NSL
Noise Solutions Ltd

Proposed care home
Station Road
Hampton

External Building
Fabric Assessment

On behalf of

Hampton Care Home Limited

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1.0 Introduction

1.1. Noise Solutions Ltd has been commissioned by Hampton Care Home Ltd to undertake an external building fabric assessment for a proposed new nursing home and elderly sheltered accommodation facility. The new development will be located on a currently vacant plot on Station Road, Hampton, formerly occupied by a police station to the north of the junction with Plevna Road.

1.2. The assessment is undertaken in order to showcase how the development can be constructed in order to comply with suitable requirements.

1.3. This report sets out the acoustic design criteria upon which the assessment has been based and provides details of the assessment results in relation to the required acoustic performance of the external building fabric.

2.0 Site description

2.1. The former police station is currently in temporary use as residential accommodation by site guardians. Part of the existing building (closest to Station Road) is to remain and will form part of the development. The rest of the development will be of new construction, replacing existing buildings and occupying part of what is currently a car park.

2.2. The main Station Road carriageway is to the south, onto which front three-storey buildings to the west of the site. These buildings have retail or commercial property at ground floor, with residential flats above. There are residential developments to the east and west of the site, while the Beveree Wildlife Site is beyond the northern boundary.

2.3. The main source of noise affecting the development site has been established to be traffic on Station Road.

2.4. Current proposals indicate that the development site is to include 67 bedrooms with 22 assisted living units over four floors including a basement level.

2.5. Appendix B contains an aerial photograph showing the surrounding area, while Appendix C. shows a proposed site plan.

3.0 Planning policy

3.1. A great deal of change has occurred in recent years in the assessment of noise impacts and their relationship with planning decisions. The following sections introduce the applicable

policies, either national or local, which ought to be considered to support the planning application.

Noise Policy Statement for England

3.2. The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- avoid significant adverse effects on health and quality of life;
- mitigate and minimise adverse effects on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

3.3. The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and quality of life occur.

3.4. The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the NPSE). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case: *"...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."*

3.5. Importantly, the NPSE goes on to state that: "This does not mean that such adverse effects cannot occur."

3.6. The NPSE does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that: *"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

3.7. It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

[1] Noise Policy Statement for England, Defra, March 2010

National Planning Policy Framework

3.8. A new edition of NPPF was published in February 2019 and came into effect immediately. The original National Planning Policy Framework (NPPF[2]) was published in March 2012, with a revision in July 2018 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2019 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the February 2019 edition.

3.9. Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) "preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability."

3.10. The NPPF goes on to state in Paragraph 180 "planning policies and decisions 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 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 ...*

3.11. The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

3.12. Paragraph 2 of the NPPF states that "planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."

3.13. Paragraph 12 of the NPPF states that "The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed"

[2] National Planning Policy Framework, DCLG, March 2012

3.14. Paragraph 117 states that "Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land."

Planning Practice Guidance – Noise

3.15. As of March 2014, a Planning Practice Guidance (PPG[5]) for noise was issued which provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- 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.

3.16. This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'noticeable', 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'noticeable' and 'disruptive', and should be 'avoided').

3.17. As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

3.18. The LOAEL is described in PPG[6] as the level above which *"noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life."*

[5] Planning Practice Guidance – Noise, http://planningguidance.planningportal.gov.uk/blog/guidance/noise/, 06 March 2014

[6] Paragraph: 005 Reference ID: 30-005-20140306

3.19. PPG identifies the SOAEL[5] as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."

3.20. In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG[7] acknowledges that *"...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."*

3.21. The relevant guidance in the PPG in relation to the adverse effect levels is summarized in Table 1.

Table 1 PPG guidance on adverse effect levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not Intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			

[7] Paragraph: 006 Reference ID: 30-006-20141224

Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.22. The Planning Practice Guidance[8] states the following in relation to mitigation measures:

> *"For noise sensitive developments mitigation measures can include avoiding noisy locations; designing the development to reduce the impact of noise from the local environment; including noise barriers; and, optimising the sound insulation provided by the building envelope. Care should be taken when considering mitigation to ensure the envisaged measures do not make for an unsatisfactory development."*

3.23. In addition[9]:

> *"consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations".*

[8] Paragraph: 008 Reference ID: 30-008-20140306
[9] Paragraph: 006 Reference ID: 30-006-20141224

4.0 Assessment criteria

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.

