

Residential Development, Lyneham, Whiston, Prescot L35 3TH

Noise Assessment

for Built Group Limited, 278 Marys Road, Liverpool L19 1QD.

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Executive Summary

Environoise Consulting Limited has been commissioned by Built Group Limited to undertake a noise assessment to inform planning application ref: 22/00630/FUL for a proposed development of 19 dwellings comprising of 7 houses and 12 apartments situated on Lyneham and Haslemere, Whiston, Knowsley, L35 3TN.

A noise survey was undertaken between 09.40hrs, Wednesday 22nd and 10.15hrs, Thursday 23rd March 2023 to inform a noise ingress and outdoor amenity assessment for proposed dwellings to determine compliance with BS 8233:2014 and World Health Organisation guideline noise targets.

Glazing & Ventilation

Recommendations for glazing and ventilation sound insulation performances to all bedrooms and living spaces are summarised below:

2-bed house bedrooms (south and east facades):

$\geq 30\text{dB } R_w + C_{tr}$ glazing

$\geq 35\text{dB } D_{ne,w}$ ventilation

All other bedrooms and living /dining spaces:

$\geq 25\text{dB } R_w + C_{tr}$ glazing

$\geq 35\text{dB } D_{ne,w}$ ventilation

Outdoor Amenity Areas

Noise levels for amenity spaces relating to 4-bed and apartment communal areas are predicted to meet the lower limit of 50dB $L_{Aeq,16\text{hour}}$ to prevent the onset of 'moderate annoyance'.

The highest predicted level within the 2-bed amenity spaces is 51dB which meets the upper limit of 55dB $L_{Aeq,16\text{hour}}$ to prevent the onset of 'serious annoyance'.

1 Criteria

1.1 Internal Ambient Noise Levels

- 1.1.1 Table 4 of BS 8233 ‘Guidance on sound insulation and noise reduction for buildings’ⁱ and World Health Organisation (WHO) Guidelines; ‘Community and Noise, 1999’ⁱⁱ gives internal ambient and maximum noise levels respectively to be achieved in habitable spaces, see Table 1.1. The maximum noise level criterion in line with WHO guidelines should not be exceeded more than 10 to 15 times during the night-time period (23.00 – 07.00hrs).

Table 1.1: Recommended internal noise level targets.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Dining	Dining Room	40dB $L_{Aeq,16hour}$	N/A
Resting	Living Room	35dB $L_{Aeq,16hour}$	
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$ 45dB $L_{Amax,fast}$

1.2 Outdoor Amenity Areas

- 1.2.1 BS 8233:2014 states that it is desirable for the steady noise level in external amenity spaces (such as gardens or outdoor living areas) to be less than 50dB $L_{Aeq,16hour}$ to prevent moderate annoyance with 55dB $L_{Aeq,16hour}$ regarded as an upper limit in order to prevent serious annoyance for occupants. BS 8233:2014 recognises that guideline values are not achievable in all circumstances where development might be desirable, it states that:

‘In higher noise areas, such as city centres or urban areas adjoining 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 need 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 Noise Surveys

2.1 Site Description

- 2.1.1 The site is located within a residential estate with proposed developments to the north and west an existing convenience store (MP Foods, News & Wine) together with associated carpark and small grassland area. The proposal site consists of a residential development of 19 dwellings split across 7 houses and 12 apartments (6 ground floor, 6 first floor).
- 2.1.2 Approximately 180 metres north of the proposal site is an overground trainline linking Rainhill and Whiston Cross stations, 1.3km to the south is the M62 major road network and approximately 40 metres to the east is Cumber Lane.

2.2 Noise Survey Details

- 2.2.1 An unattended noise survey was done between 09.40hrs, Wednesday 22nd and 10.15hrs, Thursday 23rd March 2023. One-minute contiguous A-weighted ambient, maximum ($L_{Aeq,1min}$, $L_{Amax,fast (1min)}$) and associated octave band noise levels were measured at Position 1 (described below), see Figure 2.1.
- 2.2.2 Attended 15-minute noise measurements were taken at Positions 2 and 3 between 07.00hrs and 09.00hrs to capture road traffic during a 'rush hour' period and at Position 4 between 09.15hrs and 10.15hrs to capture railroad noise on 23rd March 2023, see Figure 2.1.

