



Network Space

FARADAY ROAD, KNOWSLEY

Acoustic Report





Network Space

FARADAY ROAD, KNOWSLEY

Acoustic Report

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70073657

OUR REF. NO. 70073657

DATE: JANUARY 2023

WSP

4th Floor
6 Devonshire Square
London
EC2M 4YE

Phone: +44 20 7337 1700

Fax: +44 20 7337 1701

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft for comment	Revision		
Date	July 2020	January 2023		
Prepared by	Luke Smith	Mike Ledbetter		
Signature				
Checked by	Robert Marriner	Sarah Whydle		
Signature				
Authorised by	Robert Marriner	Sarah Whydle		
Signature				
Project number	70073657	70073657		
Report number	70073657-ACO	70073657-ACO		

REPORT LIMITATIONS

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of WSP UK Limited. WSP UK Limited accepts no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or WSP UK Limited and agree to indemnify WSP UK Limited for any and all loss or damage resulting therefrom. WSP UK Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations WSP UK Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

CONTENTS

1	INTRODUCTION	2
1.1	INSTRUCTION	2
1.2	SITE DESCRIPTION	2
1.3	PROPOSED DEVELOPMENT	2
2	PLANNING POLICY & PROFESSIONAL GUIDANCE	4
2.1	NATIONAL POLICY	4
2.2	LOCAL POLICY	5
2.3	PROFESSIONAL GUIDANCE	5
3	NOISE IMPACT ASSESSMENT	9
3.1	INTRODUCTION	9
3.2	SUMMARY OF CRITERIA	9
3.3	ACOUSTIC MODELLING AND NOISE SOURCES	9
3.4	ASSESSMENT OF POTENTIAL IMPACT	12
4	SUMMARY AND CONCLUSIONS	13

APPENDICES

APPENDIX A

ACOUSTIC GLOSSARY

APPENDIX B

MODELLED NOISE LEVELS

1 INTRODUCTION

1.1 INSTRUCTION

- 1.1.1. WSP UK Ltd (WSP) has been commissioned by Network Space to provide noise services to inform a Planning Application for the development of site for the storage of operational vehicles, including resurfacing, ancillary parking, and ancillary infrastructure at Faraday Road, Knowsley.

1.2 SITE DESCRIPTION

- 1.2.1. The site is 2.38 hectares in size and located at central OS Grid Reference: SJ 42904 97169 (hereafter referred to as 'the Proposed Development'). The Proposed Development falls within the jurisdiction of Knowsley Council (KC).
- 1.2.2. The Proposed Development is to be located at the heart of the Britonwood Trading Estate and the site is bounded, predominantly, in all directions by industrial and commercial premises, save for the adjacent parcel of undeveloped, open land to the west and wooded area to the east.
- 1.2.3. The location of the site and the nearby sensitive receptors is shown in Figure 1 below. The nearest sensitive receptors are residential premises located to the west of Moorgate Road North and approximately 500 m west of the site (as shown in yellow). Additional sensitive receptors are noted approximately 600 m north-east of the site, along South Boundary Road.

1.3 PROPOSED DEVELOPMENT

- 1.3.1. The Proposed Development forms a new storage hub for vehicles (typically light-goods vehicles up to 3.5 tonnes), the majority of which are already using the road network to serve the distribution facility on Hornhouse Road. On-site traffic data provided by transport consultant, Vectos, indicate that the peak periods of operation are between 06:00 and 09:00, and then from 17:00 to 19:00. However, given the increased sensitivity to disturbance of occupants within sensitive receptors during the night-time, the worst-case hour in terms of potential noise impacts has been taken to be between 06:00 and 07:00.
- 1.3.2. Those van drivers who arrive in their own private vehicle will enter the Proposed Development from Faraday Road, before parking in the storage area, which accommodates 359 vehicle spaces. The light-goods vehicles then exit the storage area, by re-joining Faraday Road.

