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Dear Sirs

NOISE IMPACT ASSESSMENT FOR RESIDENTIAL CARE HOME DEVELOPMENT LAND AT GOODFELLOWS PRIMARY SCHOOL, SPALDING COMMON, SPALDING, LINCOLNSHIRE

1.00 INTRODUCTION

1.01 Environmental Noise Solutions Limited (ENS) has been commissioned by LineStyle Architecture, on behalf of its client Country Court Care Group, to carry out a noise impact assessment for a residential care home development at land at Goodfellows Primary School, Spalding Common, Spalding (hereafter referred to as the application site).

1.02 The objectives of the noise impact assessment were to:

- Determine the ambient noise climate at the application site during representative periods of the daytime.
- Assess the potential impact of the ambient noise climate on the proposed development with reference to the National Planning Policy Framework and other pertinent guidelines.
- Provide recommendations for a scheme of sound attenuation works and boundary treatments, as necessary, so that the future occupants of the proposed development do not experience any unacceptable loss of amenity due to noise.

1.03 This report details the methodology and results of the assessment and provides recommendations for the building envelope (fenestration and ventilation) and boundary screening. It has been prepared to accompany a planning application to be submitted to the local authority for the development of the application site.

1.04 This report has been prepared for Country Court Care Group for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Country Court Care Group (applicant), LineStyle Architecture (applicant's agent) and ENS as to the extent to which the findings may be appropriate for their use.

1.05 A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

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2.00 APPLICATION SITE SETTING AND PROPOSED DEVELOPMENT

2.01 The application site is located in a semi-rural environment to the south of Spalding. Roughly triangular in shape (see Appendix 2 for a site layout) the application site is bound by:

- Spalding Common (a lightly-trafficked road) to the east.
- The Peterborough-to-Lincoln railway line to the west and north.
- Car park and access road for South Lincs Foundry to the south.

2.02 The noise environment at the application site is characterised by road traffic on Spalding Common, train passes on the adjacent railway line and plant/activity associated with the foundry to the south.

2.03 Although the car park and access road for South Lincs Foundry are immediately adjacent to the southern boundary of the application site, the foundry building itself is situated approximately 35 metres south of the application site boundary. It is noteworthy that there are existing residential dwellings on Spalding Common and Goodfellows Road which are in much closer proximity to the foundry building.

2.04 The development proposal is for a three-storey residential care home with 64 no. bedrooms and associated offices, lounges, kitchen and laundry.

3.00 BASELINE NOISE SURVEY

3.01 In order to establish the ambient and background noise levels at the application site, a baseline noise survey was undertaken during the daytime on Tuesday 7th April.

3.02 For the purpose of the assessment, the following noise monitoring positions were adopted (the approximate location of the noise monitoring positions is contained in Appendix 2 for reference):

- MP1 was located along the eastern boundary of the application site at 10 metres to the nearside kerb of Spalding Common.

- MP2 was located along the western boundary of the application site at 15 metres to the nearside rail of the Peterborough-to-Lincoln railway line.

- MP3 was located along the southern boundary of the application site, in the vicinity of South Lincs Foundry yard and 15 metres from the nearside rail of the Peterborough-to-Lincoln railway line.

3.03 Noise measurements were made in a free field environment at 1.5 metres above ground level and undertaken using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. A windshield was fitted for all measurements. The measurement system calibration was verified immediately before the commencement of the measurement sessions and again at the end, using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted. Weather conditions throughout the survey were appropriate for monitoring.

3.04 Measurements consisted of A–weighted broadband parameters, together with linear third-octave band L_{eq} levels. The following table contains a summary of the measurement data for each measurement session, at each measurement position, rounded to the nearest decibel.

