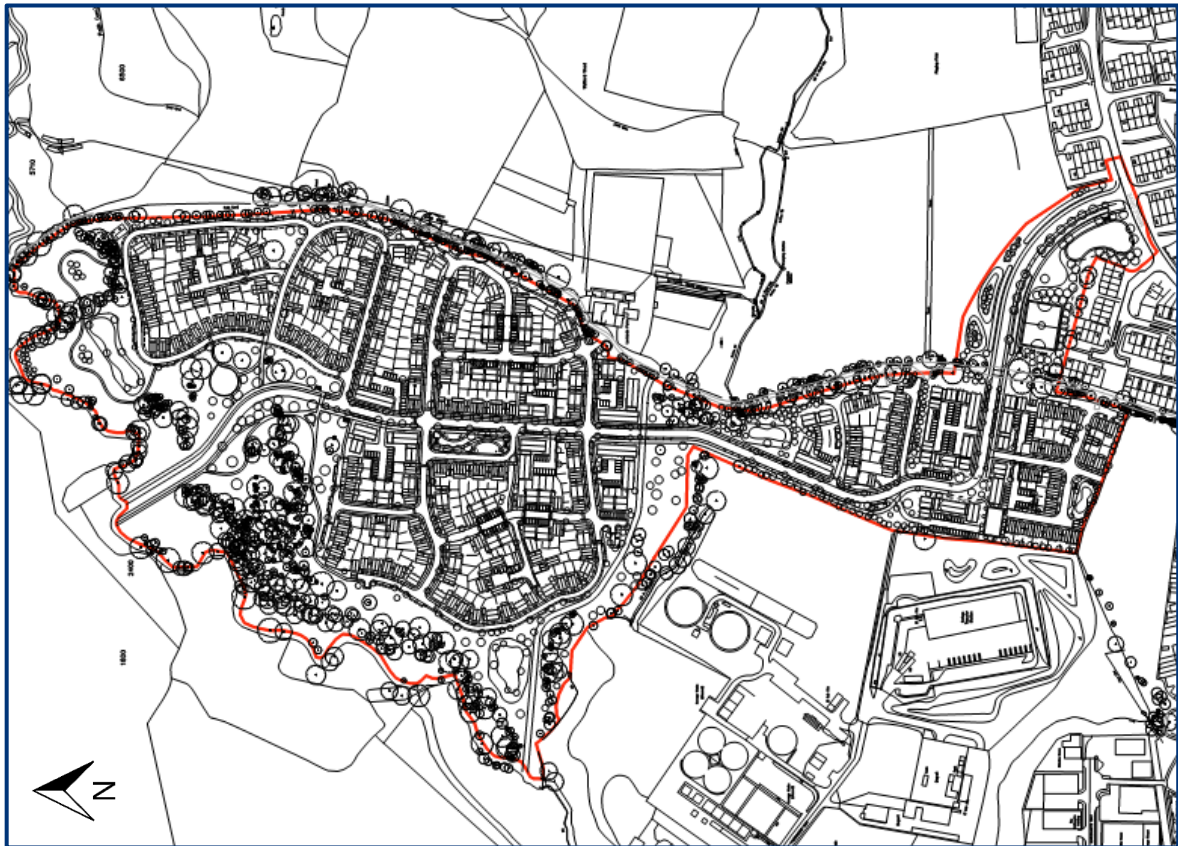


# Burgess Hill Northern Arc East, Phases 1-3, Sussex, RH15 8SE

## Noise Assessment

**784-B027195**



**Countryside Properties (UK) Ltd**

**February 2021**

**Prepared on Behalf of Tetra Tech Limited. Registered in England number: 01959704**

## Document control

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## 1.0 INTRODUCTION

### 1.1 PURPOSE OF THIS REPORT

This report presents the findings of a noise assessment for a proposed residential development on land north of Burgess Hill to discharge Condition 12 of planning permission reference DM/18/0509 which states:

12. *Prior to the occupation of any of the dwellings hereby permitted, details of a scheme of acoustic protection for those dwellings shall be submitted and approved in writing by the Local Planning Authority. The scheme shall be in accordance with recommendations listed in Section 6.1 of the submitted WYG\* Noise Assessment dated Jan 2018 and shall include details of acoustic protection sufficient to ensure the maximum internal noise levels in bedrooms and living rooms in residential properties, post construction, will comply with those stated in Table 4 of BS8233:2014. Where internal noise levels will be exceeded with windows open, the scheme shall incorporate appropriate acoustically screened mechanical ventilation or other ventilation capable of providing adequate ventilation for the thermal comfort of the occupants. The scheme shall include details of acoustic protection sufficient to ensure external amenity area & garden noise levels of not more than 55dB L<sub>Aeq</sub> T (where T is 07:00 - 23:00) unless otherwise agreed in writing. All works which form part of the approved scheme shall be completed before any part of the relevant phase of development is occupied and shall thereafter be maintained in accordance with the approved details.*

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to verify predictions of the short-term and long-term effects of noise. The noise levels from the proposed development have been predicted at local representative receptors using CADNA noise modelling software which incorporates ISO 9613 and CRTN methodologies and calculations.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A.

*\*For information, WYG is the former trading name of Tetra Tech.*

## 1.2 ACOUSTIC CONSULTANTS' QUALIFICATIONS AND PROFESSIONAL MEMBERSHIPS

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The lead project Acoustic Consultant is David Fink. The report has been checked by Emma Aspinall and verified by Nigel Mann. Relevant qualifications, membership and experience are summarised below.

**Table 1.1 Acoustic Consultants' Qualifications & Experience**

| Name          | Job Title                       | Education            | Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics) | Attained Associate Membership of the Institute of Acoustics (date) | Attained Membership of the Institute of Acoustics (date) |
|---------------|---------------------------------|----------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------|
| David Fink    | Environmental Technician        | BEng 2016            | Mar 2017                                                                                 | Jun 2017                                                           | -                                                        |
| Emma Aspinall | Senior Environmental Consultant | MGeol 2017           | Jul 2017                                                                                 | Jan 2021                                                           |                                                          |
| Nigel Mann    | Director                        | BSc 1997<br>MSc 1999 | Nov 2001                                                                                 | Nov 1998                                                           | Nov 2001                                                 |

## 2.0 ASSESSMENT CRITERIA

### 2.1 INTERNAL NOISE ASSESSMENT CRITERIA

In accordance with Condition 12 and the previous Tetra Tech (formerly WYG) Noise Assessment (Ref: A078699-1 dated January 2018), Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified in the planning condition for the site. The noise level criteria detailed below have been derived from standards and design guidance:

BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings – Code of practice'  
World Health Organisation (WHO): 'Guidelines for Community Noise (1999)'

**Table 2.1 Noise Level Criteria and Actions**

| Effect Level                                      | Noise Level Criteria                                                                                                                                                                                                                                                                                                                                                | Action/Justification                                                                                                                                                                                                                             |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lowest Observed Adverse Effect Level (LOAEL)      | Internal noise levels do not exceed (with windows open):<br>Bedrooms (night-time) – 30 dBL <sub>Aeq,8hours</sub><br>/ 45 dBL <sub>Amax</sub> (up to 10 – 15 times per night)<br>Living Rooms (daytime) – 35 dBL <sub>Aeq,16hours</sub><br>External noise levels do not exceed:<br>Private external Amenity Space (daytime) – 55 dBL <sub>Aeq,16hours</sub>          | No Action Required<br>Within BS8233/WHO Criteria                                                                                                                                                                                                 |
| Significant Observed Adverse Effect Level (SOAEL) | Internal noise levels exceed (with windows closed):<br>Bedrooms (night-time) – 30 dBL <sub>Aeq,8hours</sub><br>/ 45 dBL <sub>Amax</sub> (More than 15 times per night)<br>Living Rooms (daytime) – 35 dBL <sub>Aeq,16hours</sub><br>Depending on context, external noise levels exceed:<br>Private external Amenity Space (daytime) – 55 dBL <sub>Aeq,16hours</sub> | Mitigate to achieve (with windows closed):<br>Bedrooms – 30 dB L <sub>Aeq,8hours</sub> / 45 dBL <sub>Amax</sub><br>Living Rooms – 35 dB L <sub>Aeq,16hours</sub><br>Depending on context, external amenity space – 55 dBL <sub>Aeq,16hours</sub> |

For the purposes of this assessment, the maximum external noise level from the source under consideration will be 45 dB(A) during the daytime, and 40 dB(A) during the night-time to ensure a maximum daytime L<sub>Aeq</sub> of 35 dB, and a maximum night-time L<sub>Aeq</sub> of 30 dB within habitable rooms are achieved. Similarly, outdoor levels of 60 dB L<sub>Amax</sub> for open windows at night or internal levels of 45 dB L<sub>Amax</sub> no more than 10-15 times a night will be considered.

