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BOWLAND MEADOW, LAND EAST OF CHIPPING LANE, LONGRIDGE

Barratt Homes (Manchester)
Noise Assessment

11/04/2014



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Bowland Meadow, Land East of Chipping Lane, Longridge Barratt Homes (Manchester)

11/04/2014

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1 Introduction

- 1.1.1 WSP UK has been appointed by Barratt Homes (Manchester) to undertake an environmental noise assessment for the proposed Bowland Meadow residential development at land east of Chipping Lane, in Longridge. The assessment has been carried out to support the detailed planning application for the proposed development.
- 1.1.2 The environmental noise assessment has been based on the results of detailed baseline noise measurements undertaken over the course of a typical 24-hour weekday period. The results of the noise survey have been assessed in accordance with applicable standards and guidance, and in line with the assessment requirements of Ribble Valley Borough Council (RVBC).
- 1.1.3 Where appropriate, consideration has been given to noise mitigation measures to demonstrate how a commensurate level of protection could be afforded to the future noise sensitive receptors of the development against the prevailing local noise environment.
- 1.1.4 This report is necessarily technical in nature, so to assist the reader, a glossary of acoustic terminology is provided in **Appendix A**.

2 Site Setting

2.1 Site Location and Setting

- 2.1.1 The proposed development site currently comprises open fields and is located to the north of the residential area of Longridge.
- 2.1.2 The site is bound to the east by Chipping Lane and Longridge Cricket Club, beyond which lies the Longridge Town Football Club (F.C.) and the Alston Arms Public House. The proposed development site is screened from the football pitch by an approximately 2m high landscaped bund which runs parallel with Chipping Lane. To the north, the site is bound by open fields. To the west, the site is bound by further open fields. To the south, the site is bound by Sainsbury's Supermarket, Irelands Garage Ltd and existing residential properties on Inglewhite Road. The site boundary and setting is presented in **Appendix B**.
- 2.1.3 The opening hours of the Sainsbury's Supermarket are understood to be 07:00 to 22:00 hours Monday to Friday, 07:00 to 21:00 hours on Saturdays and 10:30 to 16:30 hours on Sundays. The service yard of the supermarket bounds the proposed development site. Vehicular access to the service yard is gained via the main entrance of the supermarket, off Inglewhite Road, and the designated access for deliveries along to the west of the supermarket building. A single roller shutter door is located on the northern façade of the supermarket. The ancillary plant of the supermarket is located on the roof of the supermarket building.
- 2.1.4 Irelands Garage Ltd is a car repair garage and MOT Testing Station. There is also a hand-car wash operating in the former petrol forecourt of the garage. The opening hours of Irelands Garage Limited is understood to be 09:00 to 17:00 hours Monday to Saturday. From observations made during the baseline noise survey, vehicles appeared to be worked on within the main building. The smaller single storey annex, to the north of the main building, appears to be used for fitting tyres. Both buildings are accessed via the south-western façades such that there is no direct line of sight with the operational activities undertaken within these premises from the proposed development site. With the exception of a parked vehicle, the area located immediately to the north of the buildings of the

garage, and immediately adjacent to the proposed development site, appeared to be un-used in terms of the typical daily activities associated with Irelands Garage Ltd.

2.2 Proposed Development

- 2.2.1 The proposed development will comprise up to 106 residential dwellings, including affordable housing, new vehicular and pedestrian accesses, on-site landscaping, public open space and ecological enhancement measures. The proposed development will be accessed via Chipping Lane. The proposed site layout prepared by Baldwin Design Consultancy Ltd, drawing number BH/LP1/SL01 Revision H dated 9th April 2014, is included in **Appendix C**.
- 2.2.2 In addition to the proposed Bowland Meadow development, Barratt Homes are also preparing to submit an outline planning application for development on a wider, circa 23 ha, site. The Bowland Meadow site forms the first phase of this development and that is the focus of this noise assessment.

