# SGN PLACE
# SEVENOAKS GASHOLDER STATION
## CRAMPTONS ROAD, SEVENOAKS, KENT, TN14 5ES
## PLANNING APPLICATION - MARCH 2021

SGN Place

# Noise Impact Assessment

Sevenoaks Gasholder site, Cramptons Road

004-SM-R01

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Rev -

## Contents


| | | |
|---|---|---|
| **1** | **Introduction** | **3** |
| **2** | **Proposed Development** | **4** |
| 2.1 | Application site | 4 |
| 2.2 | Development scheme | 4 |
| 2.3 | Noise sensitive receivers (NSR's) | 4 |
| **3** | **Relevant Policy and Guidance** | **5** |
| 3.1 | The National Planning Policy Framework (2012) _ Revised July 2018 | 5 |
| 3.2 | Noise Policy Statement for England, 2010 | 5 |
| 3.3 | Planning Practice Guidance (2014) | 5 |
| 3.4 | BS8233:2014 | 7 |
| 3.5 | British Standard BS4142:2014+A1:2019 | 8 |
| **4** | **Baseline Noise Survey** | **9** |
| 4.1 | Introduction | 9 |
| 4.2 | Survey Details | 9 |
| 4.3 | Measurement Equipment | 10 |
| 4.4 | Measurement Conditions | 10 |
| 4.5 | Measurement Uncertainty | 10 |
| 4.6 | Measurement Results | 11 |
| 4.6.1 | Representative Background Noise Levels | 12 |
| **5** | **Noise Assessment** | **13** |
| 5.1 | Initial assessment - Outdoor noise levels | 13 |
| 5.2 | Indoor Ambient Noise Levels Assessment | 14 |
| 5.2.1 | Windows Acoustic Performance Requirements | 15 |
| 5.2.2 | Building Services Noise Limits | 16 |
| 5.3 | Thermal Comfort / Overheating | 16 |
| 5.3.1 | Overheating Assessment | 16 |
| 5.3.2 | Attenuated Overheating Vents | 17 |
| 5.4 | External Amenity | 18 |
| **6** | **Plant Noise Emission Limits** | **19** |
| **7** | **Conclusions** | **20** |
| **APPENDIX A – Acoustic Terminology** | | **21** |
| **APPENDIX B – Weather conditions during noise survey** | | **22** |
| **APPENDIX C – Overheating Assessment with Open Windows** | | **23** |

# 1 Introduction

Sound-Matters Acoustics Ltd has been commissioned to undertake a noise impact assessment at the site of the proposed development at the former Gasholder site at the Cramptons Road Gaswork site, Sevenoaks.

This report provides:

- The results of a baseline noise survey together with the assessment of site suitability (with respect to noise break-in and ventilation design) for its intended use.
- Plant noise emission limits to minimise potential noise impacts generated by fixed plant upon the nearest noise sensitive receptors (NSRs).

Acoustic terminology used in this report is presented in Appendix A.

# 2 Proposed Development

## 2.1 Application site

The application site is located on Cramptons Road, Sevenoaks. The site is bound by the A225 to the West and North West, Cramptons Road to the East and the commercial premises occupied by Wickes' warehouses to the South.

An aerial image of the site is provided in **Figure 1**.

## 2.2 Development scheme

The development proposals are for

Construction of a residential development consisting of 136no. dwellings, with new vehicular accesses from Otford Road and Cramptons Road, associated parking, landscaping, drainage, boundary treatments and earthworks (the 'Proposed Development').

## 2.3 Noise sensitive receivers (NSR's)

The nearest noise sensitive receivers (NSR's) are identified residential properties on Cramptons road and Otford Road. These are shown in Figure 1 below.

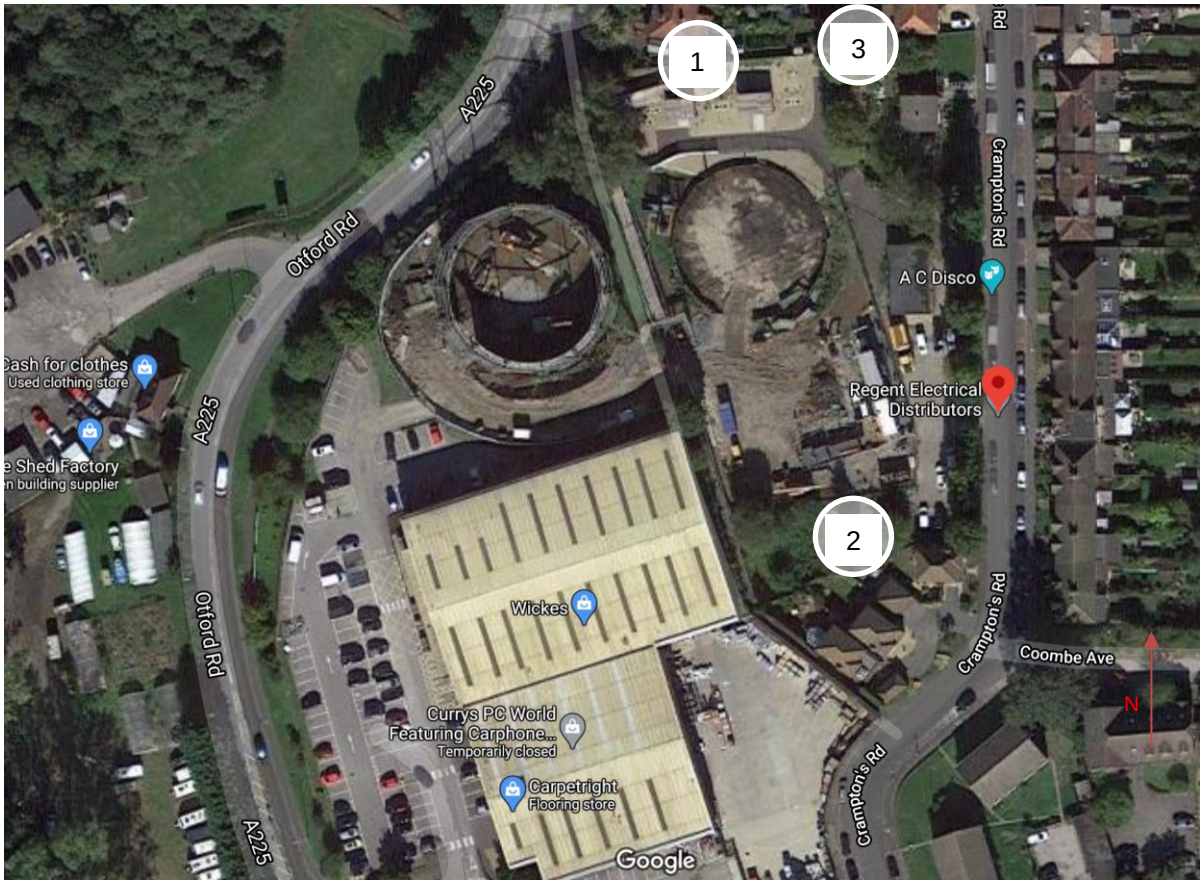



**Figure 1** Application site and Noise Sensitive Receptors (NSR's)

(1) Otford Road
(2) Cramptons Road South
(3) Cramptons Road North

# 3 Relevant Policy and Guidance

Guidance relevant to the noise impact assessment detailed in this report is presented in the following sections.

