OWL LANE, DEWSBURY

Condition 24 Discharge - Noise

Prepared for: BDW Trading Limited

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CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

Executive Summary

This report contains a noise assessment which has been completed with reference to the requirements of Condition 24 of planning permission (Ref: 2019/62/92787/E), for a proposed residential development (the Development) at land at Owl Lane, Chidswell, Dewsbury.

The noise assessment has identified the mitigation strategy required to achieve recommended external and internal guideline values.

The assessment shows that sound levels within the majority of private gardens are compliant with the recommended noise criteria. To achieve the criteria within identified plots, the installation of 1.8m or 2.5m high acoustically sound garden fences is required; the identified plots, together with the required fence height for each are presented in Figure 5-2 of this Report.

The minimum specifications for the windows and ventilators at each façade are shown on the drawing in Appendix 04. These are split across three separate specification bands, which are presented in Table 5-2 and replicated below. It is noted that for the majority of the Development, the applicant's standard double glazing and trickle ventilators will be sufficient to meet the requisite internal noise criteria.

Minimum Specifications for Windows and Ventilators

Building Element and Location	Specification	Metric	Typical Configuration
Highest Specification (North and west elevations facing the roadside)	≥ 39	dB $R_w + C_{tr}$	Double glazing 6-10-8.8 acoustic laminate
	≥ 44	dB $D_{ne,w} + C_{tr}$	High performance acoustic ventilator
	≥ 34	dB $R_w + C_{tr}$	Double glazing 6-20-4 standard glass types
	≥ 40	dB $D_{ne,w} + C_{tr}$	High performance acoustic trickle ventilator
Lowest Specification (The majority of the development)	≥ 30	dB $R_w + C_{tr}$	Client test number L118-137 specification – double glazed window with an open vent; 6.8mm laminate glass, 18mm cavity, 4mm oak soft

1.0 Introduction

BDW Trading Limited has appointed SLR Consulting Limited (SLR) to undertake a noise assessment to discharge planning condition 24 of planning permission (Ref: 2019/62/92787/E), for a proposed residential development (the Development) at land at Owl Lane, Chidswell, Dewsbury.

This report contains an assessment which has been completed with reference to the requirements of Condition 24 and relevant guidance documents.

Whilst reasonable effort has been made to make this report easily understandable, it is technical in nature. To assist the reader, a glossary of terminology is included in Appendix 01.

2.0 Policy and Guidance

2.1 Planning Condition 24

Condition 24 of the planning permission relates to noise and states:

"Prior to the commencement of superstructure works, a report specifying the measures to be taken to protect the development from noise from roads, the adjacent rugby ground and other uses shall be submitted to and approved in writing by the Local Planning Authority. The report shall detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required)…

Reason: In the interests of amenity and to accord with Policies LP24 and LP52 of the Kirklees Local Plan."

For reference, Polices LP24 and LP52 are replicated Figures 2-1 to 2-3 below.

Figure 2-1
Excerpt from Kirklees Local Plan – Policy LP24

11.1 Design

Policy LP24

Design

Good design should be at the core of all proposals in the district and should be considered at the outset of the development process, ensuring that design forms part of pre-application consultation of a proposal. Development briefs, design codes and masterplans should be used to secure high quality, green, accessible, inclusive and safe design, where applicable. Where appropriate and in agreement with the developer schemes will be submitted for design review.

Proposals should promote good design by ensuring:

a. the form, scale, layout and details of all development respects and enhances the character of the townscape, heritage assets and landscape;
b. they provide a high standard of amenity for future and neighbouring occupiers; including maintaining appropriate distances between buildings and the creation of development-free buffer zones between housing and employment uses incorporating means of screening where necessary;
c. extensions are subservient to the original building, are in keeping with the existing buildings in terms of scale, materials and details and minimise impact on residential amenity of future and neighbouring occupiers;
d. high levels of sustainability, to a degree proportionate to the proposal, through:
    i. The re-use and adaptation of existing buildings, where practicable;
    ii. design that promotes behavioural change, promoting walkable neighbourhoods and making walking and cycling more attractive;
    iii. considering the use of innovative construction materials and techniques, including reclaimed and recycled materials;
    iv. where practicable, minimising resource use in the building by orientating buildings to utilise passive solar design. This includes encouraging the incorporation of vegetation and tree planting to assist heating and cooling and considering the use of renewable energy;
    v. providing charging points to encourage the use of electric and low emission vehicles;

Figure 2-2
Excerpt from Kirkless Local Plan – Policy LP24 cont.

vi. incorporating adequate facilities to allow occupiers to separate and store waste for recycling and recovery that are well designed and visually unobtrusive and allows for the convenient collection of waste;
vii. designing buildings that are resilient and resistant to flood risk, where such buildings are acceptable in accordance with flood risk policies and through incorporation of multi-functional green infrastructure where appropriate;
viii. designing places that are adaptable and able to respond to change, with consideration given to accommodating services and infrastructure, access to high quality public transport facilities and offer flexibility to meet changing requirements of the resident / user.

e. the risk of crime is minimised by enhanced security, and the promotion of well-defined routes, overlooked streets and places, high levels of activity, and well-designed security features;
f. the needs of a range of different users are met, including disabled people, older people and families with small children to create accessible and inclusive places;
g. any new open space is accessible, safe, overlooked and strategically located within the site and well integrated into wider green infrastructure networks;
h. development contributes towards enhancement of the natural environment, supports biodiversity and connects to and enhances ecological networks and green infrastructure;
i. the retention of valuable or important trees and where appropriate the planting of new trees and other landscaping to maximise visual amenity and environmental benefits; and
j. the provision of public art where appropriate.

Figure 2-3
Excerpt from Kirklees Local Plan – Policy LP52

18.2 Protection and improvement of environmental quality

Policy LP52

Protection and improvement of environmental quality

Proposals which have the potential to increase pollution from noise, vibration, light, dust, odour, shadow flicker, chemicals and other forms of pollution or to increase pollution to soil or where environmentally sensitive development would be subject to significant levels of pollution, must be accompanied by evidence to show that the impacts have been evaluated and measures have been incorporated to prevent or reduce the pollution, so as to ensure it does not reduce the quality of life and well-being of people to an unacceptable level or have unacceptable impacts on the environment.

Such developments which cannot incorporate suitable and sustainable mitigation measures which reduce pollution levels to an acceptable level to protect the quality of life and well-being of people or protect the environment will not be permitted.

Where possible, all new development should improve the existing environment.

2.2 Guidance

2.2.1 BS8233:2014

BS8233:2014 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new 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 2-1.

Table 2-1
Suitable Internal Noise Levels, dB

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

BS8233:2014 states that the recommended limits can be relaxed by up to 5dB "*where development is considered necessary or desirable".*

Whilst it may be considered desirable to achieve the BS8233:2014 recommended internal noise levels with windows open, it is stated that where the limit cannot be met with an open window "there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level".

It is therefore not essential that the recommended internal noise levels are achievable with open windows if suitable alternative means of ventilation can be provided.

With regards to external noise, Section 7.7.3.2 of BS8233:2014 states that:

"*For traditional external areas that are used for amenity space, such as gardens and patios, 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 recognized 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, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited*".

2.2.2 ProPG on Planning & Noise, New Residential Development

As BS8233:2014 does not specify internal limits for maximum noise levels within bedrooms during the night-time, reference has been made to the guidance document 'ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise, New Residential Development', produced by the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH).

This document states:

"*For a reasonable standard in noise-sensitive rooms at night (e.g. bedrooms) individual noise events should not normally exceed 45dB L_{AFmax} more than 10 times a night."*

2.2.3 Calculation of Road Traffic Noise (CRTN)

It is understood that to facilitate the development, a new spine road connecting Owl Lane with Chidswell Lane, will be constructed.

CRTN sets out the UK standard methods and procedures to predict and measure road traffic noise. In the UK, road traffic noise is predicted and measured in terms of a statistical measure, equivalent to the 10th percentile. Termed the L_{A10}, this measure of noise is equivalent to the noise level exceeded for 10% of the measurement period.

To allow the BS8233:2014 assessment to be undertaken, the $L_{A10,18hr}$ noise levels require conversion to a $L_{Aeq,T}$. For assessment purposes, the modelled $L_{A10,18hr}$ noise levels will be converted to a $L_{Aeq,T}$, the equivalent continuous sound level using the formulae presented in Table 2-2, as recommended in the 'Method for Converting the UK Road Traffic Noise Index $L_{A10,18hr}$ to the EU Noise Indices for Road Noise Mapping' (2006).

Table 2-2
$L_{A10,18hr}$ Conversion Calculations

Time Period	Non-Motorway Conversion	Motorway Conversion
07:00 – 21:00	$L_{day} = 0.95 \times L_{A10-18hr} + 1.44$	$L_{day} = 0.98 \times L_{A10-18hr} + 0.09$
21:00 – 23:00	$L_{evening} = 0.97 \times L_{A10-18hr} - 2.87$	$L_{evening} = 0.89 \times L_{A10-18hr}$
23:00 – 07:00	$L_{night} = 0.90 \times L_{A10-18hr} - 3.77$	$L_{night} = 0.87 \times L_{A10-18hr}$
07:00 – 23:00	$L_{Aeq-16hr} = 10 \log_{10}\left(\left(12 \times 10^{\frac{L_{day}}{10}} + 4 \times 10^{\frac{L_{evening}}{10}}\right)/16\right)$	

3.0 Environmental Baseline Noise Survey

A baseline survey to establish the prevailing noise levels at the site was undertaken at three monitoring locations from Tuesday the 17th to Wednesday the 18th of September 2019. The survey methodology and results are set out below.

