Noise Impact Assessment

Palgrave Avenue

Reference: 50-477-R1-2

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NOISE IMPACT ASSESSMENT

Palgrave Avenue
Manchester

Prepared for:



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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Palgrave Avenue, Manchester M40 8JW
National Grid Reference	E 385857 N 400309
Proposed Development	Proposed residential development comprising 7 residential units along with access and landscaping.
Report Objectives	The objectives of this report are to: - Identify, measure and assess the potential impact of any existing noise sources in the immediate vicinity of the Site upon proposed residential receptors. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	E3P have undertaken attended measurements of road traffic sound along Queens Road during a typical weekday period in accordance with Calculation of Road Traffic Noise.
Assessments	A 3D noise model has been constructed to assess road traffic sound across the site and incident upon facades and within external amenity areas. Road traffic sound impact is assessed in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019.
Mitigation Requirements	The assessment has recommended higher specification glazing and System 1 ventilation for all plots due to the impact of sound internally when windows are opened for ventilation. Open windows are sufficient in mitigating overheating without undue adverse impact. Acoustic barriers are also required for certain plots where rear gardens have line of sight to Queens Road.

CONCLUSIONS

With mitigation measures in place, this assessment has shown that no adverse impact is predicted day or night at the receptors due to road traffic sound.

As such, there are no noise related reasons why planning permission should not be granted from the proposed development as long as the recommendations of this report are followed and included within the design stage.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by The Guinness Partnership to undertake a Noise Impact Assessment for a proposed residential development on land off Palgrave Avenue in Manchester, to be referred to hereafter as *'the Site'*.

This assessment looks to determine the key noise sources in the immediate vicinity of the Site and to assess their impact, if any, upon proposed residential receptors and to specify mitigation measures, where required.

1.2. PROPOSED DEVELOPMENT

The client is proposing a residential development on existing disused land off Palgrave Avenue which includes 7 residential units along with access and landscaping.

The key sources of sound impacting upon the Site is road traffic associated with Queens Road.

The assessment has been undertaken in accordance with the following planning drawing:

- Proposed Plan and Massing for both sites.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance.

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that 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.
- 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.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or is likely to occur.
- Whether or not an adverse effect is occurring or is likely to occur.
- Whether or not a good standard of amenity can be achieved.

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The "observed effect levels" are as follows:

- **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly, or having to close windows for some of the time because of the noise where there is no alternative ventilation. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed effect	Avoid
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening, loss of appetite, significant/medically definable harm (auditory and non-auditory).	Unacceptable adverse effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. MANCHESTER CITY COUNCIL PLANNING CONDITION

> *An acoustic assessment under the requirements of paragraph 180 of the National Planning Policy Framework, (Core Strategy DM1 and Saved Unitary Development Plan Policy DC26) which provides details of the existing noise levels in the area including levels during daytime, night time and weekends along with an indication of noise levels that you propose to achieve within the accommodation and details of the acoustic glazing and acoustically treated ventilation you propose to use and what measures will need to be implemented on site to meet internal noise requirements. In terms of the proposed uses, the study should identify the acoustic treatment and measures that will limit the breakout of noise in accordance with a noise study of the premises. The scheme proposed shall include measures such as acoustic lobbies at access and egress points of the premises, acoustic treatment of the building structure, sound limiters linked to sound amplification equipment, and specified maximum internal noise levels (Core Strategy DM1 and Saved Unitary Development Plan Policy DC26).*

The report addresses the above condition through the assessment and mitigation of noise. E3P note that it stipulates weekend noise levels should be assessed. However, considering the residential nature of the site area, no particular weekend sources are present with road traffic sound dominant and at a higher-level during weekday periods.

Furthermore, the proposed usage of the site is residential and so no consideration of proposed noise break-out is required.