4.1. This Standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999[10]). These guideline noise levels are shown in Table 2, below:

Table 2 BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

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

4.2. BS 8233:2014 advises that: "regular individual noise events…can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values."

4.3. BS8233 also gives general guidance on the expected sound insulation performance of a given building façade, with details of how various elements can affect the overall performance. Concerning windows, it states[11] that:

> *"If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB."*

4.4. This implies that should windows on a noise affected façade be openable, a sound insulation value of 15dB should be applied to the whole façade to an internal room being assessed. It should be noted that a sound insulation performance of much greater than 15dB is expected for non-openable standard double glazed windows. However in order to assess the worst case scenario, this report assume that windows may be opened if desired.

World Health Organisation, Guidelines for Community Noise, 1999 (WHO)

4.5. The World Health Organisation (WHO) *Guidelines for Community Noise* (1999) recommends suitable internal and external noise levels based on dose response research. The levels

[10] World Health Organisation Guidelines for Community Noise, 1999
[11] Anne G, Paragraph G1 in BS8233:2014

recommend in this guidance could be correlated to the LOAEL. Relevant guidance from this document is presented below.

- Sleep Disturbance (Night-time internal LOAEL): If negative effects on sleep are to be avoided, the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise.

- Interference with Communication (Daytime internal LOAEL): Noise tends to interfere with auditory communication, in which speech is a most important signal. However, it is also vital to be able to hear alarming and informative signals such as door bells, telephone signals, alarm clocks, fire alarms etc., as well as sounds and signals involved in occupational tasks. The effects of noise on speech discrimination have been studied extensively and deal with this problem in lexical terms (mostly words but also sentences). For communication distances beyond a few metres, speech interference starts at sound pressure levels below 50 dB for octave bands centred on the main speech frequencies at 500, 1000 and 2000 Hz. It is usually possible to express the relationship between noise levels and speech intelligibility in a single diagram, based on the following assumptions and empirical observations, and for speaker-to-listener distance of about 1 meter:

  a) Speech in relaxed conversation is 100% intelligible in background noise levels of about 35dBA, and can be understood fairly well in background levels of 45dBA.

  b) Speech with more vocal effort can be understood when the background sound pressure level is about 65dBA.

4.6. The WHO guidelines also propose that external sound levels for amenity use should not exceed 50-55dB $L_{Aeq,16hr}$ during daytime hours.

Noise Insulation Regulations 1975

4.7. The Noise Insulation Regulations 1975 define the conditions under which dwellings are eligible for noise insulation to control internal noise levels. The conditions relate to the level of traffic noise at the façade, the increase in noise levels as a result of the highway and the contribution of the new or altered scheme to the noise level received at the façade.

4.8. Noise insulation qualification criteria must abide by a few tests which include the following two:

- The facade noise threshold of 68dB $L_{A10\ 18h}$ is met or exceeded;

- There must be a noise increase of at least 1dB(A) compared to the prevailing noise level immediately before the construction of a highway or an additional carriageway were begun;

SOAELs for transportation airborne noise

4.9. Based on the noise insulation regulations a façade noise level of 69dB $L_{A10,\ 18h}$ is therefore considered as unacceptable and can trigger the provision of mitigation measures by the government. This level can therefore be used as the SOAEL in relation to transportation noise in England. This level relates to a level of 64 dB $L_{Aeq,\ 16h}$. Based on guidance[12] in BS8233:2014, an external noise level of 64 dB $L_{Aeq,\ 16h}$ would roughly equate to an internal level of 49 dB $L_{Aeq\ 16h}$, assuming partially open windows for ventilation. As daytime and night-time desirable target levels differ by 5 dB, a night-time SOAEL could be 44 dB $L_{Aeq,\ 8h}$. It should be noted that these internal SOAEL values may be deemed pessimistic since partially open windows for background ventilation do not offer compliance with the relevant building regulations.