Figure 1: Site Location



- 1.3.3. This report presents an assessment of the potential noise impact of the operation of the Proposed Development on the nearby sensitive receptors to the west of Moorgate Road North and north of South Boundary Road.
- 1.3.4. A glossary of acoustic terminology is presented in Appendix A, for reference.

2 PLANNING POLICY & PROFESSIONAL GUIDANCE

2.1 NATIONAL POLICY

NATIONAL PLANNING POLICY FRAMEWORK (NPPF), 2021

- 2.1.1. First published in 2012 and most recently revised in July 2021, the NPPF sets out the Government's planning policies for England and how these are expected to be applied. It replaces previous noise policy contained in Planning Policy Guidance Note 24. It does not replace the Noise Policy Statement for England 2010 to which it refers.
- 2.1.2. The NPPF is a concise document that provides its position on noise primarily in paragraph 185 which is reproduced below:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life⁶⁵;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".*

- 2.1.3. Footnote 65 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)"
- 2.1.4. Paragraph 187 of the NPPF provides additional policy information applicable where new development is proposed close to existing commercial noise sources and is reproduced below:
"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

NOISE POLICY STATEMENT FOR ENGLAND (NPSE), 2010

- 2.1.5. This provides more detail than the NPPF setting out the long-term vision of Government noise policy and applying to all forms of noise excluding occupational noise. The NPSE repeatedly refers to the management and control of noise within the context of Government Policy on sustainable development.
- 2.1.6. The NPSE also stresses that noise should not be considered in isolation from other related factors. At paragraph 2.7 for example it states:

‘...the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.’

2.1.7. The NPSE introduces and describes three categories, or levels, describing the presence or absence of noise effects but does not quantify those categories, stating that the corresponding objective levels are likely to be different for different noise sources, receptors and times of the day or night. These categories are:

- NOEL - No Observed Effect Level - This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
- LOAEL - Lowest Observed Adverse Effect Level - This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL - Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur.

2.1.8. The NPSE recognised that, at the time of publication, further research was needed into how these categories might be quantified for different scenarios. There is still no robust, universally accepted method of deriving suitable values and a variety of approaches are adopted in different circumstances.

2.2 LOCAL POLICY

2.2.1. The Knowsley Council Core Strategy (July 2013), which forms part of the Knowsley Local Plan, sets the strategic framework for the growth and development of Knowsley up to 2028 and beyond.

2.2.2. Section 8.6, regarding the protection of the local amenity states that:

“The design of new development should avoid unacceptable impacts which affect the amenity and living conditions of occupiers of buildings. Such effects can include generation of noise, light and air pollution and harmful overbearing and loss of privacy through overlooking”

2.2.3. Further modifications to the Core Strategy were proposed in 2014, though none relate to noise.

2.3 PROFESSIONAL GUIDANCE

2.3.1. National and local planning policy does not provide any specific guidance or criteria for assessing the potential impact of the operation of the Proposed Development on nearby sensitive receptors.

2.3.2. This assessment will be based on whether noise from the operations within the Proposed Development are likely to increase the internal ambient noise levels, or exceed the internal maximum noise criteria, within the sensitive spaces of the identified sensitive receptors. As the proposed worst-case hour, in terms of potential noise impacts, is between 06:00 and 07:00, this assessment will be based upon the criteria set out in BS 8233¹ and the WHO Guidelines² for the night-time period.

¹ British Standard (BS) 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

² World Health Organisation (WHO) *Guidelines for Community Noise*

- 2.3.3. Consideration will also be given to the acoustic character of the sources of noise and whether corrections should be applied to the predicted noise level at the identified sensitive receptors, in accordance with the guidance in BS 4142³.

INTERNAL NOISE CRITERIA

- 2.3.4. Table 1 shows recommended internal noise levels for dwellings as given in Table 4 of BS 8233. These are primarily intended to apply for “steady external noise sources” and those “without a specific character”, previously termed “anonymous noise”.

