



# e3p

Noise Impact Assessment

Edenfield Road/Greenbooth Road, Norden

Reference: 50-868-R1-5

Date: September 2023



# NOISE IMPACT ASSESSMENT

Edenfield Road/Greenbooth Road,  
Norden

Prepared for:

**Stonebond Properties Ltd**

**Report Ref: 50-868-R1-5**

**Date Issued: 25th September 2023**

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## EXECUTIVE SUMMARY

### BACKGROUND

|                                |                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site Address</b>            | Edenfield Road/Greenbooth Road, Norden OL12 7TD                                                                                                                                                                                                                                                                                                                   |
| <b>National Grid Reference</b> | E 385677 N 414772                                                                                                                                                                                                                                                                                                                                                 |
| <b>Proposed Development</b>    | Proposed residential development comprising 49 residential dwellings with associated access, car parking and landscaping.                                                                                                                                                                                                                                         |
| <b>Report Objectives</b>       | <p>The objectives of this report are to:</p> <ul style="list-style-type: none"><li>Identify, measure and assess the potential impact of any existing noise sources in the immediate vicinity of the Site upon proposed residential receptors.</li></ul> <p>The report follows current and relevant British Standards in order to provide a robust assessment.</p> |

### ASSESSMENT

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Surveys Completed</b>       | <p>An attended 3-hour road traffic noise survey has been undertaken for Edenfield Road during a typical weekday period.</p> <p>E3P also attended the boundaries with existing commercial premises during daytime and night-time periods but noted no audible commercial sound on site. As such, E3P have conducted predicted assessments of commercial sound.</p>                                                                                                  |
| <b>Assessments</b>             | <p>A 3D noise model has been constructed to assess road traffic noise impact at the residential development.</p> <p>Road traffic sound is assessed in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019 for shared external amenity areas and internal habitable rooms.</p> <p>Possible commercial noise from neighbouring properties has been assessed in accordance with BS 4142:2014+A1:2019 based on reasonable assumptions.</p> |
| <b>Mitigation Requirements</b> | <p>The assessment has determined that all plots will require a whole dwelling ventilation system to meet ventilation requirements and for certain plots to mitigate overheating. Certain plots require higher specification glazing to control internal noise levels.</p> <p>Plots closest to the commercial units require barriers of heights between 1.8 m and 2.1 m to mitigate possible future commercial noise in external amenity areas.</p>                 |

### CONCLUSIONS

This assessment has shown that no adverse impact is predicted day or night at the receptors due to existing sound sources. Potential commercial noise is recommended to be mitigated against using acoustic barriers.

As such, noise need not be a material consideration in the granting of planning permission if the recommendations of this report are followed and included within the design stage.



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## **1. INTRODUCTION**

### **1.1. BACKGROUND**

E3P were commissioned by Stonebond Properties Ltd to undertake a Noise Impact Assessment for a proposed residential development at Edenfield Road, Norden, to be referred to hereafter as '*the site*'.

This assessment looks to determine the key noise sources in the immediate vicinity of the site and to assess their impact, if any, upon proposed residential receptors and to specify mitigation measures, where required.

### **1.2. PROPOSED DEVELOPMENT**

The client intends to develop the existing site for residential use comprising 49 residential units, with associated access, car parking and landscaping.

The key sources of sound impacting upon the site is road traffic sound from Edenfield Road.

This assessment has been undertaken in accordance with the following supplied drawings:

-  Planning Layout (SBM-001-PL01 J) dated 22<sup>nd</sup> September 2023.

### **1.3. LIMITATIONS**

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance.



## 2. ASSESSMENT METHODOLOGY

### 2.1. NATIONAL PLANNING POLICY FRAMEWORK

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

- ✿ Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- ✿ Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
- ✿ Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

### 2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

- ✿ Whether or not a significant adverse effect is occurring or is likely to occur.
- ✿ Whether or not an adverse effect is occurring or is likely to occur.
- ✿ Whether or not a good standard of amenity can be achieved.

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The “observed effect levels” are as follows:

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

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.



TABLE 2.1 NOISE EXPOSURE HIERARCHY

| PERCEPTION                                       | EXAMPLES OF OUTCOMES                                                                                                                                                                                                                                                                                                                                                                                                                                                | INCREASING EFFECT LEVEL     | ACTION                           |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------|
| <b>Not Noticeable</b>                            | No effect.                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No observed effect          | No specific measures required    |
| <b>Noticeable and Not Intrusive</b>              | 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    |
| <b>Lowest Observed Adverse Effect Level</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |                                  |
| <b>Noticeable and Intrusive</b>                  | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly, or having to close windows for some of the time because of the noise where there is no alternative ventilation. 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 |
| <b>Significant Observed Adverse Effect Level</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |                                  |
| <b>Noticeable and Disruptive</b>                 | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. 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 effect | Avoid                            |
| <b>Noticeable and Very Disruptive</b>            | Extensive and regular changes in behaviour and/or 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 (auditory and non-auditory).                                                                                                                                                                                     | Unacceptable adverse effect | Prevent                          |

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 situation.

These factors include the following:

- ✳ The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- ✳ For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- ✳ The spectral content of the noise and the general character of the noise. The local topology and



topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- ✿ Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- ✿ 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.
- ✿ If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

## **2.3. BUILDING REGULATIONS: APPROVED DOCUMENT F - VOLUME 1: DWELLINGS (JUNE 2022)**

Approved document F Volume 1: Dwellings (ADF) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to means of ventilation within dwellings. The ventilation strategy specified within the ADF are as follows.

*1.9 The ventilation strategy in this approved document relies on a combination of all of the following.*

- a. Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms and kitchens), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.*
- b. Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.*
- c. Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).*

*1.10 Ventilation may be delivered through natural ventilation, mechanical ventilation or a combination of both.*

*1.11 The ventilation systems in this approved document are examples of systems that comply with Part F of the Building Regulations. Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance.*

Within the ADF there are three system specific ventilation systems that can be utilised to provide sufficient ventilation. These methods are as follow.

- 1. Natural ventilation with background ventilators and intermittent extract fans** (guidance suitable only for less airtight dwellings) - Ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. For the purposes of this approved document, natural ventilation refers to a ventilation strategy using background ventilators and intermittent extract ventilation.



2. **Continuous mechanical extract ventilation** - Mechanically driven ventilation that continuously extracts indoor air and discharges it to the outside.
3. **Mechanical ventilation with heat recovery** - A mechanically driven ventilation system that both continuously supplies outdoor air to the inside of the dwelling and continuously extracts indoor air and discharges it to the outside. For the purposes of this approved document, the guidance for mechanical ventilation with heat recovery applies to centralised or decentralised supply and extract systems, with or without heat recovery.

## 2.4. BUILDING REGULATIONS: APPROVED DOCUMENT O – OVERHEATING (JUNE 2022)

Approved document O - Overheating (ADO) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to the mitigation of overheating. In relation to noise the ADO provides the following guidance.

3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- a. 40dB  $L_{Aeq,T}$ , averaged over 8 hours (between 11pm and 7am).
- b. 55dB  $L_{AFmax}$ , more than 10 times a night (between 11pm and 7am).

3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants'

Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020)



## 2.5. BS 4142: 2014+A1:2019 'METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- ✳ Sound from industrial and manufacturing processes.
- ✳ Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- ✳ Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and
- ✳ Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted specific noise level from any of the above with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the reference time intervals depending upon whether the noise source operates during daytime (1-hour) or night-time (15-minute) periods.

There are several 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows:

### Tonality

- ✳ +2 dB: where the tonality is just perceptible.
- ✳ +4 dB: where the tonality is clearly perceptible; and
- ✳ +6 dB: where the tonality is highly perceptible.