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Table 3.1 – Summary of Noise Measurement Data

Position	Date	Time	L_{Aeq} (dB)	L_{A90} (dB)	L_{A10} (dB)	L_{A1} (dB)	Comment
MP1	07/04/15	11:56–12:11	56	40	61	67	Traffic on Spalding Common
MP1	07/04/15	13:57–14:12	55	37	60	66	
Daytime noise level 55–56 dB $L_{Aeq, T}$							
MP2	07/04/15	12:16–13:16	58	43	59	65	Passenger train passes (2 no.) Maximum noise level of 85 dB L_{AFMax}
Daytime noise level circa 58 dB $L_{Aeq,T}$							
MP3	07/04/15	13:24–13:54	55	46	58	65	Industrial/plant noise and vehicle movements at foundry
MP3	07/04/15	14:36–15:36	57	54	59	62	Industrial/plant noise and vehicle movements at foundry Note: freight train pass removed from measurement
Daytime noise levels circa 55–57 dB $L_{Aeq,T}$							

3.05 The noise climate across the application site was characterised by road traffic noise on Spalding Common, train passes on the adjacent railway line and plant noise/vehicle movements associated with the foundry to the south.

3.06 In order to assess the impact of rail movements the Sound Exposure Level (SEL) is used. The SEL of a single discrete noise event is the level which if maintained constant for a period of one second would contain as much A-weighted sound energy as is contained in the actual noise event.

3.07 During the noise survey, SELs were recorded of 92 dB(A) at 15 metres associated with freight train passes and 90 dB(A) at 15 metres associated with passenger train passes.

3.08 Timetable data indicates that the line is used by freight throughout the night, with circa 14 no. freight train passes between 2300 and 0700 hours. Additionally, there are circa 26 no. passenger train passes and 15 no. freight train passes between 0700 and 2300 hours.

3.09 The following formula may be used for calculating the night time L_{Aeq} level from the SEL:

$L_{Aeq, T} = 10 * \log_{10} [(n \times 10^{SEL/10}) / T]$ where:

SEL is the measured worst case Single Event Level (89 dB (A))
n is the number of occurrences (14 no.)
T is the time period in seconds (8 hours = 28800 seconds)

3.10 Using the above formula, together with predicted frequency of freight movements and the SEL data, the night time noise level associated with freight movements is 59 dB $L_{Aeq\ (2300\text{-}0700)}$ at 15 metres to the nearside rail (considered representative of the western façade of the development).

3.11 The cumulative daytime noise level associated with passenger and freight movements, is 59 dB $L_{Aeq\ (0700\text{-}2300)}$ at 15 metres to the nearside rail.

3.12 The maximum noise levels associated with passenger and freight train passes are 85 dB L_{AFMax} and 87 dB L_{AFMax} respectively. The 64 no. bedrooms make up the majority of the development, with plans showing no separate individual living spaces. On this basis, and given the relatively low ambient noise levels throughout the application site, the façade sound insulation requirements of the development will largely be governed by discrete event maxima associated with train passes.

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4.00 NOISE IMPACT ASSESSMENT CRITERIA

4.01 The National Planning Policy Framework (NPPF), came into force on 27 March 2012 and is a material consideration in planning decisions. At the heart of the NPPF is a presumption in favour of sustainable development, and the policies in Paragraphs 18 to 219 of the NPPF, taken as a whole, constitute the Government's view on what sustainable development in England means in practice for the planning system.

4.02 The NPPF states that there are three dimensions to sustainable development, which include an economic role (contributing to building a strong, responsive and competitive economy), a social role (providing the supply of housing required to meet the needs of present and future generations) and an environmental role (which includes minimising waste and pollution).

4.03 The NPPF supersedes Planning Policy Guidance Note 24 (PPG 24). The main policy statement in relation to noise is Paragraph 123 of the NPPF, which states 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 new 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 (note: subject to the provisions of the Environmental Protection Act 1990 and other relevant law); 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.

4.04 In relation to 'adverse impacts', the NPPF refers to the Explanatory Note to the Noise Policy Statement for England (NPSE) for guidance.

4.05 The Noise Policy Statement for England (NPSE) and associated Explanatory Note were published by DEFRA in 2010 and set out the Government's noise management strategy to enable noise management decisions to be made within the wider context (i.e. guiding principles of sustainable development), in a cost-effective manner and in a timely fashion.

4.06 Fundamental to this approach is 'there is a need to integrate consideration of the economic and social benefit of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors'.