3 Legislation and Guidance

3.1 Introduction

- 3.1.1 The noise assessment considers the potential impacts of the prevailing local noise environment at the proposed residential properties of the development. There is no specific all-encompassing guidance relating to the standards associated with these noise emissions/noise impacts on residential development. It is therefore necessary that the noise assessment has drawn upon a number of different national planning policies, British Standards and guidance documents as follows:
- Noise Policy Statement For England, 2010 (NPSE);
 - National Planning Policy Framework 2012 (NPPF);
 - National Planning Policy Guidance 2014 (NPPG);
 - British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings (BS 8233); and
 - World Health Organisation (WHO): 1999 Guidelines for Community Noise.
- 3.1.2 A summary of the planning policies and guidance relevant to the noise assessment are summarised below:

3.2 Noise Policy Statement for England (NPSE)

- 3.2.1 The Noise Policy Statement for England (NPSE) was published on 15th March 2010. It sets out the long term vision for government noise policy, to promote good health and a good quality of life through the management of noise.
- 3.2.2 The policy ensures that noise issues are considered at the right-time during the development of policy and decision making, and not in isolation. It highlights the underlying principles on noise management already found in existing legislation and guidance. The NPSE should apply to all forms of noise including environmental noise.
- 3.2.3 It sets out the long term vision of Government noise policy as follows:

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

3.2.4 This long term vision is supported by the following aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

3.2.5 To assist in the understanding of the terms "significant adverse" and "adverse", the NPSE acknowledges that there are two concepts that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

- **NOEL - No Observed Effect Level** - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- **LOAEL - Lowest Observed Adverse Effect Level** - This is the level above which adverse effects on health and quality of life can be detected.

3.2.6 The NPSE introduces a third concept that it describes as a significant observed adverse effect level.

- **SOAEL - Significant Observed Adverse Effect Level** - This is the level above which significant adverse effects on health and quality of life occur.

3.2.7 However, the NPSE goes on to state that:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

3.3 National Planning Policy Framework (NPPF)

3.3.1 Published in March 2012, this document sets out the Government's planning policies for England and supersedes a number of previous Planning Policy Guidance Notes and Planning Policy Statements (amongst other documents), including Planning Policy Guidance Note 24: Planning and noise. In contrast to PPG 24, reference to noise is scant within the new NPPF. However it does make the following references to noise in the section entitled Conserving and enhancing the natural environment:

3.3.2 *"The planning system should contribute to and enhance the natural and local environment by... [a number of points including]...preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".*

3.3.3 And

"Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*

- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

3.4 National Planning Practice Guidance (NPPG)

3.4.1 On 6th March 2014, the Department for Communities and Local Government (DCLG) launched a national planning practice guidance web-based resource. It is stated that the guidance is to complement the NPPF and provide advice on how to deliver its policies.

3.4.2 The section on noise includes a table that summarises "the noise exposure hierarchy, based on the likely average response" which offers "examples of outcomes" relevant to the NOEL, LOAEL and SOAEL effect levels described in the NPSE (see above). These outcomes are in descriptive form and there is still no numerical definition of the NOEL, LOAEL and SOAEL, or detailed advice regarding methodologies for their determination. There is also no reference to the further research that was identified as necessary in the NPSE in 2010.

3.5 BS 8233:2014: Guidance on sound insulation and noise reduction for buildings

3.5.1 This standard provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

3.5.2 The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in Table 1 below:

Table 1: Summary of Internal Ambient Noise Levels to be achieved in Habitable Rooms when assessed in accordance with BS 8233

Activity	Location	Period	
		07:00 to 23:00 Hours, i.e. Daytime	23:00 to 07:00 Hours, i.e. Night-time
Resting	Living Room	35 dB L _{Aeq} , 16 Hour	-
Dining	Dining Room/area	40 dB L _{Aeq} , 16 Hour	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq} , 16 Hour	30 dB L _{Aeq} , 8 Hour

3.5.3 With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB L_{Aeq,T}, with an upper guideline value of 55dB L_{Aeq,T} which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and

locations adjoining the strategic network, where it may be necessary may compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

3.6 World Health Organisations (WHO) 1999: Guidelines for Community Noise

3.6.1 The BS 8233 criterion for internal ambient noise levels in habitable rooms are largely concordant with the World Health Organisation (WHO) guidance: 1999: *Guidelines for Community Noise*. In addition to the ambient internal noise levels, this document draws upon guidance from Vallet and Vernay, which states:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night".

3.7 Consultation with the Environmental Health Department of Ribble Valley Borough Council

3.7.1 Consultation discussions have been held with Mr James Russell, Head of Environmental Health Services of Ribble Valley Borough Council (RVBC), to discuss and agree the scope of the noise assessment and criteria to be adopted. The noise assessment, prepared in support of the detailed planning application, focuses on the operational phase of the development and considers the suitability of the site for residential use. It was agreed that the potential noise and vibration impacts associated with the construction phase of the development could be controlled via planning condition.