### Impulsivity

- ✳ +3 dB: where the impulsivity is just perceptible.
- ✳ +6 dB: where the impulsivity is clearly perceptible; and
- ✳ +9 dB: where the impulsivity is highly perceptible.

### Intermittency

- ✳ +3dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above, there is a penalty for 'other sound characteristics' of +3 dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment. BS 4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.



Assessment of the rating level relative to the background sound level can yield the following commentary:

- ✿ Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact.
- ✿ A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- ✿ A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- ✿ 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

## 2.6. BRITISH STANDARD BS 8233:2014 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

### 2.6.1. NOISE CRITERIA LIMITS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

| CRITERION                                | TYPICAL SITUATION | DESIGN CRITERION, $L_{Aeq,T}$ (dB) |
|------------------------------------------|-------------------|------------------------------------|
| Suitable Resting and Sleeping Conditions | Living Room       | 35                                 |
|                                          | Bedroom           | 30                                 |

BS 8233 goes on to recommend noise levels for gardens:

*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. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted.*

BS 8233 goes on to say:

*In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.*



## 2.7. WORLD HEALTH ORGANISATION (WHO) – GUIDELINES FOR COMMUNITY NOISE

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

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



### 3. SURVEY RESULTS

The measurement positions are detailed in Figure 1 of Appendix II.

#### 3.1. SOUND CLIMATE

Prior to the surveys and during, E3P undertook a site walkover across the Site to determine the existing sound climate and associated sources.

It was noted that the main source of sound was road traffic sound associated with Edenfield Road and running water from the stream. As such, E3P carried out attended road traffic measurements in accordance with the Calculation of Road Traffic Noise (CRTN).

E3P noted existing commercial premises along the southern boundary and attended during key periods in order to establish whether commercial sound has the potential to impact upon the site.

#### 3.2. ROAD TRAFFIC SOUND MEASUREMENT – EDENFIELD ROAD

Due to the open nature of the site, it was not possible to install the meter in a suitable location on site for 24 hours. As such, E3P have undertaken a road traffic sound survey in accordance with the shortened measurement procedure given in Calculation of Road Traffic Noise (CRTN) during a typical weekday period. The survey was undertaken during the following period:

📍 10:17 - 13:17 Tuesday 9th May 2023.

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

📍 Noise Measurement Position 1 (NMP1): Located on the southern boundary of the site approximately 4 m from the roadside edge. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of road traffic along Edenfield Road.

Table 3.1 details the measured sound pressure levels.

TABLE 3.1 MEASURED ROAD TRAFFIC SOUND LEVELS – EDENFIELD ROAD

| MEASUREMENT<br>START TIME                            | MEASURED SOUND PRESSURE LEVELS (dB) |                                        |                    |                    |
|------------------------------------------------------|-------------------------------------|----------------------------------------|--------------------|--------------------|
|                                                      | L <sub>Aeq,T</sub>                  | 10th Highest<br>L <sub>Amax,fast</sub> | L <sub>A90,T</sub> | L <sub>A10,T</sub> |
| 10:17                                                | 69.8                                | 85.3                                   | 51.2               | 74.0               |
| 11:17                                                | 70.1                                |                                        | 54.4               | 74.0               |
| 12:17                                                | 69.8                                |                                        | 51.7               | 73.8               |
| Derived Daytime Noise Level, L <sub>Aeq,16hr</sub>   |                                     |                                        |                    | 70.9               |
| Derived Night-time Noise Level, L <sub>Aeq,8hr</sub> |                                     |                                        |                    | 61.9               |



### 3.3. COMMERCIAL SOUND MEASUREMENTS

E3P has undertaken attended measurements of commercial properties surrounding the site. The surveys were carried out over the following time periods:

-  Wednesday 10th May 10:14–11:11.
-  Wednesday 10th May 12:07–12:42.
-  Wednesday 17th May 05:00–15:00.

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

-  Noise Measurement Position 2 (NMP2): Located on the southern boundary of the site adjacent to commercial properties. The close proximity of the properties to each other and the open nature of site allowed line of site to each commercial property from this position. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of road traffic along Edenfield Road and running water from the stream.

Table 3.2 details the measured sound pressure levels.

TABLE 3.2 MEASURED COMMERCIAL SOUND LEVELS

| MEASUREMENT DURATION | MEASURED SOUND PRESSURE LEVELS (dB) |             |
|----------------------|-------------------------------------|-------------|
|                      | $L_{Aeq,T}$                         | $L_{A90,T}$ |
| 05:00-05:15          | 48.9                                | 45.6        |
| 05:15-05:30          | 49.1                                | 44.9        |
| 05:30-05:45          | 49.0                                | 44.5        |
| 05:45-06:00          | 48.5                                | <b>44.0</b> |
| 06:00-06:15          | 50.2                                | 45.7        |
| 06:15-06:30          | 50.2                                | 45.3        |
| 06:30-06:45          | 49.5                                | 45.1        |
| 06:45-07:00          | 49.5                                | 45.6        |
| 07:00-08:00          | 50.8                                | 46.8        |
| 08:00-09:00          | 50.4                                | 46.2        |
| 09:00-10:00          | 49.6                                | 44.7        |
| 10:00-11:00          | 48.5                                | 44.0        |
| 11:00-12:00          | 48.8                                | 43.9        |
| 12:00-13:00          | 48.7                                | 44.1        |
| 13:00-14:00          | 48.7                                | 43.9        |
| 14:00-15:00          | 48.1                                | <b>43.3</b> |



During the survey and site walkover, no significant commercial noise was noted, therefore a commercial noise impact assessment is not required.

However, it is noted that there is potential for commercial sound from the units due to their unrestricted usage, therefore a commercial noise impact assessment has been included to inform a robust assessment.

TABLE 3.3 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

| MEASUREMENT POSITION | EQUIPMENT DESCRIPTION | MANUFACTURER & TYPE NUMBER | SERIAL NUMBER | CALIBRATION DUE DATE AT TIME OF SURVEY |
|----------------------|-----------------------|----------------------------|---------------|----------------------------------------|
| <b>NMP1</b>          | Sound Level Meter     | 01dB Fusion                | 14226         | 01/12/2023                             |
|                      | Pre-amplifier         | 01dB Pre22                 | 2135072       |                                        |
|                      | Microphone            | GRAS 40CD                  | 470570        |                                        |
|                      | Calibrator            | Cirrus CR 515              | 99204         | 25/07/2023                             |
| <b>NMP2</b>          | Sound Level Meter     | 01dB Fusion                | 12039         | 30/06/2023                             |
|                      | Pre-amplifier         | 01dB Pre22                 | 1805124       |                                        |
|                      | Microphone            | GRAS 40CE                  | 330832        | 18/01/2024                             |
|                      | Calibrator            | 01dB Cal31                 | 87281         |                                        |

The sound level meters were field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.



## 4. ROAD TRAFFIC SOUND IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2023 MR1, to determine the impact of noise from road traffic sound.

The following inputs have been included in the model:

- ✳ Planning Layout Rev J.
- ✳ NMP1 has been used to calibrate Edenfield Road.
- ✳ Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government Licence v3.0.
- ✳ A reflection order of 2 has been used in all calculations. Ground absorption has been assumed as 0.5 due to the mixed landscape surrounding the site.
- ✳ Noise levels generated using ISO 9613-1 and ISO 9613-2 "Acoustics – Attenuation of sound during propagation outdoors" as incorporated into CadnaA software.

### 4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

The noise model has been used to predict noise levels in the shared amenity spaces which are to be used for relaxation. The predicted levels range from 42 dB and up to 55 dB in the worst affected external amenity areas.

As such, it is predicted that the No Observed Adverse Effect Level (NOAEL) is achieved in most rear garden areas with the following commentary:

*"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."*

Accordingly, no further action is required to mitigate noise levels in these areas.

