Noise Impact Assessment

Plymouth Grove, Manchester

Reference: 50-834-R1-2

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NOISE IMPACT ASSESSMENT

Plymouth Grove
Manchester

Prepared for:

Recom Solutions

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Land at Plymouth Grove, Manchester M13 9LZ
National Grid Reference	E 385166 N 396534
Proposed Development	Proposed student accommodation development within an eight-storey building comprising ground floor ancillary communal uses and 263 student bed spaces in total.
Report Objectives	The objectives of this report are to: • Identify, measure and assess the potential impact of any existing and proposed noise sources upon existing and/or proposed residential receptors. • Provide sufficient information and assessments to satisfy the criteria for BREEAM Hea 05. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	E3P have undertaken attended road traffic measurements for the surrounding roads and an unattended background and ambient sound survey over an evening and night-time period.
Assessments	An assessment of road traffic sound impacting upon the proposed development has been undertaken in accordance with the criteria given in BS 8233. This informs the indoor ambient noise level criterion for BREEAM requirements too. The assessment considers the impact of any proposed fixed plant items upon existing and proposed receptors in accordance with BS 4142. E3P have assessed the sound insulation properties of the party walls and floors in order to satisfy the requirements of BREEAM for the remaining credits.
Mitigation Requirements	The assessment has recommended higher specification glazing for certain residential units and a whole dwelling ventilation system suitable to mitigate overheating for any affected plots. It is understood that the detailed overheating assessment recommended MVHR for these plots which is sufficient.

CONCLUSIONS

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

Accordingly, no adverse impact is predicted upon the proposed receptors nor upon existing receptors as a result of the development.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Recom Solutions to undertake a Noise Impact Assessment for a proposed student accommodation development across an eight-storey building on a vacant previously developed site on land at Plymouth Grove in Manchester, to be referred to hereafter as '*the Site*'.

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

This report also provides evidence in order to satisfy the credit requirements of Hea 05 in BREEAM.

1.2. PROPOSED DEVELOPMENT

The client intends to construct a new build 8 storey development consisting of ground floor ancillary communal space and will provide 263 student bed spaces in total.

The key source of sound impacting upon the Site is road traffic noise along Plymouth Grove and the A34. The key sources of noise associated with the proposed development will be fixed plant sound, if any.

This assessment has been undertaken in accordance with the following supplied drawings:

- Site Plan – provided by Day Architectural on 3rd July 2023.

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 at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

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, for either absolute levels or frequency content.

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

Planning policies and decisions should 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:

- mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- 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
- limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation

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. BREEAM CRITERIA

During the design stages the building meets the appropriate acoustic performance standards and testing requirements for the acoustic principles of:

a. Sound Insulation
b. Indoor ambient noise level
c. Room Acoustics

2.3.1. MULTI-RESIDENTIAL SPECIFIC REQUIREMENTS

Sound Insulation: Airborne sound insulation values are at least 3 dB (1 credit), 5 dB (2 credits) higher and impact sound insulation volumes at least 3 dB (1 credit), 5 dB (2 credits) lower than the performance standards in the relevant building regulations.

Indoor ambient noise levels: Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS8233:2014.

Room Acoustics: Achieve the requirements relating to sound absorption within residential spaces and within the common spaces of the building described in the relevant building regulations.

2.4. BUILDING REGULATIONS: APPROVED DOCUMENT F - VOLUME 1: DWELLINGS (JUNE 2022)

Approved document F Volume 1: Dwellings (ADF) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to means of ventilation within dwellings. The ventilation strategy specified within the ADF are as follows.

> *1.9 The ventilation strategy in this approved document relies on a combination of all of the following.*
>
> *a. Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms and kitchens), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.*

b. Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.

c. Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).

1.10 Ventilation may be delivered through natural ventilation, mechanical ventilation or a combination of both.

1.11 The ventilation systems in this approved document are examples of systems that comply with Part F of the Building Regulations. Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance.

Within the ADF there are three system specific ventilation systems that can be utilised to provide sufficient ventilation. These methods are as follow.