Unattended

- **Position 1:** The dominant noise source was traffic along Cumber Lane and Haslemere during vehicle passes. When no cars were passing, the dominant source was from M62 to the South.

Attended

- **Position 2:** Representative of facades for proposed houses on Haslemere. Measurements were taken 5m from the near road edge and 8.5m from the centre of the road. The dominant noise sources were Cumber Lane and Haslemere during vehicle passes. When no cars were passing the M62 was dominant and also rooftop plant from the convenience store was audible.
- **Position 3:** Representative of facades for proposed apartments on Lyneham. The dominant source was Lyneham, Haslemere and Cumber Lane during vehicle passes. When no cars were passing the M62 was dominant also noise from children shouting and some distant infrequent sawing noise propagating from south-west was audible.

- **Position 4:** Measurements taken manually to capture individual train passes within a 1-hour period 15 meters from the centre of the twin railway tracks. A total of 6 passenger trains and 1 freight passed during the measurement period (09.15 - 10.15hrs).

Figure 2.1: Site boundary and survey measurement positions. Image taken from Google.



Calibration

- 2.2.3 The sound level meters were calibrated to 94.0dB at 1kHz at the start and end of the noise surveys with no recorded drift greater than 0.2dB at 1kHz. As the report level of drift is less than 0.5dB the measurements are deemed acceptable. Weather conditions were suitable throughout the survey period.

2.3 Ambient & Maximum Noise Levels

2.3.1 Table 2.1 presents the logarithmically averaged daytime and night-time ambient (L_{eq}) noise levels. The ninth highest maximum noise level has been used to determine that the maximum noise level criterion is not to be exceeded more than 10 – 15 times during a night-time period, see Table 2.2. A time history of noise survey results is presented in Figure A1, Appendix A.

Table 2.1: Logarithmically averaged octave-band ambient noise levels.

Position	Period	$L_{eq,T}$ (dB) at octave band centre frequency (Hz)							$L_{Aeq,T}$ (dB)
		63	125	250	500	1k	2k	4k	
1	Daytime 07.00 – 23.00hrs	64	61	60	59	60	52	45	62
	Night-time 23.00 – 07.00hrs	57	52	51	51	53	44	38	55

Table 2.2: Night-time maximum noise levels.

Position		$L_{max,fast}$ (dB) at octave band centre frequency (Hz)							$L_{Amax,fast}$ (dB)
		63	125	250	500	1k	2k	4k	
1	Night-time 23.00 – 07.00hrs	73	74	73	73	75	66	56	77

2.3.2 Table 2.3 presents the logarithmically averaged 15-minute ambient measurements (L_{eq}) for attended Positions 2 and 3 to determine typical levels during the rush hour period.

Table 2.3 Logarithmically averaged ambient (L_{eq}) octave-band noise levels.

Position	Measurement Period	$L_{eq,T}$ (dB) at octave band centre frequency (Hz)							$L_{Aeq,30mins}$ (dB)
		63	125	250	500	1k	2k	4k	
2	07.00 – 07.15hrs and 08.00 – 08.15hrs	61	57	53	52	54	46	39	57
3	07.30 – 07.45hrs and 08.45 – 09.00hrs	59	52	53	47	50	42	36	54

2.4 Trainline Noise

2.4.1 Manual measurements were taken at Position 4, approximately 15m from the centre of the twin railway tracks for a period of 1-hour (09.15 - 10.15hrs). The cumulative measured level from all train passes during the 1-hour period have been corrected for the 'on-time' (total train pass-by duration) and is presented in Table 2.4, the full list of measured levels is presented in Appendix A. The 'on-time' calculation is presented below:

- $L_{Aeq,T} = L + 10 \times \log(n/t)$

Where:

- L = logarithmically averaged ambient noise levels of train pass-bys (dB)
- n = total 'on time' for all train passes in the measurement hour (s) i.e. 66 seconds
- t = 1-hour reference period (s)

Table 2.4: Train passes corrected for on-time over 1-hour measurement period.