## 3.0 ASSESSMENT METHODOLOGY

### 3.1 NOISE MODELLING METHODOLOGY

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict  $L_{Aeq}$  and  $L_{Amax}$  noise levels at a large number of locations both horizontally and vertically. CADNA noise modelling software has been used (as shown in Figure 3.1). This model is based on the Department of Transport Calculation of Road Traffic Noise (CRTN) and ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.

**Figure 3.1** CADNA Noise Model



The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in the table below have been used.

**Table 3.1 Modelling Parameters Sources and Assumptions**

| Parameter                            | Source                                | Details                                                                                                                                                 |
|--------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Horizontal distances – around site   | Ordnance Survey                       | Ordnance Survey                                                                                                                                         |
| Ground levels – around site          | Ordnance Survey                       | Ordnance Survey                                                                                                                                         |
| Ground levels – other areas          | Site Observations and Ordnance Survey | OS 1:25,000 contours and OS 1:10,000 spot heights.                                                                                                      |
| Traffic data, main surrounding roads | Tetra Tech                            | Traffic flows for local roads based on Tetra Tech observations and experience                                                                           |
| Traffic data – local roads           | Tetra Tech                            | Traffic flows for local roads based on Tetra Tech observations and experience                                                                           |
| Building heights – around site       | Tetra Tech                            | 8m height for two storey residential properties.                                                                                                        |
| Barrier heights                      | Countryside Properties                | Barrier heights detailed on drawing Number: CS/BTP/01, CS/BTP/023, all garden fences modelled at 1.8m height.                                           |
| Receptor positions                   | Tetra Tech                            | 1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties. 1.5 m height for model grid and monitoring locations for validation. |
| Plans                                | Countryside Properties                | Phase 1 – Drawing No.: CS/BTP/01 Rev A<br>Phases 2 & 3 – Drawing No.: CS/BTP/023 Rev A                                                                  |

It is acknowledged that a number of these parameters will affect the overall noise levels presented in this report. However, it should be noted that certain assumptions made, as identified above, are worst-case.

## 3.2 RECYCLING NOISE - COMBINED DEPOSITING NOISE DATA

The following worst-case calculations from the Burgess Hill Civic Amenity/Transfer Station site near to the Eastern Arc have been based on worst case measurements of the glass repository at a recycling facility in use at a similar site and the levels obtained below have been used in the model to represent its use. The calculations below are based on a maximum of 10 recycling events per hour, each event lasting 5 minutes and consisting of a vehicle approaching the recycling facility (1 min) followed by the tipping of bottles into the metal repository (3 mins) and then the vehicle departing (1 min). General noise such as glass bottles being carried to the container and vehicle doors opening/closing are also represented in the monitoring data. This is modelled as a point source.

- *L<sub>Aeq</sub> Noise Level – Light Vehicles*

10 × 1 minutes at L<sub>p</sub> 44.7 dB at 3 m distance (vehicle arriving and manoeuvring)

10 × 3 minutes at L<sub>p</sub> 69.7 dB at 3 m distance (vehicle idling and bottle smashing)

10 × 1 minutes at L<sub>p</sub> 44.7 dB at 3 m distance (vehicle manoeuvring and leaving)

$$L_{Aeq}(60 \text{ mins}) = 10\log(1/60)(20 \text{ min} \times 10^{0.1 \times 44.7\text{dB}} + 30 \text{ min} \times 10^{0.1 \times 69.7\text{dB}})$$

$$= 66.7 \text{ dB at 3 m distance}$$

- *L<sub>Amax</sub> Noise levels – Light Vehicles*  
L<sub>Amax</sub> used is as 88.3 dB at 3 m distance

### 3.3 MODEL VERIFICATION

The model was verified by modelling the monitoring locations for the 'existing' baseline scenario. Daytime and night-time L<sub>Aeq</sub>, and night-time L<sub>Amax</sub> scenarios have been verified. These assessments include noise from the existing roads, Goddards Green Sewage Treatment Plant and the Burgess Hill Civic Amenity/Transfer Station site. The comparison between the monitoring and modelling results are presented in Tables 3.2 - 3.4 below.

**Table 3.2 Modelled vs. Monitored Results L<sub>Aeq</sub>; daytime 07:00 – 23:00**

| Location | Monitored L <sub>Aeq</sub> | Modelled L <sub>Aeq</sub> | Difference between Monitored and Modelled Results |
|----------|----------------------------|---------------------------|---------------------------------------------------|
| LT1      | 68.3                       | 69.3                      | 1.0                                               |
| LT2      | 47.2                       | 47.5                      | 0.3                                               |
| LT3      | 70.1                       | 70.4                      | 0.3                                               |
| ST1      | 48.1                       | 49.3                      | 1.2                                               |
| ST2      | 72.1                       | 71.9                      | -0.2                                              |
| ST3      | 77.9                       | 77.9                      | 0.0                                               |
| ST4      | 58.0                       | 55.7                      | -2.3                                              |
| ST5      | 51.0                       | 50.0                      | -1.0                                              |

All values are sound pressure levels in dB re: 2x 10<sup>-5</sup> Pa

**Table 3.3 Modelled vs. Monitored Results L<sub>Aeq</sub>; night-time 23:00 – 07:00**

| Location | Monitored L <sub>Aeq</sub> | Modelled L <sub>Aeq</sub> | Difference between Monitored and Modelled Results |
|----------|----------------------------|---------------------------|---------------------------------------------------|
| LT1      | 60.1                       | 61.9                      | 1.8                                               |
| LT2      | 40.9                       | 40.8                      | -0.1                                              |
| LT3      | 60.5                       | 61.6                      | 1.1                                               |
| ST1      | 36.4                       | 36.8                      | 0.4                                               |
| ST2      | 64.9                       | 64.8                      | -0.1                                              |
| ST3      | 68.8                       | 68.6                      | -0.2                                              |
| ST4      | 42.0                       | 42.0                      | 0.0                                               |
| ST5      | 35.8                       | 35.0                      | -0.8                                              |

All values are sound pressure levels in dB re: 2x 10<sup>-5</sup> Pa

**Table 3.4 Modelled vs. Monitored Results  $L_{A\text{Max}}$ ; night-time 23:00 – 07:00**

| Location | Monitored $L_{Aeq}$ | Modelled $L_{Aeq}$ | Difference between Monitored and Modelled Results |
|----------|---------------------|--------------------|---------------------------------------------------|
| LT1      | 91.9                | 90.1               | -1.8                                              |
| LT2      | 70.8                | 72.1               | 1.3                                               |
| LT3      | 90.6                | 87.8               | -2.8                                              |
| ST1      | 62.4                | 63.2               | 0.8                                               |
| ST2      | 85.7                | 88.5               | 2.8                                               |
| ST3      | 93.7                | 95.3               | 1.6                                               |
| ST4      | 64.5                | 63.4               | -1.1                                              |
| ST5      | 59.9                | 59.2               | -0.7                                              |