The weather conditions during the survey were acceptable for noise monitoring with dry conditions and wind speeds below 5 m/s^{-1}.

3.1 Baseline Survey Methodology

The measurements were carried out using the equipment listed in Table 3-1.

Table 3-1
Noise Monitoring Equipment

Location	Description	Serial No.
Location 1	Cirrus CR:171B Type 1 Sound Level Meter	G080288
	Cirrus CR:515 Acoustic Calibrator	83349
Location 2	Cirrus CR:171B Type 1 Sound Level Meter	G080284
	Cirrus CR:515 Acoustic Calibrator	83164
Location 3	Cirrus CR:171B Type 1 Sound Level Meter	G079816
	Cirrus CR:515 Acoustic Calibrator	81268

The sound level meters were calibrated before the measurements using an acoustic calibrator and the calibration was checked upon completion of the survey. No significant drift was observed. The calibration chain is traceable via the United Kingdom Accreditation Service (UKAS) to National Standards held at the National Physical Laboratory.

Noise levels were measured at the following locations during the survey:

- Location 1: On the western boundary of the proposed development adjacent to Owl Lane for a full 24- hour period.
- Location 2: On the eastern boundary of the proposed development adjacent to Chidswell Lane for a full 24-hour period.
- Location 3: On the northern boundary of the proposed development adjacent to Windsor Road during the daytime period between 11:15 and 18:00 and a during the night-time period between 05:00 and 06:45. A full 24 hour survey was not completed at this location due to security concerns, therefore measurements were undertaken over typical peak hours for both the daytime and night time periods.

The position of the monitoring locations can be seen in Figure 3-1.

Figure 3-1
Noise Monitoring Locations

The monitoring protocol at measurement Locations 1 and 2 consisted of a continuous 24-hour survey with measurements being logged every 15-minutes. At Location 3 the monitoring protocol consisted of two periods encompassing the daytime and night-time.

At all locations the microphone was placed 1.5m above the ground in free-field conditions, i.e. at least 3.5m from the nearest vertical, reflecting surface.

The following noise level indices were recorded:

- $L_{Aeq,T}$ – The A-weighted equivalent continuous noise level over the measurement period.
- L_{A90} – The A-weighted noise level exceeded for 90% of the measurement period.
- L_{A10} – The A-weighted noise level exceeded for 10% of the measurement period.
- L_{Amax} – The maximum A-weighted noise level during the measurement period.

3.2 Baseline Survey Results

A summary of the measured baseline noise levels used in the assessment are shown in Table 3-2. The L_{A90} and L_{A10} values are the median values over the respective time period. The full survey results can be seen in Appendix 03 of this report.

As the dataset encompasses a 24-hour period, the highest measured noise level over two daytime periods and night-time period will be used in the assessment.

Table 3-2
Summary of Measured Noise Levels, free-field, dB

Location	Date	Time Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{AFmax}[1]
1	17th September	Daytime (10:45 – 23:00)	72.0	60.7	75.5	87.3
		Night-Time (23:00-07:00)	68.7	40.5	67.4	84.7
	18th September	Daytime (07:00 – 10:45)	74.0	65.2	76.6	84.2
2	17th September	Daytime (10:15 – 23:00)	48.1	40.7	48.1	73.5
		Night-Time (23:00-07:00)	46.2	38.5	45.1	65.3
	18th September	Daytime (07:00 – 10:15)	50.0	45.5	50.8	71.0
3	17th September	Daytime (11:45 – 18:00)	58.2	44.6	60.7	75.2
		Night-Time (05:00 – 06:45)	58.5	48.3	54.1	79.9

3.3 Sound Climate

Surveyor observations at each survey location were as follows:

- At Location 1 the noise climate was dominated by local road traffic on Owl Lane, with some contribution from distant road traffic on the M1 and birdsong.
- At Location 2 the noise climate was dominated by local road traffic on the Chidswell Lane with some contribution from birdsong.
- At Location 3 the noise climate was dominated by road traffic on Windsor Road, with contribution from local road traffic on Owl Lane. Sound associated with local activities such as children playing and shouting, and birdsong was also heard.

During the survey it was noted by the surveyor that no audible noise was heard from any commercial premises during the attended daytime or night-time periods.

[1] 90th Percentile for night-time levels

4.0 Residential Noise Model Development

To determine the daytime and the night-time noise environment across the site, SLR has developed a noise model of the proposed development using the noise modelling software package CadnaA®.

The masterplan for the development is included in Appendix 02.

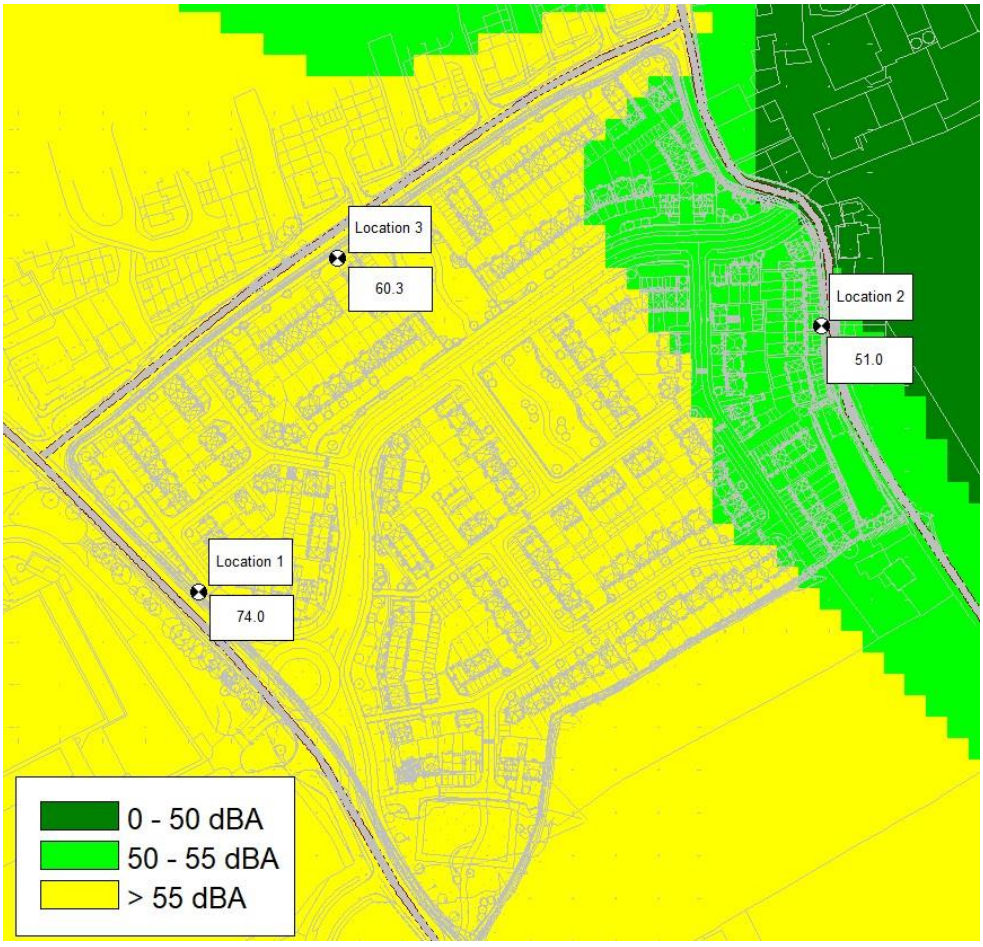
The ambient and maximum (night-time) noise survey results have been used to calibrate the noise model which contains the existing site elevation contours. The model has been adjusted to ensure that the predicted noise levels at the monitoring locations match the surveyed daytime and night-time noise levels.

4.1 Daytime

The daytime $L_{Aeq,16hr}$ noise environment at a height of 1.5m above ground level can be seen in Figure 4-1.

For model verification purposes, Locations 1, 2 and 3, and the respective predicted $L_{Aeq,16hr}$ noise levels, have been included in Figure 4-1. The plot masterplan for the development is shown for reference only and not included in the calculation.