2.4. BRITISH STANDARD BS 8233:2014+A1:2019 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.4.1. NOISE CRITERIA LIMITS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

CRITERION	TYPICAL SITUATION	DESIGN CRITERION, $L_{Aeq,T}$ (dB)
Suitable Resting and Sleeping Conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:

> *It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted.*

BS 8233 goes on to say:

> *In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.*

2.4.2. VENTILATION REQUIREMENTS

Where a partially open window cannot be relied upon to provide an adequate level of façade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS 8233 states:

> *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 may remain openable for rapid or purge ventilation, or at the occupant's choice.*
>
> *Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans.*

Section 7.7.2 states:

> *NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.*

2.5. WORLD HEALTH ORGANISATION (WHO) – GUIDELINES FOR COMMUNITY NOISE

The WHO gives guidance on desirable levels of environmental noise. The levels presented in the WHO Community Guidelines are those at which adverse effects become measurable. The 1980 WHO document suggested that *"general daytime outdoor noise levels of less than 55 dB(A) $L_{eq,16hr}$ are desirable to prevent any significant community annoyance."* This level is an external free-field noise level. The 1980 document also stated in relation to internal levels, *"that night-time noise levels of 35 dB(A) $L_{eq,8hr}$ or less will not interfere with the restorative process of sleep"*.

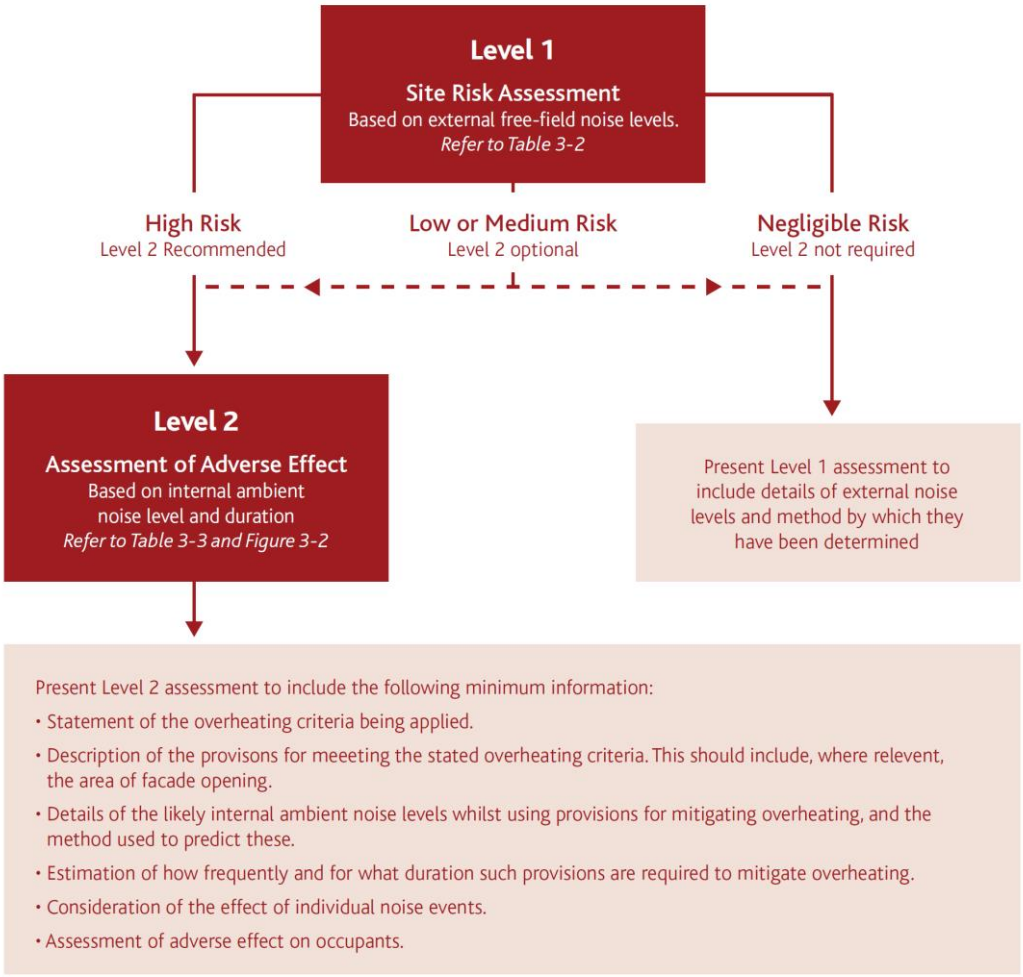
A report was submitted to the WHO in 1995 for consideration as a revision to the 1980 document and revised community guidelines were issued in 2000. In the 2000 guidelines, it is considered that the sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8\,hr}$ or an external level of 45 dB $L_{Aeq,8\,hr}$. It also recommends that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB should be limited where possible.

