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BRIEF FOR CONSULTANCY:

To conduct a road traffic noise assessment in relation to the proposed residential development and to offer advice as necessary to facilitate compliance with planning guidelines.

Road Traffic Noise Assessment Phase 3 - Barratt, Robroyston

Technical Report No.
R-8752A-EP-RGM
29 July 2020

PREPARED FOR:

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For the attention of
David Jinks

Edinburgh Napier UNIVERSITY

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Contents

1.0 Introduction

1.1 We were instructed by David Jinks of Barratt Homes West Scotland & David Wilson Homes West Scotland to undertake a road traffic noise impact assessment for the proposed Phase 3 – Barratt, housing site at Robroyston. Please note, the site has been referred to as Phase 3 only as it is the balance out with Phases 1 and 2; it is not yet clear how this will be staged.

1.2 The aim of the report is to provide guidance on the implications of existing road noise on the development scheme layout and to consider potential noise mitigation measures.

1.3 The proposed development site is bounded to the North and East by farmland, to the West by existing housing, and to the South by the M80. The development masterplan is shown in Figure 1 with specific site boundary (marked in red).

Figure 1 – Site Masterplan with specific site boundary

1.4 The report has been produced under the restrictions imposed by the Covid-19 pandemic. Reference will be made to road traffic noise measurements previously undertaken on site for alternative proposals (RMP report: R-6414C-CS-RGM, 11 March 2014). Additional road traffic noise measurements have been undertaken to provide further detail on sound propagation.

1.5 For the purposes of this report the site has been assessed against the current government guidance contain within PAN1/2011.

2.0 Planning guidance

2.1 Current guidance for local authorities with regard to noise affecting planning matters is given in the Scottish Government's PAN 1/2011 "*Planning and Noise*" document, with further details on the assessment of noise provided in its associated Technical Advice Note (TAN): 'Assessment of Noise'.

2.2 Paragraph 15 of PAN 1/2011 gives the following advice:

2.3 Issues which may be relevant when considering noise in relation to a development proposal include:

- *Type of development and likelihood of significant noise impact,*
- *Sensitivity of location (e.g. existing land uses, NMA, Quiet Area),*
- *Existing noise level and likely change in noise levels,*
- *Character (tonal, impulsivity etc),duration, frequency of any repetition and time of day of noise that is likely to be generated, and*
- *Absolute level and possible dose-response relationships e.g. health effects if robust data available.*

2.4 Paragraph 19 recommends that in order to assist in the preparation and consideration of planning applications, Noise Impact Assessments may be requested by the planning authority. Noise Impact Assessments are to "*demonstrate whether any significant adverse noise impacts are likely to occur and if so, identify what effective measures could reduce, control and mitigate the noise impact*."

2.5 Limited advice on the assessment of existing road traffic noise is given in PAN 1/2011.

2.6 Paragraph 23 states "*Road traffic noise impact assessments should take account of level, potential vibration, disturbance and variation in noise levels throughout*

the day, the pattern of vehicle movements and the configuration of the road system".

2.7 PAN 1/2011 (and the accompanying Technical Advice Note) do not provide explicit criteria to employ for the noise assessments; instead, this is recommended to be delegated to the Planning Authority.

2.8 Specific guidance has not been provided by the local authority to date, however in our experience reference will be made to the acoustic standards provided by BS 8233:2014 'Sound Insulation and noise reduction for buildings' appropriate for a residential assessment; as outlined in Table 1, relative to road traffic noise.

Table 1: BS 8233:2014 Indoor ambient noise criteria L_{Aeq} (dB re 2 x 10-5 Pa)

Activity	Typical situation	Assessment period	
		07:00 to 23:00	23:00 to 07:00
Resting	Living room	35	-
Dining	Dining rooms/area	40	-
Sleeping (inc. daytime resting)	Bedroom	35	30

2.9 For external areas that are to be used for amenity space, BS8233 states that 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".

3.0 Noise measurements

3.1 The report has been produced under the restrictions imposed by the Covid-19 pandemic. Reductions in road traffic movements during this period supress ambient noise levels and potentially unrepresentative of the prevailing noise climate. Impact assessments relative to such supressed background noise conditions risk drawing unrepresentative conclusions and should be reviewed in context of previous measurements to confirm there suitability.

3.2 Historic noise measurements from the site will be used to determine the site noise environment. An additional site survey undertaken during the Covid-19 restrictions will be used to provide additional detail on sound propagation within the site. This approach was discussed and approved in principal with Gordon Innes, Environmental Health Officer, Glasgow City Council, on 18/06/20.