Figure 4-1
Predicted $L_{Aeq,16hr}$ dB Noise Levels Across the Existing Site



Comparison with the data contained within Table 3-2 of this report shows that the CadnaA® model has predicted the $L_{Aeq,16hr}$ daytime noise level to within:

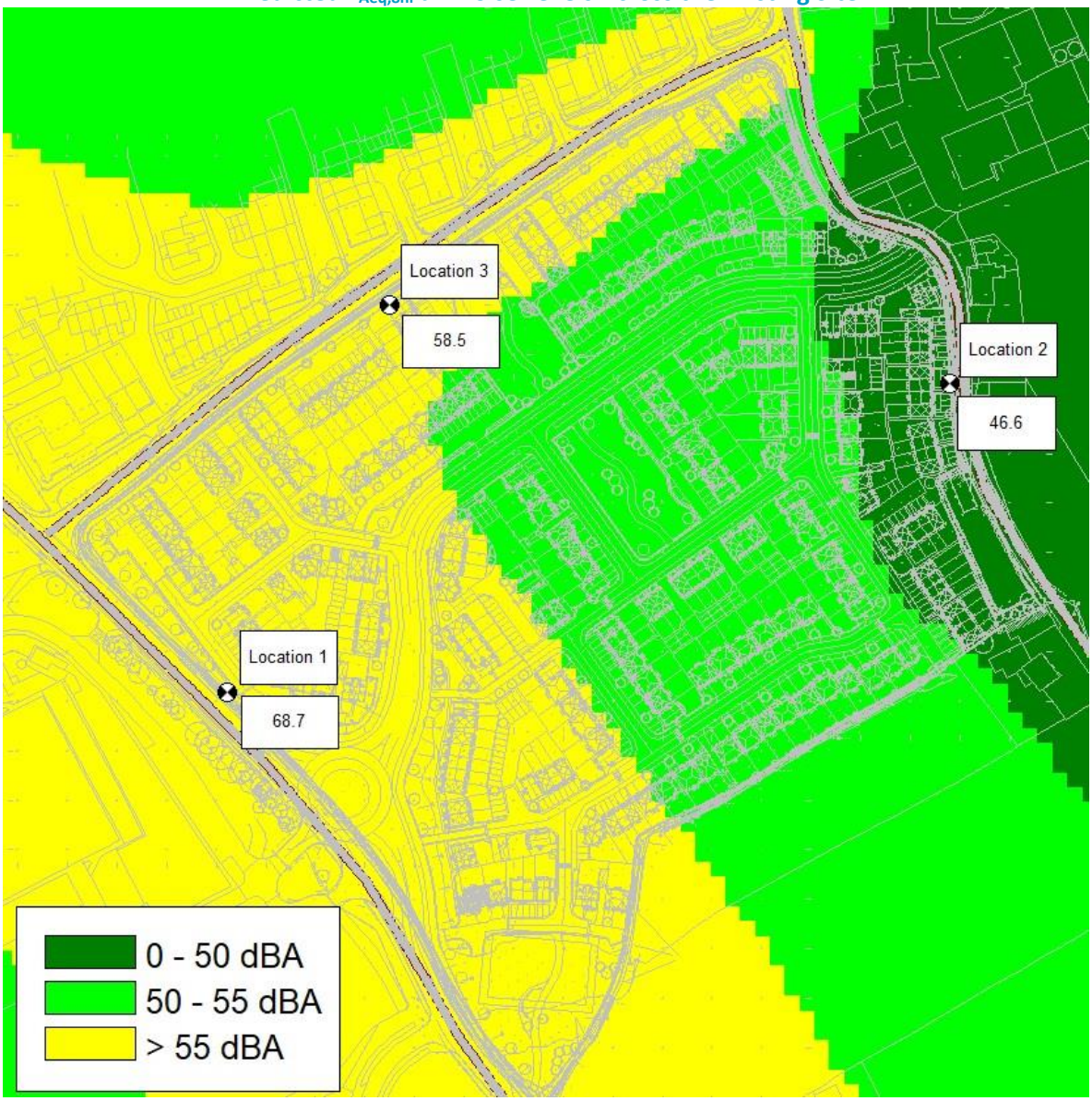
- 0.0dB(A) at Location 1.
- +1.0dB(A) at Location 2.
- +2.1dB(A) at Location 3.

4.2 Night-Time – Ambient

The night-time $L_{Aeq,8hr}$ noise environment at a height of 1.5m above ground level can be seen in Figure 4-2.

For model verification purposes, Locations 1, 2 and 3, and the respective predicted $L_{Aeq,8hr}$ noise levels, have been included in Figure 4-2. The plot masterplan for the development is shown for reference only and not included in the calculation.

Figure 4-2
Predicted $L_{Aeq,8hr}$ dB Noise Levels Across the Existing Site



Comparison with data contained within Table 3-2 of this report shows that the CadnaA® model has predicted the night-time $L_{Aeq,8hr}$ noise level to within:

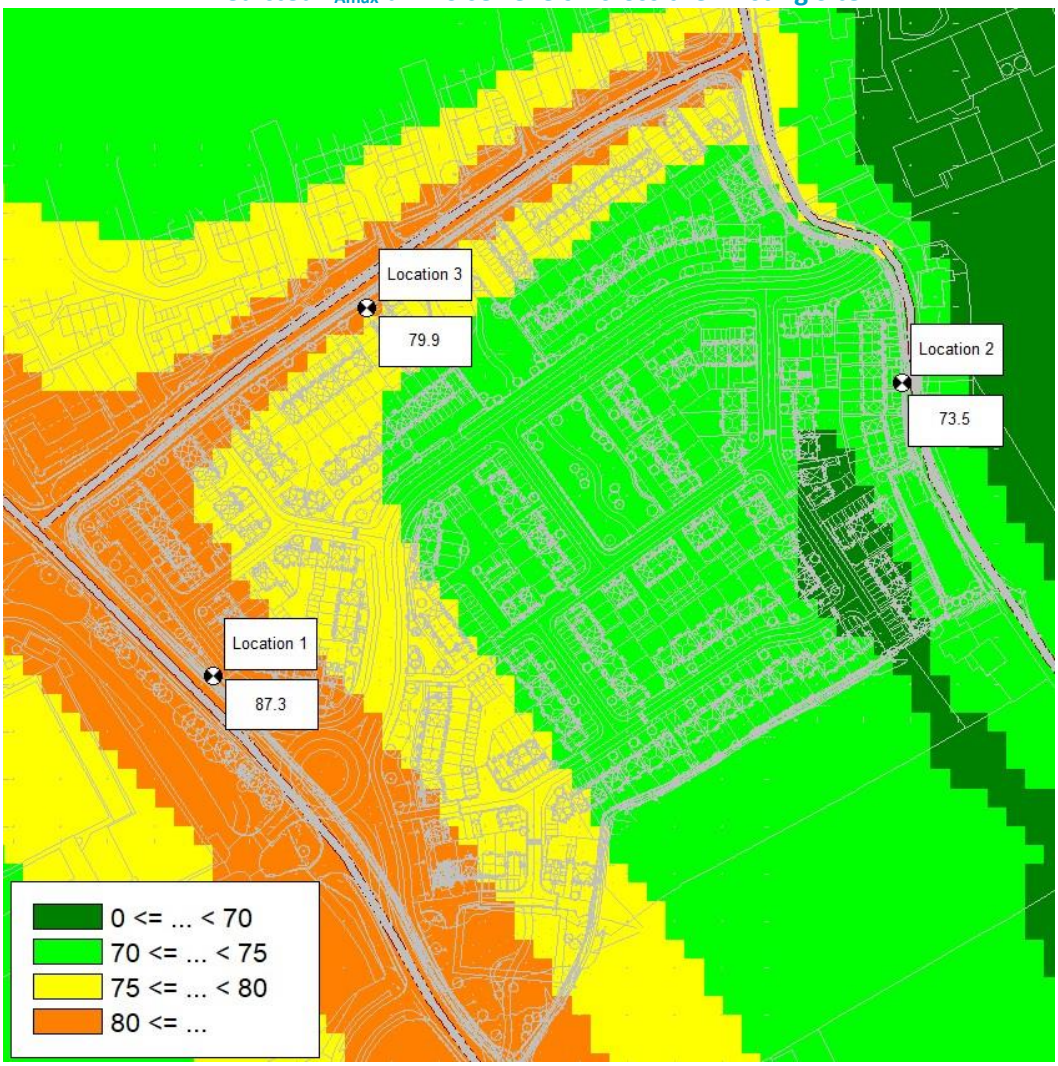
- 0.0dB(A) at Location 1.
- +0.3dB(A) at Location 2.
- 0.0dB(A) at Location 3.

4.3 Night-time – Maximum

The night-time L_{Amax} noise environment at a height of 1.5m above ground level can be seen in Figure 4-3.

For model verification purposes, Locations 1, 2 and 3, and the respective predicted L_{Amax} noise levels, have been included in Figure 4-3. The plot masterplan for the development is shown for reference only and not included in the calculation.

Figure 4-3
Predicted L_{Amax} dB Noise Levels Across the Existing Site



Comparison with the data contained within Table 3-2 of this report shows that the CadnaA® model has predicted the night-time maximum noise level to within:

- 0.0dB(A) at Location 1.
- 0.0dB(A) at Location 2.

- 0.0dB(A) at Location 3.

4.4 Model Robustness

A review of the three noise models developed, SLR consider that the noise model is robust as:

- At Location 1 the models have accurately predicted the measured noise levels.
- At Location 2 the models have over predicted the ambient daytime noise level by 1.0dB(A) and the night-time ambient noise level by 0.3dB(A), and accurately predicted the measured maximum noise level at night.
- At Location 3 the models have over predicted the ambient daytime noise level by 2.1dB(A) and accurately predicted the measured night-time ambient and maximum noise levels.
- Across all three noise models, the predicted noise levels are either accurate or have over predicted the measured ambient noise levels at site.