2.6. INSTITUTE OF ACOUSTICS AND ASSOCIATION OF NOISE CONSULTANTS (2020) ACOUSTICS VENTILATION AND OVERHEATING: RESIDENTIAL DESIGN GUIDE

The Acoustics Ventilation and Overheating (AVO) Residential Design Guide provides an approach as to how the competing aspects of thermal and acoustic comfort can be managed. The AVO Guide aims to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements.

The AVO Guide provides a method for assessing the impact of opening windows and providing whole house ventilation due to the impact of noise via a two-level noise assessment procedure, as below:

DIAGRAM 2.1 TWO LEVEL NOISE ASSESSMENT PROCEDURE – OVERHEATING CONDITION



A level 1 risk assessment is based on external free-field noise levels with the assumption of a partially opened window in use for mitigation of overheating. A level 1 assessment is appropriate for scenarios where the risk to a development is deemed 'Negligible'. 'Low' and 'Medium' risk sites only require a level 2 assessment on an optional basis in order to give further confidence in the suitability of internal noise conditions. The noise levels suggested in Table 2.3 and 2.4 assume a steady road traffic noise source but can be adapted for other transport sources.

TABLE 2.3 GUIDANCE FOR LEVEL 1 SITE RISK ASSESSMENT OF NOISE FROM TRANSPORT NOISE SOURCES RELATING TO OVERHEATING CONDITION

RISK CATEGORY FOR LEVEL 1 ASSESSMENT - EXTERNAL		RISK LEVEL	POTENTIAL EFFECT WITHOUT MITIGATION	RECOMMENDATION FOR LEVEL 2 ASSESSMENT
$L_{Aeq,T}$ during 07:00 - 23:00	$L_{Aeq,8hr}$ during 23:00 - 07:00			
≥65dB	≥55dB	**High**	Increasing risk of adverse effect	Recommended
>55 dB and <63 dB	>45 and <55 dB	**Medium**		Optional
>50dB and <55 dB		**Low**		
≤50 dB	≤45 dB	**Negligible**	Use of opening window as means of mitigating overheating is not likely to result in adverse effect	Not Required

A level 2 assessment will be carried out when the risk of adverse effect is 'High' or it is deemed appropriate for a 'low' or 'medium' risk site. An increase in internal ambient noise level can cause a change in human behaviour. At high levels this creates situations where occupants can no longer open windows for ventilation due to high external noise levels. A level 2 assessment identifies these situations and allows for appropriate alternative ventilation systems to be recommended.

TABLE 2.4 GUIDANCE FOR LEVEL 2 ASSESSMENT OF NOISE FROM TRANSPORT NOISE SOURCES RELATING TO OVERHEATING CONDITION

INTERNAL AMBIENT NOISE LEVEL AT FAÇADE LOCATIONS			EXAMPLE OF OUTCOMES
$L_{Aeq,T}$ during 07:00 - 23:00	$L_{Aeq,8hr}$ during 23:00 - 07:00	Individual noise events during 23:00 - 07:00	
>50 dB	>42 dB	Normally exceeds 65 dB $L_{AF,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time
Increasing noise levels			Increasing the likelihood of impact on reliable speech communication during the day or sleep disturbance at night
≤35 dB	≤30 dB	Do not normally exceeds $L_{AF,max}$ 45 dB more than 10 times a night	Noise can be heard but does not cause any change in behaviour

3. SURVEY RESULTS

3.1. ROAD TRAFFIC SOUND MEASUREMENT – QUEENS ROAD

E3P have undertaken a road traffic sound survey in accordance with the shortened measurement procedure given in Calculation of Road Traffic Noise (CRTN) during a typical weekday period. The survey was undertaken during the following period:

- 13:30-16:30 Thursday 11th November 2021.

The following noise measurement position was chosen for the Road Traffic Noise Survey:

- Noise Measurement Position 1 (NMP1): Located on the western boundary of the Site, approximately 10 m from the roadside edge. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of road traffic along Queens Road.

Table 3.1 details the measured sound pressure levels.

TABLE 3.1 MEASURED ROAD TRAFFIC SOUND LEVELS – QUEENS ROAD

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)			
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$	$L_{A90,T}$	$L_{A10,T}$
13:30	65.8	77.1	55.0	69.2
14:30	65.3		54.9	68.7
15:30	65.5		53.5	68.8
Derived Daytime Noise Level, $L_{Aeq,16hr}$				**65.9**
Derived Night-time Noise Level, $L_{Aeq,8hr}$				**57.3**

During the survey, conditions remained dry and wind speeds rarely exceeded 5 m/s.