3.7.2 The prevailing noise environment at the site is dominated by road traffic on the local road network, i.e. Chipping Lane and Inglewhite Road. In addition, operational activities associated with the Sainsbury's supermarket and Irelands Garage Ltd have the potential to generate noise in the southern part of the site. In absence of any guidance on appropriate noise assessment methods within the NPPF and NNPG, it was agreed that the prevailing noise environment be assessed with reference to BS 8233 and the WHO Guidelines for Community Noise.

3.7.3 In summary, the proposed noise level against which the scheme is to be assessed were therefore agreed as follows:

- 50 dB $L_{Aeq, 16-Hour}$ in gardens in the daytime 07:00 - 23:00 hour period;
- 35 dB $L_{Aeq, 16-Hour}$ in living rooms and bedrooms in the daytime 07:00 - 23:00 hour period;
- 40 dB $L_{Aeq, 16-Hour}$ in dining rooms in the daytime 07:00 - 23:00 hour period;
- 30 dB $L_{Aeq, 8-Hour}$ inside bedrooms in the night-time 23:00 - 07:00 hour period; and
- 45 dB L_{AFmax} not regularly exceeded, i.e. more than 10-15 times per night, inside bedrooms in the night-time.

4 Environmental Noise Survey

4.1 Existing Noise Sources

- 4.1.1 To inform the assessment and determine the current prevailing noise climate at the site a detailed baseline noise survey has been undertaken. Continuous baseline noise survey measurements were undertaken over a 24 hour period commencing at approximately 11:30 hours on the 1st April 2014 and concluding at approximately 14:00 hours on the 2nd April 2014.
- 4.1.2 WSP Acoustics visited the site and found the noise environmental across the site to be dominated by road traffic on the local road network surrounding the site, i.e. Chipping Lane and Inglewhite Road. In addition, it is considered that occasional operational activities associated with the service yard of the Sainsbury's supermarket may also contribute to the prevailing noise environment in the southern part of the site. However, during the attended measurements limited activities associated with service yard of the Sainsbury's Supermarket, and also Ireland's Garage Ltd, were noted.

4.2 Measurement Locations

- 4.2.1 The measurement location adopted throughout the survey is shown in **Appendix B**, and can be described as follows:
- Measurement Location 1: In the south-western part of the site situated approximately 8.5 m from the edge of the carriageway of Inglewhite Road and 28 m from the edge of Chipping Lane. This measurement location was positioned at a height of 1.5m above the local ground level and in free-field conditions. This area of the site is approximately 0.5 m above Inglewhite Road.
 - Measurement Location 2: In the north-western part of the site situated approximately 8 m from the edge of the carriageway of Chipping Lane and immediately to the south of Longridge Cricket Club. This measurement location was positioned at a height of 1.5 m above the local ground level and in free-field conditions.
 - Measurement Location 3: To the south-east of the site situated at the boundary of the existing service yard of the Sainsbury's Supermarket. This measurement location was positioned at a height of 2.0 m above the local ground level and in free-field conditions. The height of the existing service yard is approximately 0.5 m above site level, i.e. the measurement location had a direct line of sight of the operational activities in the yard of the Sainsbury's Supermarket.

4.3 Meteorological Conditions

- 4.3.1 Over the course of the baseline noise survey, meteorological conditions remained ideal for environmental noise measurements remaining dry with winds typically below 5 m/s.

4.4 Measurement Equipment

- 4.4.1 The baseline noise survey measurements were undertaken using the following Type 1 specification noise measuring equipment:

Table 2: Noise Measurement Equipment

Measurement Location	Equipment	Make and Model	Serial Number
1	Sound Level Meter	01dB-METRAVIB Solo Master	65303
	Pre-amplifier	01dB-Stell PRE 21 S	15976
	Microphone	Microtech Gefell GmbH MCE212	142812
	Calibrator	01dB-Stell Cal 21	34213780
2	Sound Level Meter	01dB-METRAVIB Solo Master	65806
	Pre-amplifier	01dB-Stell PRE 21 S	16461
	Microphone	Microtech Gefell GmbH MCE212	166412
	Calibrator	01dB-Metravib Cal 21	34323904
3	Sound Level Meter	01dB-METRAVIB Solo Master	65469
	Pre-amplifier	01dB-Stell PRE 21 S	15983
	Microphone	Microtech Gefell GmbH MCE212	142646
	Calibrator	01dB-Metravib Cal 21	35113822

4.4.2 The sound level meters and associated measurement chains have been calibrated to traceable standards within the preceding two years and the portable calibrators within the preceding 12 months. The sound level meters were calibrated both prior to and upon completion of the survey. No significant drift was noted.