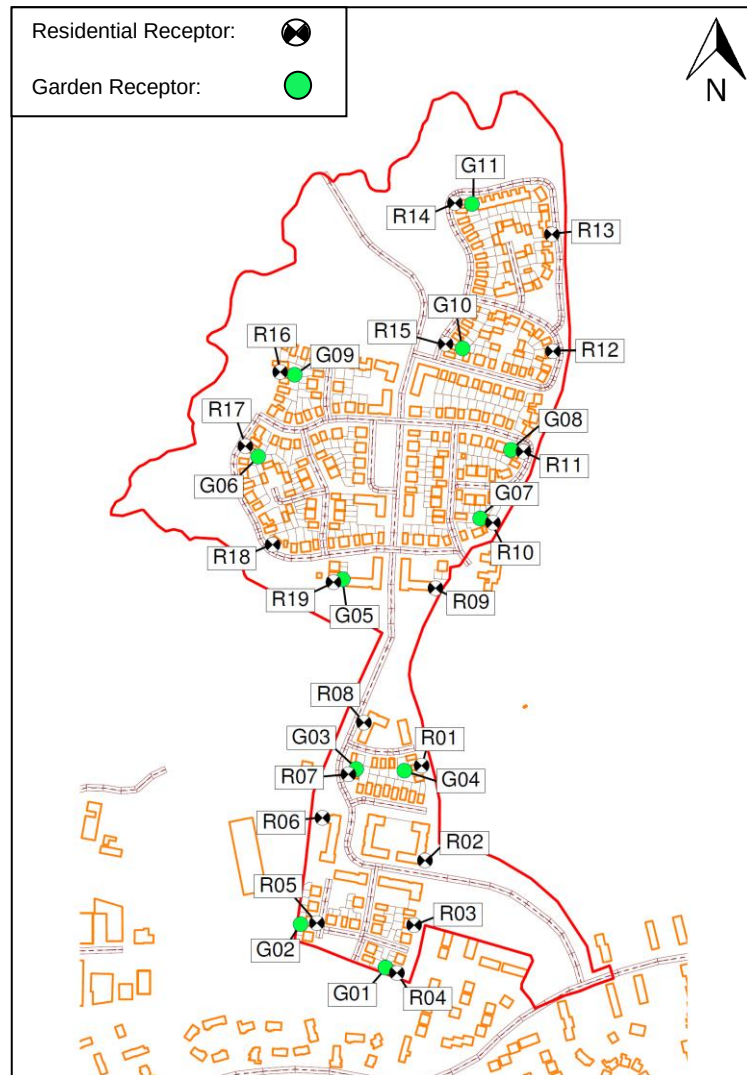
All values are sound pressure levels in dB re:  $2 \times 10^{-5}$  Pa

This model can be considered suitably verified, as there is no divergence between the monitored and modelled greater than  $\pm 3.0$  dB across all locations monitored.

### 3.4 SENSITIVE RECEPTORS

Noise levels from existing noise sources surrounding the site have been assessed at proposed properties across the site. The locations of the proposed receptors are shown in Figure 3.2 below.

**Figure 3.2 Proposed Receptor Locations**



Not to scale  
OS Licence No. AL553611

## 4.0 BASELINE NOISE SURVEY

### 4.1 NOISE SURVEY METHODOLOGY

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

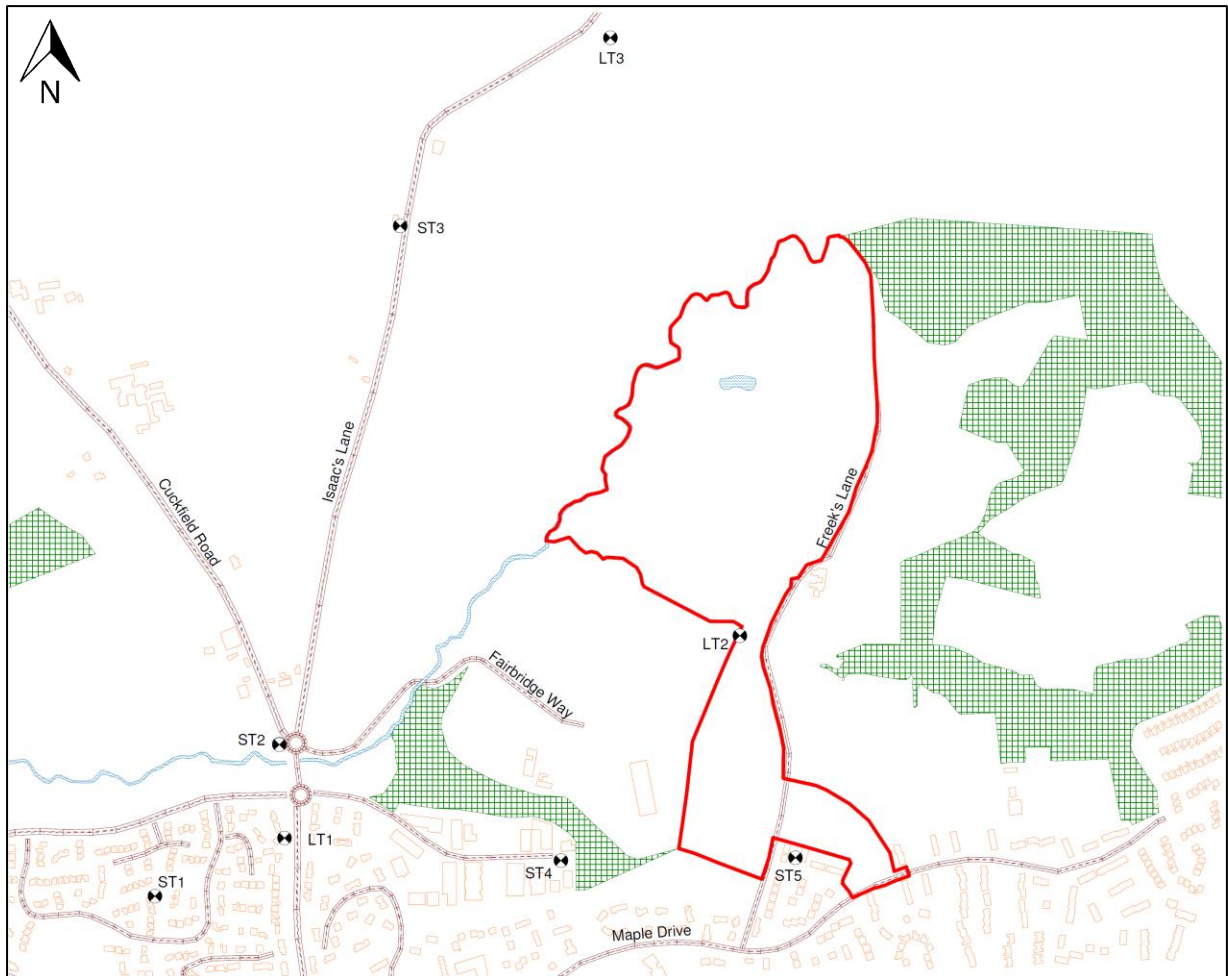
*B&K 2260 Environmental Noise Analyser (WYG1) s/n 2361273*  
*B&K 2238 Environmental Noise Analyser (WYG7) s/n 2622850*  
*B&K 2238 Environmental Noise Analyser (WYG9) s/n 2684499*  
*B&K 4231 Calibrator s/n 2176211*  
*Rion NL-32 Environmental Noise Analyser (WYG11) s/n 123729*  
*Rion NL-32 Environmental Noise Analyser (WYG12) s/n 213442*  
*Rion NL-52 Environmental Noise Analyser (WYG13) s/n 620858*  
*Rion NL-52 Environmental Noise Analyser (WYG14) s/n 610212*

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice and no drift was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

A baseline monitoring survey was undertaken at eight locations from Wednesday 24th October 2012 to Monday 29th October 2012. Attended short term measurements were undertaken at five locations during the day, evening, peak and night-time periods with three additional locations being measured unattended over a 123-hour period. The monitoring locations chosen are displayed in Figure 4.1. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 The Description and Measurement of Environmental Noise: Guide to quantities and procedures. Weather conditions during the survey period were observed as being dry with scattered showers. Anemometer readings confirmed that wind speeds were less than 5 ms<sup>-1</sup> at all times during the survey with a predominant westerly wind direction.