Table 1 - Indoor ambient noise levels for dwellings (when unoccupied)

Location (Activity)	Day (07:00 – 23:00)	Night (23:00 – 07:00)
Living Rooms (Resting)	35 dB $L_{Aeq,16h}$	N/A
Dining Rooms (Dining)	40 dB $L_{Aeq,16h}$	N/A
Bedrooms (Sleeping, daytime resting)	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

- 2.3.5. BS 8233:2014 also states that:

“regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night.”

- 2.3.6. The WHO guidelines consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic, industries, construction and neighbours.
- 2.3.7. The effects of noise in dwellings are, typically, sleep disturbance, speech interference and annoyance. Relevant guideline values and the time base over which the individual guideline values apply are summarised in Table 2, below.

Table 2 - WHO guideline values for community noise in specific environments

Specific environment	Critical health effects	$L_{Aeq,T}$	Time base (hours)*	L_{AFmax}
Outdoor living area	Serious annoyance, daytime and evening	55 dB	16	-
	Moderate annoyance, daytime and evening	50 dB	16	-
Dwellings, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35 dB	16	-
Inside bedrooms	Sleep disturbance, night-time	30 dB	8	45 dB
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45 dB	8	60 dB
* These periods are usually taken to be 07:00 – 23:00 (16-hour day) and 23:00 – 07:00 (8-hour night)				

³ British Standard BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

- 2.3.8. It can be seen from Table 1 and Table 2, above, that the internal $L_{Aeq,T}$ criteria for day and night-time periods in BS 8233 and the WHO Guidelines are identical, and these values will be used in this assessment.
- 2.3.9. Whilst BS 8233 does not provide a quantitative guideline value for individual night-time noise events, the WHO guideline value inside bedrooms is 45 dB $L_{Amax,F}$. Therefore, this criterion has been used in this assessment to ensure an adequate internal night-time noise environment.

CORRECTIONS FOR ACOUSTIC CHARACTER OF A NOISE SOURCE

- 2.3.10. BS 4142 is the standard most commonly used in assessments of the impacts of industrial and commercial noise.
- 2.3.11. A summary of the BS 4142 approach is set out below.
- Establish the specific sound level of the source(s).
 - Establish the representative background sound level(s).
 - Correct the specific sound level(s) for on-time if necessary.
 - Apply feature corrections to the specific sound level, to account for any distinguishing characteristics, to derive the rating level.
 - Determine the initial estimate of the impact by subtracting the representative background sound level from the rating level for a given assessment scenario.
 - Consider and modify the initial estimate of impact, as determined above, in the context of the noise and its environs.
- 2.3.12. Individual elements of this process are explained in greater detail below.
- 2.3.13. Where the sound source is not yet present, the specific sound level can be established by calculation using source data.
- 2.3.14. The representative background sound level can be established by measurement at the receptor location or at suitably justified proxy locations.
- 2.3.15. If the source under investigation is non-continuous the specific sound level can be corrected for the amount of time it is on or active during the reference period. The reference period is one hour during the daytime and 15-minutes during the night-time. The character of noise can be rated using the penalties below:
- Tonality up to 6 dB
 - Impulsivity up to 9 dB
 - Other sound characteristics 3 dB
 - Intermittency 3 dB
- 2.3.16. An initial estimate of the noise impact is obtained by subtracting the adopted background sound level from the rating level. The results of this comparison are assessed on the basis of the following guidance as described in section 11 of BS 4142:
- Typically, the greater the difference, the greater the magnitude of the impact.
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.3.17. All pertinent factors should be taken into account in the consideration of context include the following:

- The absolute level of the sound.
- The character and level of the residual sound compared to the character and level of the specific sound.

2.3.18. The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

3 NOISE IMPACT ASSESSMENT

3.1 INTRODUCTION

3.1.1. This section presents an assessment of the potential impact of the operation of the Proposed Development on nearby existing sensitive receptors, and is structured as follows:

- Criteria by which potential impacts will be assessed
- Details of the modelling approach for the Proposed Development (including likely sources of noise) and surrounding area
- Assessment of potential impacts at the identified sensitive receptors

3.2 SUMMARY OF CRITERIA

3.2.1. Further to the discussion presented in section 2.3, the assessment will adopt the following criteria. These internal noise criteria are in line with the guidance contained within BS 8233 and the WHO Guidelines. As above, the daytime noise levels have been included for context and completeness.