Position	Measurement Period	L _{eq,T} (dB) at octave band centre frequency (Hz)							L _{Aeq,T} (dB)
		63	125	250	500	1k	2k	4k	
4	09.15hrs – 10.15hrs, 23/03/2023	58	50	44	51	52	50	42	56

2.4.2 Train number 7 was a high-speed passenger train and resulted in the highest maximum noise level measured, therefore has been used in our assessment and is presented in Table 2.5.

Table 2.5: Maximum noise level measured at Position 4.

Position	Measurement Period	L _{max,fast} (dB) at octave band centre frequency (Hz)							L _{Amax,fast} (dB)
		63	125	250	500	1k	2k	4k	
4	09.15hrs – 10.15hrs, 23/03/2023	80	71	66	78	80	77	67	83

2.4.3 Although fewer trains are expected to run during the night-time, the calculated hourly on-time has been used for both the day and night-time periods to ensure a robust assessment.

3 Noise Ingress Assessment

3.1 Commercial Noise Sources

HGV Deliveries

- 3.1.1 MP Foods typically receive 4-5 deliveries per day¹ between the permitted opening hours of 06.00 to 23.00hrs. We have therefore considered two HGV movements for the daytime period and one during the night-time period for a robust assessment. In-house data incorporating levels from both HGV pass-by and door slams has been used to calculate delivery vehicle noise levels.

Customer Parking

- 3.1.2 Six convenience store parking bays are proposed to be located at the front entrance to the store. We have used in-house data which incorporates both car pass-by and car door slam levels and considered up to 6 cars arriving and departing in any one-hour period during the daytime and up to 3 movements in any one-hour period during the night-time (06.00 – 07.00hrs).

Plant Noise

- 3.1.3 Three air handling units were noted on-site fixed to the 1st storey flat roof of MP Foods and have therefore been considered in our SoundPLAN® noise model. The exact unit models could not be determined and therefore sound power data² for a similar split-type condenser has been considered.

Waste Collection

- 3.1.4 Waste collection associated with the convenience store is carried out Tuesdays³ on a weekly basis and therefore has not been considered in the assessment due to the infrequent occurrence.

3.2 Assessment

- 3.2.1 BS 4142:2014 is typically used to assess the noise impact of industrial/commercial sources such as those associated with MP Foods detailed above; the following is stated within the guidance:

¹ As informed by Stuart Gilbert, Level 2 Architects in email to Joel Phillips, Environoise Consulting dated 4th April 2023.

² Mitsubishi PUMY-SP112VKM2 (72dB L_{WA}).

³ As informed by Stuart Gilbert, Level 2 Architects in email to Joel Phillips, Environoise Consulting dated 4th April 2023.

Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it should be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation.

- 3.2.2 Considering the above, the internal noise level targets given in BS 8233:2014 have been used to determine the extent of mitigation required for proposed dwellings. Noise mitigation of existing industrial/commercial sources is to be provided in the form of suitable building envelope constructions (i.e., glazing, roof, external wall) and garden fencing.
- 3.2.3 A SoundPLAN® computer noise model has been created of the proposed development (see Figure B1, Appendix B). Noise levels at NSR locations have been calculated as per the methodology in ISO 9613-2:1996 'Attenuation of sound during propagation outdoors. Part 2, General method of calculation'ⁱⁱⁱ. Noise ingress levels have been calculated in accordance with BS EN 12354-3:2000^{iv} with a reverberation time of 0.6 seconds for living spaces and 0.5 seconds for bedrooms.

Building Envelope Constructions

- 3.2.4 Typical living room, bedroom and glazing dimensions have been determined from drawings received⁴. The predicted⁵ octave band sound reduction indices (R) for external walls are stated in Table 3.2. A typical brick/cavity/block construction has been considered for external walls to all dwellings.

Table 3.1: Sound insulation performance of building envelope construction.