The equipment outlined in Table 3.2 was used for the noise survey.

TABLE 3.2 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
NMP1	Sound Level Meter	Norsonic Nor145	14529152	18th June 2023
	Pre-amplifier	Norsonic Nor1209	22293	
	Microphone	Norsonic Nor1227	332220	
	Calibrator	Norsonic Nor1255	125525208	18th June 2022

The sound level meter was field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.

4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2021 MR1, to determine the impact of noise from road traffic sound.

The following inputs have been included in the model:

- Proposed Plan and Massing.
- Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- A reflection order of 2 has been used in all calculations.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

Figures 2 and 3 determine the noise levels across the Site during the daytime and night-time periods, respectively, due to road traffic.

4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

The noise model has been used to predict noise levels in external amenity areas. Only rear garden areas are assumed to be used for relaxation purposes.

The predicted levels range from 45 to 65 dB in these areas.

As such, the predicted levels are considered acceptable and fall within the design range given in BS 8233:2014 with no adverse impact predicted in most gardens. Therefore, no mitigation measures are required.

However, the gardens exposed to Queens Road to the north west and south east are subject to noise levels of up to 65 dB. As such, acoustic barriers are required for this garden area and are discussed in Section 5.0.

4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards internal noise levels, E3P has assumed a standard glazing specification of 4 mm glass/20 mm air space/4 mm glass affords sound insulation performance in the order of 31 dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction, has a sound insulation performance value of approximately 25 dB and so this value has been used to calculate internal noise levels. The recently published AVO has found that a common reduction for an open window is 13 dB based on research undertaken. As such, a figure of 13 dB is applied here.

The model has been used to predict façade noise levels at all floors on façade orientations. In order to determine any requirements for mitigation, E3P has added the reduction provided by the glazing (25 dB) to the relevant criterion for day (35 dB) and for night (30 dB). As such, any facades subject to noise levels higher than 60 dB during the day and/or 55 dB during the night will require higher specification glazing.

The highest predicted day and night façade levels here are 68 dB and 59 dB respectively. As such, higher specification glazing is required for all western habitable room windows.

It is also important to consider the maximum noise levels during the night-time period. The 10th highest measured level was 77 dB $L_{Amax,fast}$ noted at 10 m. This level is distance corrected to the closest facades, resulting in a predicted external noise level of 82 dB. When considering a sound reduction of 31 dB for standard glazing, this results in an internal noise level of 51 dB, 6 dB in exceedance of the criterion.

With regards opening windows, there is a requirement to consider the need to open windows for ventilation and the mitigation of overheating. At this stage, the assessment assumes that ventilation would be provided by way of extract fans in kitchens and bathrooms and openable windows.

4.2.1. VENTILATION CONDITION

When considering a partially open window for ventilation purposes, E3P has assessed whether the BS 8233:2014 internal criterion can be achieved with windows open for ventilation. Here ventilation is defined as:

> *To provide fresh air to the building and to dilute and disperse residual water vapour not dealt with by extract ventilation as well as removing other pollutants which are released throughout the building.*

Thermal comfort and overheating are considered in Section 4.2.2. Purge ventilation is provided by an open window regardless of the ventilation strategy.

As such, a comparison of predicted internal noise levels, with windows open, with the BS 8233:2014 criterion is required. This results in an allowable external noise level of 48 dB during the day and 43 dB during the night in order to achieve the internal criteria with windows open.

As can be seen from the Figures, all plots experience an exceedance during the daytime and night-time periods. As such, dwellings will require a whole dwelling ventilation system as, when windows are opened for ventilation, the internal ambient noise levels are not considered acceptable and exceed the required criterion. Section 5.0 discusses the requirements and provides necessary advice.

It is assumed that System 1 ventilation would be installed as standard across the development.

The exact system will also be dependent on the outcome of the overheating condition below.

4.2.2. OVERHEATING CONDITION

E3P has undertaken a level 1 assessment in accordance with the AVO Guide and adopted the noise levels outlined for negligible and low risk. Any plots that pass this test will not require whole house ventilation to control the overheating as external noise levels would be sufficiently low enough that an open window can provide the overheating mitigation without compromising internal noise levels. As such, the allowable façade noise levels are 55 dB during the day and 50 dB during the night. Any facades experiencing higher noise levels than these may be subject to an optional level 2 assessment.