4.07 The noise policy aims of NPSE are to (i) avoid significant adverse impact on health and quality of life, (ii) mitigate and minimise adverse impacts on health and quality of life, and (iii) where possible, contribute to the improvement of health and quality of life. The policy aims are always to be considered within the context of the Government's policy on sustainable development.

4.08 In relation to the mitigation and minimisation of adverse impacts, NPSE considers that '*in reality, although not always stated, the aim has tended to be to minimise noise 'as far as is reasonably practical'*. This is reinforced in Paragraph 2.24 of the Explanatory Note, which requires that '*all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur'*.

4.09 In relation to explaining the 'significant adverse' and 'adverse' effects quoted in the NPPF, NPSE uses the two established concepts from toxicology that are currently being applied to noise impacts, for example by the World Health Organisation (WHO), these are:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.

- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

4.10 The NPSE then extends these concepts to lead to a SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

4.11 No specific criteria are presented in the NPSE, to provide the necessary policy flexibility until further evidence and suitable guidance is available. In lieu of specific criteria, for residential development, ENS makes reference to existing guideline documents, which are summarised in the following paragraph(s).

4.12 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' (BS 8233) supersedes the 1999 version of the Standard, which has been withdrawn. BS 8233 sets guideline indoor ambient noise levels for dwellings, for steady external noise sources, which it is desirable are not exceeded. These levels are reproduced in Table 4.1 and are based on guidelines issued by the World Health Organisation (WHO). The Standard also states that where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The Standard considers that for regular individual noise events, a guideline value may be set in terms of SEL or L_{AFmax} depending on the character and number of events per night. The WHO Guidelines on Community Noise (1999) considers that if negative effects on sleep are to be avoided, noise events exceeding 45 dB L_{Amax} should be limited.

Table 4.1 – Indoor Ambient Noise Levels in Dwellings (as recommended in BS 8233:2014)

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

4.13 For traditional external areas that are used for amenity space, such as gardens and patios, BS 8233 considers that it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

4.14 With reference to the BS 8233 guidelines, by definition, 'reasonable internal conditions' cannot represent a significant adverse impact (the prevention of which is the 1st aim of NPSE). With cognisance to the 2nd aim of NPSE (to minimise noise impact), the internal ambient noise levels detailed in Table 4.1 are considered appropriate.

4.15 Likewise, for external amenity space, a design range of 50 to 55 dB $L_{Aeq,T}$ is considered appropriate to comply with the requirements of the NPPF. Furthermore, the BS 8233 guidance in certain circumstance that '*development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited',* is considered to be in keeping with the NPSE Explanatory Note, which requires that '*all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur*'.

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4.16 On the basis of the above, for the proposed development, the following criteria are considered to be in keeping with the aims of the NPPF:

- 35 dB $L_{Aeq(0700-2300)}$ in living rooms/bedrooms during the daytime.
- 30 dB $L_{Aeq(2300-0700)}$ in bedrooms at night.
- 45 dB L_{AFmax} not normally exceeded in bedrooms at night.
- 50 - 55 dB $L_{Aeq(0700-2300)}$ in gardens during the daytime.

5.00 SOUND ATTENUATION SCHEME PROPOSALS

External Amenity Areas

5.01 Plans indicate that landscaped communal garden areas are proposed to the west and north of the development. Accounting for distance and screening attenuation, noise levels in gardens due to road traffic and the South Lincs Foundry are < 55 dB $L_{Aeq, T}$. Whilst there is no specific need to protect garden amenity against train passes (as railway noise is not a steady, continuous noise source) it is understood that a circa 2 metre high acoustic fence is to be installed along the western site boundary.

5.02 The 2 metre high acoustic fence should have a superficial mass of at least 10 kg/m^2, the panels should be rigidly mounted and there should be no gaps between adjacent panels, or the barrier and the ground. The fence should be designed (e.g. through the use of cover strips) so that gaps do not develop between abutting panels through warping or shrinking.

5.03 BS 5228:2009 Part 1 states *'In the absence of spectral data, as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver. High topographical features and specifically designed and positioned noise barriers could provide greater attenuation.'* It is therefore considered appropriate to allow at least 10 decibels screening attenuation.