## 3.1 The National Planning Policy Framework (2012) _ Revised July 2018

The National Planning Policy Framework (NPPF) adopted in 2012 in England and revised in 2018 outlines the Government's planning policies and requirements for the planning system, superseding the former, and well established, Planning Policy Guidance 24: Planning and Noise document (PPG24). The NPPF forms a material consideration in planning decisions.

Regarding noise, the NPPF states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being affected by unacceptable levels of noise pollution.
Hence the planning system should seek 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 planning conditions;
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

To achieve these aims the NPPF refers to the Noise Policy Statement for England 2010.

## 3.2 Noise Policy Statement for England, 2010

The Noise Policy Statement for England (NPSE) sets out the long term vision of Government noise policy to promote good health and a 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.

## 3.3 Planning Practice Guidance (2014)

On the 6th March 2014 the Department for Communities and Local Government (DCLG) launched a planning practice guidance web-based resource, which includes a section on Noise (last update 22 July 2019). This resource provides guidance on how to determine the noise impact in terms of whether a significant adverse effect is likely to occur and/or whether a good standard of amenity can be achieved.

In line with the NPSE, PPG introduces the concept of:

- Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

**Table 1** summarises the noise exposure hierarchy, based on the likely average response.

| **Perception** | **Examples of Outcomes** | **Increasing Effect Level** | **Action** |
|---|---|---|---|
| No Observed Effect Level | | | |
| **Not present** | No effect | No Observed Effect | No specific measures required |
| No Observed Adverse Effect Level | | | |
| **Present 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 | | | |
| **Present 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 | | | |
| **Present 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 | Significant Observed Adverse Effect | Avoid |

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| | getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | | |
| **Present 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 |

**Table 1** PPG Noise Exposure Hierarchy

As indicated in the NPSE, objective values associated with SOAEL will depend on the specific circumstances. More information can be derived for values associated with LOAEL from existing guidance, which is presented in the following sections.

## 3.4 BS8233:2014

Table 4 of BS8233:2014 "*Guidance for sound Insulation and noise reduction for buildings*" provides internal ambient noise levels for dwellings from external noise sources. These are based on existing guidelines issued by the World Health Organisation (1999). The British Standard guidelines state that the indoor levels should not exceed those as noted in **Table 2** below.

| Activity | Location | Daytime (07:00 to 23:00) | Night-time (23:00 to 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 $L_{Aeq,8hour}$ |

**Table 2** Desireable indoor ambient noise levels for dwellings (reporduced from Table 4 of BS8233 :2014)

The levels are accompanied by various notes including:

- If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment; for mechanically ventilated rooms the ventilation system should be running to provide the whole dwelling ventilation rates prescribed in Approved Document F.
- Where a development is considered necessary or desirable, the levels in Table **2** may be relaxed by up to 5 dB and reasonable internal conditions still achieved.
- Regular individual noise events (for example, scheduled aircraft or passing trains) 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.

  **ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise (2017)** adds that in most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic

design should be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night.

## 3.5 British Standard BS4142:2014+A1:2019

*BS4142:2014*+A1:2019 – *Method for rating and assessing industrial and commercial sound* provides a method for assessing the significance of noise emissions from industrial and/or commercial sound source.

The significance of industrial and commercial sound is assessed based on the difference between the rating level resulting from plant operation measured or predicted at the nearest noise sensitive premises, and the existing background noise level in the area, as determined by a noise survey. *BS 4142* states:

*a) Typically, the greater this difference, the greater the magnitude of the impact.*

*b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*

*c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.*

*d) 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.'*

*e) A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value.'*

BS4142 also sets out the following rating penalties based on the characteristics of the noise source:

- Tonality: up to 6dB rating penalty applicable depending on its perception;
- Impulsivity: up to 9dB rating penalty applicable depending on its perception;
- Other sound characteristics: a 3dB penalty applicable for readily distinctive sound feature characteristics that are neither tonal or impulsive;
- Intermittency: a 3dB penalty applicable for specific sound that has identifiable on/off conditions.

In addition, BS4142 states that:

*"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.*

# 4 Baseline Noise Survey

## 4.1 Introduction

A baseline noise survey has been undertaken at the application site in order to provide:

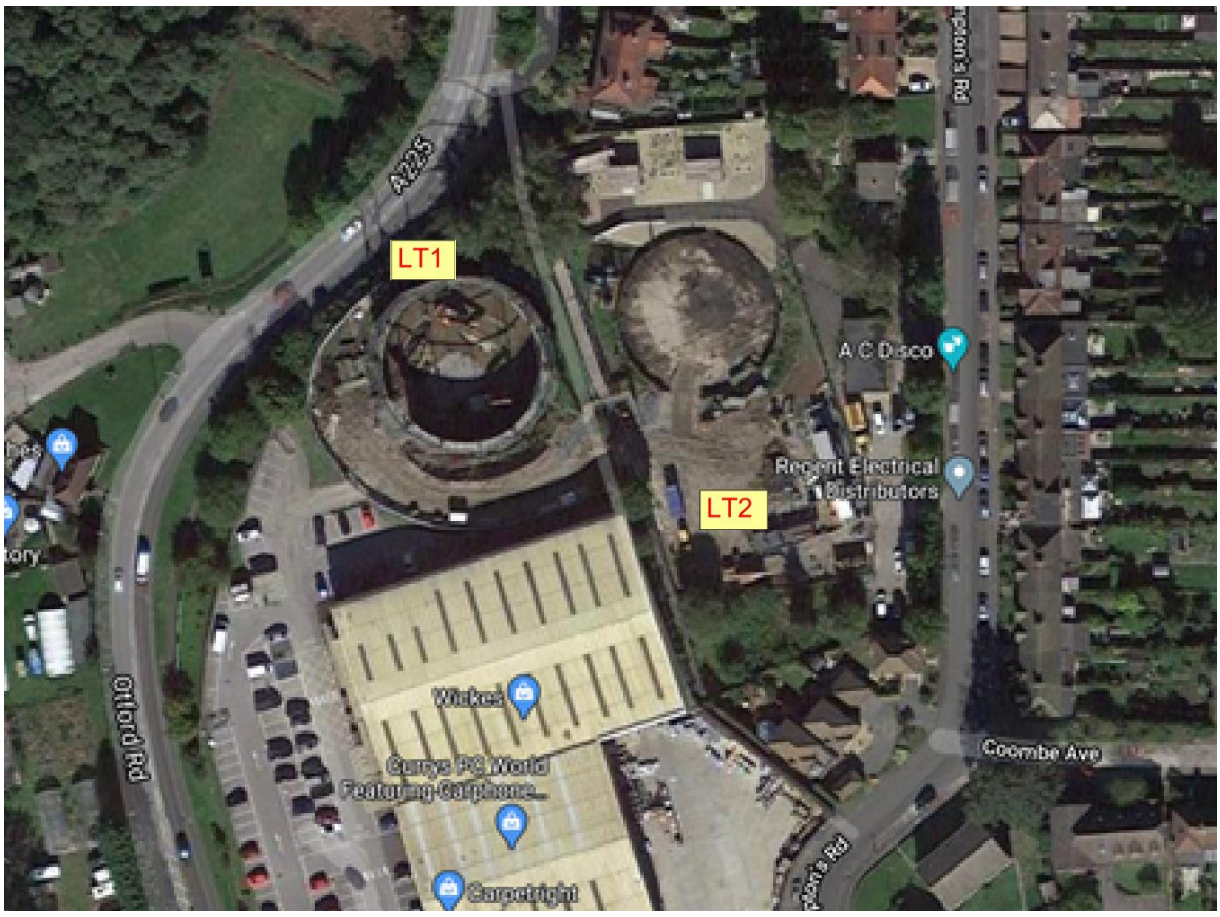
- A formal record of the existing noise climate;
- Data required to establish noise emission limits for the new building service plant associated with the development.
- Data required to assess the site suitability for development, with respect to ensuring occupants experience suitable indoor ambient noise levels.