**Figure 4.1 Noise Monitoring Locations**



Not to scale  
OS Licence No. AL553611

## 4.2 NOISE SURVEY RESULTS

Existing ambient noise levels around the site are dominated by local traffic and pedestrians. Noise environments at locations ST1, ST2 & ST3 were dominated by noise from the A2300 and Jane Murray Way. Sources from St Pauls Catholic College and the Leisure Centre off The Acorns were audible during daytime hours. From ST4 to ST6 and ST10, the main noise source was from the A273 (Sussex Way /Jane Murray Way).

At ST7, 8, 9 and 11 the predominant noise source was the B2036. The main noise sources at ST12 were local businesses and traffic on Merchants Way. The dominant noise source at ST13 was general traffic and residents on or around Maple Drive / The Hawthorns.

Ambient and background noise levels are usually described using the  $L_{Aeq}$  index (a form of energy average) and the  $L_{A90}$  index (i.e. the level exceeded for 90% of the measurement period) respectively.

Road traffic noise is generally described using the LA10 index (i.e. the level exceeded for 10% of the measurement period).

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re:  $2 \times 10^{-5}$  Pa).

**Table 4.1 Results of Baseline Noise Monitoring Survey (Average Levels)**

| Period                   | Duration (T) | Monitoring Date and Times                | Location | L <sub>Aeq,T</sub> (dB) | L <sub>Amax,T</sub> (dB) | L <sub>Amin,T</sub> (dB) | L <sub>A10,T</sub> (dB) | L <sub>A90,T</sub> (dB) |
|--------------------------|--------------|------------------------------------------|----------|-------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| Day<br>07:00 - 23:00     | 82 hours     | 24/10/2012 - 29/10/2012<br>10:34 - 11:59 | LT1      | 68.3                    | 100.9                    | 34.6                     | 70.8                    | 57.4                    |
| Night<br>23:00 - 07:00   | 40 hours     | 24/10/2012 - 29/10/2012<br>23:00 - 07:00 |          | 60.1                    | 91.9                     | 22.8                     | 57.9                    | 37.3                    |
| Day<br>07:00 - 23:00     | 82 hours     | 24/10/2012 - 29/10/2012<br>11:17 - 13:22 | LT2      | 47.2                    | 86.1                     | 31.0                     | 48.2                    | 42.1                    |
| Night<br>23:00 - 07:00   | 40 hours     | 24/10/2012 - 29/10/2012<br>23:00 - 07:00 |          | 40.9                    | 70.8                     | 20.9                     | 40.7                    | 33.7                    |
| Day<br>07:00 - 23:00     | 82 hours     | 24/10/2012 - 29/10/2012<br>11:53 - 13:13 | LT3      | 70.1                    | 99.7                     | 28.1                     | 73.8                    | 48.9                    |
| Night<br>23:00 - 07:00   | 40 hours     | 24/10/2012 - 29/10/2012<br>23:00 - 07:00 |          | 60.5                    | 90.6                     | 22.4                     | 52.1                    | 35.8                    |
| Day<br>07:00-19:00       | 15 Mins      | 24/10/2012 14:10                         | ST1      | 48.1                    | 66.6                     | 40.5                     | 49.0                    | 43.3                    |
|                          | 15 Mins      | 25/10/2012 11:30                         | ST2      | 72.1                    | 90.6                     | 48.9                     | 76.5                    | 53.6                    |
|                          | 15 Mins      | 25/10/2012 11:51                         | ST3      | 77.9                    | 93.3                     | 44.5                     | 82.5                    | 49.5                    |
|                          | 15 Mins      | 25/10/2012 12:35                         | ST4      | 58.0                    | 82.6                     | 41.7                     | 61.6                    | 44.4                    |
|                          | 15 Mins      | 25/10/2012 13:17                         | ST5      | 51.0                    | 72.0                     | 39.8                     | 50.8                    | 42.1                    |
| Evening<br>19:00 - 23:00 | 15 Mins      | 24/10/2012 20:55                         | ST1      | 45.4                    | 63.6                     | 36.2                     | 45.6                    | 39.4                    |
|                          | 15 Mins      | 25/10/2012 19:17                         | ST2      | 73.5                    | 91.9                     | 54.6                     | 77.5                    | 57.8                    |
|                          | 15 Mins      | 25/10/2012 19:36                         | ST3      | 76.7                    | 92.9                     | 47.2                     | 80.7                    | 51.9                    |
|                          | 15 Mins      | 25/10/2012 20:21                         | ST4      | 47.0                    | 62.8                     | 39.0                     | 49.1                    | 43.2                    |
|                          | 15 Mins      | 25/10/2012 20:39                         | ST5      | 46.0                    | 77.7                     | 37.5                     | 47.1                    | 39.6                    |
| Night<br>23:00 - 07:00   | 15 Mins      | 25/10/2012 00:58                         | ST1      | 36.4                    | 62.4                     | 21.8                     | 38.0                    | 24.1                    |
|                          | 15 Mins      | 25/10/2012 23:19                         | ST2      | 64.9                    | 85.7                     | 41.6                     | 63.7                    | 45.8                    |
|                          | 15 Mins      | 25/10/2012 23:36                         | ST3      | 68.8                    | 93.7                     | 33.2                     | 60.1                    | 37.1                    |
|                          | 15 Mins      | 26/10/2012 00:15                         | ST4      | 42.0                    | 64.5                     | 30.2                     | 42.0                    | 31.9                    |
|                          | 15 Mins      | 26/10/2012 00:37                         | ST5      | 35.8                    | 59.9                     | 25.1                     | 38.0                    | 26.8                    |

All values are sound pressure levels in dB re:  $2 \times 10^{-5}$  Pa

## 5.0 ASSESSMENT OF EFFECTS

### 5.1 NOISE INTRUSION ASSESSMENT

Internal noise levels within potential dwellings have been assessed both with windows open, where a reduction from a partially open window of 10 dB has been used, and with windows closed where an assumption of glazing with specification  $R_w$  30 dB (e.g 6/12/6mm double glazing or equivalent) has been used. The results presented in tables 5.1 – 5.3 below show the predicted noise intrusion levels across the site, with noise contour plots for the daytime and night-time  $L_{Aeq}$  scenario shown on figures 5.1 and 5.2.

**Table 5.1 Residential: Daytime ( $L_{Aeq,16hr}$ ) Noise Intrusion**

| Location | External $L_{Aeq}$ at 1m from facade | Internal $L_{Aeq}$ with windows open | Internal $L_{Aeq}$ with windows closed | Criteria Internal $L_{Aeq}$ |
|----------|--------------------------------------|--------------------------------------|----------------------------------------|-----------------------------|
| R01      | 45.3                                 | 35.3                                 | 15.3                                   | 35                          |
| R02      | 45.6                                 | 35.6                                 | 15.6                                   | 35                          |
| R03      | 42.7                                 | 32.7                                 | 12.7                                   | 35                          |
| R04      | 48.6                                 | 38.6                                 | 18.6                                   | 35                          |
| R05      | 51.8                                 | 41.8                                 | 21.8                                   | 35                          |
| R06      | 73.2                                 | 63.2                                 | 43.2                                   | 35                          |
| R07      | 62.6                                 | 52.6                                 | 32.6                                   | 35                          |
| R08      | 59.1                                 | 49.1                                 | 29.1                                   | 35                          |
| R09      | 47.6                                 | 37.6                                 | 17.6                                   | 35                          |
| R10      | 42.8                                 | 32.8                                 | 12.8                                   | 35                          |
| R11      | 41.1                                 | 31.1                                 | 11.1                                   | 35                          |
| R12      | 39.4                                 | 29.4                                 | 9.4                                    | 35                          |
| R13      | 38.5                                 | 28.5                                 | 8.5                                    | 35                          |
| R14      | 54.8                                 | 44.8                                 | 24.8                                   | 35                          |
| R15      | 53.5                                 | 43.5                                 | 23.5                                   | 35                          |
| R16      | 51.9                                 | 41.9                                 | 21.9                                   | 35                          |
| R17      | 55.7                                 | 45.7                                 | 25.7                                   | 35                          |
| R18      | 56.8                                 | 46.8                                 | 26.8                                   | 35                          |
| R19      | 55.8                                 | 45.8                                 | 25.8                                   | 35                          |