Building element	Construction	Sound Reduction Indices R (dB)							R _w + C _{tr} (dB)
		63	125	250	500	1k	2k	4k	
External Wall Construction (New Build)	• 100mm rendered dense blockwork or 102.5mm brick.								
	• 75mm insulation cavity								
	• 100mm inner leaf aerated blockwork								
	• 12.5mm standard plasterboard (e.g., Gyproc WallBoard) on dabs	38	41	45	45	54	58	61	48
Pitched Roof Construction (New Build)	• Roof tiles								
	• Timber pitched roof system with 100mm mineral wool insulation (≥10kg/m ³) between the joists.	15	31	43	51	57	61	56	45
	• 12.5mm standard plasterboard (≥7.7kg/m ² e.g., Gyproc WallBoard)								

⁴ Drawings received on 24/03/2023 from Level 2 Architects, 28-30 Grange Road West, Birkenhead, CH41 4DA. Drawing numbers: 418-1-PLN-002 - 418-1-PLN-012.

⁵ Using Insul 9.0.20 modelling software. +/- 3dB margin of error.

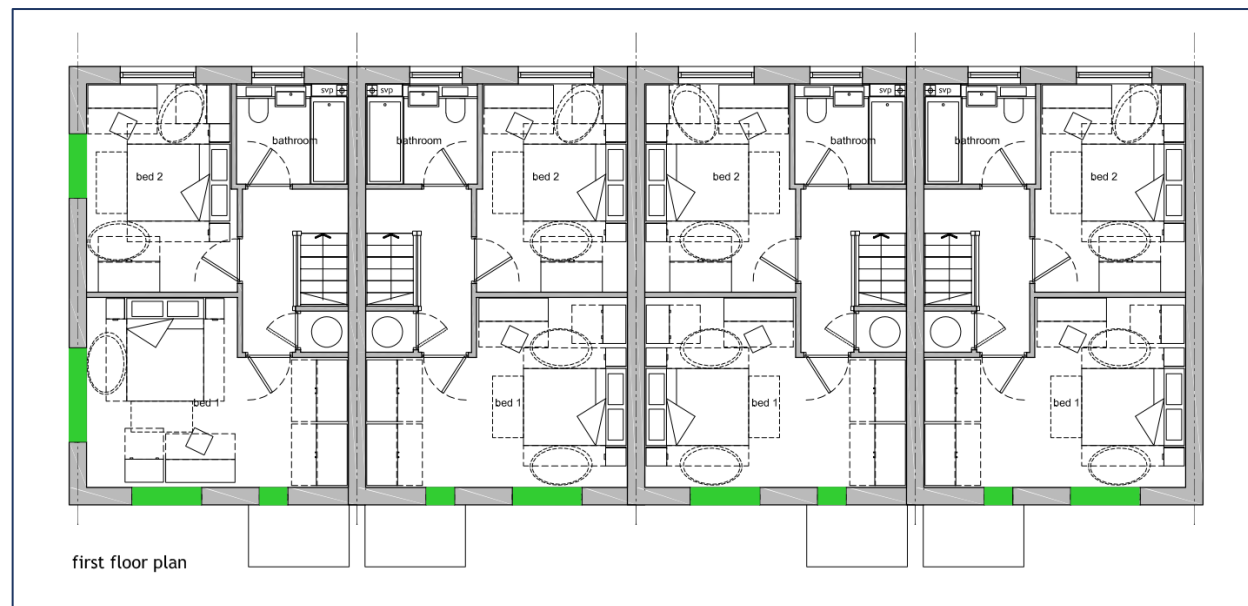
3.3 Recommendations

- 3.3.1 Recommended sound insulation performances and example specifications are given for glazing and trickle ventilation units to meet internal noise targets, see Table 3.2.

Table 3.2: Example glazing and background ventilation specifications.

Key	Space	Glazing Performance [$\geq R_w + C_{tr}$ (dB)]	Example Glazing Specification	Vent Performance [$\geq D_{ne,w}$ (dB)]	Example Vent Type
	2-bed house bedrooms (south and east facades only)	30	10mm pane / 6 to 20 mm cavity / 4mm pane	35	Standard vent / C25
N/A	All other spaces	25	4mm pane / 6 to 20mm cavity / 4mm pane		

Figure 3.1: Recommended 1st floor bedrooms (2-bed houses on Haslemere).