Proposed LOAEL and SOAEL for transportation airborne noise affecting rooms used for residential purposes

4.10. A summary of the proposed LOAEL and SOAEL values are provided in Table 3 below. It should be highlighted that the Secretary of State's approved assessment methodology for the HS2 project includes a SOAEL of 65 dB $L_{Aeq,16h}$. The HS2 project also includes a LOAEL of 50 dB $L_{Aeq,16h.}$ Therefore the difference between the LOAEL and SOAEL for transportation noise in the secretary of state's approved HS2's environmental statement is 15dB.

Table 3 Proposed LOAEL and SOAEL for transportation noise affecting dwellings

Level	Daytime (07.00 – 23.00 hours)	Night-time (23.00 – 07.00 hours)
LOAEL Internal	35 $L_{Aeq,16h\ (dB)}$	30 $L_{Aeq,8h\ (dB)}$
SOAEL Internal	49 $L_{Aeq,16h\ (dB)}$	44 $L_{Aeq,8h\ (dB)}$
LOAEL External	50 $L_{Aeq,16h\ (dB)}$	40 $L_{Aeq,8h\ (dB)}$
SOAEL External	65 $L_{Aeq,16h\ (dB)}$	55 $L_{Aeq,8h\ (dB)}$

Building Regulations

4.11. Part L of the Building Regulations mandates that buildings become more airtight, and Part F stipulates ventilation requirements. Even though there appears to be a contradiction in this, Part L limits uncontrollable ventilation, while Part F ensures that ventilation requirements are provided in a controlled manner.

[12] BS8233:2014 states that "If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB"

Ventilation requirements for dwellings

Background ventilation

4.12. Three types of ventilation are required under Part F. Whole building ventilation provides nominally continuous air exchange which may be reduced or ceased when the building is not occupied. It can be provided via background ventilators operating alone, or together with:

- passive stack ventilators;
- continuous mechanical extract; or
- continuous mechanical supply and extract with heat recovery.

4.13. Extract ventilation is applicable to rooms where most water vapour and/or pollutants are released (e.g. kitchens and bathrooms). It can be provided by intermittent fans, passive stack or continuous mechanical extract with or without mechanical supply and heat recovery.

4.14. The four systems described in Part F do not present solutions which utilise the use of opening windows for background ventilation. Opening windows do not provide a controllable means of ventilation and also pose security risks.

Purge ventilation

4.15. Purge ventilation is required throughout the building to aid the removal of high concentrations of pollutants and water vapour. It is commonly provided simply by opening windows and doors.

4.16. Even though purge ventilation is recommended via opening windows, the temporary and intermittent occurrence of this does not normally result in an unacceptable increase of internal noise levels.

4.17. Part F goes on to say[13] that "Purge ventilation provisions may also be used to improve thermal comfort, although this is not controlled under the Building Regulations."

Summary in relation to ventilation

4.18. In summary, background ventilation for new residential dwellings should be provided via one of the four systems in Approved Document F. The composite external building fabric should be designed to ensure that appropriate internal noise levels due to external incident noise are met during background ventilation.

[13] Paragraph 4.15 in Approved Document F

4.19. Purge ventilation for new residential dwellings should be provided via open windows. The slight increase of internal noise levels should be considered acceptable.

5.0 Existing noise climate

Measurement period

5.1. Measurements of the existing background noise level were undertaken at two locations between 14.30 hours on Wednesday 17th July and 14.45 hours on Thursday 18th July 2019. Full details of the survey are provided in Appendix D.