## 4.2 Survey Details

The noise survey was conducted by Ryan Wilson BSc (Hons) AMIOA, and Fabrizio Filippi CEng MIOA. All noise measurements were undertaken in compliance with measurement procedures set out in *BS7445:2003 Part 1 Environmental noise – Guide to quantities and procedures*.

The survey comprised of long-term noise monitoring at two locations from Friday 4th September through to Tuesday 8th September 2020.

A site plan showing the measurement positions can be seen in **Figure 2**.




LT Long term unattended monitor position

**Figure 2** Site map showing location of long-term noise monitoring equipment

## 4.3 Measurement Equipment

The sound level meter and microphone calibration were checked before and after use to confirm there was no significant drift in meter response at the calibrator frequency and level.

Measurements were carried out using the equipment detailed in **Table 3**. The sound level meters were Type 1 conforming to BS EN 60804.

| Equipment | Manufacturer | Type | Serial No. |
|---|---|---|---|
| Precision grade sound level meter 1 | Rion | NL-52 | 00764926 |
| Precision grade sound level meter 2 | Rion | NL-52 | 01265463 |

**Table 3** Instrumentation used for the environmental noise survey

Calibration certificates are available upon request.

## 4.4 Measurement Conditions

At measurement position LT2, the noise climate was dominated by distant traffic from the A225. At times, construction activities from refurbishment works to some of the house on Cramptons Road also affected the noise climate. Air traffic noise was audible but this was at a relatively low level. The noise logger was positioned at approximately 10m distance from the road.

At measurement position LT1 the noise climate was dominated by road traffic from the A225. The noise logger was positioned at approximately 5m distance from the road. Air traffic noise was audible but this was at a relatively low level.



**Figure 3** Photographs of measurements positions

Weather conditions were generally dry with low wind speeds for the duration of the survey. A data chart with weather conditions for the period is provided in Appendix B.

The conditions were considered appropriate for the assessment of external noise levels at the site.

## 4.5 Measurement Uncertainty

The following principles were used when undertaking the noise survey to minimise uncertainty:

- Unattended measurements were undertaken for both weekdays and the weekend giving a large sample size.
- Measurements were undertaken with appropriate weather conditions.
- Two noise loggers were used at locations that are both nearest noise to sensitive properties as well as representative of noise levels incident on the future buildings' facades.
- Class 1 sound level meters were used to undertake measurements.

## 4.6 Measurement Results

The results of the noise measurements are provided in **Table 4** and **Table 5**.

| **Measurement Position** | **Date** | **Period** | **$L_{Aeq,T}$** | **$L_{AFmax}$** | **$L_{AFmax}$ (not more than 10 times per night)** | **Lowest $L_{A90,T}$ [1]** |
|---|---|---|---|---|---|---|
| **LT1** | 2020/09/04 | Daytime (0700-2300) | 67 | - | - | 48 |
| | | Night-time (2300-0700) | 57 | 77 | 74 | 38 |
| | 2020/09/05 | Daytime (0700-2300) | 67 | - | - | 49 |
| | | Night-time (2300-0700) | 55 | 78 | 73 | 34 |
| | 2020/09/06 | Daytime (0700-2300) | 66 | - | - | 46 |
| | | Night-time (2300-0700) | 57 | 80 | 75 | 36 |
| | 2020/09/07 | Daytime (0700-2300) | 67 | - | - | 46 |
| | | Night-time (2300-0700) | 58 | 80 | 74 | 34 |
| | 2020/09/08 | Daytime (0700-2300) | 67 | - | | 48 |
| | | Night-time (2300-0700) | 57 | 80 | 75 | 36 |
| Average | | | | | Daytime (0700-2200) | 47 |
| | | | | | Night-time (2300-0700) | 36 |
| [1]T=1hr for Day-Time and 15min for Night-Time<br>DayTime period for background noise levels corrected to 0700 – 2200 | | | | | | |

**Table 4** Unattended noise survey results (LT1)

| **Measurement Position** | **Date** | **Period** | **$L_{Aeq,T}$** | **$L_{AFmax}$** | **$L_{AFmax}$ (not more than 10 times per night)** | **Lowest $L_{A90}$** |
|---|---|---|---|---|---|---|
| **LT2** | 2020/09/04 | Daytime (0700-2300) | 51 | - | - | 43 |
| | | Night-time (2300-0700) | 46 | 74 | 59 | 38 |
| | 2020/09/05 | Daytime (0700-2300) | 51 | - | - | 45 |
| | | Night-time (2300-0700) | 44 | 64 | 56 | 35 |
| | 2020/09/06 | Daytime (0700-2300) | 49 | - | | 43 |
| | | Night-time (2300-0700) | 47 | 61 | 56 | 36 |

| Measurement Position | Date | Period | $L_{Aeq,T}$ | $L_{AFmax}$ | $L_{AFmax}$ (not more than 10 times per night) | Lowest $L_{A90}$ |
|---|---|---|---|---|---|---|
| | 2020/09/07 | Daytime (0700-2300) | 51 | - | - | 39 |
| | | Night-time (2300-0700) | 44 | 76 | 57 | 34 |
| | 2020/09/08 | Daytime (0700-2300) | 50 | - | - | 40 |
| | | Night-time (2300-0700) | 45 | 73 | 56 | 34 |
| Average | Daytime (0700-2300) | | | | | 42 |
| | Night-time (2300-0700) | | | | | 35 |
| [1]T=1hr for Day-Time and 15min for Night-Time | | | | | | |

**Table 5** Unattended noise survey results (LT2)

### 4.6.1 Representative Background Noise Levels

BS4142 states that:

*"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods".*

In this respect, representative background levels during Daytime and Night-time are taken as the average of the lowest $L_{A90}$ measured each day between 07:00-23:00 and between 07:00-22:00.

| | Daytime (0700 to 2300) | Night-Time (2300 to 0700) |
|---|---|---|
| Noise Sensitive Receiver Position | Representative Background Noise Levels, dB $L_{A90,1hr}$ | Representative Background Noise Levels, dB $L_{A90,15min}$ |
| NSR 1 (Otford Road) | 47 | 36 |
| NSR 2/ NSR 3 Cramptons Road | 42 | 35 |

**Table 6** Representation background noise level at the nearest NSRs

# 5 Noise Assessment

This noise assessment follow guidance provided in the following documents:

- **ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise (May 2017**) This document sets out the approach to to the management of noise with respect to new residential development within the planning system and complements the Government's overarching Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and Planning Practice Guidance (including PPG-Noise).

- **The ANC - Acoustics, Ventilation and Overheating Guide ('AVO Guide')** This document recommends an approach to acoustic assessments for new residential development that take due regard of the interdependence of provisions for acoustics, ventilation, and overheating. Application of the AVO Guide is intended to demonstrate good acoustic design as described in the ProPG: Planning & Noise, May 2017, when considering internal noise level guidelines.