1. ***Natural ventilation with background ventilators and intermittent extract fans*** *(guidance suitable only for less airtight dwellings) - Ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. For the purposes of this approved document, natural ventilation refers to a ventilation strategy using background ventilators and intermittent extract ventilation.*

2. ***Continuous mechanical extract ventilation*** *- Mechanically driven ventilation that continuously extracts indoor air and discharges it to the outside.*

3. ***Mechanical ventilation with heat recovery -*** *A mechanically driven ventilation system that both continuously supplies outdoor air to the inside of the dwelling and continuously extracts indoor air and discharges it to the outside. For the purposes of this approved document, the guidance for mechanical ventilation with heat recovery applies to centralised or decentralised supply and extract systems, with or without heat recovery.*

2.5. BUILDING REGULATIONS: APPROVED DOCUMENT O – OVERHEATING (JUNE 2022)

Approved document O - Overheating (ADO) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to the mitigation of overheating. In relation to noise the ADO provides the following guidance.

3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40dB $L_{Aeq,T,}$ averaged over 8 hours (between 11pm and 7am).
b. 55dB $L_{AFmax,}$ more than 10 times a night (between 11pm and 7am).

3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants'

Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020)

2.6. BS 4142: 2014+A1:2019 'METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- Sound from industrial and manufacturing processes.
- Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted specific noise level from any of the above with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the reference time intervals depending upon whether the noise source operates during daytime (1-hour) or night-time (15-minute) periods.

There are several 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows:

Tonality

- +2 dB: where the tonality is just perceptible.
- +4 dB: where the tonality is clearly perceptible; and
- +6 dB: where the tonality is highly perceptible.

Impulsivity

- +3 dB: where the impulsivity is just perceptible.
- +6 dB: where the impulsivity is clearly perceptible; and

- +9 dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above, there is a penalty for 'other sound characteristics' of +3 dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment. BS 4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background sound level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of 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; and
- 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

2.7. BRITISH STANDARD BS 8233:2014 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.7.1. 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.*

2.7.2. 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.*

2.8. 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.

3. SURVEY RESULTS

3.1. SOUND CLIMATE

Prior to the surveys and during, E3P undertook a site walkover to determine the existing sound climate and associated sources.

It was noted that the main source of sound was road traffic sound associated with Plymouth Grove and the A34. As such, E3P carried out an attended road traffic measurement in accordance with the Calculation of Road Traffic Noise (CRTN) for Plymouth Grove, with a meter installed to also capture night-time noise levels. Traffic data will be used for the A34 to allow for separation of the roads.

3.2. ROAD TRAFFIC SOUND MEASUREMENT – PLYMOUTH GROVE

Due to the open nature of the site, it was not possible to install the meter on site for 24 hours. As such, 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. It was possible to install a meter overnight and, as such, this was used to capture the night-time periods. The survey was undertaken during the following period:

- 11:53-14:53 Monday 17th April 2023.
- 23:00 Tuesday 18th April to 07:00 Wednesday 19th April 2023.

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

- Noise Measurement Position 1 (NMP1): Located on the southern site boundary with Plymouth Grove approximately 5 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 Plymouth Grove and the A34 – 3 Hour CRTN.
- Noise Measurement Position 2 (NMP2): Located on the southern site boundary with Plymouth Grove approximately 13 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 Plymouth Grove and the A34 – Overnight.

Table 3.1 details the measured sound pressure levels.

TABLE 3.1 MEASURED ROAD TRAFFIC SOUND LEVELS – PLYMOUTH GROVE AT 5 M

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)			
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$	$L_{A90,T}$	$L_{A10,T}$
11:53	64.9	83.0	52.6	68.2
12:53	65.9		53.5	67.9
13:53	65.2		53.4	69.5
Derived Daytime Noise Level, $L_{Aeq,16hr}$				**65.5**
Measured Night-time Noise Level, $L_{Aeq,8hr}$				**62.3**

3.3. UNATTENDED BACKGROUND AND AMBIENT SOUND SURVEY

Due to the site being openly accessible to the public and therefore not secure enough to install a sound level meter over a full period, E3P has conducted unattended background sound measurements during worst-case daytime and night-time periods in a position representative of the receptors in the immediate vicinity of the site.