Measurement positions

5.2. The following locations were selected for unattended monitoring:

- Position 1: To the south (front) of the site overlooking Station Road, microphone on an extended boom at first floor level.
- Position 2: To the rear of the site, on an existing vehicle access ramp to the buildings at the rear of the site.

5.3. It is noted that road traffic from Station Road was audible at Position 2. As the proposed building will provide significant screening from Station Road to the bedrooms on the north façade, this survey position represents a robust assessment.

5.4. The above measurement positions are considered representative of the potential building façade locations anticipated to be worst affected by existing noise sources surrounding the development site. In accordance with the methodology detailed in BS 7445:1991 "Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use", the microphones were positioned at suitable heights above ground at the measurement locations under free-field conditions.

Noise level measurements

5.5. The following broadband noise parameters were measured over 15-minute intervals;

- $L_{Aeq,T(fast)}$ The "A" weighted equivalent continuous noise level
- $L_{A90,T(fast)}$ The "A" weighted level exceeded for 90% of sample period
- $L_{Amax(slow)}$ The "A" weighted maximum noise level
- $L_{Amax(fast)}$ The "A" weighted maximum noise level

5.6. Octave band frequency data was also gathered.

Results

5.7. The noise climate at all monitoring positions was dominated by local and distant road traffic.

5.8. The results of the unattended noise monitoring at Positions 1 and 2 have been summarised in Table 4, below. The full set of measured noise levels can be found in Appendix D.

Table 4 Summary of unattended noise monitoring results

Position	Period (T)	$L_{Aeq,T}$ (dB)	Typical L_{Amax} (dB)
1	Daytime (07.00 - 23.00 hours)	66	n/a
	Night-time (23.00 - 07.00 hours)	58	80
2	Daytime (07.00 - 23.00 hours)	54	n/a
	Night-time (23.00 - 07.00 hours)	45	66

5.9. To assist with façade design and glazing specification for the proposed building, representative frequency data in single-octave bands has been provided in Table 5, below. The full measurement results, including one-third-octave band measurements, can be provided on request.

Table 5 Sample frequency data

Position	Index	Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Daytime L_{eq}	66	58	59	58	60	55	50	45	63
	Night-time L_{eq}	61	50	53	51	52	47	41	36	55
	Night L_{max}	87	73	79	77	76	71	67	63	80
2	Daytime L_{eq}	61	54	52	50	51	46	41	37	54
	Night-time L_{eq}	55	47	45	43	41	36	32	27	45
	Night L_{max}	78	70	67	61	59	60	49	42	66

6.0 Assessment of noise impact - internal

6.1. Using the octave band frequency noise levels presented in Sections 5.0 calculations have been undertaken to determine the noise levels that will occur within the bedrooms of the development. The calculations are based on the methodology set out in BS 8233:2014 and make use of information obtained from the drawings by PRC Architecture and Planning

numbered 11045 FE_010 to 015, together with the sound reduction performance of the various external building elements.

6.2. The composite acoustic performance required of any portion of the building envelope will depend on its location relative to the principal noise sources around the site and the nature of the spaces behind it (noise criteria, size, room finishes etc).

6.3. The detailed calculation methodology described in BS8233:2014 will be used in the assessment using the following equation[14] as detailed in the British Standard:

$$L_{eq,2} = L_{eq,ff} + 10log_{10}\left(\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{w1}}{S}10^{\frac{-R_{w,i}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_o}{10}}\right) + 10log_{10}\left(\frac{S}{A}\right) + 3$$

6.4. Table 8 presents the input data used to predict the resultant internal noise level in a typical bedroom (note that some rooms overlooking Station Road have larger, bay windows).

Table 8 Room information used in the noise break in assessment

Typical bedroom	
Room volume (m^3)	35
Room type	Bedroom
Furnishings	Curtains, bed, carpet
Area of window (m^2)	3.1
Area of wall (m^2)	12
Effective area of ventilator (mm^2)	8000

External building fabric – acoustic requirements

6.5. Based on the above assessment, the necessary glazing performances to achieve the project criteria have been calculated.