As can be seen from the Figures, only west facing facades will exceed the criteria day and night and are considered high risk and, as such, a Level 2 Assessment is required.

An overheating assessment of the site has been undertaken as per the method provided by Good Homes Alliance. The assessment determined a medium risk of overheating. Secondly, it is important to consider the predicted internal noise levels with windows open. The anticipated internal levels with a partially open window (13 dB attenuation) to control overheating would be up to 55 dB during the day and 46 dB at night for the worst affected plots as above, with overheating design case L_{AFmax} levels up to 69 dB.

Considering these levels on the AVO diagrams, these are above the “SOAEL” level, and above a level at which noise causes a material change in behaviour. However, given the medium risk of overheating and that quieter facades are available for open windows to mitigate overheating, a mechanical system is not considered necessary.

As such, a means of providing ventilation only will be required for the plots which a system 1 whole dwelling ventilation system would provide. This would typically entail extract fans to wet rooms and background ventilators installed in habitable rooms.

In order to achieve the required internal ambient noise levels, any background ventilators, where required, must achieve at least that of the glazing stipulated in Section 5.0 in the open position. This level of reduction is likely to be achieved by a standard background ventilator. The number of background ventilators per room will be dependent on the requirements given in Building Regulations Part F.

The exact requirements on a plot-by-plot basis are detailed in Section 5.0

5. MITIGATION

5.1. ACOUSTIC BARRIERS

The previous section determined that the rear gardens of the two side on plots would experience noise levels of up to 65 dB. As such, acoustic barriers are required for these gardens in order to achieve, at most, 55 dB.

An additional grid noise map has been run with 2.1 m high close boarded fences in place, see Figure 4. As shown, this barrier achieves the required criterion in the garden with noise levels reduced to, at most, 55 dB.

The barriers must be of wooden fence or brick wall construction, be free from holes, sealed at the base and have a minimum mass of 10 kg/m^2.

5.2. FAÇADE INSULATION

The previous section determined that habitable room windows fronting Queens Road would require higher specification glazing. As such, the below is required to all living room and bedroom windows located on southern, western or northern elevations of all plots:

- The glazing must achieve 37 dB R_w and 33 dB $R_w + C_{t,r}$ reduction. An example specification would be 6 mm glass / nominal air space / 6.8 Pilkington Optiphon glass (38 dB R_w (-2;-5)).

Where a different specification is used, it is important the glazing achieves, as a minimum, the above R_w and $R_w + C_{t,r}$ reductions.

A whole dwelling ventilation system due to the impact of noise internally and ventilation requirements is also required for all plots, should windows be opened for background ventilation. As such, a system 1 ventilation system is recommended.

System 1 consists of background ('trickle') ventilators open in living rooms and bedrooms to provide whole dwelling ventilation paired with extract fans in wet rooms.

It is assumed that System 1 is installed as standard to all plots.

In order to achieve the required internal ambient noise levels, any background ventilators must achieve at least 33 dB $D_{n,e,w} + C_{t,r}$ in the open position. This level of reduction is likely to be achieved by a standard background ventilator. The number of background ventilators per room will be dependent on the requirements given in Building Regulations Part F.

6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by The Guinness Partnership in order to undertake a Noise Impact Assessment for a proposed residential development at Palgrave Avenue in Manchester.

Attended road traffic measurements have been undertaken in order to determine the impact of the sound sources upon the Site.

A 3D noise model has been constructed to assess road traffic sound impact and is assessed in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019.

The assessment has recommended that a whole dwelling ventilation system is installed for all plots and paired with higher specification glazing for all habitable rooms fronting Queens Road due to the impact of sound internally due to road traffic sound. System 1 is sufficient.

Two 2.1 m high acoustic barriers are also required for two plots.

With mitigation measures in place, this assessment has shown that no adverse impact is predicted day or night at the receptors due to road traffic sound.

As such, there are no noise related reasons why planning permission should not be granted from the proposed development as long as the recommendations of this report are followed and included within the design stage.

