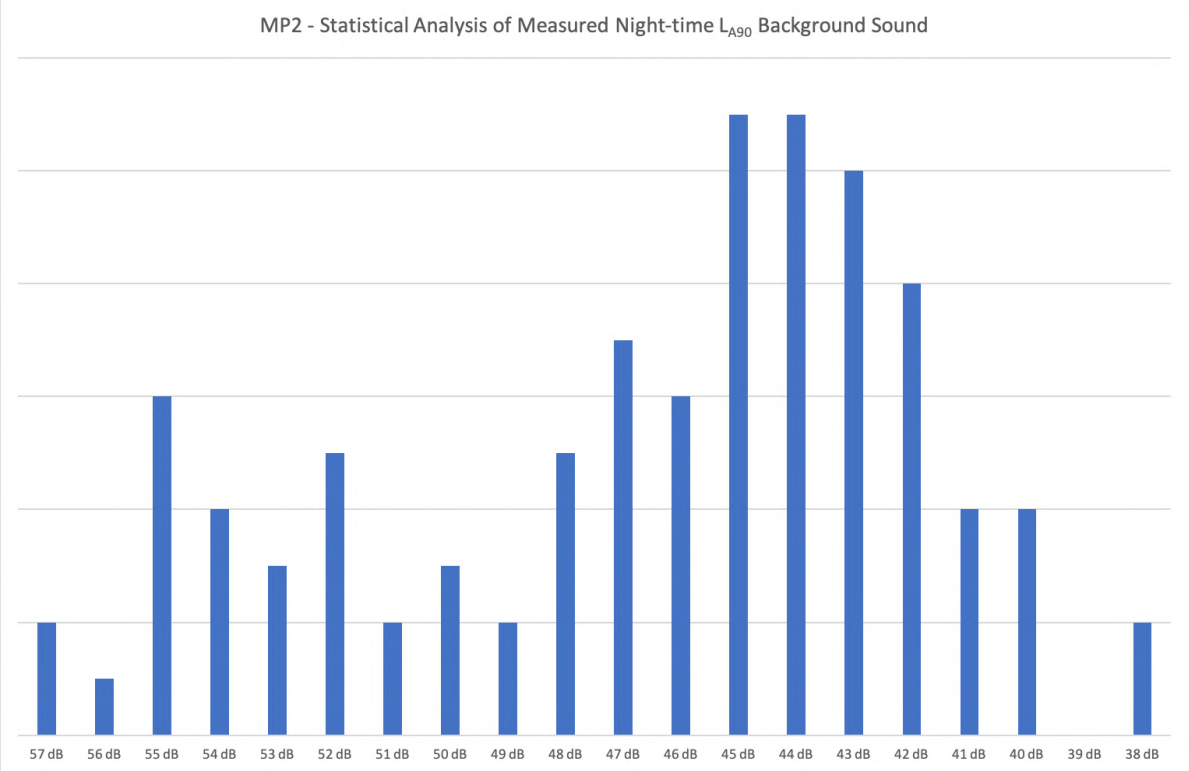
Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

9.2. Appendix B – Measurement Results






MP2 - Statistical Analysis of Measured Daytime L_{A90} Background Sound
58 dB
57 dB
56 dB
55 dB
54 dB
53 dB
52 dB
51 dB
50 dB
49 dB
48 dB
47 dB
46 dB
45 dB
44 dB


MP2 - Statistical Analysis of Measured Night-time L_{A90} Background Sound
57 dB
56 dB
55 dB
54 dB
53 dB
52 dB
51 dB
50 dB
49 dB
48 dB
47 dB
46 dB
45 dB
44 dB
43 dB
42 dB
41 dB
40 dB
39 dB
38 dB

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