### 4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards to internal noise levels, E3P has assumed a standard glazing specification of 4 mm glass/20 mm air space/4 mm glass affords sound insulation performance in the order of 29 dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C<sub>tr</sub>' correction, has a sound insulation performance value of approximately 25 dB and so this value has been used to calculate internal noise levels.

The recently published AVO guide recommends that a partially open window provides approximately 13 dB attenuation.

The model has been used to predict façade noise levels at all floors. In order to determine any requirements for mitigation, E3P has added the reduction provided by the glazing (25 dB) to the relevant criterion for day (35 dB) and for night (30 dB). As such, any facades subject to noise levels higher than 60 dB during the day and/or 55 dB during the night will require higher specification glazing.



As can be seen from Figures 2 and 3, multiple facades closest to Edenfield Road are subject to external daytime noise levels that would result in the affected dwellings requiring higher specification glazing. As such, higher specification glazing is required.

Consideration must also be given to maximum noise levels generated by road traffic. The 10th highest maximum noise level has been used and distance corrected to the closest plot. Internal maximum noise levels of 45 dB  $L_{Amax}$  should also not be exceeded. The sound insulation performance achieved by standard glazing (31 dB) has been added to the 45 dB maximum internal noise level limit. As, such facades subject to maximum noise levels above 76 dB will require higher specification glazing.

The maximum noise level at the worst affected facades are as follows:

TABLE 4.1 MAXIMUM ROAD TRAFFIC SOUND LEVELS

| ROAD           | MEASURED 10 <sup>TH</sup><br>HIGHEST $L_{Amax}$ , 1 min | DISTANCE TO<br>RECEPTOR (m) | $L_{Amax}$ AT CLOSEST<br>RECEPTOR |
|----------------|---------------------------------------------------------|-----------------------------|-----------------------------------|
| Edenfield Road | 85.3                                                    | 25.0                        | 77.3                              |

As shown above, closest facades are subject to levels higher than 76 dB  $L_{Amax}$ . Therefore, higher specification glazing would be required to mitigate against maximum noise levels generated by road traffic from Edenfield Road.

With regards opening windows, there is a requirement to consider the need to open windows for ventilation and the mitigation of overheating. At this stage, the assessment assumes that ventilation would be provided by way of extract fans in kitchens and bathrooms and openable windows.

#### 4.2.1. VENTILATION CONDITION

It is assumed that the developer would be installing a whole dwelling ventilation system in accordance with Part F of the Building Regulations as it is assumed Natural Ventilation is not appropriate for these dwellings.

Where background ventilators form part of the system, consideration is required to the sound reduction provided by these when in the open position and, as such, are discussed in Section 5.0.

#### 4.2.2. OVERHEATING CONDITION

E3P has considered the potential impact of noise, internally, should windows be opened to mitigate overheating, as per the criteria stipulated in ADO. Any plots/facades that pass this test can open windows for this without resulting in unacceptable internal noise levels. Those that fail the test would be subject to a Part O Overheating Assessment by a suitably qualified consultant.

Part O only applies to bedrooms at night in relation to the average 8-hour noise level and 10th highest maximum noise level.

Given that the site is within a moderate risk location, as per guidance within Approved Document O the external noise limit threshold is 49 dB during the night-time ( $L_{Aeq,8hr}$ ) and 64 dB more than 10 times a night ( $L_{Af,max}$ ).

As can be seen from the figures, plots 1-10, experience an exceedance of the above criterion. As such, a full overheating assessment will be required for these plots as the opening of windows is not an acceptable method for mitigation against overheating. A full overheating assessment should be completed by a suitably qualified consultant and is beyond the scope of the noise impact assessment.



## 5. COMMERCIAL NOISE IMPACT ASSESSMENT

E3P understand that the adjacent existing commercial buildings have no restriction to operations and, although no significant source of sound were observed on site, this assessment has made assumptions on the sources of sound that could potentially exist at the neighbouring units, to predict the noise level impact on the existing closest residential dwellings during the daytime and night-time periods. At this stage, it is assumed that all units will operate 24/7.

With regard to assumptions for the assessment, the following has been considered for the full planning application aspects:

- ✿ Ground elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- ✿ The daytime period has been assessed between the hours of 07:00 to 23:00. For the assessment, BS 4142:2014+A1:2019 has been used to determine the likelihood of adverse impact within the garden areas over a reference time period of 1 hour.
- ✿ The night-time period has been assessed between the hours of 23:00 and 07:00 for a reference time period of 15 minutes.
- ✿ During the daytime periods, it is assumed, that roller shutters to each of the units are open. During the night-time, roller shutters are assumed to be closed.
- ✿ Noise breakout from the façades of the units has been input into the model as vertical area sources; and
- ✿ Soft ground attenuation has been applied, where necessary.

At this stage, the exact noise sources for the units are not known nor can they be predicted in the future. As such, the only viable sources that can be modelled is breakout noise from the units as all yard activity and open roller shutters are fully shielded from the development.

Given that there is an assumed minimum sound reduction of 28 dB is expected for a typical industrial building facade and that it is highly unlikely that internal operations at any unit would exceed 80 dB inside, external noise levels at the facades are expected to be, at most, 46 dB radiating from the façade itself. A simple equation of Sound pressure level outside = Sound pressure level inside – Sound Reduction Index (SRI) of building envelope – 6 dB for diffuse field to free-field correction. In terms of the shutters, when open the sound radiating from this is equal to 74dB.

For the BS 4142:2014+A1:2019 assessments, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source. Given that the proposed usage could possibly be readily distinct against the background sound, a penalty of +3dB has been added.



## 5.1. DAYTIME ASSESSMENT

Table 5.1 details the resultant rating level at each receptor, output from the model. The grid noise map can be seen in Figure 4 of Appendix II.

The median measured background sound level during the daytime periods have been used for each corresponding receptor. This informs a worst-case assessment. Levels correspond to worst case garden noise levels.

TABLE 5.1 BS 4142:2014+A1:2019 ASSESSMENT - DAYTIME

| RECEPTOR        | CALCULATED<br>SPECIFIC LEVEL,<br>$L_{Aeq,T}$<br>(dB) | RATING LEVEL,<br>$L_{A,r}$<br>(dB) | MEDIAN<br>MEASURED<br>BACKGROUND<br>SOUND LEVEL,<br>$L_{A90,1hr}$<br>(dB) | DIFFERENCE<br>+/-<br>(dB) |
|-----------------|------------------------------------------------------|------------------------------------|---------------------------------------------------------------------------|---------------------------|
| Plot 11         | 50                                                   | 53                                 | 44                                                                        | +9                        |
| Plot 12         | 44                                                   | 47                                 |                                                                           | +3                        |
| Plots 13 and 14 | 44                                                   | 47                                 |                                                                           | +3                        |
| Plots 15 and 16 | 47                                                   | 50                                 |                                                                           | +6                        |
| Plot 17         | 45                                                   | 48                                 |                                                                           | +4                        |
| Plot 18         | 38                                                   | 41                                 |                                                                           | -3                        |

Table 5.1 indicates that the predicted rating level exceeds the daytime background sound level by up to 9 dB which is an indication of the source having an adverse impact. As such, mitigation measures are required.

## 5.2. NIGHT-TIME ASSESSMENT

Table 5.2 details the resultant rating level at each receptor, output from the model. The grid noise map can be seen in Figure 5, with façade noise levels noted, of Appendix II.

The lowest measured background sound level during the night-time periods have been used for each corresponding receptor. This informs a worst-case assessment. Levels correspond to worst case garden noise levels. It is assumed that the units would be most active between 06:00 and 07:00.