3.4 Ventilation

Purge (Approved Document F)

- 3.4.1 Openable windows to all habitable spaces for the purpose of purge ventilation is permitted as internal noise level targets are not applicable during these conditions. The openable window specification should comply with the requirements given in Appendix B of The Building Regulations 'Approved Document F: Ventilation'^v.

Overheating (Approved Document O)

- 3.4.2 Should overheating be a potential concern for the development, Requirement 01(2)(a) section 3 of The Building Regulations 'Approved Document O: Overheating'^{vi} states that windows are likely to be closed where internal noise levels in bedrooms exceed the following noise levels:
- 40dB $L_{Aeq,T}$, averaged over 8 hours (between 23.00 and 07.00hrs)
 - 55dB $L_{Amax,fast}$, no more than 10 times a night (between 23.00 and 07.00hrs)
- 3.4.3 A 'simple method' overheating assessment is likely suitable for all bedrooms not marked green in Figure 3.1. For these bedrooms, a partially opened window is likely suitable as a means of passive ventilation during overheating conditions whilst allowing ADO overheating noise targets to be met
- 3.4.4 An ADO dynamic thermal modelling assessment is likely required for the 2-bed house bedrooms to the south and east facades only (as per the green specification in Table 3.1). An alternative cooling strategy (e.g. attenuated louvres/wall vents, attenuated windows, mechanical ventilation / cooling system) may be required to remove excess heat. This should be considered by the M&E and noise consultant at an early design stage so compliance with ADO can be demonstrated.

4 Outdoor Amenity Noise

4.1 Assessment

4.1.1 Amenity spaces considered are described below:

- All gardens to proposed terraced 2-bed houses.
- All gardens to proposed terraced 4-bed houses.
- Communal outdoor amenity space associated with apartments.

4.1.2 The predicted noise levels in amenity spaces for 2-bed, 4-bed and apartments is 51dB, 46dB and 43dB $L_{Aeq,16hr}$ respectively.

4.1.3 Noise levels for amenity spaces relating to 4-bed and apartment communal areas are predicted to meet the lower limit of 50dB $L_{Aeq,16hr}$ to prevent the onset of 'moderate annoyance'. The highest predicted level within the 2-bed amenity spaces is 51dB which meets the upper limit of 55dB $L_{Aeq,16hr}$ to prevent the onset of 'serious annoyance'.

Appendix A: Noise Data

Figure A1: Time history of measured noise levels at Position 1.