The survey was carried out over the following time period:

- 19:00 Tuesday 18th April to 07:00 Wednesday 19th April 2023.

The following noise measurement position was chosen for the Background and Ambient Sound Survey:

- Noise Measurement Position 2 (NMP2): Located on the southern site boundary with Plymouth Grove approximately 13 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 Plymouth Grove and the A34.

Table 3.2 details the measured background and ambient sound levels.

TABLE 3.2 MEASURED BACKGROUND SOUND PRESSURE LEVELS

DATE	MEASUREMENT PERIOD	MEASURED BACKGROUND SOUND PRESSURE LEVEL, $L_{A90,T}$ (dB)	MEASURED AMBIENT SOUND PRESSURE LEVELS, $L_{Aeq,T}$ (dB)
Tuesday 18th to Wednesday 19th April 2023	19:00-20:00	49.8	61.3
	20:00-21:00	49.2	60.5
	21:00-22:00	49.4	60.2
	22:00-23:00	48.0	60.8
	23:00-00:00	45.9	57.3
	00:00-01:00	43.5	55.1
	01:00-02:00	42.7	54.3
	02:00-03:00	42.2	54.3
	03:00-04:00	44.0	54.0
	04:00-05:00	46.1	62.4
	05:00-06:00	48.4	60.3
	06:00-07:00	51.1	60.7

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

The equipment outlined in Table 3.3 was used for the noise survey. During the survey, conditions remained dry and wind speeds rarely exceeded 5 m/s.

TABLE 3.3 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
NMP1	Sound Level Meter	01dB Fusion	14616	29/06/2024
	Pre-amplifier	01dB Pre22	20951	
	Microphone	GRAS 40CD	494264	
	Calibrator	Cirrus CR 515	99206	25/07/2023
NMP2	Sound Level Meter	Cirrus CR:171A	G303884	20th September 2024
	Pre-amplifier	Cirrus MV:200F	12731F	
	Microphone	Cirrus MK:224	215899D	
	Calibrator	Cirrus CR:515	99403	20th September 2023

The sound level meters were 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. ROAD TRAFFIC NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2023 MR1, to determine the impact of noise from road traffic sound. The following information has been used to inform the noise model:

- Proposed Site Plan.
- 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.
- Existing buildings are included.
- A reflection order of 1 has been used in all calculations.
- Ground absorption has been taken as 0 due to the acoustically hard landscape.
- 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 the external roof terrace amenity space in the northern area of the site. The model determined a maximum noise level of 54 dB at the very edge of this area and 44 dB in the centre. Levels are likely to be no more than 50 dB at the edges within the terrace.

E3P note the below from BS 8233:

> *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.*

Given the locality of the site, the proximity of major roads and the predicted desirability of the development, achieving traditional noise criteria is not considered appropriate. However, as shown above, levels are below 55 dB in this space and considered acceptable.

4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards to 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 29 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 guide recommends that a partially open window provides approximately 13 dB attenuation.

The model has been used to predict façade noise levels at all floors. 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.

As can be seen in Figures 2 and 3, Southern and eastern habitable room windows associated with south facing apartments are subject to noise levels higher than these values. As such, these plots will require higher specification glazing. Standard double glazing is sufficient across the rest of the Site.

Exact glazing requirements will be discussed in section 5.

Consideration must also be given to maximum noise levels generated by road traffic on Plymouth Grove. The 10th highest maximum noise level from the night-time survey has been used for each façade which equates to 84 dB at the southern facades.

Internal maximum noise levels of 45 dB L_{Amax} should also not be exceeded. The sound insulation performance achieved by standard glazing (29 dB) has been added to the 45 dB maximum internal noise level limit. As, such facades subject to maximum noise levels above 74 dB will require higher specification glazing.

As shown above, facades along Plymouth Road are subject to levels in excess of this by up to 10 dB. Therefore, higher specification glazing is required on these facades.