All values are sound pressure levels in dB re:  $2 \times 10^{-5}$  Pa

**Table 5.2 Residential: Night-time ( $L_{Aeq,8hr}$ ) Noise Intrusion**

| Location | External $L_{Aeq}$ at 1m from facade | Internal $L_{Aeq}$ with windows open | Internal $L_{Aeq}$ with windows closed | Criteria Internal $L_{Aeq}$ |
|----------|--------------------------------------|--------------------------------------|----------------------------------------|-----------------------------|
| R01      | 36.8                                 | 26.8                                 | 6.8                                    | 30                          |
| R02      | 33.9                                 | 23.9                                 | 3.9                                    | 30                          |
| R03      | 31.8                                 | 21.8                                 | 1.8                                    | 30                          |
| R04      | 38.0                                 | 28.0                                 | 8.0                                    | 30                          |
| R05      | 34.1                                 | 24.1                                 | 4.1                                    | 30                          |
| R06      | 46.6                                 | 36.6                                 | 16.6                                   | 30                          |
| R07      | 45.7                                 | 35.7                                 | 15.7                                   | 30                          |
| R08      | 46.0                                 | 36.0                                 | 16.0                                   | 30                          |
| R09      | 33.5                                 | 23.5                                 | 3.5                                    | 30                          |
| R10      | 32.7                                 | 22.7                                 | 2.7                                    | 30                          |
| R11      | 32.4                                 | 22.4                                 | 2.4                                    | 30                          |
| R12      | 31.7                                 | 21.7                                 | 1.7                                    | 30                          |
| R13      | 32.1                                 | 22.1                                 | 2.1                                    | 30                          |
| R14      | 47.8                                 | 37.8                                 | 17.8                                   | 30                          |
| R15      | 46.5                                 | 36.5                                 | 16.5                                   | 30                          |
| R16      | 47.3                                 | 37.3                                 | 17.3                                   | 30                          |
| R17      | 51.0                                 | 41.0                                 | 21.0                                   | 30                          |
| R18      | 48.2                                 | 38.2                                 | 18.2                                   | 30                          |
| R19      | 43.0                                 | 33.0                                 | 13.0                                   | 30                          |

All values are sound pressure levels in dB re:  $2 \times 10^{-5}$  Pa

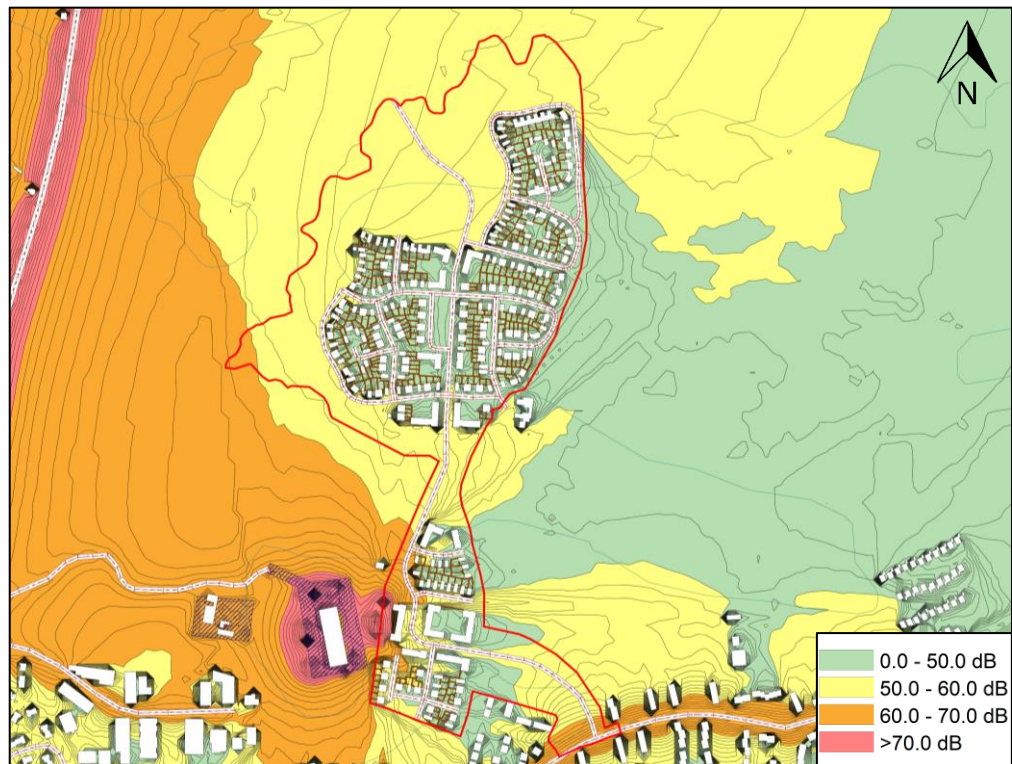
**Table 5.3 Residential: Night-time ( $L_{Amax}$ ) Noise Intrusion**

| Location | External $L_{Amax}$ at 1m from facade | Internal $L_{Amax}$ with windows open | Internal $L_{Amax}$ with windows closed | Criteria Internal $L_{Amax}$ |
|----------|---------------------------------------|---------------------------------------|-----------------------------------------|------------------------------|
| R01      | 60.9                                  | 50.9                                  | 30.9                                    | 45                           |
| R02      | 53.4                                  | 43.4                                  | 23.4                                    | 45                           |
| R03      | 52.1                                  | 42.1                                  | 22.1                                    | 45                           |
| R04      | 57.7                                  | 47.7                                  | 27.7                                    | 45                           |
| R05      | 54.9                                  | 44.9                                  | 24.9                                    | 45                           |
| R06      | 71.4                                  | 61.4                                  | 41.4                                    | 45                           |
| R07      | 70.5                                  | 60.5                                  | 40.5                                    | 45                           |
| R08      | 70.4                                  | 60.4                                  | 40.4                                    | 45                           |
| R09      | 54.2                                  | 44.2                                  | 24.2                                    | 45                           |
| R10      | 53.5                                  | 43.5                                  | 23.5                                    | 45                           |
| R11      | 53.4                                  | 43.4                                  | 23.4                                    | 45                           |
| R12      | 54.1                                  | 44.1                                  | 24.1                                    | 45                           |
| R13      | 55.8                                  | 45.8                                  | 25.8                                    | 45                           |
| R14      | 73.6                                  | 63.6                                  | 43.6                                    | 45                           |
| R15      | 72.3                                  | 62.3                                  | 42.3                                    | 45                           |
| R16      | 72.2                                  | 62.2                                  | 42.2                                    | 45                           |
| R17      | 76.5                                  | 66.5                                  | 46.5                                    | 45                           |
| R18      | 72.7                                  | 62.7                                  | 42.7                                    | 45                           |
| R19      | 64.9                                  | 54.9                                  | 34.9                                    | 45                           |