3.3 Historic measurements were undertaken by Chris Steel BSc (Hons), M.Phil, MIOA, ICIOB and Heather Andrews B.Sc (Hons) on Thursday the 11th of July 2013. These were undertaken in close proximity to the M80 so as to ensure that road noise was the dominant source.

3.4 We expect these measurements to remain representative given the volume of traffic on the M80, and halving/doubling in traffic volumes required to result in a +/- 3dB change in the noise environment.

3.5 The noise measurements were conducted, in so far as was practicable, according to the guidance document ‘Calculation of Road Traffic Noise’.

3.6 The measurement position was set back 30 m from the edge of Northbound M80 carriage (i.e. including depth of hard shoulder), and located approximately 2 m above the motorway; with a good line of sight to a long stretch of road.

3.7 The recent sound measurements were undertaken by Russell Macdonald BSc (Hons), M.Phil, MIOA on Thursday the 2nd July 2020. At all locations the M80 was the dominant source of noise.

3.8 The locations of the noise measurement positions utilised in the assessment are shown in the plan in Figure 2. Historic measurement position in 2013 is indicated by red dot and yellow highlighted text (referred hereafter as Position A). The latest measurement locations are indicated by P1 and P2, see Table 2 for additional position information.

Figure 2: Measurement Location

3.9 The sound level meters were calibrated before and after the measurements. No deviation from the calibration level of 94 dB re 2×10^{-5} Pa at 1000 Hz was recorded. The equipment used for the measurements is listed in Appendix A.

3.10 The meteorological conditions were similar during both surveys, in that they were constant over the duration of the survey with very little wind (< 1 m/s), bright sunshine and warm air temperatures of (+18 ^{o}C). These conditions are acceptable for road traffic noise survey.

3.11 The measurement results are shown in Table 2 presented as the 'A' weighted equivalent continuous sound level, L_{Aeq} (a logarithmic average over the measurement duration) and the L_{A90} & L_{A10} levels.

Table 2. Noise measurement results, (dB re 2x10-5 Pa)

Measurement position and distance from M80	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,}$(dB)	L_{A10}(dB)	L_{A90}(dB)
Position A @30m, 2013	11:05	03:00	72	74	68
P1 @ 13m, 2020	14:30	01:00	80	83	74
P2 @ 15m, 2020	14:10	01:00	79	82	72

3.12 The measurement results show good agreement between P1 and P2. The results at Position A are in line with our expectations for distance attenuation (-3 dB) and barrier attenuation (-5 dB for a partial barrier from existing earth bund) when compared to those at P1.

3.13 The results in Table 1 therefore indicate that 2013 measurements are representative of the noise level at the proposed housing closest to M80.

4.0 Assessment & Recommendations

Calculation Method to determine impact

4.1 In order to determine the day time and night time noise levels at the nearest proposed dwelling on the development site it is necessary to adjust the measured noise level.

4.2 The measurement position is significantly closer to the M80 in comparison to the proposed building line.

4.3 A distance attenuation assuming line source attenuation has been applied using the equation

$$L_2 = L_1 - 10 \log r_2/r_1 \qquad \text{Eq(1)}$$

Where L_2 = sound level at the residential property (dB)
L_1 = sound level at measurement position (dB)
r_1 = distance from source to measurement position (m)
r_2 = distance from source to the residential property (m)

4.4 The measurement location was 13 m from the carriage way. The nearest residential dwelling has been proposed along the road boundary at 40 m away. This would suggest a 4.9 dB reduction in the measured noise level stated in Table 3, not allowing for any barrier attenuation.

4.5 The acoustic bund is suggested to be allocated along the road (as discussed in previous report, R-6414C-CS-RGM) and also shown in Figure 3 below. In that report the barrier is suggested to be temporary, until the next line of buildings is constructed, however it should be made permanent for Phase 3 buildings.

4.6 We would expect a minimum -15dB barrier attenuation provided by the full height permanent acoustic barrier on top of the bund as shown in Figure 3 at ground

level. At first floor level we expect the attenuation will be approximately 5 dB from top part of the barrier.

4.7 The key requirement for the barrier height is that it breaks the line of sight from the first floor windows to M80 vehicle tyres. Ideally the barrier should extend along the full Southern perimeter including West of the path adjacent to the play area (see Figure 1). If the barrier is not practical in this area, localised acoustic fencing will be required to the gardens.