END OF REPORT

APPENDIX I
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.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain

ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
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 (2E-05 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 as such can be regarded as the "average maximum level". Similarly, L_{90} is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
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.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
FIGURES

Figure 1 - Noise Survey Measurement Positions



Project:
Palgrave Avenue

Project-No:
50-477

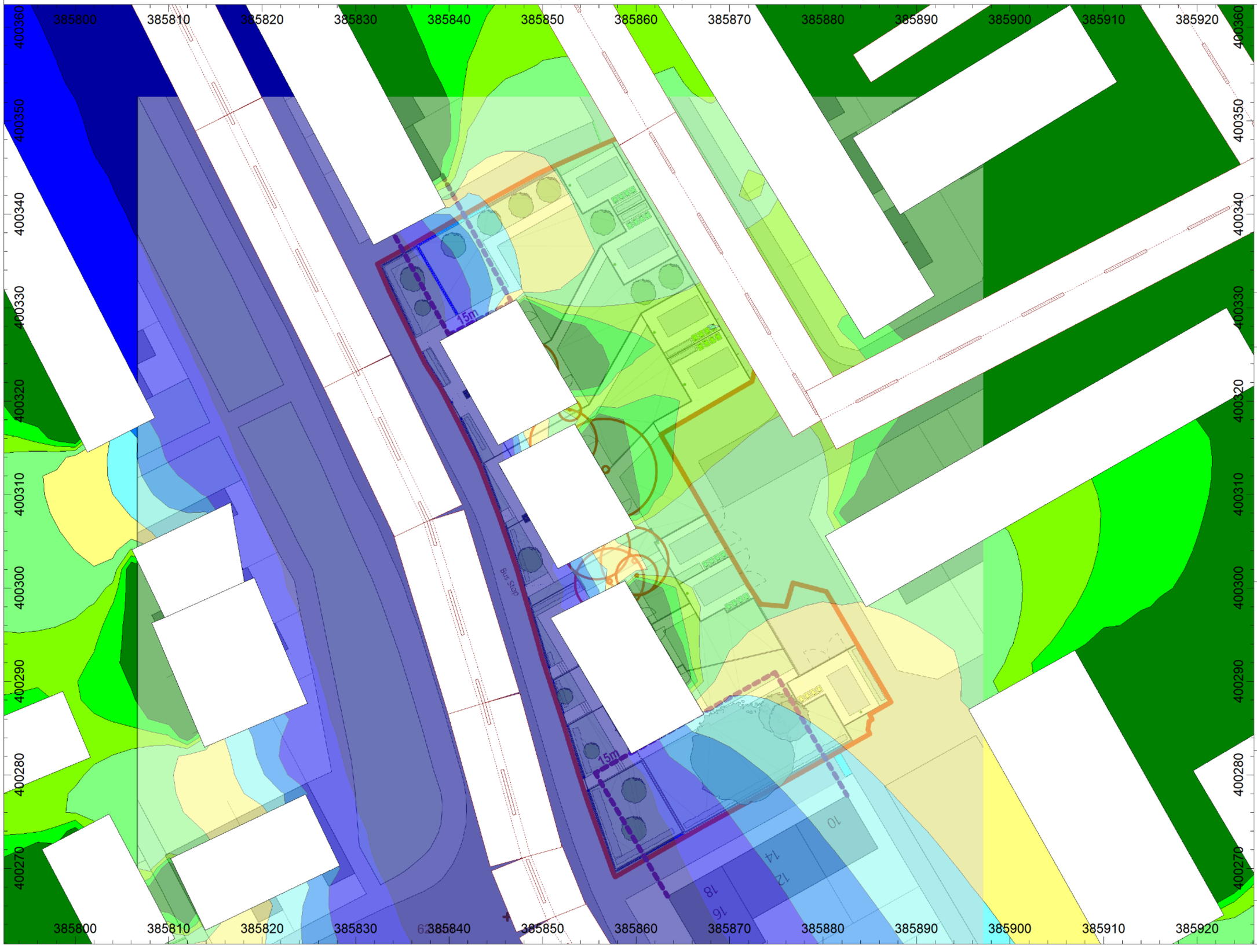
Client:
The Guinness Partnership

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e3p

Project Engineer: L Faulkner
Date: 18/11/2021

Figure 2 - Daytime Grid Noise Map - Calculation at 1.5m above ground level



Project:
Charlestown Phase 2

Project-No:
50-477

Client:
The Guinness Partnership

Daytime Noise Level, LAeq,16hr (dB)

- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 56
- 56 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