TABLE 5.2 BS 4142:2014+A1:2019 ASSESSMENT – NIGHT-TIME

| RECEPTOR        | CALCULATED<br>SPECIFIC LEVEL,<br>$L_{Aeq,T}$<br>(dB) | RATING LEVEL,<br>$L_{A,r}$<br>(dB) | LOWEST<br>MEASURED<br>BACKGROUND<br>SOUND LEVEL,<br>$L_{A90,15mins}$<br>(dB) | DIFFERENCE<br>+/-<br>(dB) |
|-----------------|------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------|---------------------------|
| Plot 11         | 41                                                   | 44                                 | 44                                                                           | 0                         |
| Plot 12         | 39                                                   | 42                                 |                                                                              | -2                        |
| Plots 13 and 14 | 39                                                   | 42                                 |                                                                              | -2                        |
| Plots 15 and 16 | 40                                                   | 43                                 |                                                                              | -1                        |
| Plot 17         | 40                                                   | 43                                 |                                                                              | -1                        |
| Plot 18         | 33                                                   | 36                                 |                                                                              | -8                        |

Table 5.2 indicates that the predicted rating level achieves the night-time background sound level.

As such, this is a positive indication of no adverse impact.

Furthermore, at night-time it can be considered more prudent to assess specific levels at internal areas where residents are likely to be sleeping especially between 23:00 and 06:00. The AVO guide suggests an attenuation of 13dB for an open window, which would result in worst case internal levels of 28 dB. This falls below the criteria for internal noise levels during the night-time period.

As such, no further mitigation measures are required.



## 6. MITIGATION

### 6.1. ROAD TRAFFIC SOUND

#### 6.1.1. FAÇADE INSULATION

The previous section determined that certain facades would require higher specification glazing. Specifically, the following glazing specifications are required, per facade, along with details on whole dwelling ventilation.

The worst-case required glazing is chosen per facade. For example, where a glazing needed due to night-time noise is higher than for daytime periods, the night-time requirements are recommended.

Maximum noise level events will also determine the glazing requirement and where mitigation is required due to maximum noise levels the sound reduction values will be given in terms of  $R_w$  and  $R_w+C_{tr}$ . This will allow for the correct glazing units to be selected for each facade.

TABLE 6.1 GLAZING AND VENTILATION REQUIREMENTS

| PLOT    | REQUIRED GLAZING REDUCTION,<br>(dB) | EXAMPLE GLAZING | WHOLE DWELLING VENTILATION SYSTEM                                                                                                                                                                                 |
|---------|-------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Plot 1  | 28 $R_w$ + Ctr (32 $R_w$ )          | 6 / 16 / 4      | Whole dwelling ventilation in accordance with the requirements in Approved Document Part F Volume 1 and an overheating assessment will be required as the criteria in Approved Document Part O has been exceeded. |
| Plot 2  | 28 $R_w$ + Ctr (32 $R_w$ )          | 6 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 3  | 28 $R_w$ + Ctr (32 $R_w$ )          | 6 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 4  | 29 $R_w$ + Ctr (32 $R_w$ )          | 8 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 5  | 29 $R_w$ + Ctr (32 $R_w$ )          | 8 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 6  | 29 $R_w$ + Ctr (32 $R_w$ )          | 8 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 7  | 27 $R_w$ + Ctr (31 $R_w$ )          | 6 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 8  | 27 $R_w$ + Ctr (31 $R_w$ )          | 6 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 9  | 27 $R_w$ + Ctr (31 $R_w$ )          | 6 / 16 / 4      |                                                                                                                                                                                                                   |
| Plot 10 | 27 $R_w$ + Ctr (31 $R_w$ )          | 6 / 16 / 4      |                                                                                                                                                                                                                   |

Figure 6 outlines the specification and locations of these glazing requirements.

The system should be in line with the requirements of Approved Document Part F, Volume 1: Dwellings.

It is assumed that this would be continuous mechanical extract ventilation as the dwellings are not likely to be suitable for natural ventilation. This will consist of either a central extract system, individual room extract fans or a combination of both.

Additionally, background ventilators should satisfy the requirements of ADF and, in order to achieve the required internal ambient noise levels, must achieve a reduction of at least that of the glazing specified for each facade, which is at most 32 dB  $D_{n,e,w}$  in the open position. This level of reduction is likely to be achieved by a standard background ventilator.



## 6.2. COMMERCIAL SOUND

### 6.2.1. EXTERNAL AMENITY AREA

Section 5 determined that the rating level would exceed the background sound level in the rear gardens of plots 11, 12, 17 and 18 during the daytime and therefore have the potential to cause adverse impact on residents using such areas. As such the noise model has been used to predict noise levels in the affected areas but with acoustic barriers in place.

Specifically, the following barriers are modelled:

- 🔊 2.1 m high barrier bounding plots 11 and 12.
- 🔊 1.8m high barrier bounding plots 15, 16, and 17.
- 🔊 2.1m high barrier bounding plot 18 up to the edge of plot 17.

TABLE 6.2 BS 4142:2014+A1:2019 ASSESSMENT - DAYTIME WITH MITIGATION

| RECEPTOR        | CALCULATED<br>SPECIFIC LEVEL,<br>$L_{Aeq,T}$<br>(dB) | RATING LEVEL<br>WITH BARRIERS,<br>$L_{A,r}$<br>(dB) | MEDIAN<br>MEASURED<br>BACKGROUND<br>SOUND LEVEL,<br>$L_{A90,1hr}$<br>(dB) | DIFFERENCE<br>+/-<br>(dB) |
|-----------------|------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------|---------------------------|
| Plot 11         | 41                                                   | 44                                                  | 44                                                                        | 0                         |
| Plot 12         | 40                                                   | 43                                                  |                                                                           | -1                        |
| Plots 13 and 14 | 39                                                   | 42                                                  |                                                                           | -2                        |
| Plots 15 and 16 | 41                                                   | 44                                                  |                                                                           | 0                         |
| Plot 17         | 38                                                   | 41                                                  |                                                                           | -3                        |
| Plot 18         | 32                                                   | 35                                                  |                                                                           | -9                        |

Figure 6 shows the resultant grid noise map. As can be seen, all external areas now achieve or fall below the typical background sound level of 44 dB with mitigation in place.

The barriers proposed can be of wooden fence or brick wall construction but must be sealed at the base, be free from holes and have a minimum mass of 10kg/m<sup>2</sup>.



## **7. CONCLUSION AND RECOMMENDATIONS**

E3P were commissioned by Stonebond Properties Ltd to undertake a Noise Impact Assessment for a proposed residential development at Edenfield Road, Norden.

An attended 3-hour road traffic noise survey has been undertaken for Edenfield Road during a typical weekday period. This provided the daytime average noise levels.

A 3D noise model has been constructed to assess road traffic sound upon the proposed receptors in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019. Possible commercial noise from neighbouring properties has been assessed in accordance with BS 4142:2014+a1:2019 based on reasonable assumptions.

The assessment determined that certain facades require higher specification glazing and all plots require a whole dwelling ventilation system to meet ventilation requirements. Certain plots require acoustic barriers to mitigate commercial noise in external amenity areas.

With mitigation in place, this assessment has shown that no adverse impact is predicted day or night at the receptors due to existing sound sources.

As such, noise need not be a material consideration in the granting of planning permission if the recommendations of this report are followed and included within the design stage.