4.5 Development Spine Road

The baseline noise levels presented above do not include development-related traffic associated with the proposed development spine road. Therefore, it is necessary to include the spine road traffic flow (average annual weekly traffic flow, % HGV and speeds as provided by the Transport consultant for the project) within the noise model to predict future noise levels.

Development-related traffic movements in the development opening year, as input to the model, are detailed in Table 4-1.

Table 4-1
Development Traffic Data

Road	AAWT	%HGV	Speed km/hr
Spine Road	6555	3	48

5.0 Residential Noise Assessment

5.1 External Noise Assessment

With the proposed spine road and layout included within the noise model, the daytime external $L_{Aeq,16hr}$ noise environment at a height of 1.5m can be seen in Figure 5-1.

It is noted that the site layout indicates that embedded mitigation comprising close boarded timber fencing will be installed at garden boundaries. As fencing will provide gardens with screening from the noise sources, 1.8m high fences that would have a positive impact (i.e. lead to a reduction in noise levels) within the development have been included in the noise model and are shown by the red lines on Figure 5-1 below.

Figure 5-1
External Daytime Noise Levels – Including Development, $L_{Aeq,16hr}$ dB

With reference to BS8233:2014, it is recommended that the $L_{Aeq,16hr}$ noise level in outdoor amenity areas should be 55dB(A) or less.

It can be seen from Figure 5-1 that:

- Across the majority of the site, the daytime $L_{Aeq,16hr}$ noise levels are less than 55dB(A).
- Many of the plots are predicted to experience $L_{Aeq,16hr}$ noise levels of 50dB(A) or less.
- At Plots 1, 11, 18, 30, 31, 163, 164, 243, 244 the upper guidance value of 55dB(A) is exceeded by up to 8dB.

Overall, an external noise level of equal to or less than 55dB(A) is predicted to be met at 96% of the plots. As the Site is adjacent to a main B-road, noise levels are relatively high and the Site has been carefully designed to reduce noise levels across the site as far as practicable.

Whilst noise levels in external amenity areas are predicted to exceed at nine of the plots, BS8233:2014 states that:

"For traditional external areas that are used for amenity space, such as gardens and patios, 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 recognized 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, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited".

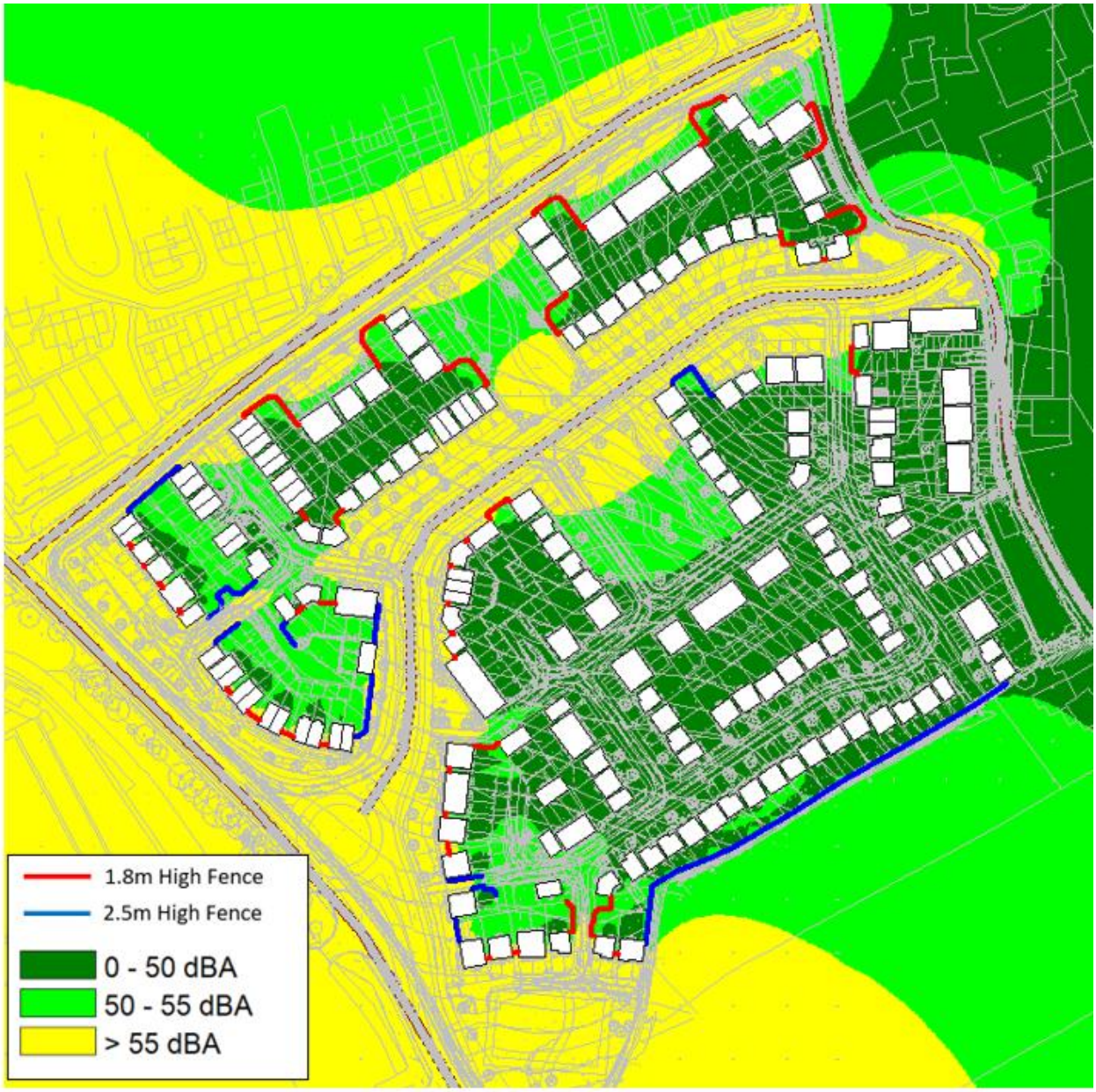
However, Policy LP24 states that the design should provide a high standard of amenity for future occupiers.

Improvements to the noise climate in amenity spaces could be achieved by increasing the height of the fencing to reduce the number of plots that contain amenity space above or within the upper guidance value contained in BS8233:2014.

Therefore, an assessment based on increasing the fencing height from 1.8m to 2.5m has been undertaken at key plots where a reduction in noise levels in gardens could be achieved.

Figure 5-2 shows the daytime $L_{Aeq,16hr}$ noise levels with fencing at key plots amended to a height of 2.5m.

Figure 5-2
External Daytime Noise Levels with Amended Fencing, $L_{Aeq,16hr}$ dB



It can be seen from Figure 5-2 that when compared to Figure 5-1:

- Within all gardens, except one, the daytime ambient noise levels are lower than $L_{Aeq,16hr}$ 55dB(A).
- A greater number of gardens are predicted to experience a noise level of $L_{Aeq,16hr}$ 50dB(A) or less compared to Figure 5-1.
- One garden (Plot 163) is expected to experience a noise level of $L_{Aeq,16hr}$ 56dB(A), which marginally exceeds the upper guideline value of 55dB(A). However, an improvement of the noise climate at these plots and

surrounding plots has been achieved, therefore reducing the overall noise levels across most of the identified plots to below 55dB(A).

5.2 Internal Noise Levels

With regard to acceptable internal noise levels BS8233:2014 requires the following:

- Bedrooms 30 dB $L_{Aeq\ (15\ Minutes)}$ (2300 hrs – 0700 hrs).
- Living/Bedrooms 35 dB $L_{Aeq\ (15\ Minutes)}$ (0700 hrs – 2300 hrs).
- All Other Habitable Rooms 40 dB $L_{Aeq\ (15\ Minutes)}$ (0700 hrs – 2300 hrs).

Further to the above, the ProPG guidance states that a reasonable standard in noise-sensitive rooms at night (e.g. bedrooms) individual noise events should not normally exceed 45dB L_{AFmax} more than 10 times a night.

As a measured maximum (L_{AFmax}) noise level for traffic movements associated with the spine road is not available, the maximum (L_{AFmax}) noise level measured at Location 3 (shown in Table 3-2) has been used in the noise model. Noise data gathered at Location 3 is representative of vehicles travelling at a speed which is comparable to the speed limit of the proposed spine road.

From an analysis of the noise data and the creation of a number of noise models to reflect the different limits, it has been determined that from the three criteria described above, the criterium indicating the 'highest' glazing requirement is the ProPG criteria for night-time maxima levels, which states that individual noise events should not normally exceed 45dB L_{AFmax} more than 10 times a night.

The required sound reduction of the glazing has been provided in this Report. It is assumed that in terms of sound insulation, the glazing is the weakest element of the building envelope i.e. all other elements of the building envelope, including exterior walls and roof, must achieve a sound reduction at least as high as the specified glazing performance at that location.

The highest façade reduction specification determined within this report is $R_w + C_{tr}$ 40dB and so the building envelope / roof is to achieve a minimum of R_w ≥41dB at these locations. In order to provide some guidance for a suitable roof construction to meet this sound insulation target, Table 8 from BS8233:2014 which provides guidance on the sound insulation of roofs is replicated below.