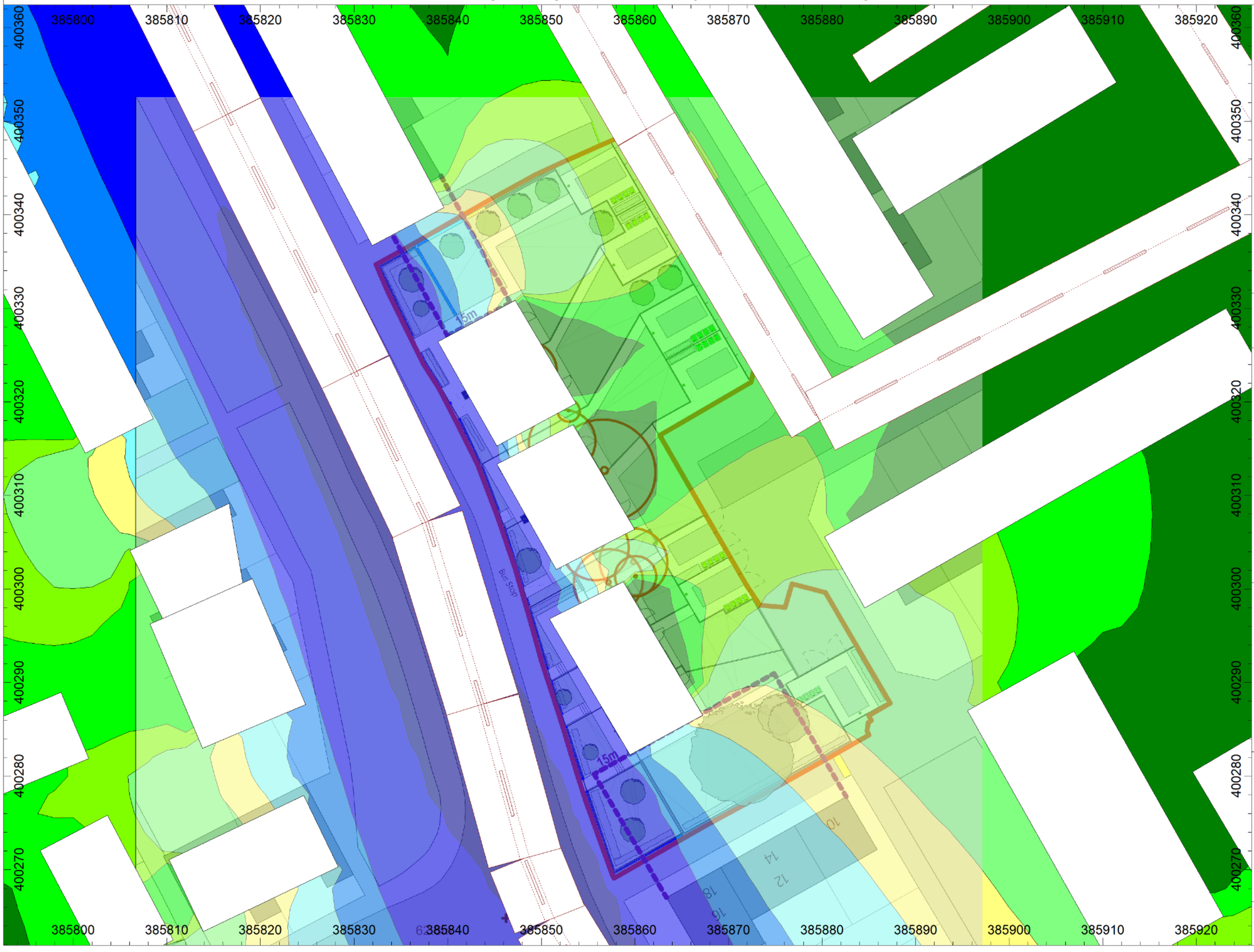
Noise Map Objects

- Road
- Building
- Barrier
- Height Point
- Calculation Area

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Project Engineer: L Faulkner
Date: 18/11/2021

Figure 3 - Night-time Grid Noise Map - Calculation at 4m above ground level



Project:
Charlestown Phase 2

Project-No:
50-477

Client:
The Guinness Partnership

Night-time Noise Level, LAeq,8hr (dB)

- ... <= 42
- 42 < ... <= 45
- 45 < ... <= 47
- 47 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ... <= 57
- 57 < ... <= 60
- 60 < ...