Glazing

5.04 In order to control discrete event maxima, first and second floor bedrooms along the western and southern façades (with windows overlooking the railway line) should be fitted with glazing rated at $\geq$ 39 dB R_w+C_{tr}. This can be achieved using an acoustic laminate such as the Saint Gobain Glass (SGG) 8.8 mm SGG Stadip Silence / 20 mm air / 10.4 mm SGG Stadip Silence double glazing system (or equivalent), or, a secondary window system consisting of a 6 mm glazing unit and a 4 mm glazing unit in individual frames separated by a 150 mm cavity. Window frame trickle vents are not appropriate. In order to provide background ventilation without the need to open windows, it is recommended that upper floor bedrooms on the western and southern façades are provided with the Greenwood Airvac MA3051 acoustic wall ventilator (or equivalent) with a rating of 52 dB $D_{n,e,w} + C_{tr}$.

5.05 Ground floor bedrooms on the western and southern façades will be fully screened from the adjacent railway line by the proposed 2 metre high acoustic fence, therefore a – 10 dB of screening attenuation is applied.

5.06 In order to control discrete event maxima, ground floor bedrooms along the western and southern façades should be fitted with glazing rated at $\geq$ 32 dB R_w+C_{tr}, such as a generic 10 mm glass / 6 to 20 mm air / 6 mm glass double glazing system. In order to provide background ventilation without the need to open windows, it is recommended that ground floor bedrooms on the western and southern façades are provided with acoustic trickle vents rated at least 42 dB $D_{n,e,w}$ (such as the Greenwood EAR42W or equivalent).

5.07 Bedrooms on the eastern façade are fully screened from the railway line and at least 22 metres from the nearside rail. Accounting for screening and distance attenuation, the predicted maximum level at these bedrooms is $\leq$ 74 dB L_{AFmax}. In order to control discrete event maxima, these bedrooms should be fitted with glazing rated at $\geq$ 30 dB R_w+C_{tr}, such as 10mm glass / 6 to 20 mm air / 4 mm glass (or equivalent) with acoustic trickle vents rated at

least 42 dB $D_{n,e,w}$ (such as the Greenwood EAR42W or equivalent).

5.08 Standard double glazing with standard trickle vents is considered appropriate for the communal lounges of the development.

5.09 Should there be any room-in-roof constructions, these should have: a) double boarded ceilings/walls (and 'cheek' walls to dormer windows); and b) dormer / roof windows with an equivalent glazing specification to that specified above.

Ventilation

5.10 Where an enhanced glazing specification is required, in order to provide rapid ventilation without the need to open windows, it is recommended that the habitable rooms are provided with a mechanical ventilation strategy. Appropriate ventilation solutions include:

- A fully ducted mechanical ventilation system with heat recovery (MVHR).
- A System 3 mechanical extract ventilation (MEV) system.
- A whole house positive input ventilation (PIV) system (e.g. Nuaire Drimaster 365).
- An individual room ventilator, such as the Titon Sonair unit (or equivalent).
- Note: where make up air is provided by trickle vents, these should be as specified in the glazing section above.

5.11 The ventilation recommendations above relate to the sound insulation scheme only and the developer should ensure compliance with the ventilation requirements of the Building Regulations.

6.00 CONCLUSIONS

6.01 A noise impact assessment has been undertaken for a proposed residential care home development at land at Goodfellows Primary School, Spalding Common, Spalding.

6.02 The noise environment at the application site is characterised by road traffic on Spalding Common, train passes on the adjacent railway line and plant/activity associated with the foundry to the south.

6.03 A scheme of sound insulation works and boundary screening has been developed to protect the proposed residential development from the ambient noise climate in accordance with the National Planning Policy Framework.

I trust the foregoing is sufficient for your needs. Should you have any queries regarding the above, please do not hesitate to contact me.

Yours sincerely

T. Crabb

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cc File

Appendix 1
Glossary of Acoustic Terms

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 µPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 µPa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_W)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2
Drawings (Site Plan / Noise Monitoring Positions/ Proposed barrier)