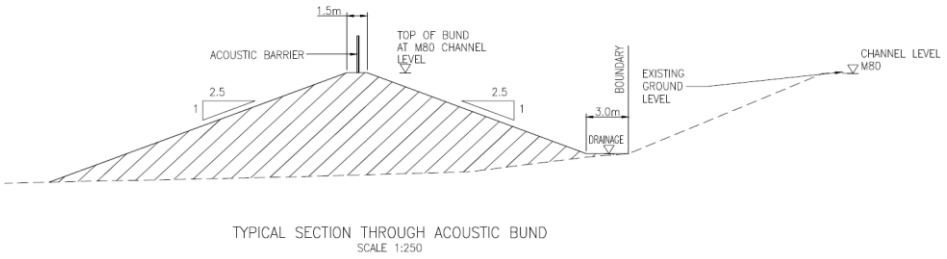

Figure 3 – Acoustic bund along the road

4.8 The results presented in Table 3 below include the shortened measurement results from a 3 hour daytime measurement in accordance with CRTN. The assessment noise levels, based on a 16-hour daytime and an 8 hour night-time period, can be derived from the shortened measurement result using guidance issued in the Transport Research Laboratory Report "*Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping*".

4.9 The methodology for this conversion is summarised in Appendix B; the derived external road traffic noise results, rounded to the closest decibel, are presented in Table 3.

Table 3. Conversion of survey data to overall road traffic noise level at first row of housing @ 40m from the M80 with the proposed bund in place dB (re 20 µPa)	
Noise parameter	Noise Level (dB)
$L_{A10, 3hr}$	83
$L_{A10, 18 hr}$	82
$L_{Aeq (07:00 - 19:00)}$	79
$L_{Aeq (19:00 - 23:00)}$	76.6
$L_{Aeq (07:00 - 23:00)}$	78.6
$L_{Aeq (23:00 - 07:00)}$	70.4
Distance attenuation	-4.9
Barrier attenuation	-15
$L_{Aeq (07:00 - 23:00)}$ @ 40m	**58.7**
$L_{Aeq (23:00 - 07:00)}$ @ 40m	**50.5**

4.10 The results in Table 3 above provide the predicted noise level at the front of the dwellings.

4.11 The external amenities / gardens are shown on the plan as facing the road on the adjacent side of the dwelling. With this attenuation applied, the results suggest that daytime levels will be above the BS8233 criteria of L_{Aeq} 55dB for the nearest dwelling.

4.12 Consideration should be given to amending the site layout to have the main rear gardens located to the north of the properties in the southern row of housing.

Assessment of Internal Noise Levels

4.13 Predicted free field noise levels at the front of the dwelling must be adjusted to account for façade reflections by the order of +3dB.

4.14 A closed windows assessment is required as the minimum level of attenuation provided by an open window (-10dB) is insufficient to meet the criteria.

4.15 In order to determine the internal noise level within the dwellings it is necessary to define the level of insulation offered by the façade. As glazing is usually the weakest element we have taken this as the total insulation of the façade to allow for a worst case scenario where there is no benefit from composite façade effects. Similarly, no room absorption effects are considered.

4.16 Table 4 details the expected internal day and night time noise levels for the ground floor' habitable rooms, where the presence of noise barrier is affecting the overall noise levels.

Table 4. Predicted Internal Noise Levels, Gnd floor (dB re 2x10-5 Pa)

Description	Daytime L_{Aeq} (dB)	Night Time L_{Aeq} (dB)
Free field level (with barrier)	59	51
Façade Correction	+3	+3
Façade / glazing insulation as specified	-28	-28
Predicted internal level	34	26
BS8233 Criteria	35	30

4.17 For the dwelling façade facing the road, we would recommend a glazing unit capable of achieving R_{TRA} 28 dB (e.g. a glazing unit of 4mm float glass/12mm cavity/6.4mm laminate glass). Trickle vents should provide a minimum $D_{n,e,w}$ 33 dB (for each additional window ventilator add 10log(N) to the requirement).

4.18 Table 5 details the expected internal day and night time noise levels for the first floor' habitable rooms.

Table 5. Predicted Internal Noise Levels, 1st floor (dB re 2x10-5 Pa)		
Description	Daytime L_{Aeq} (dB)	Night Time L_{Aeq} (dB)
Free field level @ 40m	74	66
Barrier correction	-5	-5
Façade Correction	+3	+3
Façade / glazing insulation as specified	-37	-37
Predicted internal level	35	27
BS8233 Criteria	35	30

4.19 For the dwelling façade facing the road, we would recommend a deep glazing unit capable of achieving R_{TRA} 37 dB (e.g. glazing unit of 8.4mm float glass/12mm cavity/10.8 mm glass or similar). Trickle vents should provide a minimum $D_{n,e,w}$ 42 dB (for each additional window ventilator add 10log(N) to the requirement).