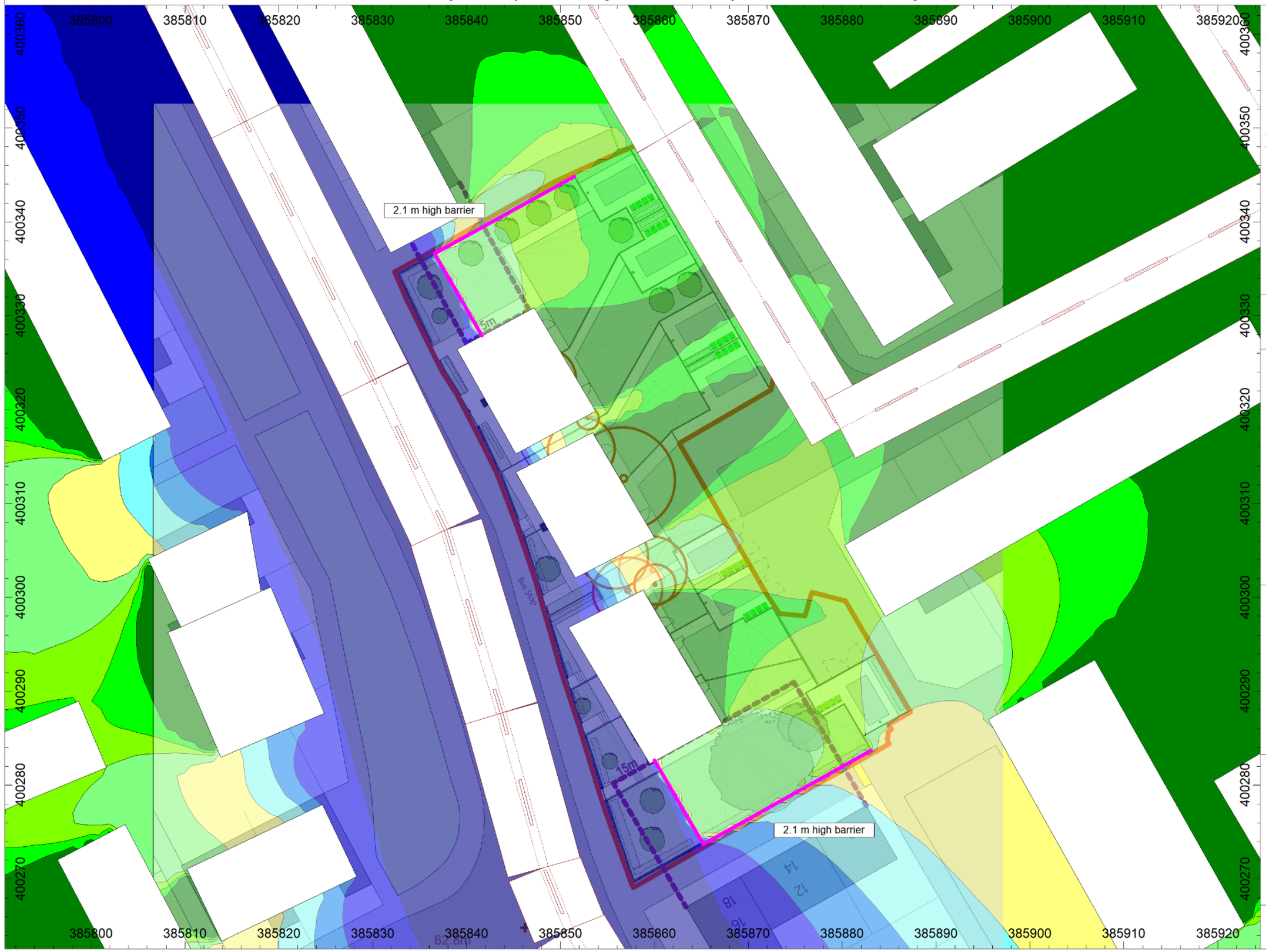
Noise Map Objects

- Road
- Building
- Barrier
- Height Point
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 18/11/2021

Figure 4 - Daytime with Mitigation Grid Noise Map - Calculation at 1.5m above ground level



Project:
Charlestown Phase 2

Project-No:
50-477

Client:
The Guinness Partnership

Daytime Noise Level, LAeq,16hr (dB)

- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 56
- 56 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

Noise Map Objects

- Road
- Building
- Barrier
- Height Point
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 18/11/2021