All values are sound pressure levels in dB re:  $2 \times 10^{-5}$  Pa

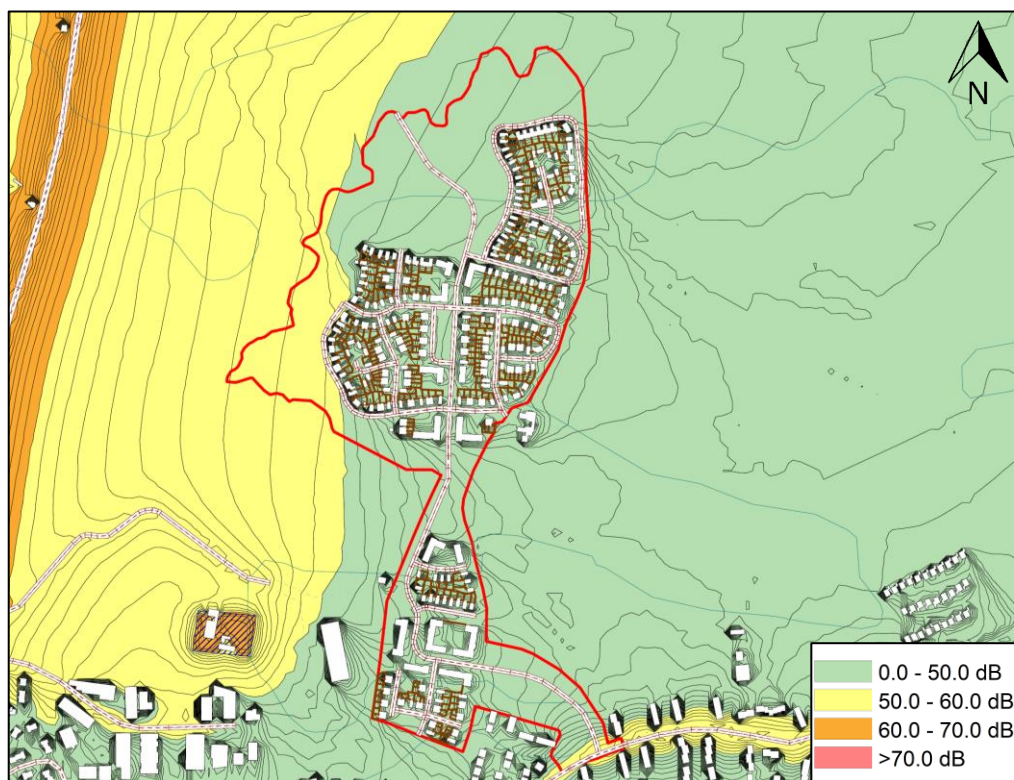
The results presented above demonstrate that the recommended BS 8233 internal noise levels are generally achieved assuming a windows-closed scenario during the daytime, with the exception of R06 (adjacent to the Refuse Transfer Station). During the night-time, noise levels are generally achieved across the site, assuming a windows-closed scenario. However, dwellings located on the western boundary, adjacent to the A273, exceed the maximum noise levels criteria, assuming a windows-open scenario, therefore, in order to achieve the recommended internal noise criteria, a range of mitigation measures are outlined in Section 6.0 of this report.

**Figure 5.1 Noise Contour Plot Daytime ( $L_{Aeq,16hour}$ )**



Not to scale  
OS Licence No. AL553611  
Contour Plot at 1.5m height

**Figure 5.2 Noise Contour Plot Night-time ( $L_{Aeq,8hour}$ )**



Not to scale  
OS Licence No. AL553611  
Contour Plot at 4.0m height

## 5.2 EXTERNAL AMENITY AREAS

Predicted daytime noise levels within proposed dwelling garden areas are presented in Table 5.4. The assessment includes garden fences in the form of close board timber fences of 1.8m height which have been outlined within current site plans. These barriers should be of solid construction with no gaps and a minimum mass of 10kg/m<sup>2</sup>.

**Table 5.4 External Daytime ( $L_{Aeq,16hour}$ ) Noise Levels**

| Location | External Daytime $L_{Aeq, 0700-2300}$ | External $L_{Aeq, 0700-2300}$ Criteria |
|----------|---------------------------------------|----------------------------------------|
| G01      | 45.8                                  | 55                                     |
| G02      | 54.7                                  | 55                                     |
| G03      | 51.3                                  | 55                                     |
| G05      | 45.7                                  | 55                                     |
| G06      | 45.1                                  | 55                                     |
| G07      | 41.7                                  | 55                                     |
| G08      | 40.0                                  | 55                                     |
| G09      | 42.0                                  | 55                                     |
| G10      | 43.0                                  | 55                                     |
| G11      | 46.3                                  | 55                                     |

All values are sound pressure levels in dB re: 2x 10<sup>-5</sup> Pa

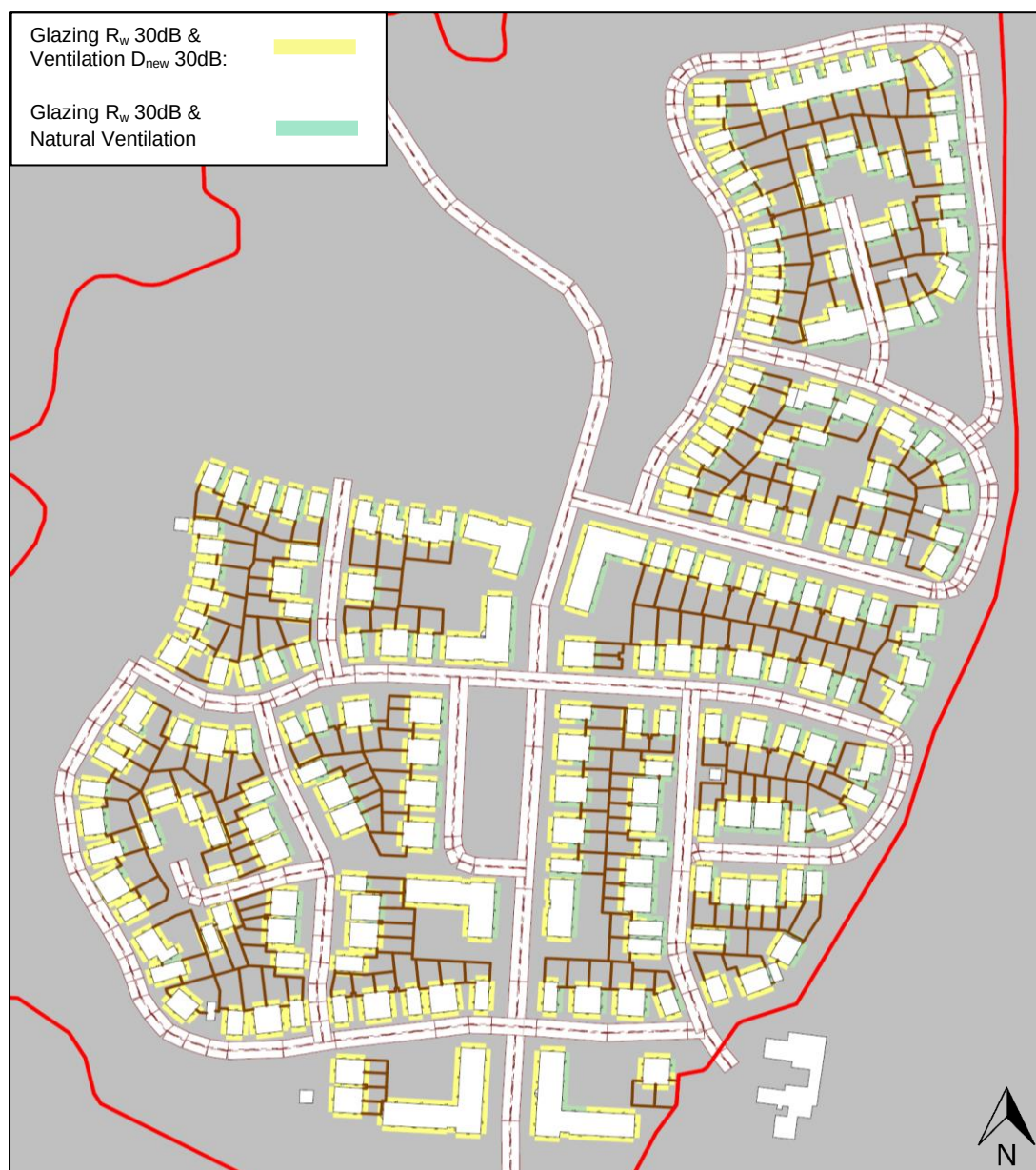
As demonstrated in the above table, the external WHO/BS 8233 noise level targets are met across the site, and no further mitigation is required.