Table 3 - Internal Noise Criteria for Residential Development

	Daytime	Night-time	
	L _{Aeq,16h}	L _{Aeq,8h}	Typical L _{AFMax}
Internal noise levels (habitable rooms)	35 dB	30 dB	45 dB

3.2.2. Consideration will also be given to the acoustic character of the sources of noise and whether corrections should be applied to the predicted noise level at the identified sensitive receptors, in accordance with the guidance in BS 4142.

3.3 ACOUSTIC MODELLING AND NOISE SOURCES

3.3.1. A detailed acoustic model of the Proposed Development and surrounding area has been produced to calculate the level of noise at the identified sensitive receptors. The model has been produced using CadnaA® noise mapping software and the modelled site layout is based upon the site layout plan provided by SMR Architects (drawing reference: DWN2_P5-SMR-41-ZZ-DR-A-8002-S3-P2).

3.3.2. The base mapping has been established using Ordnance Survey open data and the topography across the Proposed Development and the surrounding area has been based on 1 m Digital Terrain Model (DTM) data. For the purpose of this assessment, it has been assumed that the Proposed Development will not significantly change the existing topography within the application site.

3.3.3. The following assumptions have been adopted in the acoustic model:

- Ground absorption has been set at 0 (i.e. hard and reflective conditions) to approximate the hard ground cover between the noise sources and the proposed facades
- Buildings are reflecting
- The order of reflections has been set within the model at 2
- The heights of buildings located between the Proposed Development and the identified sensitive receptors have been approximated individually using online mapping software

- The receiver points for the identified sensitive receptors have been set at a height of 1.2 m above first floor level (i.e. 4.2 m), to account for the location of bedrooms at first floor level
- All residential buildings, including those identified as sensitive receptors have an assumed height of 8 m
- Traffic data have been taken from the transport consultant, Vectos, for the operation of the Proposed Development
- WSP library data for noise sources for the Proposed Development (including van idling and door slams).

3.3.4. The following key noise sources have been considered within the 3D digital noise model and assessment:

- Vehicles manoeuvring within the storage area, including door slams
- Vehicles entering and leaving the storage area

Vehicles manoeuvring within the storage area

3.3.5. The current proposals indicate that there will be 359 van parking spaces. It is anticipated that vehicles will generally manoeuvre within the site at low speeds (<15 km/h) and, as such, generate low levels of noise. However, higher noise levels can be generated briefly from doors being slammed and engines starting.

3.3.6. In order to determine the potential impact of noise generated by the Proposed Development at the identified sensitive receptors, calculations have been undertaken based on typical sound exposure levels (SEL) from vehicle activities and movements that WSP has measured previously, as presented in Table 4, below.

Table 4 – Source Data

Source	SEL
Vehicle pass-by (including engine revving)	71 dBA at 10m
Vehicle door slam	63 dBA at 10m

3.3.7. A SEL is the total sound energy generated by one discrete noise event normalised to a 1 second duration. The approach of using SEL values for discrete events is useful for calculating equivalent noise levels (L_{Aeq}) over a longer period.

3.3.8. For the one hour peak period between 06:00 and 07:00, the hourly traffic data provided by Vectos shows that approximately a quarter of the spaces would be used. However, for each time the space is used there are likely be four sets of vehicle movements, which are as follows:

- private vehicle pulling up to the space;
- removal of the light-goods vehicle
- parking of the private vehicle into the space; and
- driving away in the light-goods vehicle.