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 continuous extract fans in wet rooms and window mounted trickle ventilators or similar, in accordance with the requirements of Building Regulations Approved Document Part F (ADF).

4.2.1. 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, 53 dB during the night (taken from Part O criteria of 40 dB plus 13 dB attenuation of an open window) and maximum noise levels of 68 dB (as per Part O). Any facades experiencing higher noise levels than these may be subject to an optional level 2 assessment.

As can be seen from the Figures, southern apartments are subject to higher daytime and night-time noise levels than the limits above. As such, a Level 2 assessment has been undertaken for these plots.

An overheating assessment of the site has been undertaken as per the method provided by Good Homes Alliance. The assessment determined a high risk of overheating. Secondly, it is important to consider the predicted internal noise levels with windows open.

Considering expected noise levels with windows open and comparing these levels on the AVO diagrams, the levels for apartments are above the "SOAEL" level, and above a level at which noise causes a material change in behaviour.

Therefore, southern facing apartments will require mechanical ventilation that provides background ventilation as well as the ability to mitigate overheating as, furthermore, the affected apartments would not be compliant with the criterion given in Part O of the Building Regulations when windows are opened at night.

E3P have been provided with the results of the TM59 Overheating Study which has recommended the following:

- No windows opening on any facades.
- Ceiling or window mounted MVHR for all apartments with varying degrees of ventilation rate

Given the above, this satisfies the requirement of this Noise Impact Assessment. As such, the only requirement for the facades here is the level of glazing specification to be installed and consideration to the noise level output from the MVHR systems.

5. PROPOSED FIXED PLANT SOUND

E3P have been provided with plant noise data for all proposed plant associated with the development, via a marked up floor plan by King Associates, dated 6th July 2023.

As such, the following plant are included in the noise model:

- Ground floor LV Generator Room – Standby Generator – 85 dBA at 1 m.
- Ground floor Mechanical Plant Room – Water Pumps – 70 dBA sound power level.
- Ground floor Substation – Transformer – 59 dBA sound power level
- Roof mounted Air Source Heat Pump (ASHP) – 65 dBA sound power level.
- Roof mounted extract fan – 36 dBA sound power level.

An additional noise model as been run to determine noise levels at ground level and also façade levels at existing receptors. As the plant equipment are all assumed to run continuously in any given assessment period the façade levels calculate worst-case day and night levels.

With regards the ground floor plant rooms, noise break-out calculations have been conducted based on the assumption of a sound reduction index of 10 dB for the doors which are assumed to be louvred.

The results of the background sound level survey determined that typical background sound levels at night are 45 dB $L_{A90,15mins}$. As such, and to accord with typical plant noise emission limits of $L_{A,r} = L_{A90,T}$ - 10 dB, a limit of 35 dB at the facades is applicable.

As proposed receptors will have no line of sight to any plant items, these are not considered, and existing receptors are assessed. Indeed, the doors to these rooms are set under the first floor but within the noise model are modelled at the edge of the façade to inform a worst-case assessment

As can be seen in Figure 4, the highest predicted rating level at the existing receptors is 35 dB to the north west and 27 dB to the east. These levels achieve the required criterion of 10 dB below the background sound level and, accordingly, no mitigation measures are required.

6. BREEAM ASSESSMENT

6.1. SOUND INSULATION

Sound Insulation: Airborne sound insulation values are at least 3 dB (1 credit), 5 dB (2 credits) higher and impact sound insulation volumes at least 3 dB (1 credit), 5 dB (2 credits) lower than the performance standards in the relevant building regulations.

The following table outlines the requirements as given in BREEAM in relation to the standard criterion of:

- Airborne sound insulation $D_{nT,w} + C_{t,r}$ – 45 dB for walls and floors.
- Impact sound insulation $L'_{nT,w}$ – 62 dB for floors.