## 6.0 MITIGATION

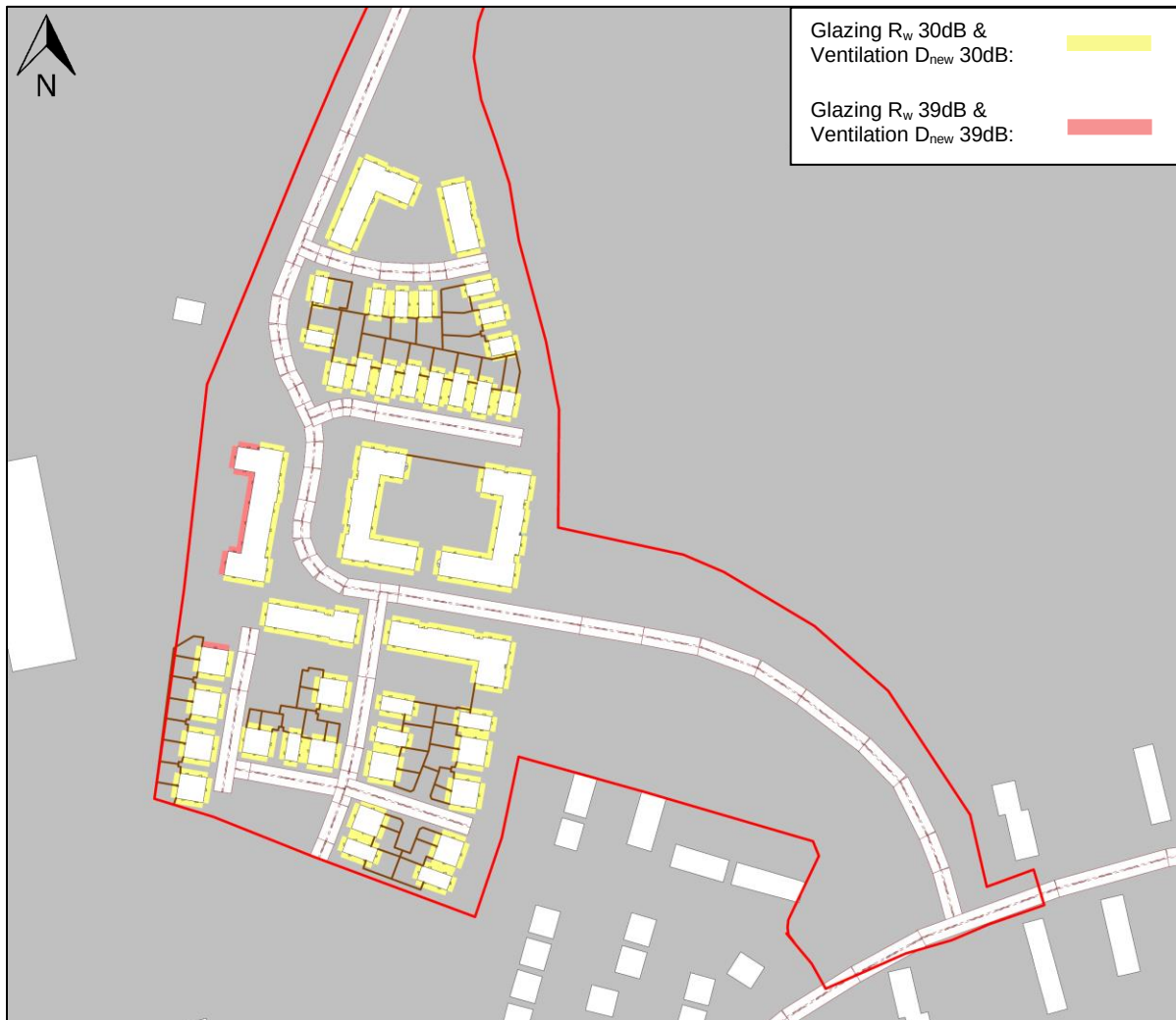
### 6.1 GLAZING AND VENTILATION STRATEGY

In accordance with the requirements of Condition 12 of planning permission reference DM/18/0509, the glazing and ventilation strategy provided in Figures 6.1 - 6.4 has been designed to achieve the BS 8233:2014 criteria (internal daytime  $L_{Aeq}$  of 35 dB, internal night-time  $L_{Aeq}$  of 30 dB and an internal night-time  $L_{Amax}$  of 45 dB) in habitable rooms of the proposed development.