**END OF REPORT**



# **APPENDIX I**

## **GLOSSARY OF ACOUSTIC TERMINOLOGY**

## NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or  $L_{Aeq}$ ,  $L_{A90}$  etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

| SOUND PRESSURE LEVEL | LOCATION/EXAMPLE           |
|----------------------|----------------------------|
| 0                    | Threshold of hearing       |
| 20–30                | Quiet bedroom at night     |
| 30–40                | Living room during the day |
| 40–50                | Typical office             |
| 50–60                | Inside a car               |
| 60–70                | Typical high street        |
| 70–90                | Inside a factory           |
| 100–110              | Burglar alarm at 1 m away  |
| 110–130              | Jet aircraft on take off   |
| 140                  | Threshold of pain          |



## ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

| DESCRIPTOR                               | EXPLANATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>dB (decibel)</b>                      | The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).                                                                                                                                                                                                                                                                                                                                                        |
| <b>dB(A)</b>                             | A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.                                                                                                                                                                                                                                                                                                                   |
| <b>L<sub>Aeq, T</sub></b>                | L <sub>Aeq</sub> is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.                                                                                                                                                                                                                                                                                                                                       |
| <b>L<sub>Amax</sub></b>                  | L <sub>Amax</sub> is the maximum A-weighted sound pressure level recorded over the period stated. L <sub>Amax</sub> is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L <sub>eq</sub> noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.                                                                                                                                         |
| <b>L<sub>10</sub> and L<sub>90</sub></b> | If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L <sub>n</sub> indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L <sub>10</sub> is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L <sub>90</sub> is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L <sub>10</sub> index to describe traffic noise. |
| <b>Free-field Level</b>                  | A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.                                                                                                                                                                                                                                                                                                                                  |
| <b>Fast</b>                              | A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Slow</b>                              | A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.                                                                                                                                                                                                                                                                                                                                                                                                                                             |