6.6. An initial assessment has shown that the most difficult LOAEL to achieve is that regarding the night-time L_{Amax}. Therefore, the assessment concentrated on this element first. As the proposed construction is masonry, appropriate elements were chosen for the assessment. A suitable double glazed unit and acoustically treated trickle ventilator was chosen in order to the resultant internal L_{Amax} level to approach the LOAEL (i.e. 45dB L_{Amax}).

6.7. It is noted that, where bedrooms are shielded from Station Road by the building structure (i.e. rooms on the east, north and west elevations), a relaxed specification could be installed and has been detailed for reference.

[14] See page 65 and 66 of BS8233:2014 for an explanation of the various terms used in the equation.

6.8. Two sets of acoustic performance figures have been prepared, relating to the following areas:

- A: Bedrooms on Station Road elevation
- B: All other rooms

6.9. Tables 9 and 10, below, present appropriate design proposals which could be utilised to comply with the criteria in the most affected rooms:

Table 9 External building fabric elements – Specification A

External building fabric element	Construction element	Sound reduction indices at Octave band Centre Frequencies (Hz)				
		125	250	500	1000	2000
Glazing configuration, glass mm/airgap mm/glass mm	10mm glass / 12mm airgap / 6mm glass (openable unit)	20	29	35	37	35
Trickle vent	Acoustic trickle vent ($D_{n,e}$)	35	35	43	45	45
Non vision wall	Masonry	41	45	45	54	58

Table 10 External building fabric elements – Specification B

External building fabric element	Construction element	Sound reduction indices at Octave band Centre Frequencies (Hz)				
		125	250	500	1000	2000
Glazing configuration, glass mm/airgap mm/glass mm	4mm glass / 12mm airgap / 4mm glass (openable unit)	23	22	29	31	31
Trickle vent	Hit and miss vent ($D_{n,e}$)	31	24	34	32	55
Non vision wall	Masonry	41	45	45	54	58

6.10. Ultimately, it should be ensured that the SRIs recommended within Tables 9 and 10 are achieved. The manufacturers / suppliers of the glazing should confirm the sound insulation performance specifications of their proposed glazing system for comparison with the recommended acoustic performances. The glazing, including proposed framing and seals, should be laboratory tested.

Outdoor sound levels

6.11. From Table 4, it can be seen that the existing external sound levels at the south of the site (i.e. at Position 1) are currently 66dB $L_{Aeq,16hr}$. A reduction in nose from road traffic of around 10dB or more would therefore be required in order for sound levels within the open space to the south of the site to be reduced to a level comfortably within the LOAEL.

6.12. As the building itself will provide significant screening from the adjacent roads (the open space to the south is screened from both adjacent roads by the building structure), suitable levels should result.

7.0 Summary

7.1. Noise Solutions Ltd has been commissioned by Hampton Care Home Ltd to undertake an external building fabric assessment for a proposed new nursing home and elderly sheltered accommodation facility. The new development will be located on a currently vacant plot on Station Road, Hampton, formerly occupied by a police station to the north of the junction with Plevna Road.

7.2. The assessment is undertaken in order to show how the development can be constructed in order to comply with the requirements of national policy on noise.

7.3. Based on architects' drawings, the environmental noise survey data acquired and requisite internal noise level criteria, the acoustic performance requirements of the external building fabric have been derived.

7.4. From the results of this assessment, acoustic performance specifications and glazing configurations have been proposed for the glazing elements of the external building fabric of the proposed care home development in order to comply with the recommended internal design criteria. Advice in relation to the required ventilation provisions has also been provided.

7.5. Bedrooms on elevations other than Station Road and lounge areas should achieve acceptable internal noise levels with standard openable thermal double glazing and trickle ventilation.