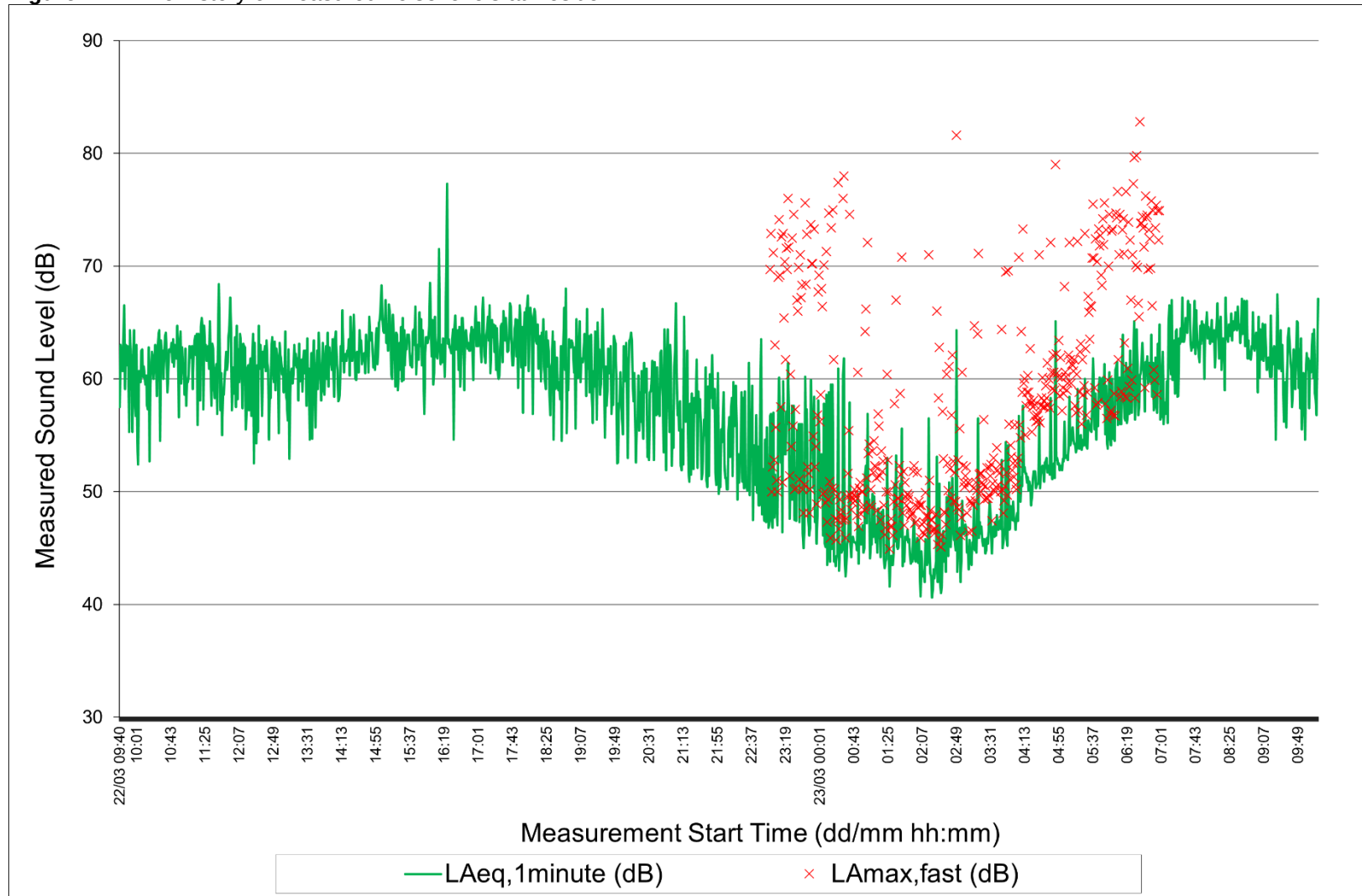


Table A1: Trainline ambient noise levels.