Table 5-1
The Sound Insulation of Roofs

Roof Type	Weighted Sound Reduction Index R_w dB
Tiles on felt, pitched roof with 100 mm mineral wool on plasterboard ceiling	43
100 mm flat concrete roof (230 kg/m2)	52
Flat timber joist roof, asphalt on boarding, 12 mm plasterboard ceiling, thermal insulation	45
Single-skin galvanized steel cladding	22
50 mm sandwich panel, galvanized steel panels with thermal foam infill 26	26
Double-skin galvanized steel cladding with mineral fibre infill 38	38

With reference to Table 5-1, it is expected that with tiles on a pitched roof design, with an appropriate thickness of mineral wool, and a plasterboard ceiling, the required R_w 41dB sound reduction should be achieved.

Cavity masonry construction is advised for all exterior building envelope walls.

5.3 Glazing

Windows do not reduce noise equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window and by extension, the resulting noise levels within the receiving room.

However, many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a very useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates. This performance index is known as the $R_w + C_{tr}$ dB noise level.

The minimum specification for windows and ventilators at each façade can be seen in Appendix 04. For information, the applicants standard glazing with trickle vent open provides an $R_w + C_{tr}$ dB value of 30dB; where this specification is suitable, the façades are shown as green in Appendix 04. Where a higher specification is required, these façades are shown as blue and orange. The minimum specification for the three different requirements is listed below in Table 5-2.

Table 5-2
Minimum Specifications for Windows and Ventilators

Building Element and Location	Specification	Metric	Typical Configuration
Highest Specification (North and west elevations facing the roadside)	≥ 39	dB $R_w + C_{tr}$	Double glazing 6-10-8.8 acoustic laminate
	≥ 44	dB $D_{ne,w} + C_{tr}$	High performance acoustic ventilator
	≥ 34	dB $R_w + C_{tr}$	Double glazing 6-20-4 standard glass types
	≥ 40	dB $D_{ne,w} + C_{tr}$	High performance acoustic trickle ventilator
Lowest Specification (The majority of the development)	≥ 30	dB $R_w + C_{tr}$	Client test number L118-137 specification – double glazed window with an open vent; 6.8mm laminate glass, 18mm cavity, 4mm oak soft
	≥ 36	dB $D_{ne,w} + C_{tr}$	

5.4 Background Ventilation

Where a closed window would be required for internal noise level limits to be achieved, it is anticipated that background ventilation would be provided by trickle ventilators, specified to comply with the requirements of the Building Regulations Approved Document F. Occasional purge ventilation (for example to dispel smoke from burnt toast) may be provided by an open window, as during purge ventilation it is not necessary for the noise limits to be met.

Background ventilation must be provided in accordance with the Building Regulations Approved Document F. If a passive ventilation strategy will be implemented, then window mounted trickle vents or through-wall ventilators, which are acoustically attenuated to provide an equivalent sound reduction to the glazing, should be installed. Professional Practice Guidance on Planning & Noise (ProPG) recommends that, *"Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however, any facade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the 'open' position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded".* This means that the vent, when 'open', should provide a sound reduction not less than that provided by the selected glazing system.

The sound reduction performance of ventilators is typically indicated as a $D_{n,e,w} + C_{tr}$ rating. Where window mounted or through-wall ventilators are to be installed, in order to provide a sound reduction equivalent to that of the specified glazing, the $D_{n,e,w} + C_{tr}$ value of the vent (when open) should be approximately 6dB higher than the specified $R_W + C_{tr}$ of the glazing.

It is important to note that the sound insulation performance of the external building fabric must be at least that of any specified glazing and ventilation system. Furthermore, the glazing attenuation specified previously must be achieved by the glazing system as a whole, including all framing and furniture.

Example ventilators are provided in Table 5-3.

Table 5-3
Example Ventilator Products and Associated Sound Reduction Indices

Product	$D_{n,e,w}$ (dB)	$D_{n,e,w} + C_{tr}$ (dB)
Titon Invent	31	30
Airflow DB5	31	30
Titon SF 3300 EA Vent	32	33
Titon Trimvent SW	33	33
Greenwood Slotvent 4000S	33	32
Titon Trimvent Mk11	34	33
Greenwood Slotvent 3000S	34	33

Product	$D_{n,e,w}$ (dB)	$D_{n,e,w} + C_{tr}$ (dB)
Greenwood 2000D	36	35
Willan Fresh 100dB	42	40
Greenwood Airvac Acoustic Air Brick AAB-4000	43	40
Greenwood EHA574	45	42
Greenwood AAB Acoustic Airbrick	46	44
Greenwood Airvac Wall Vent MA3051	52	49

5.5 Rugby Ground and Other Uses

Condition 24 states that "*…a report specifying the measures to be taken to protect the development from noise from roads, the adjacent rugby ground and other uses…*"

In this assessment, road traffic noise was deemed to be the dominant noise source as the western boundary of the proposed development overlooks Owl Lane with the rugby facilities beyond.

SLR has concluded in this report that mitigation measures are required to reduce the impact from road traffic noise from Owl Lane and surrounding roads upon the development. This mitigation advice includes enhanced glazing specification to protect internal amenity space from road traffic noise from Owl Lane.

In relation to noise from the rugby facilities, it is felt that while infrequent and occurring outside of the night-time period, noise from the facilities could potentially be perceptible and that mitigation advice outlined in this report would reduce impact of noise from the rugby facilities sufficiently. Also, with all outdoor amenity space (discounting driveways) located behind to those properties facing Owl Lane and the rugby facilities, that noise impact would be sufficiently low.

It is understood that the wording in Condition 24 referring to "others uses" is referring to a local car boot 'Dewsbury Rams RLFC Trust Car Boot' which occurs every Sunday, weather dependant.

Noise from the car boot could potentially be perceptible and that mitigation advice outlined in this report would reduce impact of noise from car boot sufficiently and that noise impact would be sufficiently low.

6.0 Conclusion

BDW Trading Limited has appointed SLR Consulting Limited (SLR) to undertake a noise assessment to discharge planning condition 24 of planning permission (Ref: 2019/62/92787/E), for a proposed residential development (the Development) at land at Owl Lane, Chidswell, Dewsbury.

6.1 External Noise

According to British Standard 8233:2014, the noise level in outdoor amenity areas would ideally remain 55dB(A) or less.

With specific mitigation in the form of fencing of 1.8m and 2.5m in height at identified plots (as shown in Figure 5-2), it is concluded that:

- Within all gardens, except one, the daytime ambient noise levels are less than $L_{Aeq,16hr}$ 55dB(A).
- Many proposed gardens are predicted to experience a noise level of $L_{Aeq,16hr}$ 50dB(A) or less compared to Figure 5-1.
- One garden (Plot 163) out of 260 is expected to experience a noise level of $L_{Aeq,16hr}$ 56dB(A) , which marginally exceeds the upper guideline value of 55dB(A).
- As the proposed development is adjacent to a main-B road, noise levels are relatively high and the site layout has been carefully designed to reduce noise levels as far as practicable.

6.2 Internal Noise

The glazing and ventilation specifications required to achieve the recommended indoor noise levels in BS8233:2014 at each façade have been determined and iare provided within Appendix 04

APPENDIX 01

Glossary of Terminology

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 01-01
Sound Levels Commonly Found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel) — 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 ($2x10^{-5}$ Pa).

dB(A) — 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.

L_{Aeq} — L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

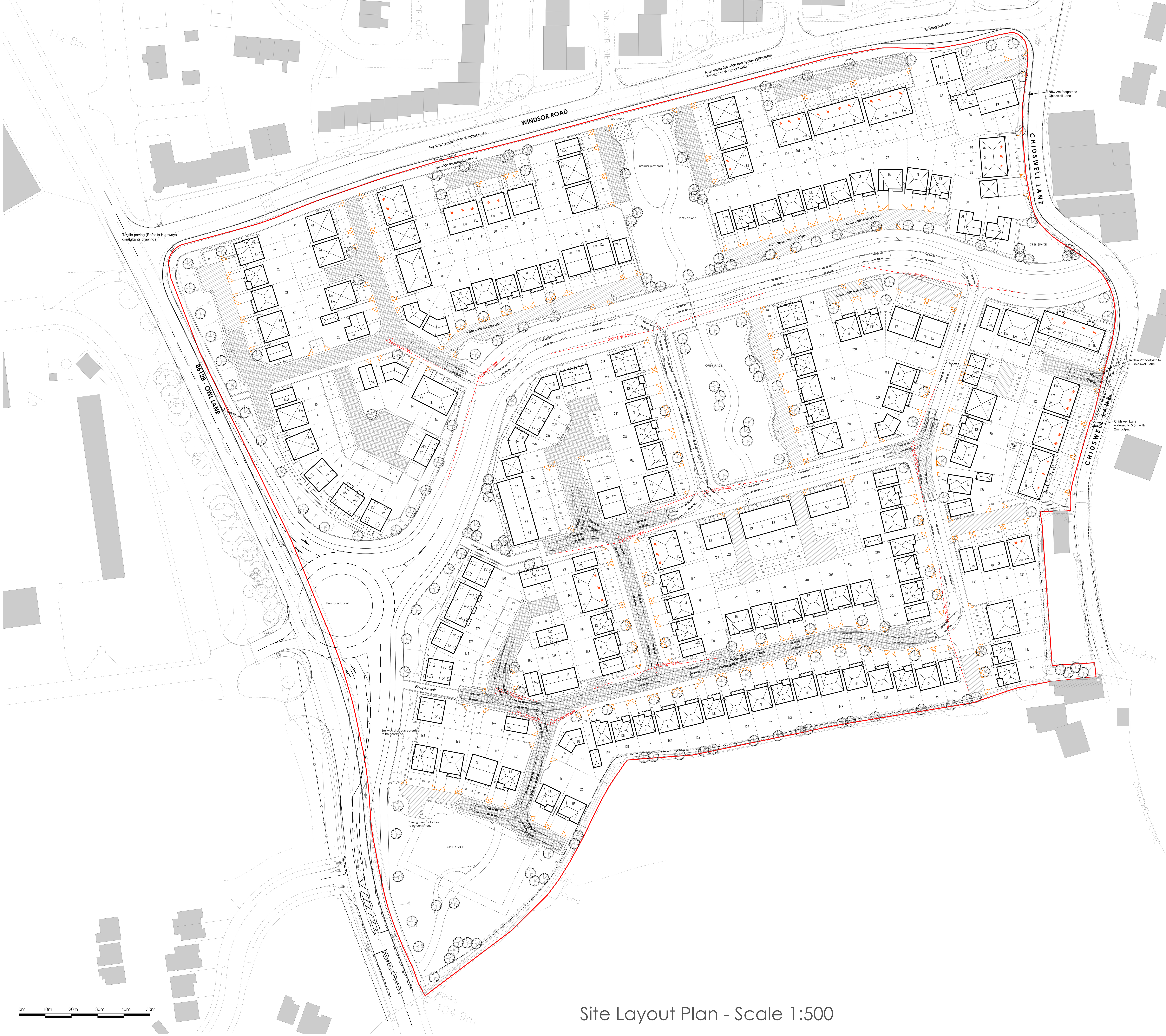
L_{10} & L_{90} — If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.