7.6. A slightly enhanced specification should achieve acceptable internal noise levels to bedrooms on Station Road.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
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. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	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 recorded during a noise event with a 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.
SRI	Sound Reduction Index, used to represent the level of sound insulation provided by a material or structure, such as a wall or a window. When referring to windows, represents the SRI of the glazed unit including frames, not just the glass.

Appendix B Aerial photograph of site

Appendix C Site layout

Appendix D Environmental noise survey

D.1 Measurements of the existing background noise level were taken at two locations between 14.30 hours Wednesday 17th July and 14.45 hours on Thursday 18th July 2019.

D.2 The sound level meters were programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive 15-minute sample periods for the duration of the survey.

Measurement positions

D.3 Unattended noise monitoring was undertaken at the following locations:

- Position 1: To the south (front) of the site overlooking Station Road, microphone on an extended boom at first floor level.
- Position 2: To the rear of the site, on an existing vehicle access ramp to the buildings at the rear of the site.

D.4 The approximate locations of the monitoring positions are shown in the aerial photograph in Appendix B.

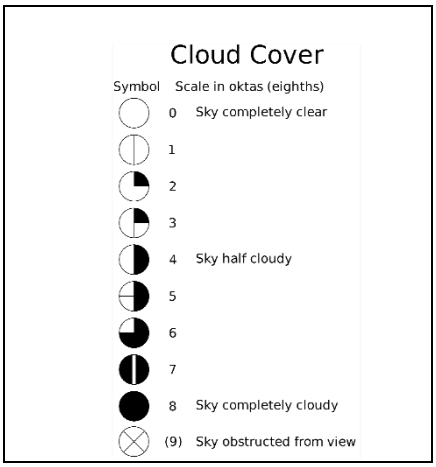
Equipment

D.5 Details of the equipment used during the survey are provided in the table below. The sound level meters were calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Measurement position	Equipment description	Manufacturer/Model	Calibration date	Certificate no.
1	Class 1 Sound level meter	Svantek 977/ 69747	26/09/2018	Factory conformity declaration
	Condenser microphone	ACO Pacific 7052E / 70829		
	Preamplifier	Svantek SV12L / 73687		
	Calibrator	Svantek SV 40A / 10843	26/09/2018	14010559
2	Class 1 Sound level meter	Svantek 977 / 36190	06/07/2018	15444
	Condenser microphone	ACO Pacific 7052E / 57366		
	Preamplifier	Svantek SV12L / 41504		
	Calibrator	CEL 284/2 /4/03326334	24/05/2019	TCRT19/1408