# APPENDIX II

## FIGURES

Figure 1 - Noise Measurement Positions



**Project:**  
Edenfield Road,  
Norden

**Project-No:**  
50-868

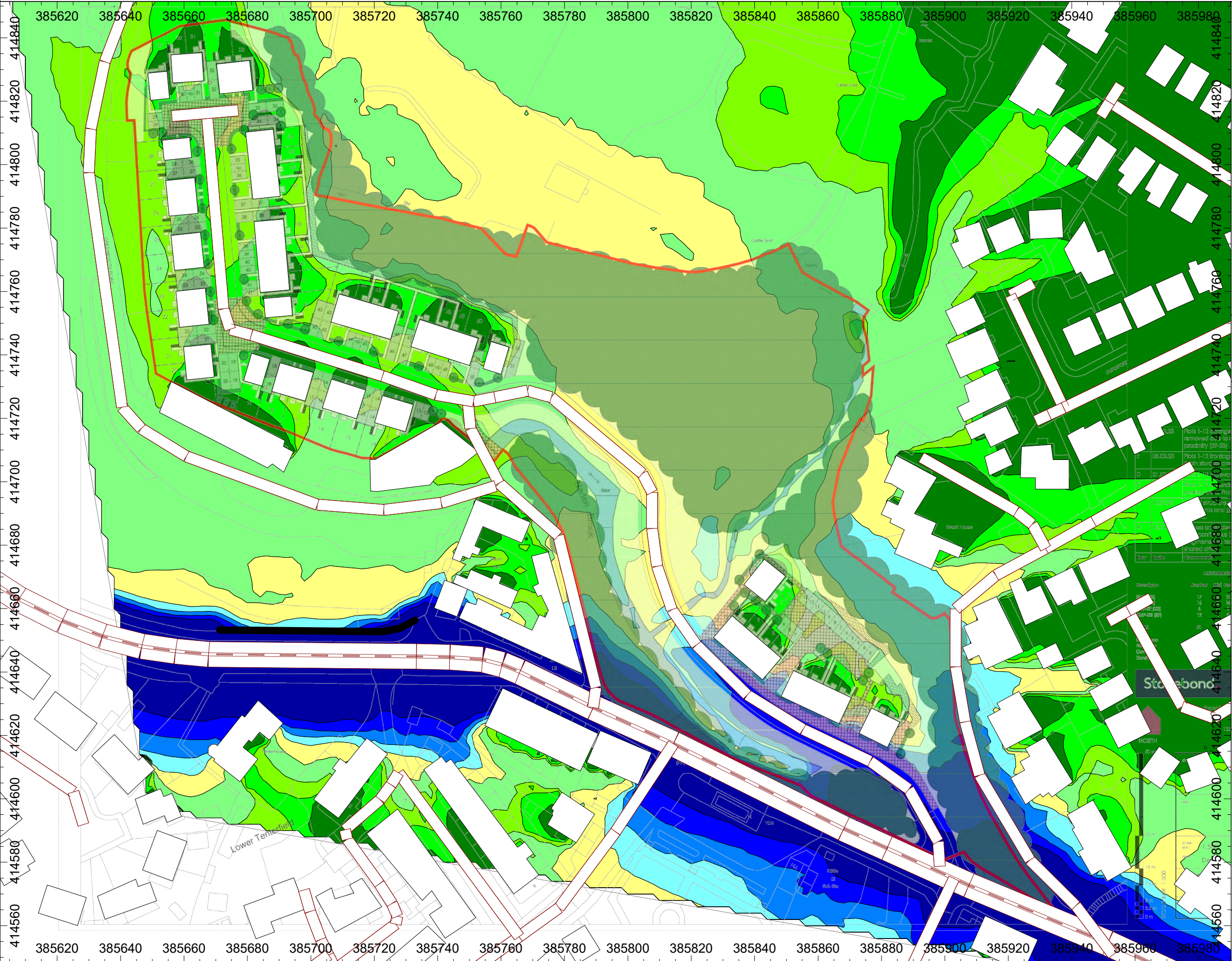
**Client:**  
Stonebond

**N**



Project Engineer: Melissa Bailey  
Date: 18/05/2023

Figure 2 - Daytime Grid Noise Map - Calculation at 1.5 m above ground level



**Project:**  
Edenfield Road,  
Norden

**Project-No:**  
50-868

**Client:**  
Stonebond

**Daytime Noise Level,  
LAeq 16hr (dB)**

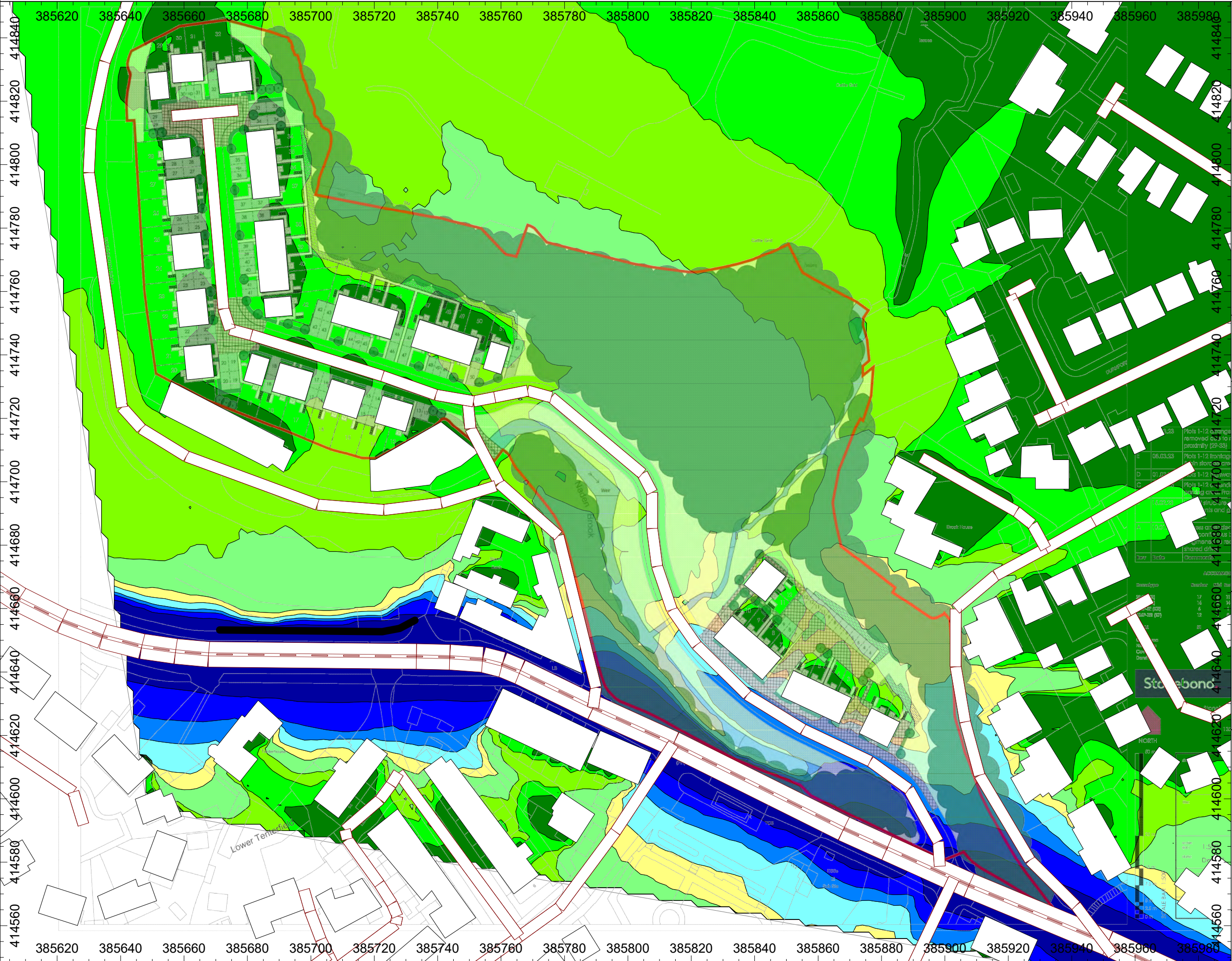
|          |      |
|----------|------|
| ...      | ≤ 48 |
| 48 < ... | ≤ 50 |
| 50 < ... | ≤ 52 |
| 52 < ... | ≤ 56 |
| 56 < ... | ≤ 58 |
| 58 < ... | ≤ 60 |
| 60 < ... | ≤ 62 |
| 62 < ... | ≤ 65 |
| 65 < ... |      |

**Noise Map Objects**

|  |                  |
|--|------------------|
|  | Road             |
|  | Building         |
|  | Barrier          |
|  | Calculation Area |

Project Engineer: Melissa Bailey  
Date: 19/05/2023

Figure 3 - Night-time Grid Noise Map - Calculation at 4 m above ground level



**Project:**  
Edenfield Road,  
Norden

**Project-No:**  
50-868

**Client:**  
Stonebond

**Night-time Noise Level,  
LAeq 8hr (dB)**

|                |                |
|----------------|----------------|
| Dark Green     | ... <= 42      |
| Light Green    | 42 < ... <= 45 |
| Yellow-Green   | 45 < ... <= 47 |
| Light Yellow   | 47 < ... <= 50 |
| Yellow         | 50 < ... <= 52 |
| Light Blue     | 52 < ... <= 55 |
| Blue           | 55 < ... <= 57 |
| Dark Blue      | 57 < ... <= 60 |
| Very Dark Blue | 60 < ...       |

**Noise Map Objects**

|                    |                  |
|--------------------|------------------|
| Red outline        | Road             |
| White outline      | Building         |
| Thick black line   | Barrier          |
| Thin black outline | Calculation Area |



Project Engineer: Melissa Bailey  
Date: 19/05/2023

### Figure 4 - Glazing Requirements

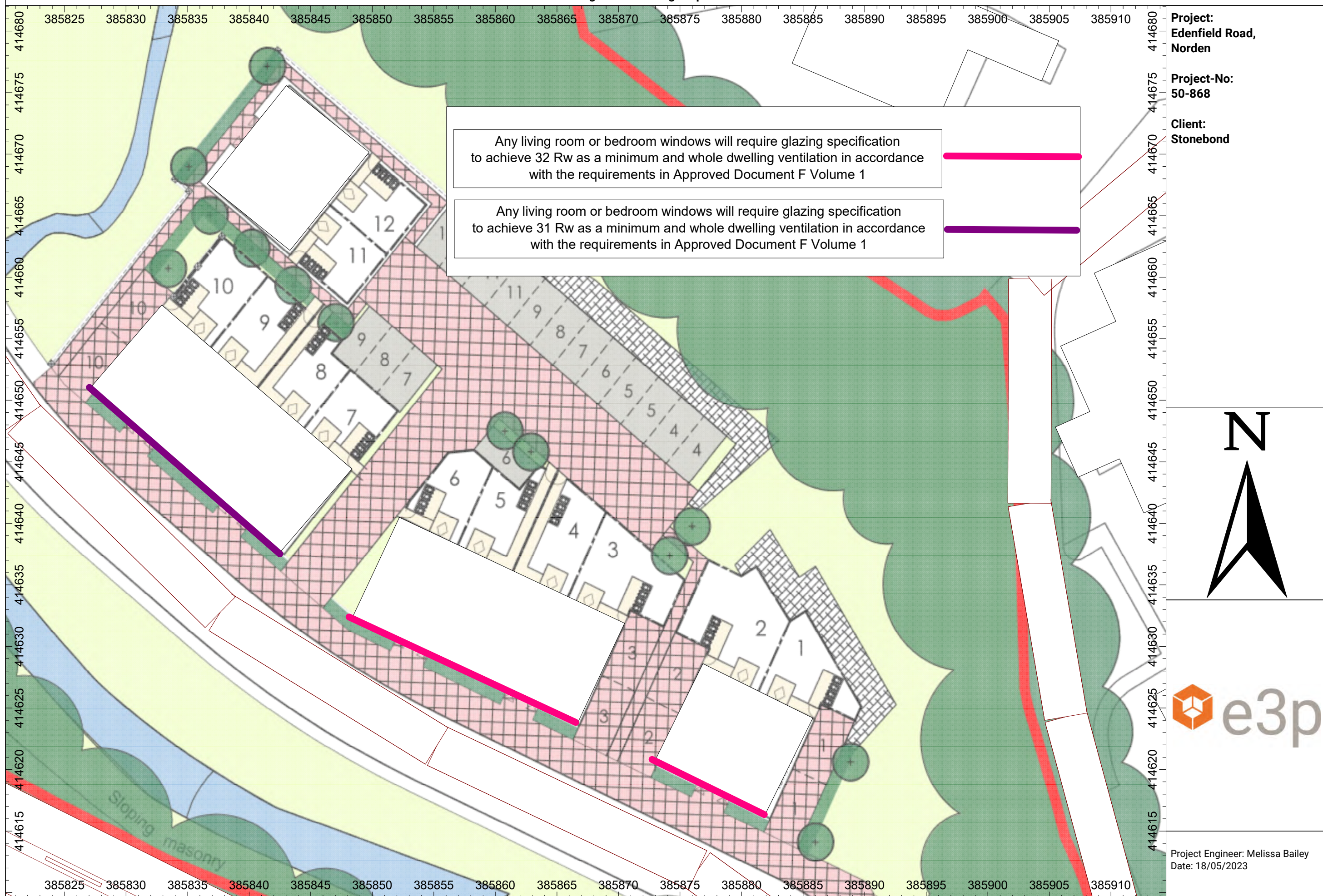
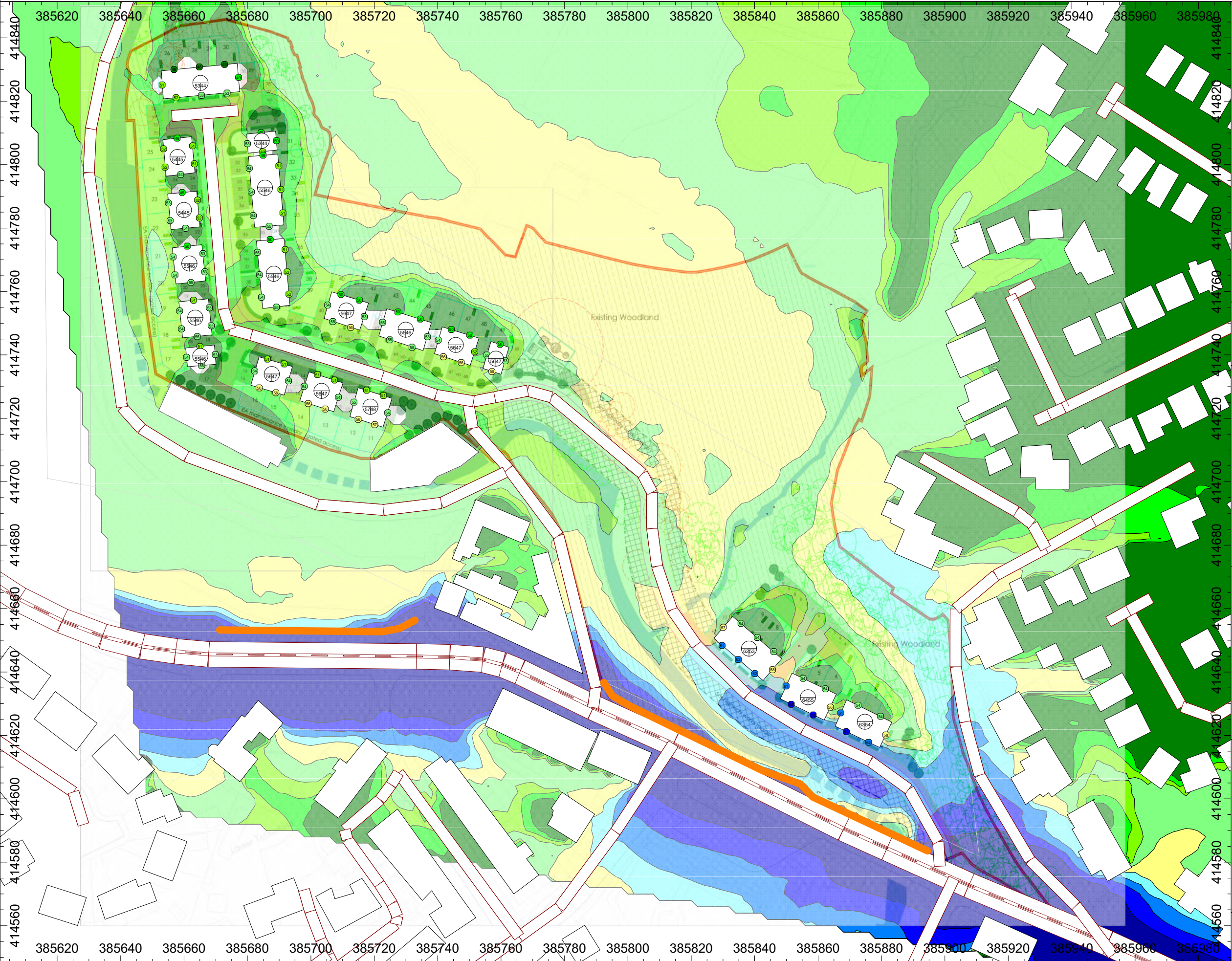