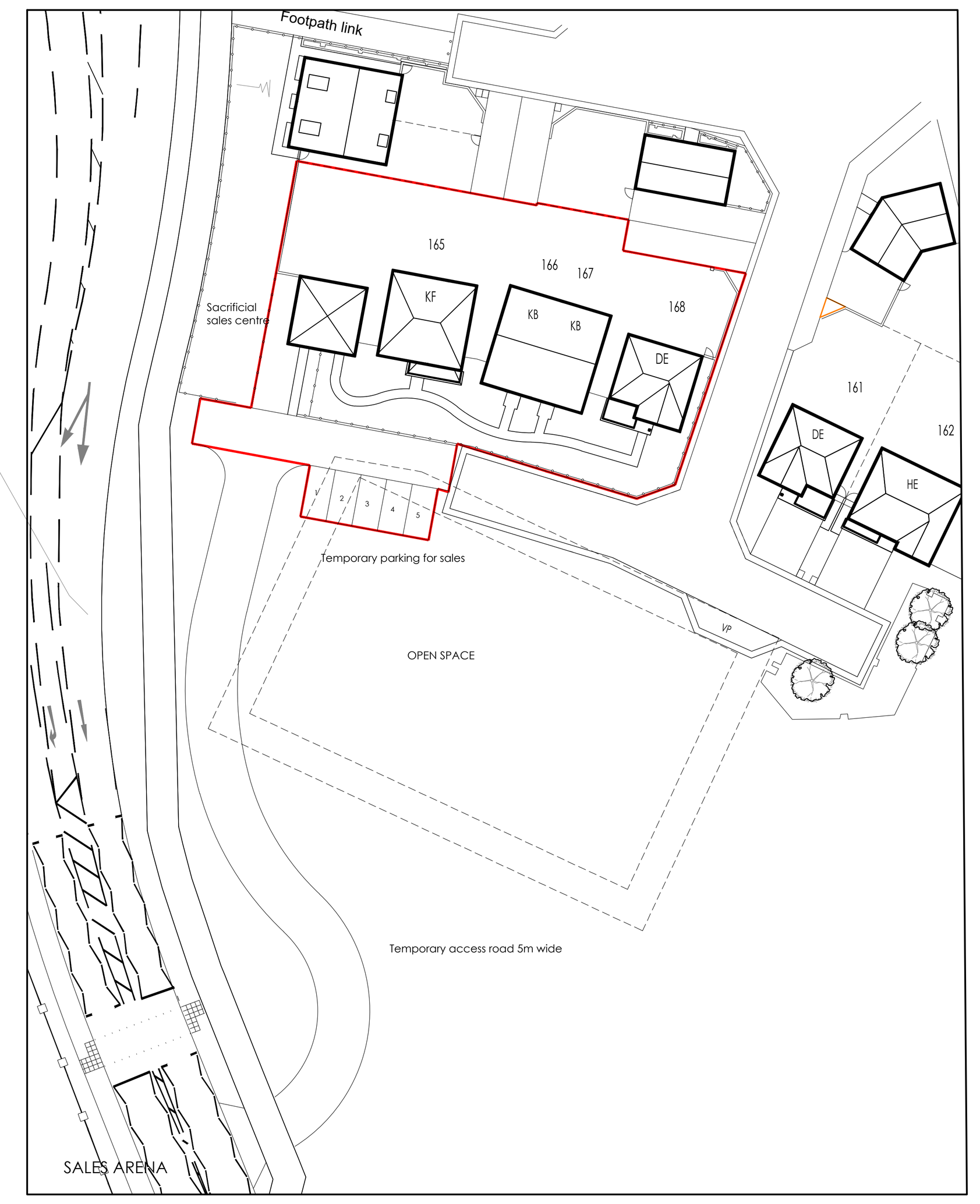
L_{AFmax}	L_{AFmax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 02

Site Layout

Owl Lane, Chidswell, **DEWSBURY**





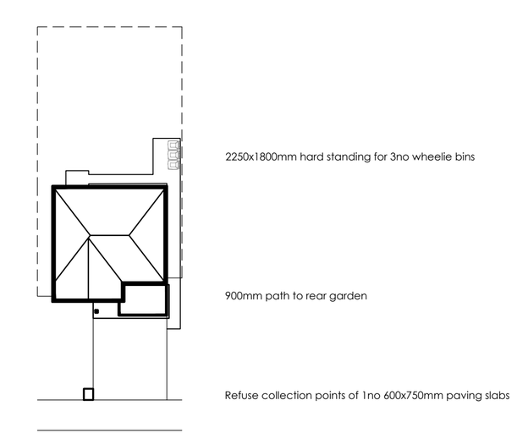
Site Layout Plan - Scale 1:500

ISSUE FOR PLANNING

NOTES:

REFUSE COLLECTION:
3no wheelie bins to be provided to each dwelling in accordance with Kirklees MC recycling/ collection policy. Refuse collection points to plot entrances comprising 1no 600x750mm paving slabs to be provided also.

- Lockable personnel gate.
- Lockable personnel gate (serving rear garden access paths) - Key to all those plots it serves and lock from both sides
- Refuse collection point. Max distance from Refuse vehicle 25m and 30m from house or apartment.
- Communal refuse store.
- 2 x 2m Vision splay to drive entrances. Max height of enclosures within splay to be 900mm
- Visibility splays



TYPICAL PLOT LAYOUT

Surface finishes:

- Block paving
- Tarmac
- Proposed trees and shrubs. Refer to Rosetta Landscape Architects plans for details.
- Affordable housing

Enclosures:

- 1800mm privacy panel and 1200mm timber fence
- 1800mm close boarded fence
- 1800mm wall/fence
- 900mm bow top railing
- 1200mm estate railing
- 1200mm post and rail fence
- 450mm knee rail

ACCOMMODATION SCHEDULE

HOUSE TYPE	DESCRIPTION	NO
AFFORDABLE 20% = 52 UNITS		
58	1 BEDROOM APARTMENT	1
59	1 BEDROOM APARTMENT	1
60	1 BEDROOM APARTMENT	6
61	1 BEDROOM APARTMENT	6
KEWDALE	2 BEDROOM SEMI-DET / TERR HOUSE	26
KIRKBRIDGE	3 BEDROOM SEMI-DET / TERR HOUSE	12
PRIVATE UNITS		
SEVERN	1 BED SEMI-DET HOUSE	1
WASHINGTON	2 BED SEMI-DET HOUSE	1
DENFORD	2 BEDROOM SEMI-DET/ TERR HOUSE	3
KEWDALE	2 BEDROOM SEMI-DET/ TERR HOUSE	28
ALVERTON	2 BEDROOM FLAT OVER GARAGE	5
MAIDSTONE	3 BEDROOM SEMI-DET / TERR HOUSE	3
KIRKBRIDGE	3 BEDROOM SEMI-DET / TERR HOUSE	44
MORESBY	3 BEDROOM DET /SEMI / DET HOUSE	17
DENBY	3 BEDROOM DETACHED HOUSE	27
LUTTERWORTH	3 BEDROOM DETACHED HOUSE	7
KINGSVILLE	3 BEDROOM SEMI-DET TOWN HOUSE	19
BRENTFORD	3 BEDROOM SEMI-DET TOWN HOUSE	4
WOODCOTE	3 BEDROOM SEMI-DET TOWN HOUSE	5
KINGSLEY	4 BEDROOM DETACHED HOUSE	3
KENNFORD	4 BEDROOM DETACHED HOUSE	26
HEMSWORTH	4 BEDROOM DETACHED HOUSE	12
ALDERNEY	4 BEDROOM DETACHED HOUSE	3
TOTAL		**260**