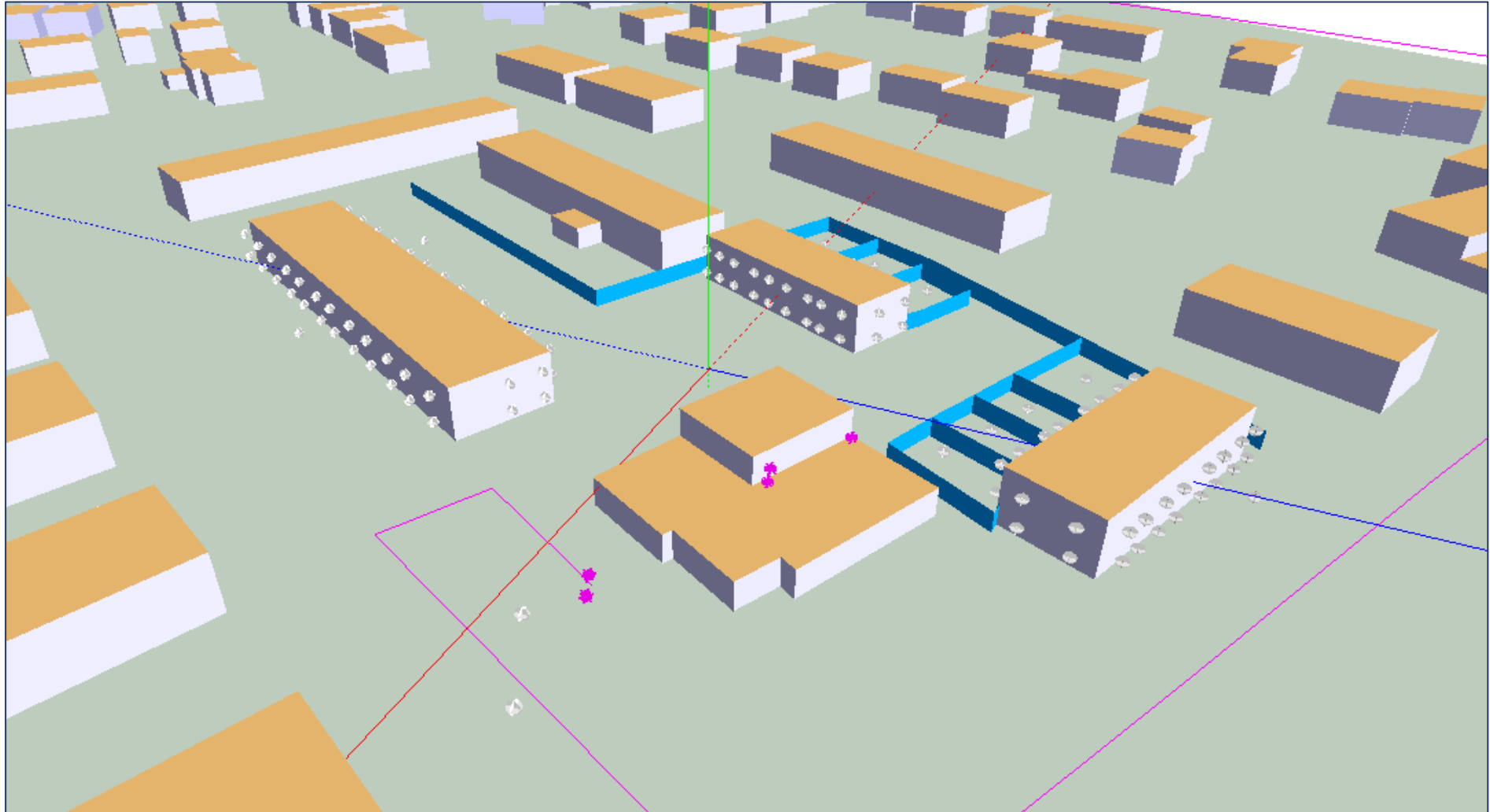
Measurement	Start time (hrs)	Measurement time (seconds)	L _{eq,T} at octave band centre frequency (Hz) dB							L _{Aeq,T} (dB)
			63	125	250	500	1k	2k	4k	
1	9.13	12	71	63	60	58	61	59	54	65
2	9.19	10	66	61	58	66	69	65	58	72
3 (freight)	9.25	10	79	71	66	70	68	65	61	72
4	9.43	9	66	62	58	58	60	58	53	64
5	9.5	7	80	70	63	67	70	67	59	73
6	9.58	9	72	66	60	66	67	69	63	73
7	10.03	9	76	67	62	73	75	72	61	78

Table A2: Trainline maximum noise levels.

Measurement	Start time (hrs)	Measurement time (seconds)	L _{max,f} at octave band centre frequency (Hz) dB							L _{Amax,fast} (dB)
			63	125	250	500	1k	2k	4k	
1	9.13	12	74	67	66	63	67	65	60	70
2	9.19	10	71	65	61	70	74	70	69	78
3 (freight)	9.25	10	85	78	72	79	76	74	71	81
4	9.43	9	67	66	58	62	66	62	57	69
5	9.5	7	82	71	64	69	73	71	63	77
6	9.58	9	77	72	67	74	72	78	71	81
7	10.03	9	80	71	66	78	80	77	67	83

Appendix B: SoundPLAN® Model

Figure B1: SoundPLAN® model of proposed residential development at Lyneham, Whiston, Prescott L35 3TH.



Appendix C: Risk Management Schedule

Table C1: Assessment of risks with control measures.