## 5.1 Initial assessment - Outdoor noise levels

Based on the results of the noise survey we have calculated the external free field noise level incident on the façade of the proposed development. The results for Daytime and Nigh-Time are provided graphically in **Figure 4** and **Figure 5**.

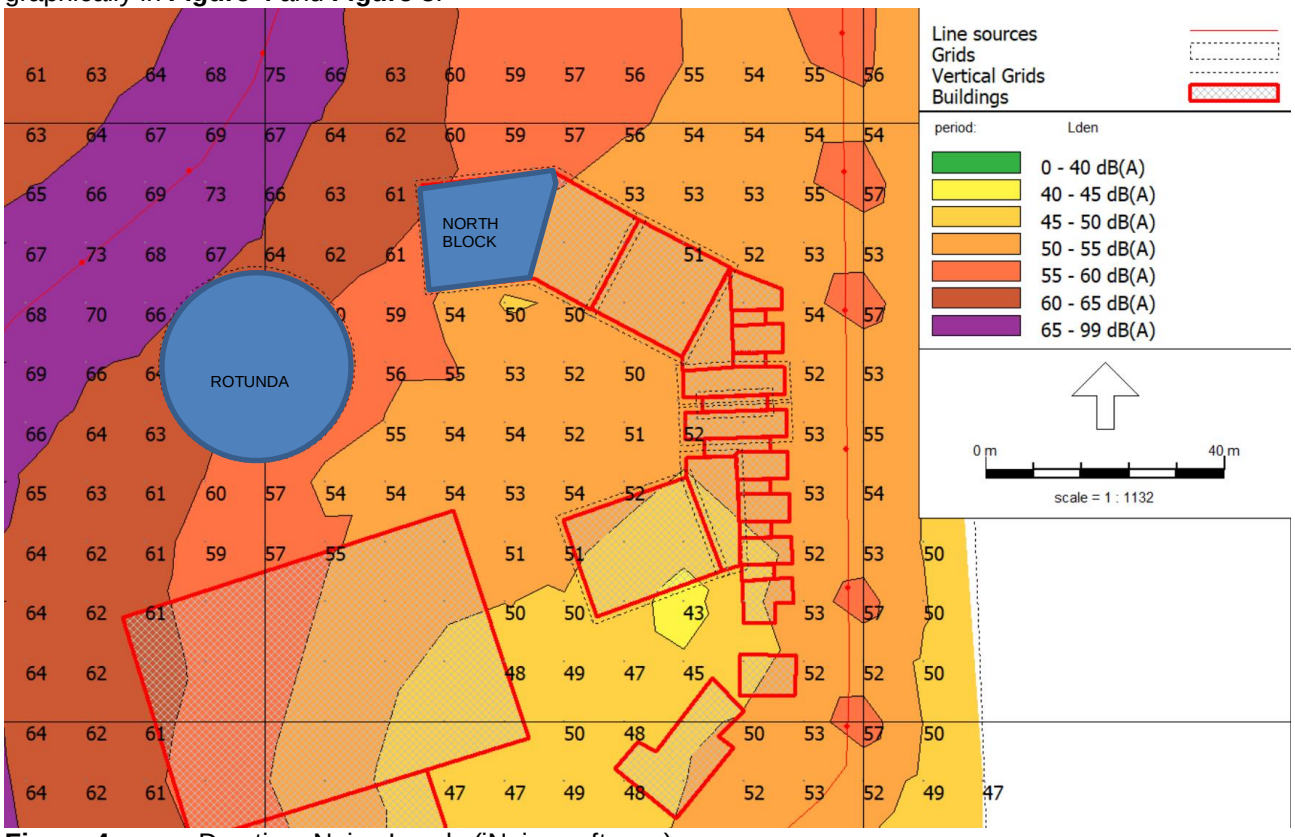



**Figure 4** Day-time Noise Levels (iNoise software)

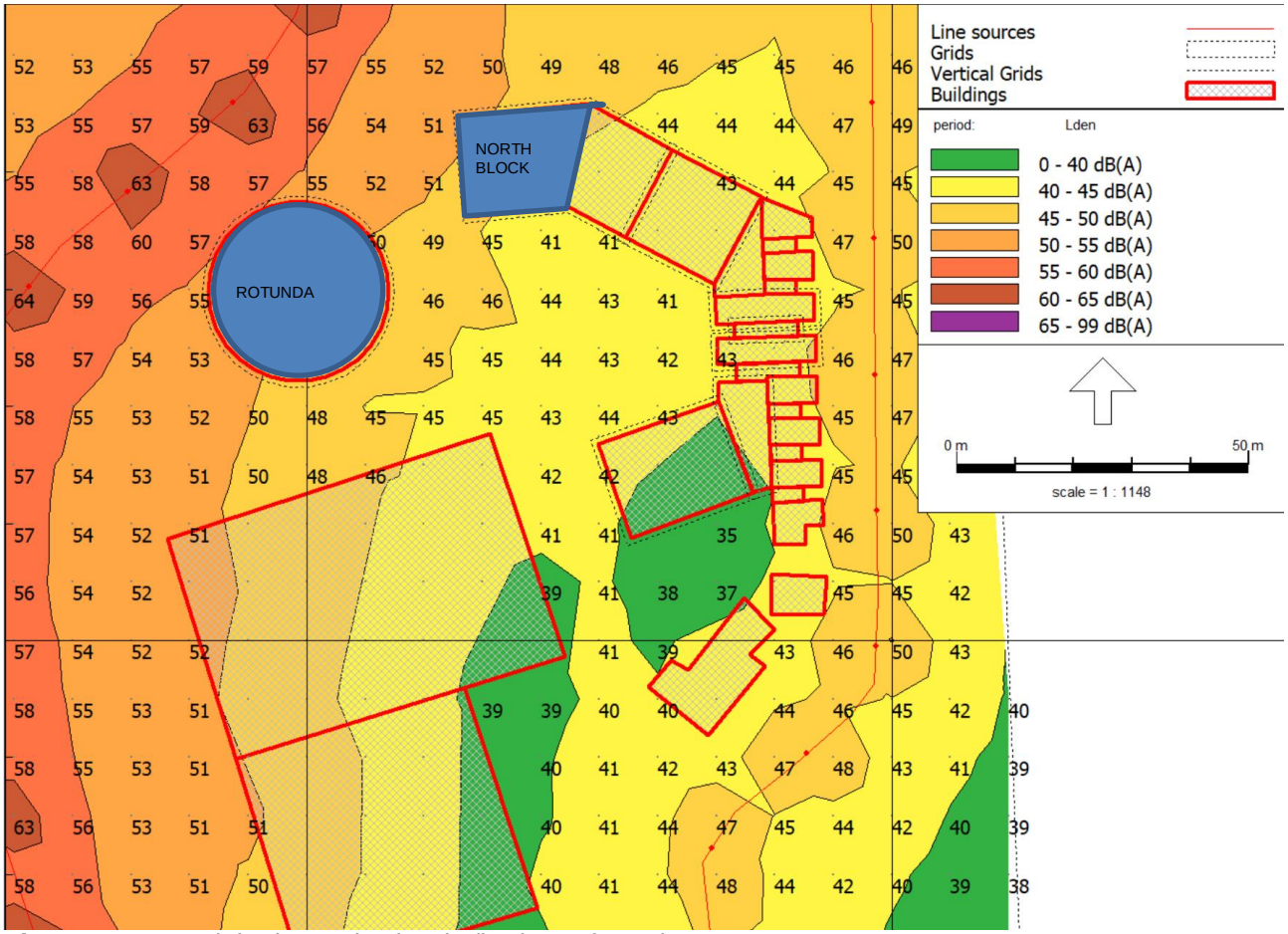



**Figure 5** Night-time noise levels (iNoise software)

Based on guidance provided in the AVO guide, for dwellings (or habitable rooms) where external ambient noise level do not exceed $L_{Aeq,8hrs}$ 48 dB (Nightime) and $L_{Aeq,16hrs}$ 53 dB (Daytime), a design that uses passive cooling (i.e open windows) to control overheating, will be suitable. No further assessment is required for these dwellings.