4.5 Measurement Results

4.5.1 A summary of the longer term continuous noise levels measured at measurements locations 1 to 3 are presented within Table 3.

Table 3: Summary of Long Term Continuous Noise Measurement Results at Measurement Locations 1 to 3, Free-field (dB(A))

Measurement Location	Period	Time Period	$L_{Aeq,T}$	Typical $L_{A(max),T}$ ¹
1	Daytime	16 Hour (12:30 – 23:00, 07:00 – 12:30)	63.5	-
	Night-time	8 Hour (23:00 – 07:00)	55.4	77.8
2	Daytime	16 Hour (11:30 – 23:00, 07:00 – 11:30)	58.9	-
	Night-time	8 Hour (23:00 – 07:00)	48.9	71.8
3	Daytime	16 Hour (13:00 – 23:00, 07:00 – 13:00)	52.2	-
	Night-time	8 Hour (23:00 – 07:00)	48.1	

¹ Typical $L_{A(max)}$ noise level taken as the 10th highest $L_{A(max)}$ during the night-time in accordance with guidance referenced by the WHO.

- 4.5.2 The site was attended during the installation and removal of the longer term continuous measurement. During the attended measurements it was noted that the dominant source of noise at the site was road traffic on the local road network. Sheep grazing in the open fields were occasionally audible.
- 4.5.3 Limited activities associated with the service yard of the Sainsbury's Supermarket and Ireland's Garage Ltd were observed. A heavy goods vehicle (HGV) was noted to be leaving the service yard of the Sainsbury's Supermarket at approximately 12:20 hours on the 1st April 2014 following installation of the measurement equipment at Measurement Location 1 but prior to the installation of equipment at Measurement Location 3. The ancillary plant associated with the Sainsbury's supermarket was barely audible at Measurement Location 3, i.e. at the development site boundary.
- 4.5.4 The monitoring data at Measurement Location 3 has been reviewed to establish potential events during the continuous baseline measurements considered to be associated with typical activities of a supermarket service yard. For example, the arrival and/or departure of vehicles. It is assumed that the operational activities would typically be undertaken in the centre of the service yard, i.e. approximately 25 m from Measurement Location 3. The noise levels measured during potential events considered to be associated with activities of the existing service yard at Measurement Location 3 are presented within Table 4.

Table 4: Summary Noise Measurements of Potential Events of Activities Associated with the Existing Service Yard of Sainsbury's Supermarket at Measurement Location 3, Free-field (dB(A))

Date	Start Time (HH:MM)	Approximate Duration of Potential Event (HH:MM)	Measured Level	Comments
01/04/2014	14:10	00:50	55.9	Period of increased activity, including a potential arrival and departure of vehicle with possible unloading activities.
01/04/2014	17:32	00:15	55.7	Possible vehicle movement.
01/04/2014	22:36	00:20	56.3	Period of increased activity, including a potential arrival and departure of vehicle with possible unloading activities
02/04/2014	03:12	00:09	55.7	Period of increased activity, including a potential arrival of vehicle with possible unloading activities
02/04/2014	03:31	00:02	62.5	Possible HGV arriving / departing from the service yard
02/04/2014	03:35	00:02	50.7	Possible HGV arriving / departing from the service yard
02/04/2014	04:20	00:12	51.3	Period of increased activity, including a potential arrival and departure of vehicle with possible unloading activities
02/04/2014	05:59	00:31	55.4	Period of increased activity, including a potential arrival and departure of vehicle with possible unloading activities

5 Noise Assessment

5.1 Introduction

5.1.1 In order to determine the suitability of the site for residential development it is useful to determine the dominant sources of noise across the site, i.e. road traffic and operational activities of the service yard of the Sainsbury's Supermarket in the southern part of the site.