Severity Classifications (S)	Probability Classifications (P)	Degree of Risk (R)
1. Minor – Minor accident, resulting in no serious injuries or lost time; little or no damage to property or the environment.	1. Improbable – no known instances of such an event occurring.	0 – 5 = Low Risk; ensure controls are adhered to and activity need not alter.
2. Moderate – Potential injury necessitating less than 3 days off work; damage to property or the environment requiring remedial work.	2. Remote – past experience suggests that event rarely occur.	6 – 10 = Moderate Risk; tolerable, but efforts should be made to reduce the risk where cost effective and reasonably practicable.
3. Serious – Accident reportable under RIDDOR 95; serious damage to property or the environment.	3. Possible – experience shows that events occur on occasions.	11 – 15 = Substantial Risk; all practicable measures must be taken to reduce the level of risk; tolerable only where further risk reduction is impracticable or disproportionate to the risk involved.
4. Major – Accident resulting in serious or permanent injury; major or permanent damage to property or the environment.	4. Probable – experience shows that events occur frequently.	16 – 25 = Extreme Risk; Unacceptable except in extraordinary circumstances; all control measures must be taken regardless of cost.
5. Catastrophic – Accident resulting in death or severe disablement; destruction of property; irreversible damage to the environment.	5. Likely – very likely to happen unless actively prevented.	>26. Works must be aborted and project need to be reviewed.

Table C1 (continued): Assessment of risks with control measures.

Activity	Hazard	Consequence	Degree of Risk			Risk Control Measures	Residual Risk			Risk Owner
			S	P	R		S	P	R	
Access to/from site	Tripping or slipping hazards and falling objects.	Low risk	2	2	4	Take due care and attention to avoid tripping hazards. Do not work externally at height. Always sign in and out of site if required.	2	1	2	Contractor and consultant
Lifting or moving blockwork	injury through heavy load or improper lifting technique	Low risk	2	3	6	Blocks should be less than 20kg. Workers should wear gloves, steel toe cap boots and protective glasses. Workers must lift by bending their knees not their back. Make sure path is not obstructed by items being carried.	2	2	4	Contractor
Handling sheets of plasterboard	Injury through heavy load or improper lifting technique	Low risk	2	3	6	Plasterboard handled should be less than 20kg per sheet. Regardless of the mass several contractors may be needed to carry boards. Workers should wear gloves, steel toe cap boots and protective glasses. Workers must lift by bending their knees not their back. Make sure path is not obstructed by items being carried.	2	2	4	Contractor
Handling sheets of glass	Injury through heavy load/ improper lifting technique or laceration	Moderate	3	3	9	Detailed review of handling and positioning of glass to be done before installation by contractor. Glazing may need to be craned into position due to high mass. All glazed units must be clearly marked with tape/ marker to avoid people walking into the glass. Glazing must be handled with appropriate gloves only. Regardless of the weight, several contractors may be needed to carry units. Workers should wear gloves, steel toe cap boots and protective glasses. Workers must lift by bending their knees not their back. Make sure path is not obstructed by items being carried.	3	2	6	Contractor
Dust inhalation	Injury through being temporarily blinded of damage to lungs	Low risk	2	3	6	Only work in well-ventilated space and wear appropriate PPE including dust mask. If cutting material make sure gloves are worn. Signage may be required to prevent other workers entering the space.	2	2	4	Contractor
Hearing damage	Injury to hearing or consequence of verbal communication not being heard	Moderate	3	3	9	Review of construction or demolition methods and all workers exposed to high levels of noise to be provided with suitable hearing protection. In the case of sound insulation testing, suitable signage should be used to warn contractors of high noise risk to certain rooms.	3	2	6	Contractor. Contractor and acoustic consultant for sound insulation tests.

References

- ⁱ BS 8233 'Guidance on sound insulation and noise reduction for buildings', 2014.
- ⁱⁱ World Health Organisation (WHO) Guidelines; 'Community and Noise, 1999'
- ⁱⁱⁱ ISO 9613-2:1996 'Attenuation of sound during propagation outdoors. Part 2, General method of calculation.' 1996.
- ^{iv} BS EN 12354-3:2000 'Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound', 2000.
- ^v The Building Regulations 'Approved Document F: Ventilation' (2010 edition incorporating 2010 and 2013 amendments).
- ^{vi} The Building Regulations (2010) 'Approved Document O: Overheating' (2021 edition)