Figure 2 - Daytime Grid Noise Map - Calculation at 1.5 m above ground level



**Project:**  
Edenfield Road,  
Norden

**Project-No:**  
50-868

**Client:**  
Stonebond

**Daytime Noise Level,  
LAeq 16hr (dB)**

|                |               |
|----------------|---------------|
| Dark Green     | ... ≤ 48      |
| Light Green    | 48 < ... ≤ 50 |
| Yellow-Green   | 50 < ... ≤ 52 |
| Yellow         | 52 < ... ≤ 56 |
| Light Blue     | 56 < ... ≤ 58 |
| Medium Blue    | 58 < ... ≤ 60 |
| Dark Blue      | 60 < ... ≤ 62 |
| Very Dark Blue | 62 < ... ≤ 65 |
| Black          | 65 < ...      |

**Noise Map Objects**

- vert. Area Source
- Road
- Building
- Barrier
- Building Evaluation
- Calculation Area



Project Engineer: Melissa Bailey  
Date: 15/05/2023

**Client:**  
**Stonebond**

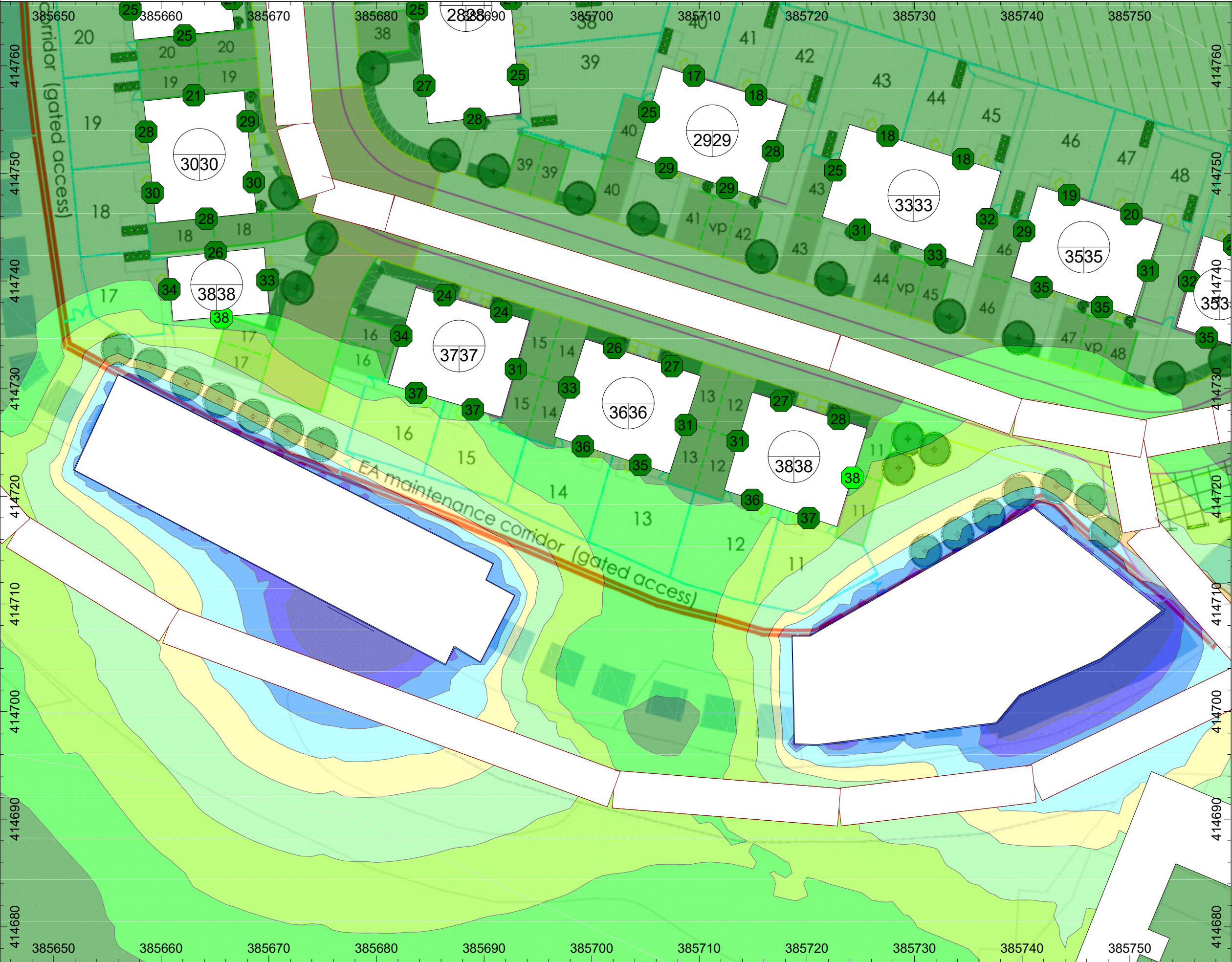
|                                                                                     |                |
|-------------------------------------------------------------------------------------|----------------|
|  | ... <= 42      |
|  | 42 < ... <= 45 |
|  | 45 < ... <= 47 |
|  | 47 < ... <= 50 |
|  | 50 < ... <= 52 |
|  | 52 < ... <= 55 |
|  | 55 < ... <= 57 |
|  | 57 < ... <= 60 |
|  | 60 < ...       |