5.1.2 Noise levels present across the site have been considered drawing on the results of the baseline noise survey and the proposed site layout. The proposed site layout prepared by Baldwin Design Consultancy Ltd on behalf of Barratt Homes, drawing number BH/LP1/SL/01 Revision H dated 9th April 2014, is included in **Appendix C**.

5.2 Road Traffic Noise

5.2.1 To establish the levels of road traffic noise across the site predictions have been carried out have been carried out in accordance with the Department of Transport and Welsh Office document *Calculation of Road Traffic Noise (CRTN) 1988*.

5.2.2 The predicted free-field noise levels at sensitive areas of the development, i.e. the proposed residential properties, are summarised in Table 5 below.

Table 5: Predicted Daytime and Night-time Noise Levels at Sensitive Area of the Proposed Development, Free-Field, dB(A)

Proposed Sensitive Receptor Location	Location	Period	Predicted Noise Level, L_{Aeq}	Predicted Maximum Noise Level, L_{Amax}
Residential Properties in the Northern Part of the site, i.e. Plots 38 to 45 ¹	Garden	Daytime – 16 Hour	48.7	-
	Façade		49.3	-
	Façade	Night-time – 8 Hour	39.3	52.6
Residential Properties in the Southern Part of the site, i.e. Plots 103 to 106 ²	Garden	Daytime – 1 Hour ⁴	52.6	-
	Façade		54.2	-
	Façade	Night-time – 1 Hour ⁴	54.1	72.9 ⁵
Residential Properties in the South-Western Part of the site, i.e. Plots 89 to 94 ³	Garden	Daytime – 16 Hour	61.9	-
	Façade		62.5	-
	Façade	Night-time – 8 Hour	53.9	68.5
Residential Properties in the Western Part of the site, i.e. Plots 87 to 88 ³	Garden	Daytime – 16 Hour	55.0	-
	Façade		57.8	-
	Façade	Night-time – 8 Hour	47.8	69.6

¹ Based on measurements taken at measurement location 2.
² The measured levels at Measurement Location 3 are considered to be representative of the residential properties in the southern part of the site, i.e. Plots 103 to 106.
³ Based on measurements taken at measurement location 1.
⁴ Based on the modelled noise levels of operational activities associated with the service yard of Sainsbury's supermarket.
⁵ Based on the maximum noise levels measured at measurement location 3.

5.2.3 The results in Table 5 indicate that mitigation measures will need to be incorporated into the proposed site design to ensure the required external and internal noise limits are achieved at sensitive areas of the development.

5.3 Assessment of Operational Activities Associated with the Service Yard of the Sainsbury's Supermarket

5.3.1 The noise generated by operational activities associated with the service yard of the Sainsbury's supermarket has been assessed at the residential dwellings in the southern part of the site. From a review of the continuous measurements at measurement location 3 it is considered that:

- Deliveries will typically take up to 30 minutes;
- Only one delivery takes place over a 1-hour period; and
- Deliveries have the potential to take place during daytime and night-time hours.

5.3.2 A detailed acoustic computer simulation of the potential operational activities associated with the service yard of the Sainsbury's supermarket site has been generated to calculate the noise generated in the southern part of the development site. The model has been generated using CadnaA[®] noise mapping software including for downwind propagation. The modelling software conforms to the prediction methodology set out in the International Standard ISO9613-2: 1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO9613-2).

5.3.3 In summary, the noise model has taken the following into consideration:

- Mapping of the site and the surrounding area was calibrated into the noise model based on known Ordinance Survey grid reference points;
- The topography across the site and the service yard of the Sainsbury's supermarket. Observations made during the baseline noise survey indicate that the service yard is elevated by approximately 0.5 m above the southern part of the development site.
- The proposed residential buildings themselves (assumed to be 8 m high) and localised barriers associated with outdoor living areas of the development (assumed to be 1.8 m high) are based on the proposed site layout in **Appendix C**.
- In general, ground absorption for the model was set to $G=0$ (100% hard ground 0% acoustically absorptive ground) as a worst case scenario for intervening ground between sources and receivers. The model has been set for $G=1$, i.e. soft ground, for the proposed public open spaces in the southern part of the site.
- The model was set up to include second order reflected noise from solid structures.
- During the daytime periods the receiver height is taken as 1.5 m above local ground for the daytime scenario (i.e. ground floor) and at 4 m above local ground for the night-time scenario (i.e. first floor).