A more detailed assessment is required for dwellings where external ambient noise level are higher, to demonstrate how appropriate internal ambient noise levels will be achieved given the exterior noise level and the chosen mean of ventilation, including the overheating condition.

On this basis, for the Sevenoaks Gasholder development, a detailed assessment is required for the Rotunda and the North Block. These are highlighted in blue in **Figure 4** and **Figure 5**.

## 5.2 Indoor Ambient Noise Levels Assessment

The internal acoustic environment within dwellings, and in particular the indoor ambient noise level experienced by the occupants depends on the external noise, the ventilation strategy adopted for each dwelling and the acoustic performance of the building envelope.

Approved Document F whole dwelling ventilation requirements will be satisfied using continuous mechanical supply and extract with heat recovery (MVHR).

This strategy will ensure that external noise is well attenuated as there is no need for open trickle ventilators on the building façade. Fresh air will be supplied by the MVHRs.

### 5.2.1 Windows Acoustic Performance Requirements

On most elevations standard double glazed windows and doors will provide the necessary sound attenuation. Windows on the elevations that are most exposed to noise will require higher acoustic performance.

A mark-up showing acoustic performance requirements for windows across the development is provided in **Figure 6.**

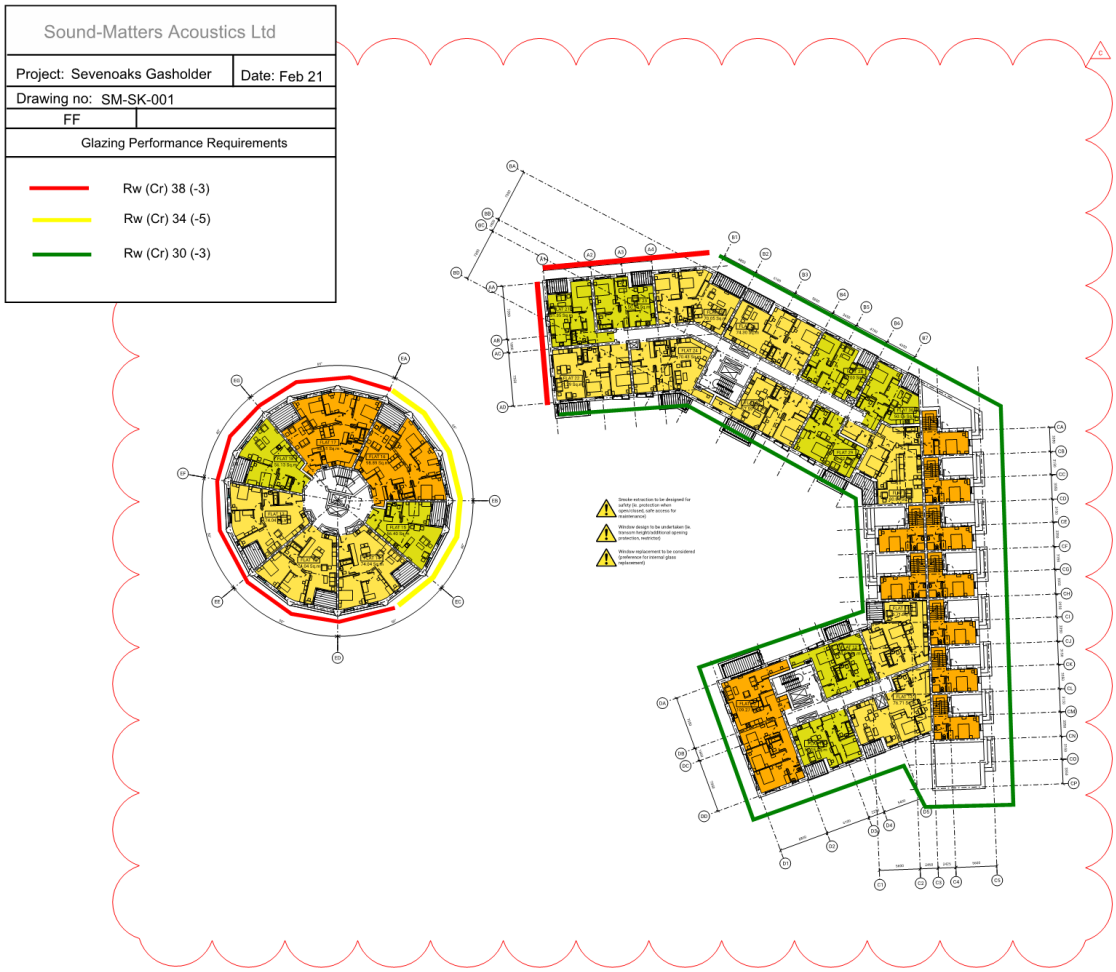



**Figure 6** External windows acoustic performance requirements

Possible glazing construction for the windows to achieve the desired acoustic performance are shown in **Table 7**.

| **Window Acoustic Performance Requirement** | **Possible glazing construction** |
|---|---|
| $R_w$ ($C_{tr}$) 30 (-3) dB | 4 mm toughened glass, 16 mm air gap, 4 mm toughened glass |
| $R_w$ ($C_{tr}$) 34 (- 5) dB | 4 mm toughened glass, 12 mm air gap, 6 mm toughened glass |
| $R_w$ ($C_{tr}$) 38 (- 3) dB | 10 mm toughened glass, 6 mm air gap, 8.8 mm laminated glazing |

**Table 7** Windows acoustic performance requirements and possible glazing constructions

We confirm that with windows providing the above performance requirements also the maximimum interior noise level from isolated events will not exceed 45dB $L_{Amax}$ more than 10 times per night.

### 5.2.2 Building Services Noise Limits

Approved Document F (ADF) states that to ensure good acoustic conditions, the noise levels within living rooms and bedrooms should not exceed $L_{Aeq,T}$ 30 dB for mechanical systems operating at the whole dwelling ventilation rate.

Evidence indicates that “a more prudent limit for mechanical services noise around 24 – 26 dB(A) is likely to be required to prevent an adverse reaction from most occupants while falling asleep”.

A summary of the proposed noise levels for the MVHRs operating at the whole dwelling ventilation condition is provided in **Table 8**.

| | **Desirable internal ambient noise levels from mechanical services** |
|---|---|
| Bedrooms | ≤ $L_{Aeq}$ 30 dB ($L_{Aeq}$ 26 dB if possible) |
| Living / Dining Rooms | ≤ $L_{Aeq}$ 30 dB |
| Bathroom / WC / Kitchen | ≤ $L_{Aeq}$ 45 dB |

**Table 8** Indoor ambient noise levels from mechanical services

## 5.3 Thermal Comfort / Overheating

The apartments require additional ventilation (above ADF whole dwelling ventilation provisions) in order to mitigate overheating.