- 3.3.9. The equivalent 1 hour L_{Aeq} level has been calculated from the SEL values for each parking space, and taking the above into account as follows:

$$L_{Aeq,1h} = SEL + 10\log N - 10\log T$$

where: **N** = movements per space (taken to be four, reflecting the number of movements associated with each space)

T = time period in seconds (i.e. 3600s for a 1 hour period)

- 3.3.10. The 1 hour sound pressure level ($L_{Aeq,1h}$ calculated at a reference distance of 10m) for each parking space has been converted to a sound power level by adding 28 dB. Consideration has then been given to the capacity of the storage area as approximately a quarter of the spaces would be used in the worst-case hour. The resulting sound power level of 90 dB L_{WA} has been applied across the overall storage area within the 3D digital noise model.
- 3.3.11. The nearest of the identified sensitive receptors to the west of Moorgate Road North are approximately 500 m from the site boundary of the Proposed Development. At this distance, the resultant L_{Amax} from door slams at the receptor would be 29 dB. Assuming a 13 dB sound reduction for a partially open window⁴, the resultant L_{Amax} internal level would be 16 dB, which is comfortably below the criterion of 45 dB (as specified in Table 3). Therefore, individual events are considered no further in this assessment.
- 3.3.12. The nearest of the additional identified sensitive receptors to the north of South Boundary Road are approximately 600 m from the site boundary of the Proposed Development. At this distance, the resultant L_{Amax} from door slams at the receptor would be 27 dB. Assuming a 13 dB sound reduction for a partially open window, the resultant L_{Amax} internal level would be 14 dB, which is comfortably below the criterion of 45 dB (as specified in Table 3). Therefore, individual events are considered no further in this assessment.

Vehicles entering and leaving the storage area

- 3.3.13. Based on the traffic data provided, during the hour between 06:00 and 07:00, a total of 205 private and light-goods vehicle movements are anticipated between Faraday Road and the storage area.
- 3.3.14. These vehicle movements have been included within the 3D digital noise model using the prediction method set out in BS 5228-1⁵ for haul roads (Annex F, F.2.5). The sound pressure level for a rigid road lorry has been taken from source data in BS 5228-1 as 82 dB (Annex C Table C.6 Item 23) and assumed to be travelling at 30 km/h along the access route. The sound pressure level is a drive-by maximum level, as required by the BS 5228 calculation method for haul routes.
- 3.3.15. It is assumed that vehicles would drive to their parking spaces which would be distributed across the Proposed Development, then drivers would access their light goods vehicles and leave. However, for the purposes of this assessment, the vehicles are assumed to enter the site and follow the route system around the western side of the site (i.e. closest to the identified sensitive receptors) and then leave. As such, this is considered the worst-case scenario.

⁴ This assumption is in line with the guidance within the *Acoustics Ventilation and Overheating Residential Design Guide* (January 2020), which states that “partially open window will provide an outside-to-inside level difference of 13 dB”.

⁵ British Standard (BS) 5228-1: 2009+A1: 2014 *Code of practice for noise and vibration control on construction and open sites*

3.4 ASSESSMENT OF POTENTIAL IMPACT

- 3.4.1. Figure B-1 in Appendix B presents the predicted noise levels from on-site operations across the Proposed Development and surrounding area, between 06:00 and 07:00. These operations include those detailed in the sections above. With the noise sources described above included in the noise model, the predicted noise level at the nearest of the sensitive receptors on Moorgate Road North is 25 dB $L_{Aeq,1h}$ and the predicted noise level at the nearest of the sensitive receptors on South Boundary Road is 20 dB $L_{Aeq,1h}$ between 06:00 and 07:00. Assuming a 13 dB sound reduction for a partially open window, the predicted noise level in internal spaces of the identified sensitive receptors would be 12 dB and 7 dB, respectively.
- 3.4.2. As such, the predicted noise level falls comfortably below the night-time criterion of 30 dB $L_{Aeq,8h}$ (as defined in Table 3) for habitable rooms of the identified sensitive receptors with windows open.
- 3.4.3. The corrections which may be applied to account for the acoustic character of the noise source, as set out in BS 4142, are subject to the source of noise being perceptible. Assuming an existing internal noise level of 30 dB within habitable spaces of the identified sensitive receptors, a noise level of 12 dB or 7 dB would be considered imperceptible. Furthermore, the proposed sources of noise are similar in character to the existing dominant source of noise (i.e. road traffic) in proximity to the identified sensitive receptors. Therefore, no corrections have been applied.
- 3.4.4. In line with NPSE, it is anticipated that, given the particularly low predicted noise level levels, in comparison to the guideline criteria, noise from the Proposed Development is likely to fall below the LOAEL and significant noise effects are not anticipated.
- 3.4.5. Whilst it is acknowledged there is a degree of uncertainty with any calculations and assessment for the operation of a development of this nature, which will vary day-by-day, the assumptions adopted in this report are considered reasonably worst-case and consequently the conclusions are considered robust.