5.3.4 The measured noise levels of potential events considered to be associated with activities of the existing service yard at Measurement Location 3, as detailed in Table 4, have been used to prepare the detailed noise model. The measurement data adopted within the noise modelling includes the vehicle movement at 03:31 and the period of increased activity lasting of 31 minutes between 05:59 and 06:30 hours on the 2nd April 2014.

5.3.5 The results of the noise modelling indicate that the levels of noise generated by the operational activities of the service yard in gardens of Plots 103 to 106, i.e. located nearest to the service yard, will range between 50 dB $L_{Aeq, 1 Hour}$ and 53 dB $L_{Aeq, 1 Hour}$. At the first floor of Plot 106, located nearest to the service yard, the noise levels generated are predicted to be 54.1 dB $L_{Aeq, 1 Hour}$.

- 5.3.6 Mitigation measures will need to be incorporated into the proposed site design to ensure the required external and internal noise limits are achieved and to protect the amenity of the future residents in the southern part of the site.

6 Proposed Mitigation Measures

6.1 Proposed Scheme Layout

- 6.1.1 The proposed site layout prepared by Baldwin Design Consultancy Ltd on behalf of Barratt Homes, drawing number BH/LP1/SL/01 Revision H dated 9th April 2014, is included in **Appendix C**. Mitigation measures utilised to meet the RVBC external and internal criteria are discussed further in the following sections:

6.2 External Noise Levels

- 6.2.1 The assessment of the prevailing noise environment at the site indicates that mitigation measures will be necessary to meet the external daytime noise limit of 50 dB $L_{Aeq, 16-hour}$ criteria agreed with RVBC in gardens.
- 6.2.2 The proposed site layout indicates that the majority of gardens located nearest to Chipping Lane and Inglewhite Road are located to the east of the proposed dwellings, i.e. screened from road traffic by the building of the proposed dwellings themselves. To ensure the external daytime noise limit is met in the garden of Plot 89 in the southern part of the site, i.e. nearest to and with a direct line of sight of Inglewhite Road, it is recommended that a 2.5 m barrier be constructed along the southern perimeter boundary of the proposed garden. With the exception of Plot 89, it is considered that localised barriers, with a height of 1.8 m to 2.0 m high, would be sufficient to ensure the external daytime noise limit is met in gardens of dwelling located nearest to Chipping Lane and Inglewhite Road.
- 6.2.3 With the exception of the gardens located nearest to Chipping Lane and Inglewhite Road, the majority of the gardens located further into the site will be protected by the proposed residential buildings themselves and/or screened by localised barriers. The noise levels in these garden areas are therefore likely to be no more than 50dB $L_{Aeq, 16-hour}$.
- 6.2.4 To protect the amenity of residents in the southern part of the development, it is recommended that a 2.5 m high barrier be constructed along the southern site boundary adjoining the service yard of the Sainsbury's Supermarket and Ireland's Garage Limited. With the mitigation measures in place, the levels of noise generated by the operational activities of the service yard in gardens of Plots 103 to 106, i.e. located nearest to the service yard, will range between 37 dB $L_{Aeq, 1 Hour}$ and 42 dB $L_{Aeq, 1 Hour}$. In addition, the majority of gardens immediately to the north of the service yard are situated to the north and west of the proposed dwellings, i.e. screened from the service yard by the building of the proposed dwelling. The attenuation afforded by the proposed mitigation measures, buildings of the proposed dwellings and localised barriers will be sufficient to ensure the external daytime noise limits will be met in gardens of the dwellings closest to the service yard of the Sainsbury's supermarket.
- 6.2.5 To ensure the acoustic integrity of the localised barriers, they should be continuous, imperforate (i.e. no holes/perforations), sealed at the base and with a mass per unit area of 10-15 kg/m². Such a construction would typically be achievable with the use of a close boarded timber fence of appropriate thickness (thickness based on the selected timber mass, according to the stated mass per unit area). For example, a close boarded timber fence with a mass per unit area of 12.5 kg/m² can be achieved with a 22 mm thick marine grade plywood fence.