**Figure 6.1 Glazing and Ventilation Strategy – Living Rooms (Phases 2 and 3)**

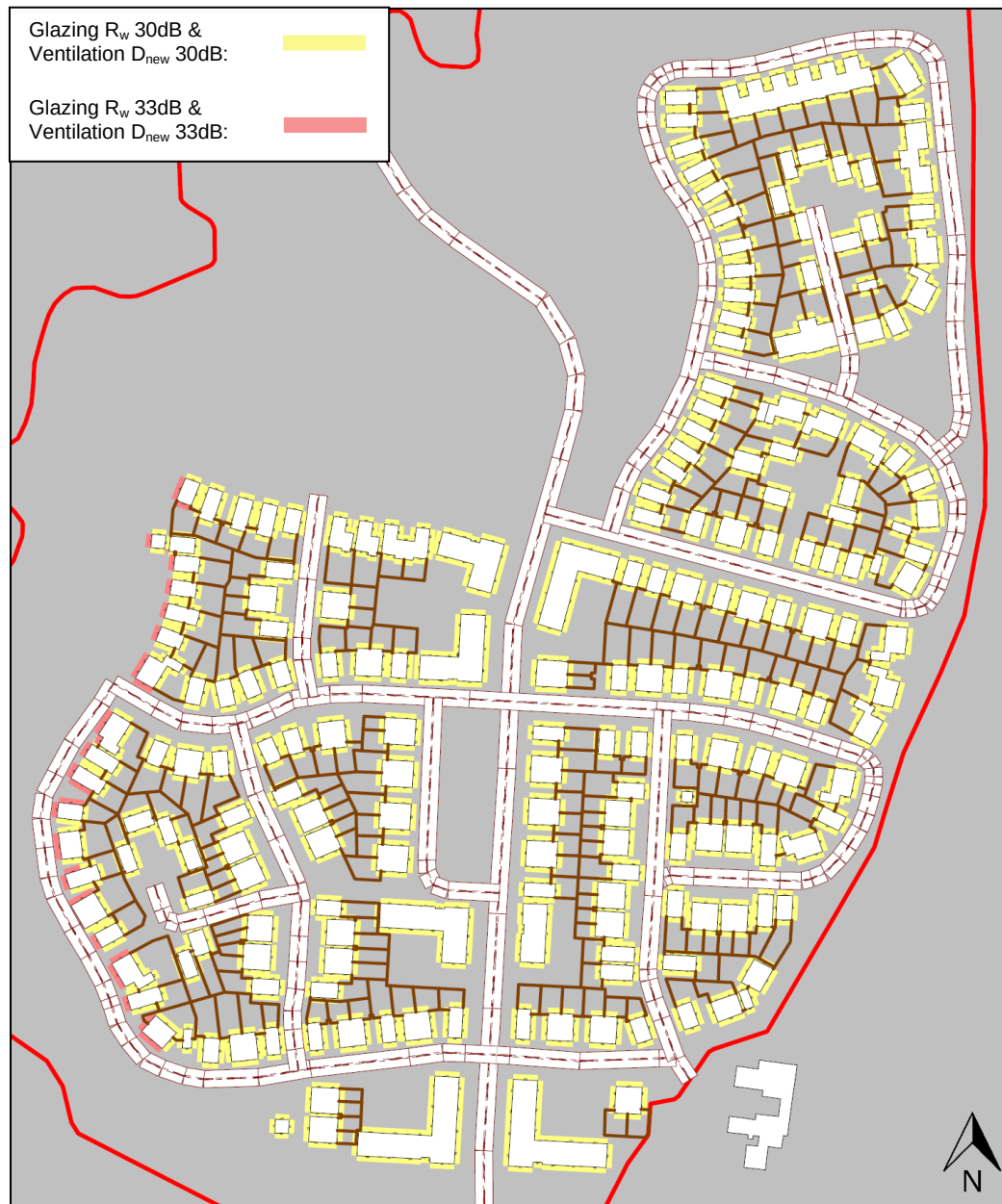


**Figure 6.2** Glazing and Ventilation Strategy – Living Rooms (Phase 1)

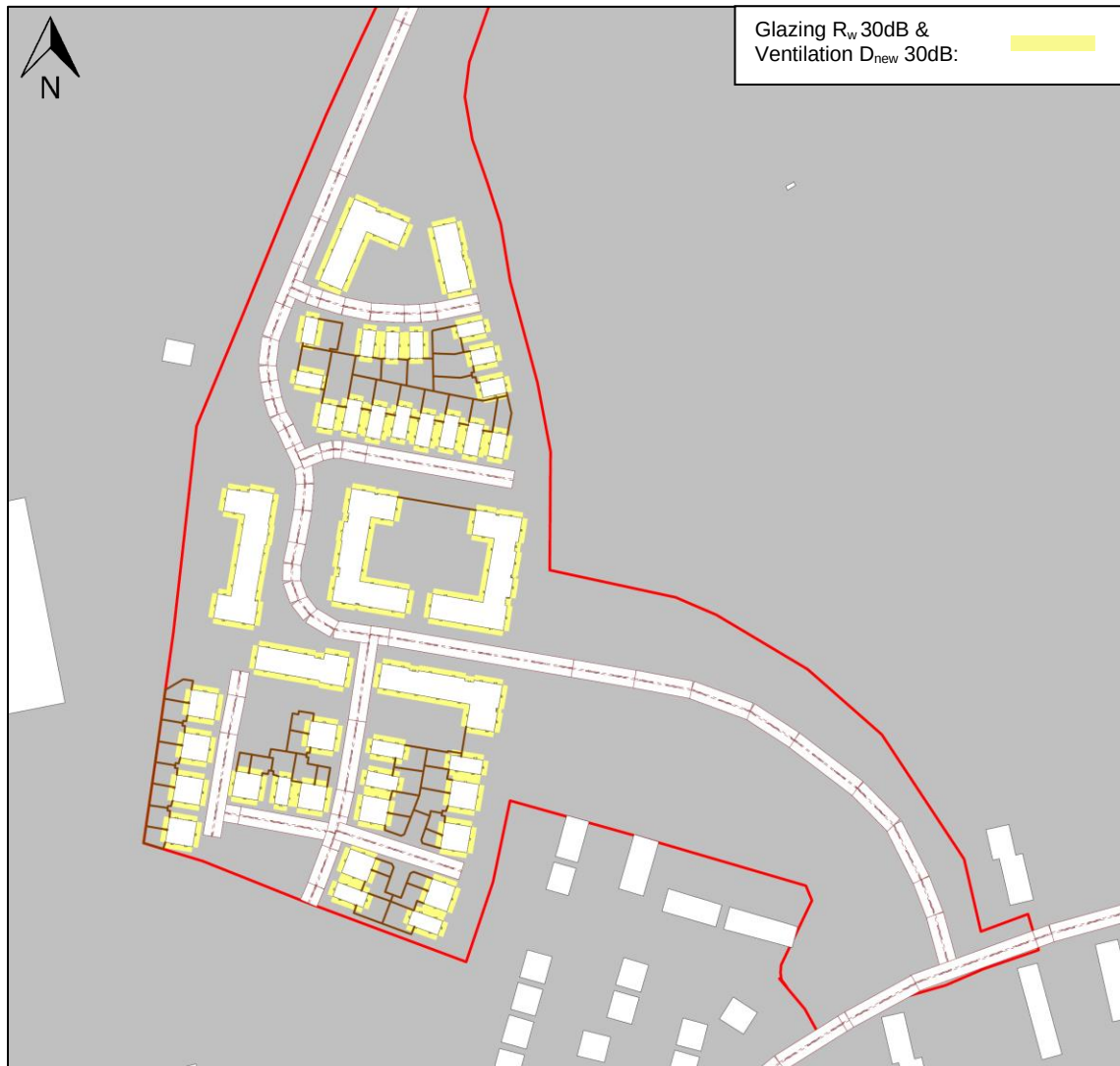


Not to scale  
OS Licence No. AL553611

**Figure 6.3 Glazing and Ventilation Strategy – Bedrooms (Phases 2 and 3)**



**Figure 6.4 Glazing and Ventilation Strategy – Bedrooms (Phase 1)**



Not to scale  
OS Licence No. AL553611

The majority of noise sensitive rooms throughout the proposed development will feature ventilation in the form of acoustic trickle vents with a sound reduction equal to or greater than the glazing due to the proximity of the A273 and Refuse Transfer Station, with some living rooms in the northern section of the site suitable for natural ventilation.

Glazing with a sound reduction of  $R_w$  30dB will be suitable for living rooms across the majority of the site, with some facades adjacent to the Refuse Transfer Station provided with glazing of  $R_w$  39dB.

Glazing with a sound reduction of  $R_w$  33dB will be provided for bedrooms located in the northern section of the site in proximity to the A273, with glazing of  $R_w$  30dB suitable for the remainder of the site.

## 7.0 CONCLUSIONS OF NOISE ASSESSMENT

This report presents the findings of a noise assessment undertaken for a residential development on land to the north of Burgess Hill, Sussex. Measurements of the existing ambient noise climate have been undertaken and mitigation measures proposed to demonstrate compliance with the requirements of Condition 12 of planning permission reference DM/18/0509.

A glazing and ventilation strategy has been provided which is considered sufficient to reduce internal noise levels to below the criteria outlined in BS 8233 guidance, in-line with the requirements of Condition 12. Additionally, the proposed external fencing strategy has been assessed against BS 8233 external noise criteria, with all spaces meeting the recommended criteria of below 55dB, and are therefore in-line with Condition 12.

Therefore, internal and external noise levels across the site are predicted to meet the relevant noise criteria with the mitigation measures specified and as such, it is considered that the requirements of Condition 12 are met and the condition can be suitably discharged.

## APPENDICES

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## APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

An explanation of the specific acoustic terminology referred to within this report is provided below.

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dB         | Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.                                                                                                                                                         |
| dB(A)      | Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.                                                                                                                                                                                                                                                                                                                         |
| $L_{Aeq}$  | Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The $L_{Aeq, 07:00 - 23:00}$ for example, describes the equivalent continuous noise level over the 12 hour period between 7 am and 11 pm. During this time period the $L_{pA}$ at any particular time is likely to have been either greater or lower than the $L_{Aeq, 07:00 - 23:00}$ .                                                                                                                                                                                                                                                            |
| $L_{Amin}$ | The $L_{Amin}$ is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| $L_{Amax}$ | The $L_{Amax}$ is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| $L_n$      | Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say. 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the $L_{A10, 1 hr} = x$ dB.<br><br>The $L_{A10}$ index is often used in the description of road traffic noise, whilst the $L_{A90}$ , the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. $L_{A1}$ and $L_{Amax}$ are common descriptors of construction noise. |
| $R_w$      | The <i>weighted sound reduction index</i> determined using the above <i>measurement</i> procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.                                                                                                                                                                                                                                                                                                                                                                                                                                               |

An explanation of abbreviations used within this report is provided below.

CADNA – Computer Aided Noise Abatement  
DMRB – Design Manual for Roads and Bridges  
HGV – Heavy Goods Vehicle  
UDP – Unitary Development Plan  
UKAS – United Kingdom Accreditation Service

## **APPENDIX B – REPORT CONDITIONS**

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