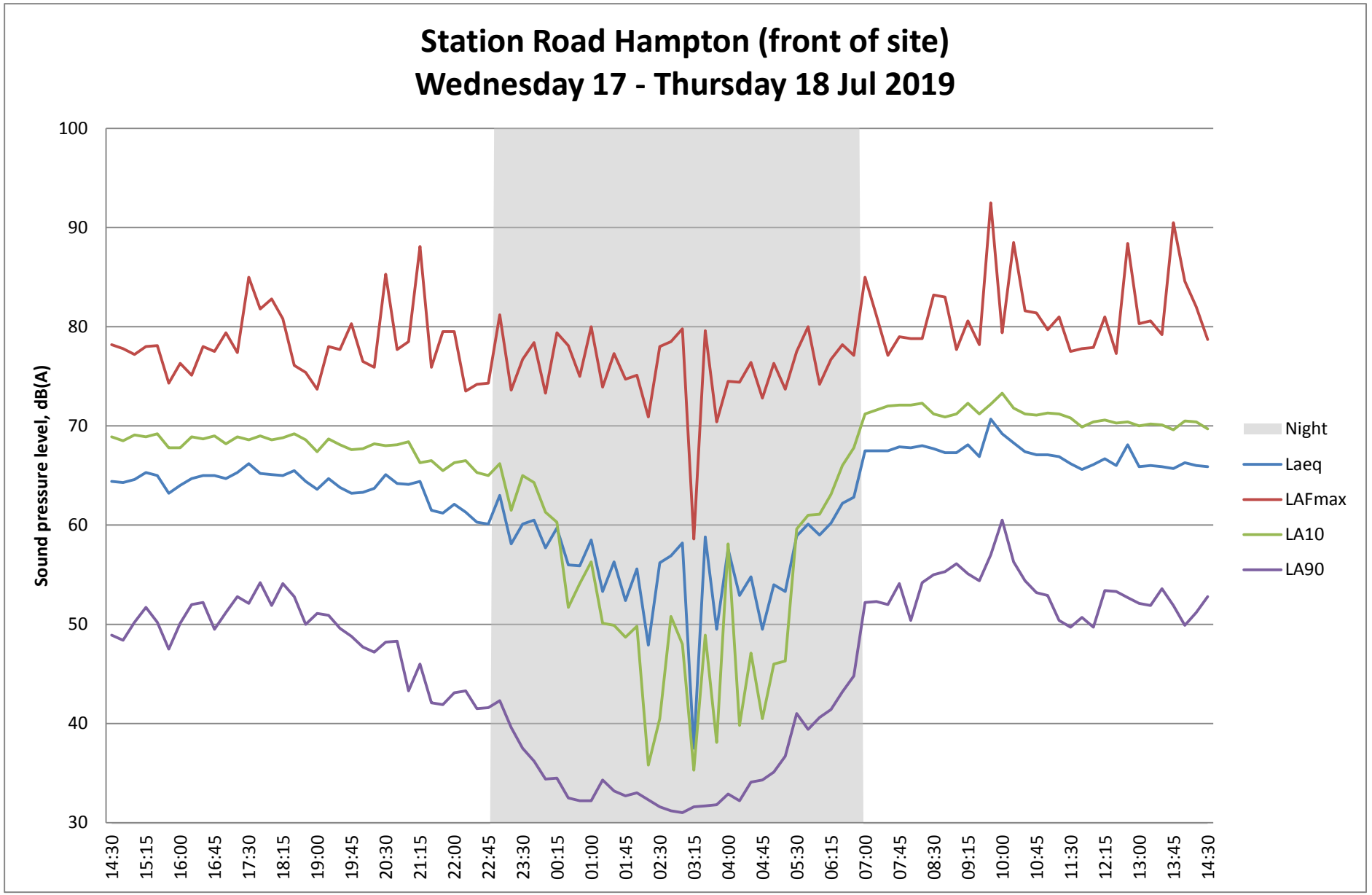
Weather conditions

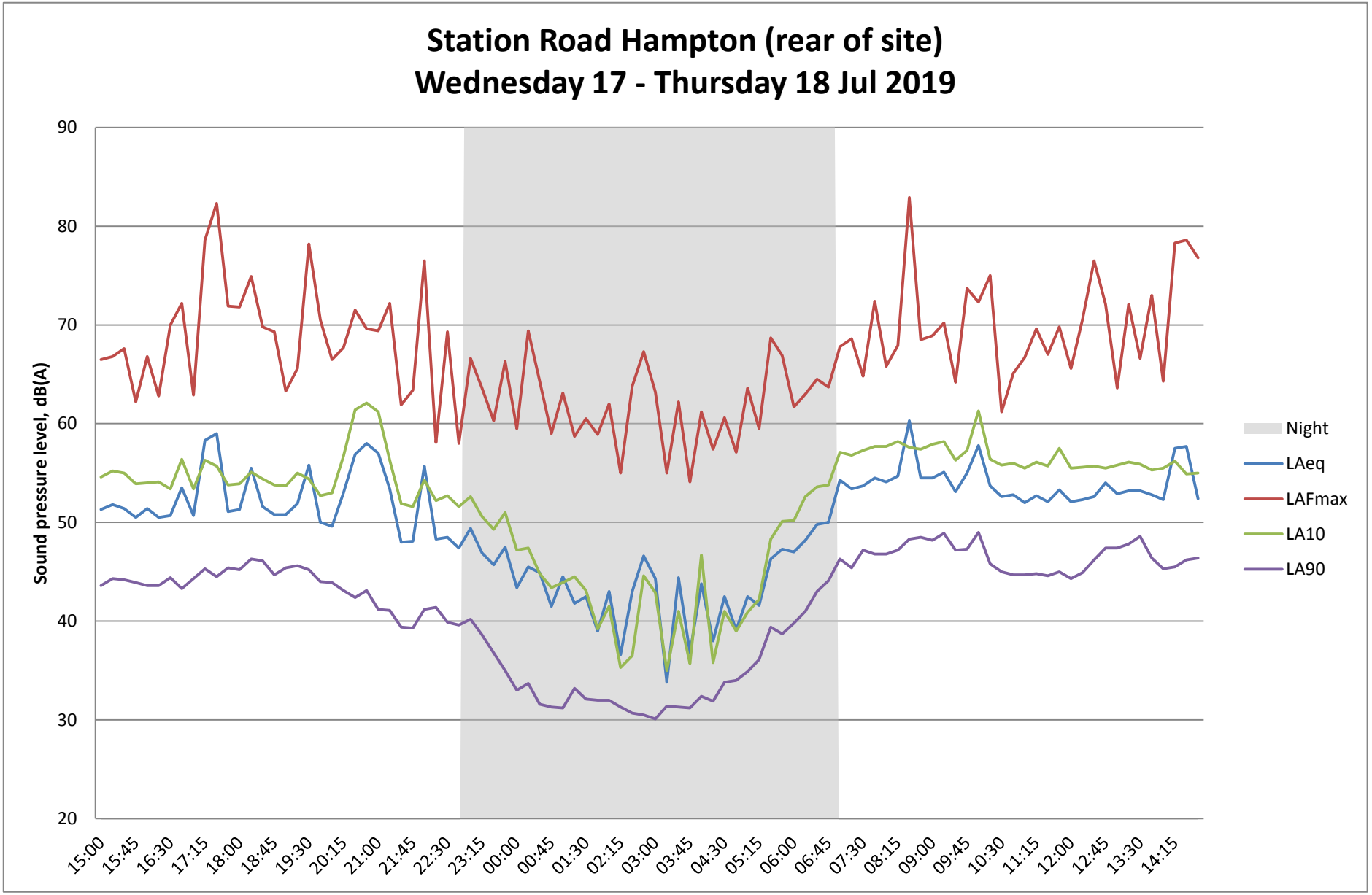
D.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table overleaf presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	14.30 17/7/19 – 14.45 18/7/19	Temperature (°C)	26	24
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	8	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	<1	<1
		Wind Direction	NW	E
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

D.7 The noise climate at the beginning and end of the survey period consisted of local road traffic using Station Road and occasional aircraft. The results of the survey are presented in time history graphs overleaf.


Station Road Hampton (front of site)
Wednesday 17 - Thursday 18 Jul 2019
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
14:30
15:15
16:00
16:45
17:30
18:15
19:00
19:45
20:30
21:15
22:00
22:45
23:30
00:15
01:00
01:45
02:30
03:15
04:00
04:45
05:30
06:15
07:00
07:45
08:30
09:15
10:00
10:45
11:30
12:15
13:00
13:45
14:30
Night
Laeq
LAFmax
LA10
LA90


Station Road Hampton (rear of site)
Wednesday 17 - Thursday 18 Jul 2019
Sound pressure level, dB(A)
90
80
70
60
50
40
30
20
15:00
15:45
16:30
17:15
18:00
18:45
19:30
20:15
21:00
21:45
22:30
23:15
00:00
00:45
01:30
02:15
03:00
03:45
04:30
05:15
06:00
06:45
07:30
08:15
09:00
09:45
10:30
11:15
12:00
12:45
13:30
14:15
Night
LAeq
LAFmax
LA10
LA90