-  vert. Area Source
-  Road
-  Building
-  Barrier
-  Building Evaluation
-  Calculation Area



Project Engineer: Melissa Bailey  
Date: 15/05/2023

Figure 4 - Daytime Grid Noise Map (BS 4142) - Calculation at 1.5 m above ground level



**Project:**  
Edenfield Road,  
Norden

**Project-No:**  
50-868

**Client:**  
Stonebond

**Daytime Noise Level,  
LAr (dB)**

|          |       |
|----------|-------|
| ...      | <= 38 |
| 38 < ... | <= 40 |
| 40 < ... | <= 42 |
| 42 < ... | <= 45 |
| 45 < ... | <= 48 |
| 48 < ... | <= 50 |
| 50 < ... | <= 52 |
| 52 < ... | <= 55 |
| 55 < ... |       |

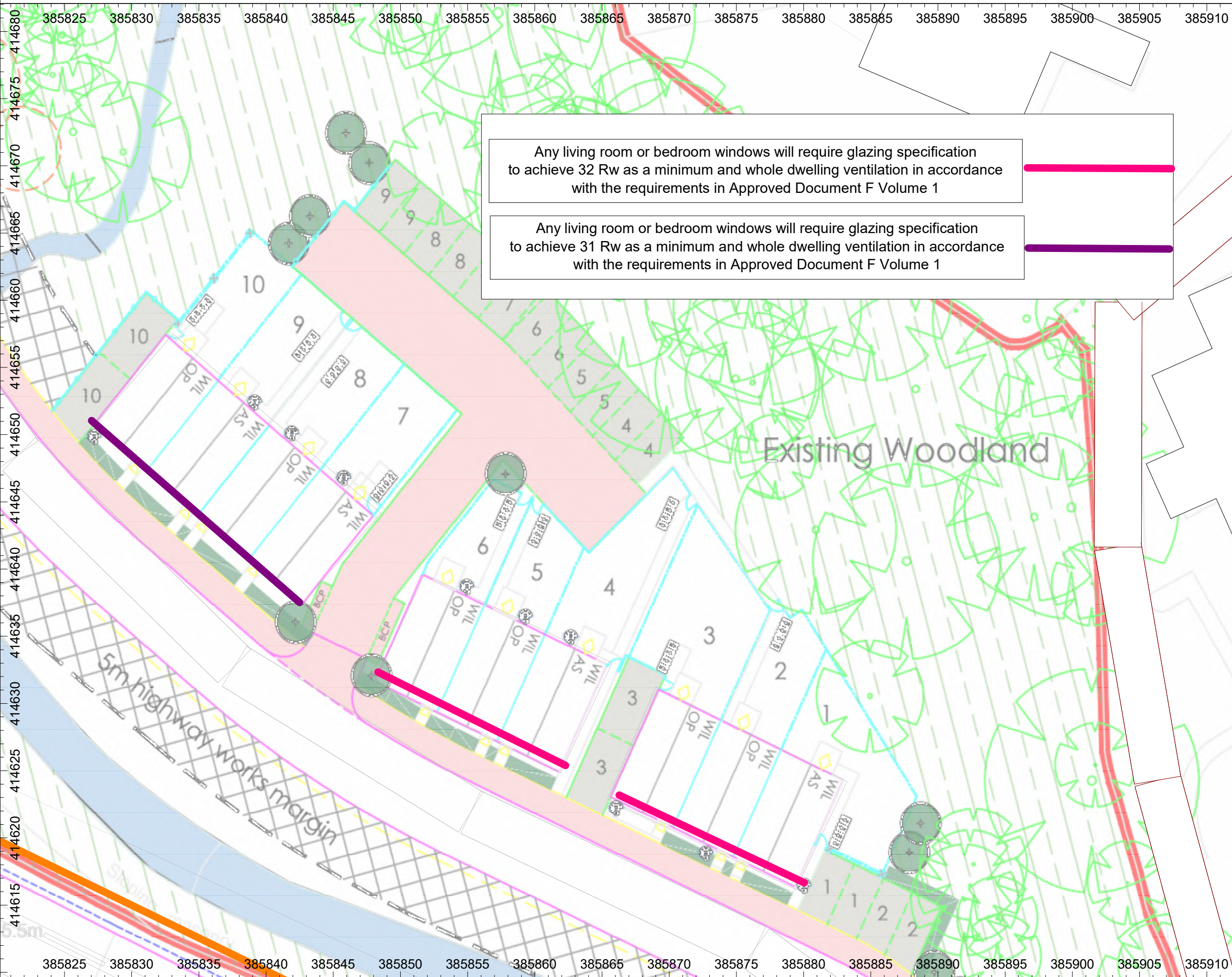
**Noise Map Objects**

- vert. Area Source
- Road
- Building
- Barrier
- Building Evaluation
- Calculation Area

**e3p**

Project Engineer: Melissa Bailey  
Date: 22/09/2023

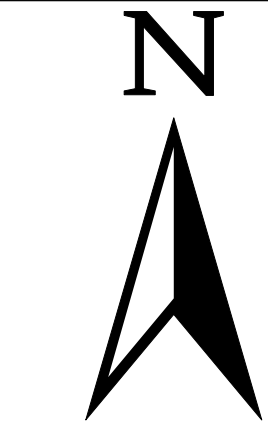
Figure 5 - Glazing Requirements



Project:  
Edenfield Road,  
Norden

Project-No:  
50-868

Client:  
Stonebond



Project Engineer: Melissa Bailey  
Date: 15/05/2023

Figure 6 - Daytime Grid Noise Map (BS 4142) - Mitigation - Calculation at 1.5 m above ground level

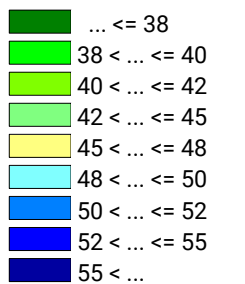


**Project:**  
Edenfield Road,  
Norden

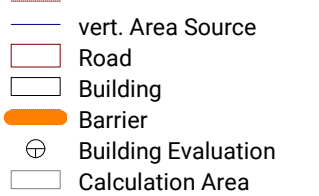
**Project-No:**  
50-868

**Client:**  
Stonebond

**Daytime Noise Level,  
LAr (dB)**



**Noise Map Objects**



Project Engineer: Melissa Bailey  
Date: 22/09/2023