Rev	Description	Date
U.	Plots 1-6 adjusted. 260 plots.	07/01/21 - RP
T.	NDSS houses added.	07/01/21 - RP
S.	Affordable housing adjusted/sub station added/roof line adjusted.	21/10/20 - RP
R.	Affordable housing adjusted.	19/10/20 - RP
Q.	Affordable housing adjusted.	16/10/20 - RP
P.	Link road adjusted.	15/10/20 - RP
N.	Link road adjusted.	13/10/20 - RP
M.	Section 38 highway amendments.	06/10/20 - RP
L.	Stambournes replaced by Kingsville.	30/07/20 - RP
K.	Updated to roundabout design Rev E. Spine road widending adjacent plots 247-249, 85-87 and 134-137.	09/07/20 - RP
J.	Roundabout layout updated.	07/07/20 - RP
I.	Roundabout layout revised and various amendments to layout to 280 plots.	07/05/20 - RP
H.	Layout updated.	30/03/20 - RP
G.	Layout updated.	17/03/20 - RP
F.	Dropped kerbs added to Windsor Road. New topo added.	14/08/19 - AK
E.	Alverton roof hipped to client's requirements.	05/08/19 - RP
D.	Enclosures updated to client's requirements.	02/08/19 - RP
C.	Landscape architects details added.	01/08/19 - RP
B.	Revised to client's requirements. Plots 161-165.	31/07/19 - RP
A.	Revised to client's requirements. Plots 1-7 and 161-165 with extra plot. Indicative tanker turning area and easements added.	30/07/19 - RP

BARRATT HOMES

PARKER PEEL ARCHITECTURAL

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Client
Barratt Homes

Project
1820
Residential Development at
Owl Lane, Chidswell, Dewsbury

Title
Site Layout Plan

Drw. No.	Rev.	Scale	Drawn	Checked	Date
1820-SI-01	U	1:500@A0	RP	-	07/19

APPENDIX 03

Survey Results

Table 03-01
Location One, Survey Results – dB

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
10:45	72.0	59.8	75.5	81.4
11:00	71.9	60.0	75.4	81.7
11:15	71.8	60.7	75.5	82.3
11:30	72.1	60.9	75.5	85.7
11:45	71.3	58.7	74.8	88.9
12:00	71.8	58.5	75.6	82.1
12:15	71.4	59.9	75.2	79.9
12:30	72.4	62.6	75.7	83.6
12:45	72.0	60.3	75.6	83.6
13:00	72.3	60.0	75.9	82.6
13:15	72.5	61.9	76.0	85.9
13:30	72.6	58.8	75.6	96.3
13:45	72.2	62.8	75.4	84.5
14:00	72.2	62.3	75.5	81.0
14:15	72.0	59.5	75.4	81.9
14:30	71.9	61.7	75.3	82.1
14:45	72.0	60.4	75.4	80.2
15:00	72.7	62.4	76.1	80.6
15:15	72.5	62.9	75.8	81.4
15:30	72.9	63.9	75.9	82.0
15:45	73.2	63.3	76.4	86.0
16:00	72.2	63.4	75.4	82.1
16:15	73.6	65.1	76.3	94.6
16:30	72.7	65.8	75.7	80.2
16:45	73.6	66.7	76.2	82.2
17:00	72.5	65.0	75.4	80.4
17:15	72.4	65.9	75.1	83.2
17:30	73.3	66.2	76.1	83.0
17:45	73.6	67.2	76.3	81.6
18:00	73.8	66.8	76.5	82.2
18:15	72.8	62.8	76.1	81.1
18:30	73.0	64.0	76.2	84.3

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
18:45	72.3	62.8	75.7	82.2
19:00	72.6	62.5	76.1	83.3
19:15	74.3	62.2	76.3	96.4
19:30	71.8	60.1	75.6	81.6
19:45	71.0	58.3	75.2	81.0
20:00	70.9	58.1	74.8	83.2
20:15	70.6	55.9	75.0	83.8
20:30	70.1	56.1	74.6	82.7
20:45	70.1	56.0	74.4	85.7
21:00	70.2	55.1	74.9	85.8
21:15	70.0	50.3	74.6	86.9
21:30	69.8	55.0	74.3	82.7
21:45	69.1	51.1	74.0	85.1
22:00	72.0	59.4	76.0	89.1
22:15	69.1	54.4	73.7	83.4
22:30	68.0	48.6	72.7	85.1
22:45	66.7	42.4	71.2	80.8
23:00	65.3	43.2	68.5	83.4
23:15	67.6	45.1	72.5	82.1
23:30	64.6	43.2	68.1	81.9
23:45	64.3	43.4	67.4	82.3
00:00	64.5	41.6	67.4	83.9
00:15	64.0	42.7	66.8	79.5
00:30	62.7	41.1	64.4	80.5
00:45	62.9	39.0	63.4	83.3
01:00	60.8	36.8	60.1	81.9
01:15	54.9	38.0	49.2	77.7
01:30	61.4	38.6	60.9	79.9
01:45	61.5	38.8	58.6	84.8
02:00	61.5	37.9	60.6	81.1
02:15	60.5	37.2	57.6	81.1
02:30	78.1	39.7	68.8	104.6
02:45	58.1	38.6	50.8	82.2
03:00	62.6	39.6	60.3	82.6
03:15	62.1	39.6	60.9	82.8
03:30	63.6	40.2	65.4	82.9

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
03:45	65.2	40.0	67.1	83.4
04:00	64.3	39.8	65.8	82.7
04:15	65.8	39.5	68.4	84.2
04:30	66.1	40.6	68.8	82.7
04:45	66.7	40.7	70.6	84.9
05:00	66.7	40.4	71.2	82.3
05:15	69.2	46.2	74.0	84.0
05:30	70.7	54.1	75.4	82.8
05:45	72.6	59.4	76.7	84.9
06:00	71.4	54.7	75.9	83.2
06:15	72.1	58.3	76.1	84.0
06:30	73.1	61.6	76.8	83.1
06:45	73.6	63.6	76.8	82.6
07:00	74.2	65.5	77.4	82.6
07:15	74.5	67.2	77.4	83.5
07:30	74.3	65.9	77.2	82.3
07:45	73.9	66.6	76.8	81.5
08:00	74.2	67.5	77.0	84.3
08:15	73.0	65.2	76.2	81.5
08:30	73.5	65.2	76.6	82.8
08:45	79.0	63.4	77.1	105.8
09:00	73.6	65.3	76.8	82.2
09:15	72.8	64.4	76.1	82.8
09:30	72.7	62.3	76.0	82.8
09:45	71.9	60.5	75.6	84.0
10:00	72.4	62.2	75.9	82.2
10:15	71.9	59.8	75.5	82.2
10:30	71.8	61.1	75.5	82.4

Table 03-02
Location Two, Survey Results – dB

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
10:15	49.3	63.9	50.9	43.6
10:30	44.9	57.2	46.7	42.4
10:45	48.3	65.7	49.4	42.3
11:00	51.8	73.5	53.9	42.6
11:15	47.6	64.6	46.9	41.6
11:30	44.8	64.6	45.4	41.5
11:45	48.0	67.7	48.3	41.5
12:00	49.3	68.3	48.8	42.8
12:15	45.3	62.5	45.9	41.4
12:30	46.4	71.2	47.9	40.7
12:45	43.2	57.8	44.6	40.2
13:00	50.3	68.9	50.8	40.6
13:15	47.2	63.6	49.7	40.6
13:30	49.2	68.9	53.0	39.9
13:45	49.9	69.5	50.4	40.1
14:00	43.2	60.0	44.5	38.7
14:15	48.6	64.2	49.9	40.8
14:30	49.3	74.6	46.3	39.4
14:45	48.2	66.4	48.8	40.0
15:00	44.3	64.2	46.1	38.8
15:15	44.9	62.8	46.1	41.2
15:30	52.3	78.7	51.2	41.1
15:45	48.1	72.9	47.7	38.8
16:00	45.1	63.1	45.8	41.0
16:15	47.1	68.3	49.1	40.7
16:30	47.8	66.3	49.7	41.6
16:45	49.2	68.9	51.7	41.5
17:00	48.6	66.4	48.6	40.1
17:15	54.4	76.2	55.3	42.4
17:30	49.8	71.5	51.4	41.5
17:45	50.9	72.9	53.5	41.4
18:00	48.4	73.2	49.8	41.3
18:15	49.6	66.8	52.9	41.6