4 SUMMARY AND CONCLUSIONS

- 4.1.1. WSP UK Ltd (WSP) was commissioned by Network Space to undertake a noise impact assessment to inform a Planning Application for the development of site for the storage of operational vehicles, including resurfacing, provision of ancillary parking, and ancillary infrastructure at Faraday Road, Knowsley.
- 4.1.2. On-site operations have been assessed against internal noise criteria for habitable spaces, in accordance with BS 8233 and WHO guidelines. Consideration has also been given to the requirement for corrections to the predicted noise levels to account for the perceptibility of acoustic character of the noise sources, in line with BS 4142.
- 4.1.3. A 3D digital noise model has been prepared to predict the noise levels generated by the operation of the Proposed Development.
- 4.1.4. It is predicted that noise from the operation of the Proposed Development during the assumed worst-case hour (between 06:00 and 07:00) would be 25 dB at the nearest of the identified sensitive receptors on Moorgate Road North and 20 dB at the nearest of the identified sensitive receptors on South Boundary Road. Assuming 13 dB sound reduction for an open window, it is predicted that internal noise levels in the habitable spaces would be 12 dB and 7 dB, respectively, which both fall comfortably below the 30 dB criterion for internal ambient noise levels during the night-time.
- 4.1.5. Assuming an existing internal noise level of 30 dB within habitable spaces of the identified sensitive receptors, a noise level of 12 dB or 7 dB would be considered imperceptible. Furthermore, the proposed sources of noise are similar in character to the existing dominant source of noise (i.e. road traffic) in proximity to the identified sensitive receptors. Therefore, no corrections have been applied.
- 4.1.6. Maximum noise levels from individual impulsive events (i.e. car door slams) have been predicted to fall comfortably below the 45 dB criterion, during the night-time.
- 4.1.7. Consequently, it is concluded that the operation of the Proposed Development will not cause changes to behaviour or response to noise and as such, will not give rise to a likely significant effect.

Appendix A

ACOUSTIC GLOSSARY

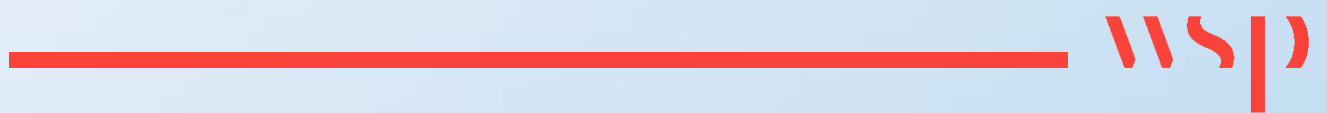


Table A1: Acoustic Glossary

Terminology	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-Weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, 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.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Sound Exposure Level (SEL)	Level of a sound, of one second duration, that has the same sound energy as the actual sound event considered.
Sound Power Level (L_w)	Sound power measured on a decibel scale, relative to a reference value of 10^{-12} W.