ProPG Planning and Noise (2017) includes a section on overheating control stating that:

"*open windows can be used to mitigate overheating. Should the LPA accept a scheme is to be assessed with windows closed, but this scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition. In this case a more detailed assessment of the potential impact on occupants should be provided..* ".

### 5.3.1 Overheating Assessment

The ANC - Acoustics, Ventilation and Overheating Guide (‘AVO Guide’) (2020) sets out internal noise thresholds (SOAEL) above which noise causes a material change of behaviour and for which a significant adverse effect can be observed (i.e. like having to keep the windows closed most of the times).

The risk of an adverse effect occurring depends on the external noise level and for the duration of the overheating condition occurring.

The assessment for the overheating condition for the Sevenoaks Gasholder project is provided in the graphs on **Figure 9** in Appendix C to this report.

In summary:

ROTUNDA

- The assessment for the South / West orientation indicates a high risk of overheating – for the North and East orientations the overheating risk is lower, however noise levels are higher.

  Standard opening windows only are not considered suitable because when these are open, internal levels would exceed the AVO diagram SOAEL (Significant Observed Adverse Effect Level) threshold (this does not apply to north-east and east facing rooms with balconies).

  The design will therefore also include acoustically attenuated ventilation openings.

NORTH BLOCK

- The assessment for the South / West orientation indicates a high risk of overheating – for the North orientation the overheating risk is lower, however noise levels are higher.

Standard opening windows only are not considered suitable for the West and North Elevation because when these are open internal levels would exceed the AVO diagram SOAEL threshold (this does not apply to north facing rooms with balconies).

The design will therefore also include acoustically attenuated ventilation openings.

### 5.3.2 Attenuated Overheating Vents

Ventilation openings with means of attenuating sound are required where the outdoor noise levels are high and overheating is likely. Typically these may be acoustic louvres or acoustically lined ducts/plena or a combination of the two.

Depending on the design these can provide an outdoor to indoor attenuation up to 29 dB.

The mark-up in ***Figure 7*** shows recommended locations for the introduction of overheating vents. Acoustic vents will use min 150mm deep acoustic louvres ($R_w$ 15dB) integrated in the façade (louvres are to be insulated and the vents provided with insulated doors).

Standard opening windows/doors will also be provided and these can be open at occupant's discretion and for purge ventilation.

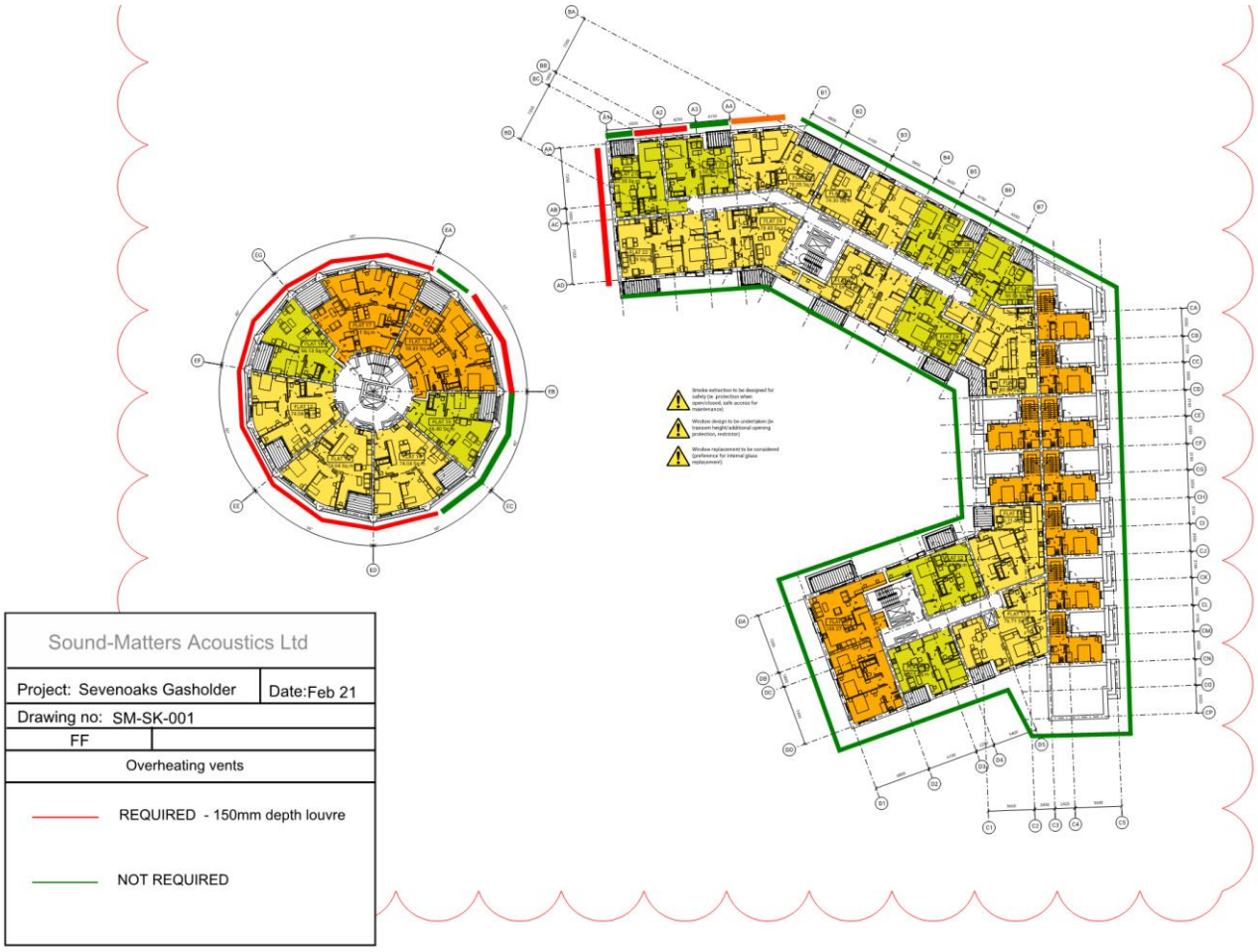



**Figure 7** *Mark-up of proposed development showing provisions for acoustically attenuated overheating vents*

## 5.4 External Amenity

BS8233:2014 states that "the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$".

The standard continues… "*These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited*."

Based on the results of the noise survey and the mapping provided in Figure 3 (duplicated below in **Figure 8**), it can be seen that most of the development external amenities (i.e. Cramptons Road terraces and balconies and balconies of the South and North blocks) will comply with the BS8233 guidance.

Balconies of the Rotunda and of the North elevation of the North Block that are exposed to road traffic noise from the A225 will, inevitably, experience higher noise level. However, apartments will have access to the external landscaped area at the centre of the site where noise levels will be within the guidance values.