6.3 Internal Noise Levels

- 6.3.1 The dominant source of environmental noise across the site is road traffic on the local road network. Operational activities associated with the service yard of the Sainsbury's Supermarket also contribute to the prevailing noise levels in the southern part of the site. In accordance with BS 8233 and the WHO Guidelines for Community Noise, RVBC have agreed that internal noise levels of 35 dB $L_{Aeq\ 16\text{-hour}}$ during the daytime in living rooms and bedrooms, 40 dB $L_{Aeq\ 16\text{-hour}}$ during the daytime in dining rooms and 35dB $L_{Aeq\ 8\text{-hour}}$ during the night-time in bedrooms. In addition, a noise level of 45dB L_{AFmax} should not normally be exceeded during the night-time period.
- 6.3.2 The results of the baseline noise survey have been used to determine the noise levels at the facades of the proposed dwellings; these levels have been compared to the requirements of RVBC to determine the sound insulation performance requirement of the façade. To calculate the required sound insulation performance of the façade it is appropriate to explore the protection that can be afforded by the sound insulation of the glazing package.
- 6.3.3 Following the 'simple calculation' method given in BS 8233, single figure values can be used in lieu of a full spectral noise break-in analysis. This provides adequate information about the suitability of the design at the outline application stage although the sound reduction performance of the façade should be investigated in more depth as part of the detailed design. BS 8233 notes that the simple method can underestimate the R_w requirement by up to 5dB, and so a 5dB allowance has been included in the calculations. The simple method uses free-field external noise levels and so no façade reflection correction has been required.
- 6.3.4 In order to meet the internal noise criterion of BS 8233 and the WHO Guidelines, the relevant facades of the proposed residential properties would need to achieve the sound insulation values set out in the table below.

Table 6: Required Sound Insulation Performance for Noise Sensitive Areas of the Development

Façade Location	Period	Noise Index	Internal Target Level (dB) ¹	Predicted External Noise Level	Required Sound Insulation Performance (dB R_w) ²	Maximum Required Sound Insulation Performance (dB R_w) ³
Residential Properties in the Northern Part of the site, i.e. Plots 38 to 45 ¹	Day	$L_{Aeq\ 16\text{-hour}}$	35	50	20	20
	Night	$L_{Aeq\ 8\text{-hour}}$	30	40	15	
		L_{AFmax}	45	53	13	
Residential Properties in the Southern Part of the site, i.e. Plots 103 to 106 ²	Day	$L_{Aeq\ 1\text{-hour}}$	35	42	17	33
	Night	$L_{Aeq\ 1\text{-hour}}$	30	52	27	
		L_{AFmax}	45	73	33	
Residential Properties in the South-Western Part of the site, i.e. Plots 89 to 94 ³	Day	$L_{Aeq\ 16\text{-hour}}$	35	63	33	33
	Night	$L_{Aeq\ 8\text{-hour}}$	30	54	29	
		L_{AFmax}	45	73	33	
Residential Properties in the Western Part of the site, i.e. Plots 87 to 88 ³	Day	$L_{Aeq\ 16\text{-hour}}$	35	58	28	30
	Night	$L_{Aeq\ 8\text{-hour}}$	30	48	23	
		L_{AFmax}	45	70	30	

Façade Location	Period	Noise Index	Internal Target Level (dB) ¹	Predicted External Noise Level	Required Sound Insulation Performance (dB R _w) ²	Maximum Required Sound Insulation Performance (dB R _w) ²
¹ To be robust, the lower internal noise limit for living rooms and bedrooms has been used as the internal target for the daytime period. ² Includes +5dB allowance in line with BS 8233 simple calculation method.						

- 6.3.5 The noise attenuation required to reduce the maximum noise levels is generally greater than that required to mitigate the night-time L_{Aeq} noise levels. However, the glazing recommended will need to ensure that both the internal night-time L_{Aeq} and L_{AFmax} criteria are met.
- 6.3.6 British Standard 12354-3:2000 *Building Acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 3: Airborne sound insulation against outdoor sound* (BS12354-3) sets out data relating to the typical noise reduction performance of different glazing systems including when the dominant source of noise is road traffic noise. A selection of these performances is set out below.

Table 7: Typical Sound Reduction Properties of Insulating Glass Units

Glass / Cavity Width / Glass (mm)	Sound Reduction (R _w [R _w C _w] dB)
4 mm glass / 6 – 16 mm air gap / 4 mm glass	29 [25]
6mm glass/ 6 – 16 mm air gap / 4 mm glass	32 [28]
8 mm glass / 6 – 16 mm air gap / 4 mm glass	33 [29]
10 mm glass / 6 – 16 mm air gap / 4 mm glass	35 [30]
6 mm glass / 6 – 20 mm air gap / 6.8 Pilkington Optiphon glass ¹	38 [33]

¹ Pilkington published data. All other data extracted from BS12354-3:2000.