4.20 For facades at 90 degrees to the road, most will have their line of sight to the road obscured by nearby adjacent dwellings, with the exception of dwellings at the end of street rows. An angle of view correction of -6dB would be applied to such dwelling façades, and therefore closed windows would again be required. Additional distance attenuation would be minimal and therefore we would recommend the aforementioned proposed specification for such facades. We expect this to include a minimal amount of windows given these are likely to be gable ends.

4.21 For all other facades and dwellings beyond the first row, standard glazing and ventilation will be acceptable due to shielding from the intervening buildings.

4.22 Figure 4 below provides a mark-up of where the aforementioned specification are required, indicated in orange.

Figure 4: Dwellings where aforementioned glazing is required (marked in orange)

5.0 Conclusions

5.1 We were instructed by David Jinks of Barratt Homes West Scotland & David Wilson Homes West Scotland to undertake a road traffic noise impact assessment for the proposed Phase 3 – Barratt housing site at Robroyston.

5.2 The assessment has been produced under the restrictions imposed by the Covid-19 pandemic. Recent road traffic measurements and the reference to relevant road traffic noise measurements, previously undertaken on site (RMP report: R-6414C-CS-RGM, 11 March 2014) has been made.

5.3 An assessment of external noise levels at the associated gardens has been conducted, showing that the garden noise levels are expected to be higher than recommended in BS8223.

5.4 The internal noise levels are also calculated that for the dwellings along the boundary, with closed windows and enhanced glazing and ventilation specification would be required in order to provide good levels of noise control within the dwellings at ground and first floor levels.

5.5 Indicative locations for glazing upgrades are included within Section 4 along with specification details.

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Appendix A: List of equipment

2013:

Brüel & Kjær Sound Level Calibrator Type 4231

Serial No: 2393980

Brüel & Kjær Pre-polarised Condenser Microphone Type 4189

Serial No: 25002954

Brüel & Kjær Modular Precision Sound Analyser Type 2260

Serial No: 1772256

Brüel & Kjær Pre-polarised Condenser Microphone Type 4189

Serial No: 2775324

Brüel & Kjær Modular Precision Sound Analyser Type 2250

Serial No: 2590391

Prova AVM-03 Anemometer

Serial No: 96000832

2020:

RION Sound Level Meter Type NL52 Modular Precision Sound Analyzer, running Rion's programs NX-42EX Version 1.3, NX-42WR Version 1.2 and NX-42RT Version 1.2

Serial No: 00620898

RION Pre-amplifier Type NH-25

Serial No: 10681

RION Condenser Microphone Type UC-59

Serial No: 03974

RION Sound Level Meter Type NL52 Modular Precision Sound Analyzer, running Rion's programs NX-42EX Version 1.3, NX-42WR Version 1.2 and NX-42RT Version 1.2

Serial No: 00420769

RION Pre-amplifier Type NH-25

Serial No: 20818

RION Condenser Microphone Type UC-59

Serial No: 13127

Brüel & Kjær Sound Level Calibrator Type 4231

Serial No: 2326986

Appendix B: Conversion of Road Noise Metrics

The conversion of data from the Calculation of Road traffic Noise (CRTN) survey measurement result to the BS 8233 assessment indices has been performed using the following steps:

Step	Conversion			Reference
1	$L_{A10\ 3\ hr}$	⇨	$L_{A10\ 18\ hr}$	CRTN §4.3
2	$L_{A10\ 18\ hr}$	⇨	$L_{Aeq\ 07:00 – 19:00}$ $L_{Aeq\ 19:00 – 23:00}$	TRL §4.5.2
3	$L_{Aeq\ 07:00 – 19:00}$ $L_{Aeq\ 19:00 – 23:00}$	⇨	$L_{Aeq\ 07:00 – 23:00}$	-
4	$L_{A10\ 18\ hr}$	⇨	$L_{Aeq\ 23:00 – 07:00}$	TRL §4.5.2

$$L_{A10,\,18\,hr} = L_{A10,\,3\,hr} - 1\,dB(A)$$ Equation 1

$$L_{Aeq,\,07:00\,-\,19:00} = L_{A10,\,18\,hr} \times 0.9471 + 1.4385$$ Equation 2

$$L_{Aeq,\,19:00\,-\,23:00} = L_{A10,\,18\,hr} \times 0.9697 - 2.8702$$ Equation 3

$$L_{Aeq,\,07:00\,-\,23:00} = 10 \times Log_{10}\left(\frac{12}{16} \times 10^{L_{Aeq,\ 07:00\,-\,19:00}/10} + \frac{4}{16} \times 10^{L_{Aeq,\ 19:00\,-\,23:00}/10}\right)$$ Equation 4

$$L_{Aeq,\,23:00\,-\,07:00} = L_{A10,\,18\,hr} \times 0.9044 - 3.7683$$ Equation 5

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