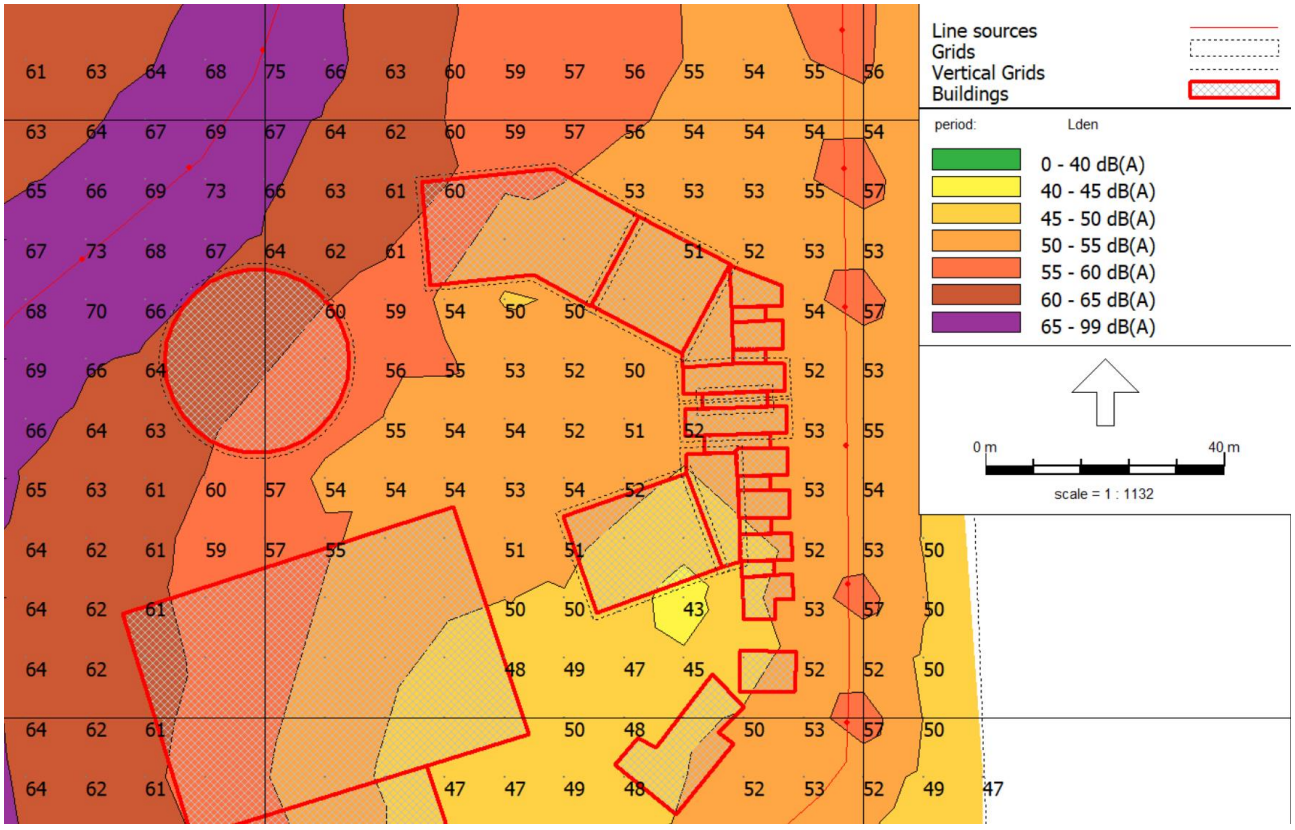



**Figure 8** Day-time Noise Levels mapped on site with the proposed development (iNoise software)

# 6 Plant Noise Emission Limits

Plant nose emission limits are set based on guidance from BS4142:2014+A1:2019 which states:

"*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***.'

We therefore propose that plant noise emissions are set so that the rating level **is at least 5 dB below** the representative background noise level measured at the location of the Nearest Noise Sensitive Receivers (NSR's).

The plant noise emission limits at the nearest NSRs are shown in **Table 9**.

| | **Daytime (0700 to 2300)** | | **Night-Time (2300 to 0700)** | |
|---|---|---|---|---|
| Noise Sensitive Receiver Position | Representative Background Noise Levels, dB $L_{A90,1hr}$ | **Plant Noise Emission Limit, dB $L_{Ar,15min}$** | Representative Background Noise Levels, dB $L_{A90,15min}$ | **Plant Noise Emission Limit, dB $L_{Ar,15min}$** |
| NSR 1 | 46 | **41** | 40 | **35** |
| NSR 2/ NSR 3 | 39 | **34** | 38 | **33** |

**Table 9** Representative Background noise level and plant noise emission limits at the nearest NSRs

# 7 Conclusions

The proposed residential development at the Gasholder Site of Cramptons Road, Sevenoaks has been assessed in relation to noise within the guidelines of National Planning Policy Framework (2010), the Noise Policy Statement for England (2012), the Planning Practice Guidance (2014) and the Professional Practice Guidance on Planning and Noise for new residential development (ProPG 2017).

An environmental noise survey has been undertaken to establish the noise clime at the site. The survey included long term noise monitoring (5 days continuous monitoring) at two locations.

An initial assessment showed that part of the site is low risk with regard to noise. In fact, the future building elevations on Cramptons Road and on the South and North Blocks have external noise levels below 55 dB Daytime and between 45-50 dB during the Night-time period. The maximum noise level from individual events ($L_{Amax}$) during night-time does not exceed 60 dB more than 10 times per night.

The Rotunda building and the West and North elevation of the North Block will experience higher noise levels and therefore a detailed noise assessment of the internal ambient noise levels has been undertaken.

Approved Document F whole dwelling ventilation requirements will be satisfied using continuous mechanical supply and extract with heat recovery (MVHR).This strategy will ensure that external noise is well attenuated as there is no need for open trickle ventilators on the building façade.

Glazing performance requirements to achieve the indoor ambient noise levels of BS8233:2014 have been calculated.

The apartments require additional ventilation (above ADF whole dwelling ventilation provisions) in order to mitigate overheating. An assessment has been undertaken in line with guidance set out in the ANC - Acoustics, Ventilation and Overheating Guide ('AVO Guide') (2020).

While standard opening windows will be suitable to provide the additional air necessary to mitigate overheating on most elevations, acoustically attenuated natural ventilation openings will be used where exterior noise levels are too high to reduce impact on the occupants.

External amenities area will generally comply with the 50-55dB $L_{Aeq,\ 16hrs}$ exterior noise level recommendation of BS8233. Where this is not possible apartments will still have access to a quiet communal outdoor area.