Appendix B

MODELLED NOISE LEVELS

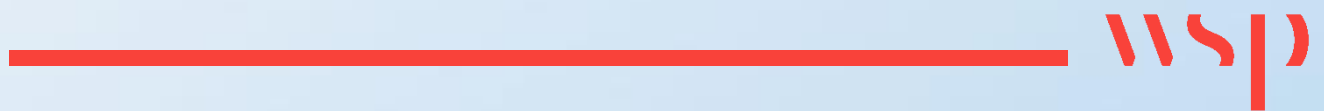
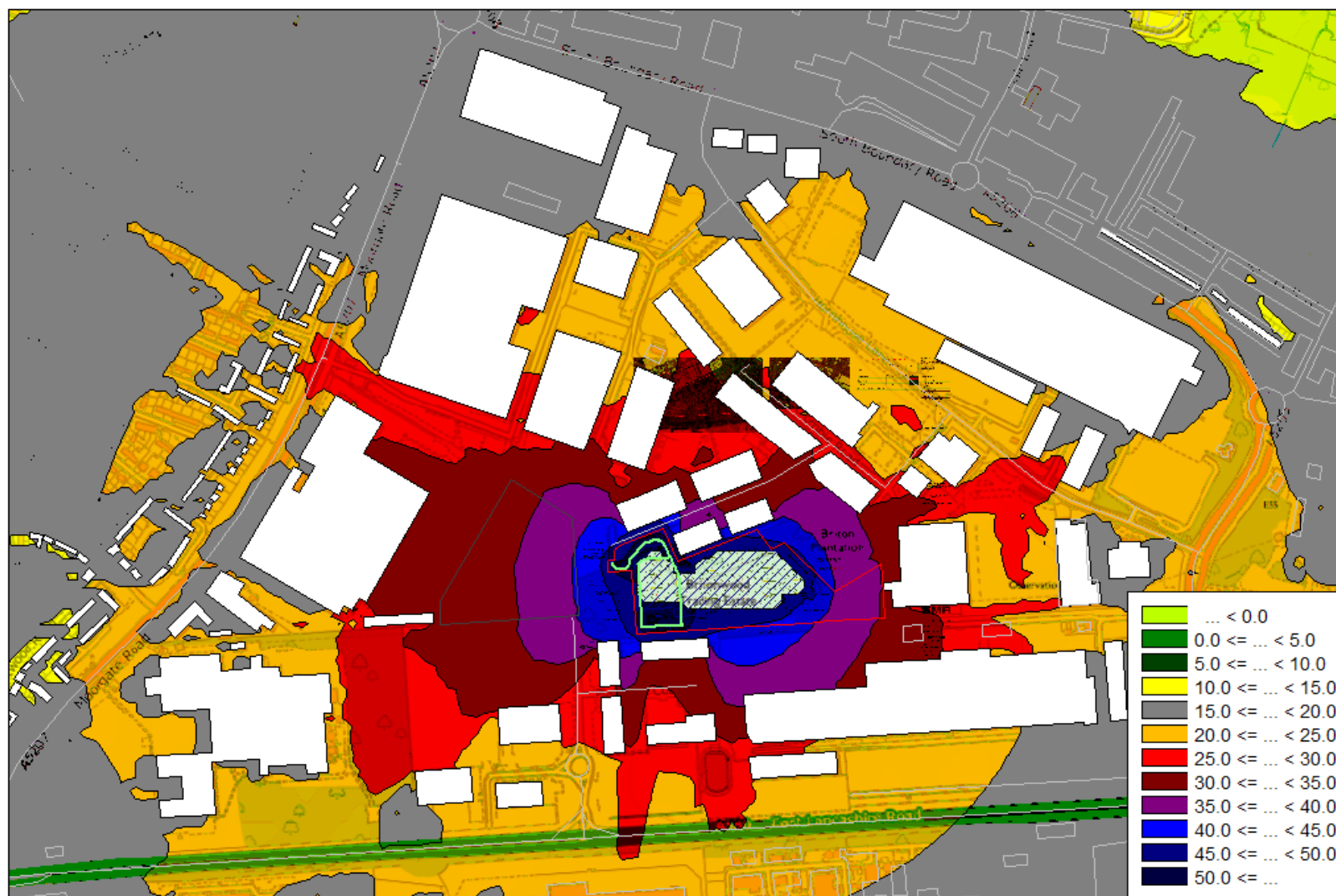


Figure B-1 – Predicted noise levels between 06:00 and 07:00





4th Floor
6 Devonshire Square
London
EC2M 4YE

wsp.com

PUBLIC