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
18:30	44.2	62.8	46.2	40.3
18:45	47.0	68.3	48.4	39.0
19:00	48.2	68.8	50.0	41.9
19:15	51.4	79.0	50.4	41.6
19:30	49.0	63.5	51.5	40.2
19:45	48.7	73.5	47.8	40.7
20:00	46.0	68.0	45.2	40.6
20:15	44.0	64.7	44.1	40.4
20:30	42.6	62.5	43.1	39.4
20:45	42.4	64.1	42.5	39.3
21:00	46.8	72.2	44.9	38.9
21:15	45.4	67.0	46.5	37.7
21:30	42.4	64.2	41.9	37.1
21:45	40.2	57.1	41.4	36.5
22:00	45.6	60.5	47.4	41.1
22:30	43.4	57.4	46.3	39.0
22:45	41.7	51.7	43.5	38.8
23:00	43.4	53.0	46.2	40.0
23:15	42.8	56.8	44.8	39.3
23:30	44.6	58.7	46.3	38.9
23:45	43.3	66.1	44.4	37.3
00:00	43.2	62.3	45.7	38.3
00:15	43.5	60.7	45.2	39.5
00:30	44.9	61.0	44.6	38.6
00:45	41.8	56.8	44.6	37.6
01:00	38.6	49.3	40.7	35.8
01:15	37.7	47.2	39.3	35.5
01:30	40.0	50.9	42.9	35.7
01:45	39.6	51.1	42.2	35.9
02:00	40.7	47.8	42.8	37.7
02:15	39.8	51.7	41.8	36.4
02:30	55.9	77.7	55.0	37.9
02:45	39.9	52.5	41.8	37.1
03:00	42.7	55.3	45.0	37.2
03:15	43.4	63.1	45.0	37.8
03:30	42.3	52.8	45.3	37.3

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
03:45	41.7	50.5	43.9	38.8
04:00	40.8	49.7	42.7	38.0
04:15	41.5	56.8	43.7	37.8
04:30	43.4	52.9	45.8	40.4
04:45	44.7	57.9	47.4	40.4
05:00	45.1	54.4	47.8	41.0
05:15	46.5	63.2	48.1	43.0
05:30	47.5	66.8	48.7	44.8
05:45	47.3	53.2	48.8	45.2
06:00	47.7	62.9	49.0	45.6
06:15	47.8	55.4	49.0	45.8
06:30	51.3	63.9	53.1	48.3
06:45	50.9	65.4	52.0	49.3
07:00	51.9	71.6	52.5	49.0
07:15	52.5	68.6	53.2	50.5
07:30	51.1	68.3	51.9	48.2
07:45	49.3	64.7	49.8	47.6
08:00	50.2	67.4	50.6	47.1
08:15	50.3	65.7	51.5	46.0
08:30	49.5	66.3	49.9	45.5
08:45	51.3	73.2	54.4	44.9
09:00	45.9	59.5	47.0	43.8
09:15	46.4	64.7	47.1	43.3
09:30	48.9	65.8	50.8	44.9
09:45	50.1	64.6	52.0	44.6
10:00	48.3	66.3	49.1	44.9
10:15	46.8	62.3	48.0	44.6
10:30	47.8	63.8	48.6	44.8

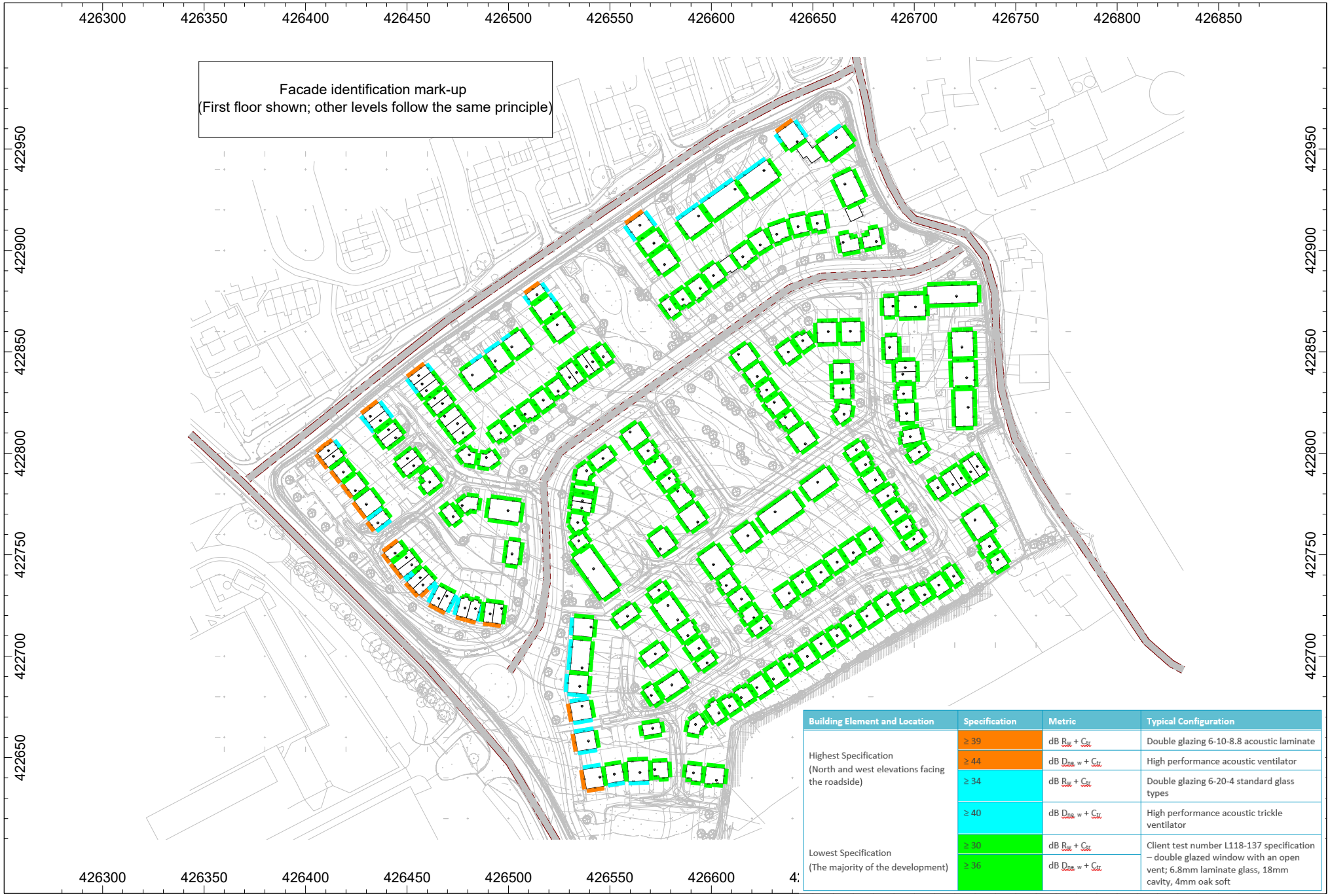
Table 03-03
Location Three, Survey Results – dB

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
11:15	54.7	41.8	58.9	71.5
11:30	56.4	41.8	59.8	73.4
11:45	55.1	40.8	59.0	72.1
12:00	57.4	41.8	58.8	83.7
12:15	55.1	41.0	58.4	72.4
12:30	58.6	41.6	58.4	87.6
12:45	56.5	39.8	60.0	73.6
13:00	56.2	41.0	60.0	72.4
13:15	54.9	41.0	57.5	72.6
13:30	56.8	40.5	60.7	77.3
13:45	56.6	40.9	59.7	76.2
14:00	55.0	39.8	58.6	71.5
14:15	55.7	41.9	59.8	70.8
14:30	58.0	40.4	62.1	77.0
14:45	57.0	40.9	61.5	73.9
15:00	55.7	41.0	60.0	70.3
15:15	59.2	43.5	63.5	78.6
15:30	59.0	43.2	64.0	74.7
15:45	60.2	43.5	64.4	80.1
16:00	57.9	43.4	62.9	72.3
16:15	59.2	43.2	64.2	78.9
16:30	60.7	43.9	64.3	84.8
16:45	58.8	44.8	63.4	78.4
17:00	61.0	45.1	65.8	77.0
17:15	60.5	44.4	65.3	75.3
17:30	61.0	43.9	65.5	80.8
17:45	61.3	45.8	65.9	75.2
18:00	63.8	54.7	69.0	71.8
05:00	55.8	37.7	53.6	80.1
05:15	54.8	40.7	52.7	79.0
05:30	59.4	42.4	53.2	85.2
05:45	57.7	45.6	54.1	82.7
06:00	57.0	45.6	54.7	77.3
06:15	59.4	47.3	56.9	79.0

Time	L_{Aeq}	L_{A90}	L_{A10}	L_{AFMax}
06:30	61.5	49.8	61.0	79.9

APPENDIX 04

Glazing and Ventilation Specifications



Building Element and Location	Specification	Metric	Typical Configuration
Highest Specification (North and west elevations facing the roadside)	≥ 39	dB $R_w + C_{tr}$	Double glazing 6-10-8.8 acoustic laminate
	≥ 44	dB $D_{ne,w} + C_{tr}$	High performance acoustic ventilator
	≥ 34	dB $R_w + C_{tr}$	Double glazing 6-20-4 standard glass types
	≥ 40	dB $D_{ne,w} + C_{tr}$	High performance acoustic trickle ventilator
Lowest Specification (The majority of the development)	≥ 30	dB $R_w + C_{tr}$	Client test number L118-137 specification – double glazed window with an open vent; 6.8mm laminate glass, 18mm cavity, 4mm oak soft
	≥ 36	dB $D_{ne,w} + C_{tr}$	

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