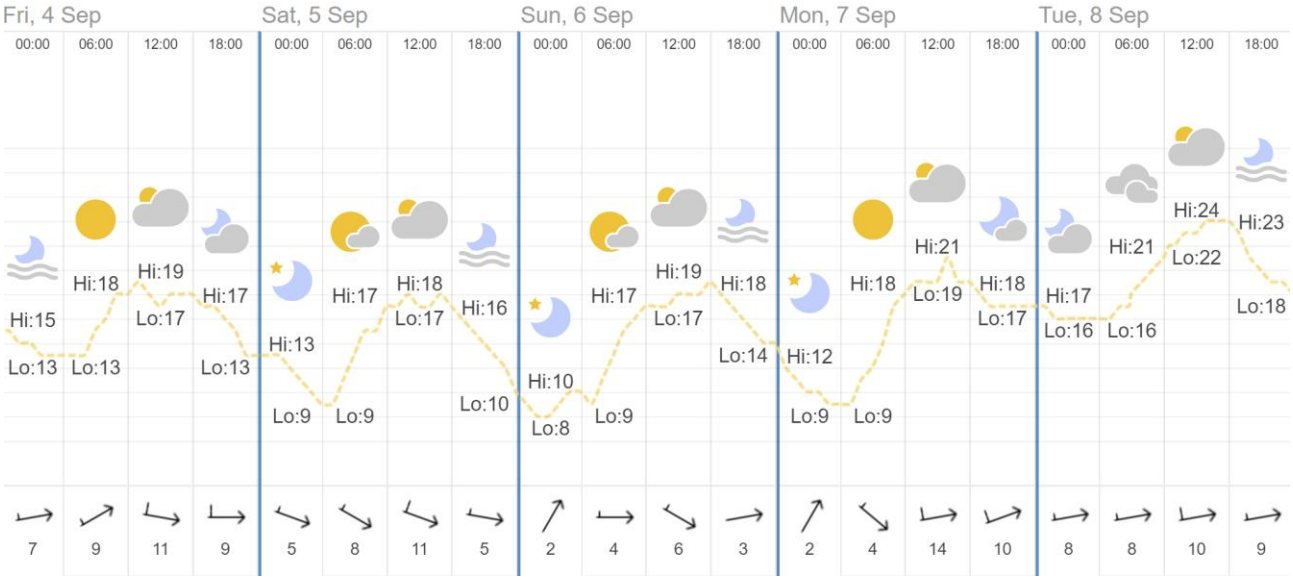
Noise emission limits for new mechanical plant (which will be very limited considering the passive cooling strategy) have been set based on representative background noise levels measured on site in line with guidance from BS4142.

Overall the proposed development complies with the relevant national planning policy in relation to noise and therefore a recommendation is made for the application to be granted.

# APPENDIX A – Acoustic Terminology

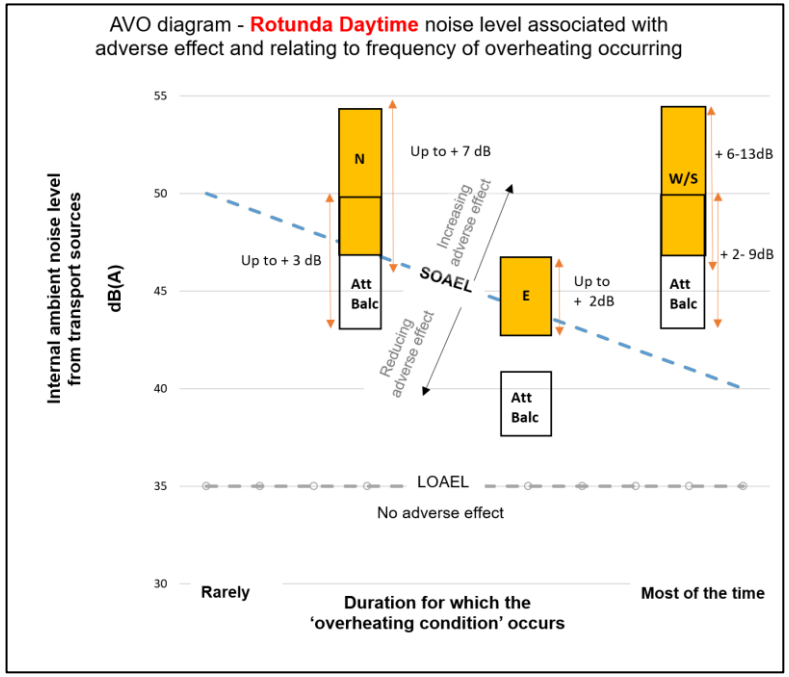
| Term | Definition |
|---|---|
| Sound Pressure | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure. |
| Sound Pressure Level (Sound Level) | The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel 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. |
| $L_{Aeq,T}$ | 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 during the time period T. Lmax 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. |
| $L_{90,T}$ or Background Noise Level | A noise level index defined as the noise level exceeded for 90% of the time over the time period T. $L_{90}$ can be considered to be the "average minimum" noise level and is often used to describe the background noise. |
| Free-Field | Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres. |

# APPENDIX B – Weather conditions during noise survey



# APPENDIX C – Overheating Assessment with Open Windows

Orange = Interior noise level with open window on facade line ;
Att Balc = Interior noise level with balcony open windows set back from the facade line



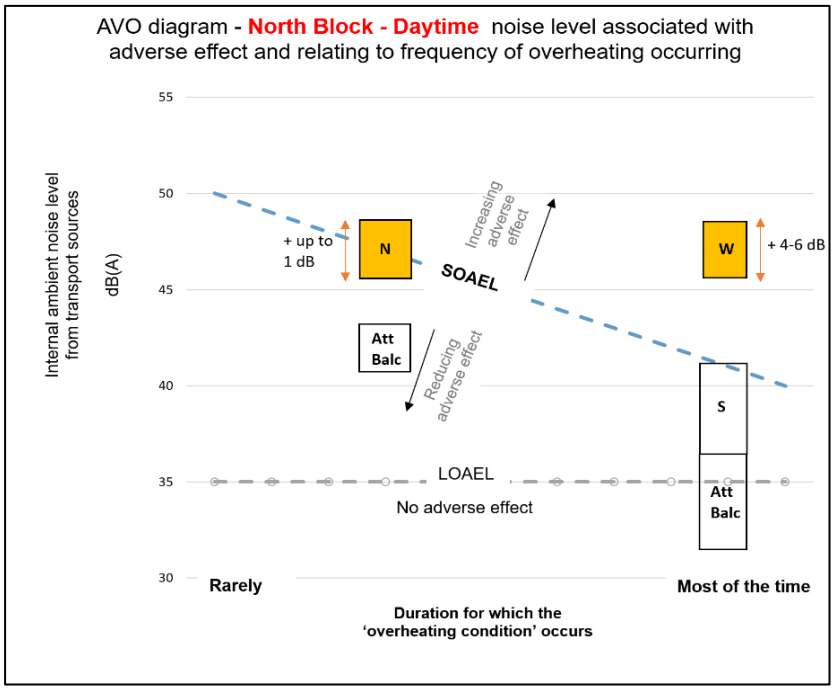




**Figure 9** Internal noise levels assessment with ventilation provision (open windows) to control overheating – Day-Time

N = North Elevation

E = East Elevation

W + West Elevation

S = South Elevation

Notes:

- Using open windows to introduce external air to a space to provide a cooling effect provides a maximum sound attenuation of 13 dB[1].

- Balconies can reduce the noise levels impacting on natural ventilation openings in the façade; this is acknowledged within the ProPG text. The range of effect of standard balconies is determined by the location of the balcony (protruding or within the building footprint), whether the balustrades are solid or open, and whether there are absorptive or reflective finishes on the soffit. Several papers have been produced based on both measured and predicted levels, and improvements of up to 10 dB[1] on the sound insulation provided by a standard open window can be achieved.

- Most Living Rooms at the Sevenoaks Gasholder have external balconies – a sound attenuation of up to 17 dB has been assumed (i.e. 4 dB improvement over open windows on the façade).

- A detailed assessment is only provided for the Rotunda and the North Block. This is because exterior noise levels at the facades of the South Block and the Townhouses are sufficiently low to allow open windows to be used for overheating control.

- The assessment presented, for brevity, is for the Day-Time condition only. We confirm this will also satisfy Night-Time requirements.

[1] The ANC - Acoustics, Ventilation and Overheating Guide (2020)