- 6.3.7 Comparing the sound insulation performance requirements in Table 6, with the typical sound insulation performance values of those different glazing systems presented in Table 7, it can be seen that a double glazing system with a 6 mm glass / 6 - 20 mm air gap / 6.8 mm Pilkington Optiphon glass build up would achieve the internal requirements in the south-western part of the development site, i.e. Plots 89 to 94, with windows closed. It should be noted that a lower specification glazing may be used in living rooms across the site and bedrooms across the rest of the site and for those proposed dwellings screened from road traffic noise.
- 6.3.8 The above glazing calculations are intended to be for planning purposes only. More detailed calculations may be required for the selection and procurement of the glazing units, once the site layout and housing floor plans / elevations have been finalised.
- 6.3.9 The above calculations do not make any allowance for the incorporation of permanent ventilation to the dwellings. On ventilation, BS 8233 advises that:
- "The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows must remain openable for rapid or purge ventilation, or at the occupant's choice."*
- 6.3.10 Where appropriate, the preferred choice of ventilation is through the use of natural ventilation openings such as trickle vents, air-bricks and passive ventilation devices. Such ventilators can be used to meet the requirements of the Building Regulations Approved Document F for background ventilation. The future occupants would then have the option of keeping windows closed for most of the time and opening windows for rapid ventilation and summer cooling.

- 6.3.11 Passive through wall ventilators are available that meet the requirements of the Building Regulations Approved Document F for background ventilation and also provide a sound insulation performance that meets or exceeds that required from the glazing elements. It should be noted that window mounted trickle vents may be used for those proposed dwellings screened from road traffic noise.

7 Conclusions

- 7.1.1 WSP UK has been commissioned by Barratt Homes (Manchester) to undertake an environmental noise assessment for the proposed Bowland Meadow development at land to the east of Chipping Lane in Longridge.
- 7.1.2 This assessment has been based upon the results of detailed baseline noise measurements conducted over a 24-hour period between the 1st and 2nd April 2014. Calculations have been carried out to establish the existing levels of road traffic noise across the development site for assessment against the external and internal noise levels criteria. In addition, acoustic modelling has been carried out to establish the level of noise likely to be generated by the operational activities of the service yard of the Sainsbury's supermarket in the southern part of the site.
- 7.1.3 The results of the noise assessment have been used to ascertain the need for, and degree of, mitigation measures required to offer a commensurate level of protection against noise to the future occupants of the proposed dwellings from the surrounding environment.
- 7.1.4 The majority of gardens in the western and central parts of the site will be protected from road traffic on the local road network by the proposed residential buildings themselves and/or screened by localised barriers. However, to ensure the external noise levels of 50 dB L_{Aeq,16-hour} are met in the south-western part of the site it is recommended that a 2.5 m high barrier be constructed along the southern perimeter boundary of the garden of Plot 89.
- 7.1.5 To protect the amenity of residents in the southern part of the development, it is recommended that a 2.5 m high barrier be constructed along the southern site boundary adjoining the service yard of the Sainsbury's Supermarket and Ireland's Garage Limited. The majority of gardens immediately to the north of the service yard are situated to the north and west of the proposed dwellings, i.e. screened from the service yard by the building of the proposed dwelling.
- 7.1.6 The attenuation afforded by the proposed mitigation measures, buildings of the proposed dwellings and localised barriers will be sufficient to ensure the external daytime noise limits will be met in gardens of the dwellings closest to the local road network and the service yard of the Sainsbury's supermarket.
- 7.1.7 The assessment has demonstrated that appropriate internal ambient noise levels can be achieved within the development providing that glazing and ventilation openings with the required sound insulation performance are used.

Appendices

Appendix A – Glossary of Acoustic Terminology

NOISE

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

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc, according to the parameter being measured.

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

An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(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 ($2 \times 10^{-5} \text{Pa}$).
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.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} 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.
L_{10} and 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 L_n 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 the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

Appendix B – Site Location and Setting



Appendix C – Proposed Site Layout



Appendix D – Limitations

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