TABLE 6.1 AIRBORNE AND IMPACT SOUND INSULATION PERFORMANCE STANDARDS

CREDITS	CREDITS AWARDED ACCORDING TO SOUND INSULATION PERFORMANCE STANDARDS	
	AIRBORNE SOUND INSULATION, $D_{nT,w} + C_{t,r}$ (dB)	IMPACT SOUND INSULATION, $L'_{nT,w}$ (dB)
1	48	59
2	50	57
3	53	54

6.2. INDOOR AMBIENT NOISE LEVELS

Indoor ambient noise levels: Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS8233:2014.

See Section 4.0.

6.3. TESTING

A programme of pre-completion testing is carried out by a compliant test body EITHER:

9.a Based on the normal programme of testing described in the relevant national regulations for every group or sub-group of rooms for residential purposes; this must demonstrate that the performance standards detailed within this issue are achieved OR

9.b Where there are no relevant national regulations in place, or they require laboratory measurements to demonstrate compliance, the programme of on site pre-completion testing must be carried out based on the 'Frequency of testing required' guidance (see calculation procedures in Methodology) for every group or sub-group of rooms.

7. MITIGATION

7.1. FAÇADE INSULATION

The previous section determined that most apartments would experience acceptable noise levels with standard double glazing. However, higher specification glazing and a suitable ventilation system capable of providing mitigation to overheating risk is needed for certain plots, specifically south facing apartments. It was found that MVHR would be installed across the site with sealed windows. As such, only consideration to glazing is given.

Only living room and bedroom windows on the affected plots facing the road are subject to the below glazing. Glazing is specified on the worst-case period, i.e. for living rooms the glazing specification need may be lower than those for bedrooms but to avoid confusion the bedroom glazing specification is applied to living rooms too. Where no glazing is highlighted, standard double glazing will be sufficient.

Overriding the average noise level exceedance of up to 6 dB is the maximum noise level requirement of glazing with a minimum reduction of 39 dB R_w.

The following provides example specifications for each required glazing performance:

- 29 dB $R_w + C_{t,r}$ (35 dB R_w) - Example configuration of 8 / 16 / 6
- 30/31/32 dB $R_w + C_{t,r}$ (40 dB R_w) - Example configuration of 6 / 16 / 6.8 Pilkington Optiphon

The following southern apartments and floors will need the above glazing:

- South facing apartments – floors ground, 1st, 2nd and 3rd - 30/31/32 dB $R_w + C_{t,r}$ (40 dB R_w).
- South facing apartments - 4th, 5th, 6th and 7th floors - 29 dB $R_w + C_{t,r}$ (35 dB R_w).

The affected windows/facades are marked up on Figure 4.

All apartments will have an MVHR system in order to provide ventilation and mitigate overheating. Any mechanical ventilation system must ensure they comply with the necessary internal noise limits specified in Building Regulations. Part F states:

> *Although there is no requirement to undertake noise testing, achieving the levels in the following guidance would ensure good acoustic conditions. The average A-weighted sound pressure level for a ventilator operating under normal conditions and not at boost rates should not exceed both of the following.*
>
> a. *30dB LAeq,T* for noise-sensitive rooms (e.g. bedrooms and living rooms) when a continuous mechanical ventilation system is running on its minimum low rate.*
>
> *b. 45dB LAeq,T* in less noise-sensitive rooms (e.g. kitchens and bathrooms) when a continuous operation system is running at the minimum high rate or an intermittent operation system is running.*

8. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Recom Solutions to undertake a Noise Impact Assessment for a proposed student accommodation development at a previosuyl developed site on land at Plymouth Grove in Manchester.

E3P have undertaken measurements of road traffic noise associated with Plymouth Grove and background sound levels within the site. E3P have also relied upon traffic flow information for Upper Brook Street.

Consideration has been given to the sound insulation of the proposed external facades. The assessment found that higher specification glazing is needed in order to control internal noise levels on southern facades.

The assessment has assessed plant noise for the proposed plant room in accordance with BS 4142.

E3P have provided advice on sound insulation properties of the party walls and floors in order to satisfy the requirements of building regulations and Hea05.

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

Accordingly, no adverse impact is predicted upon the proposed receptors nor upon existing receptors as a result of the proposed development.

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:
Plymouth Grove
Manchester

Project-No:
50-834

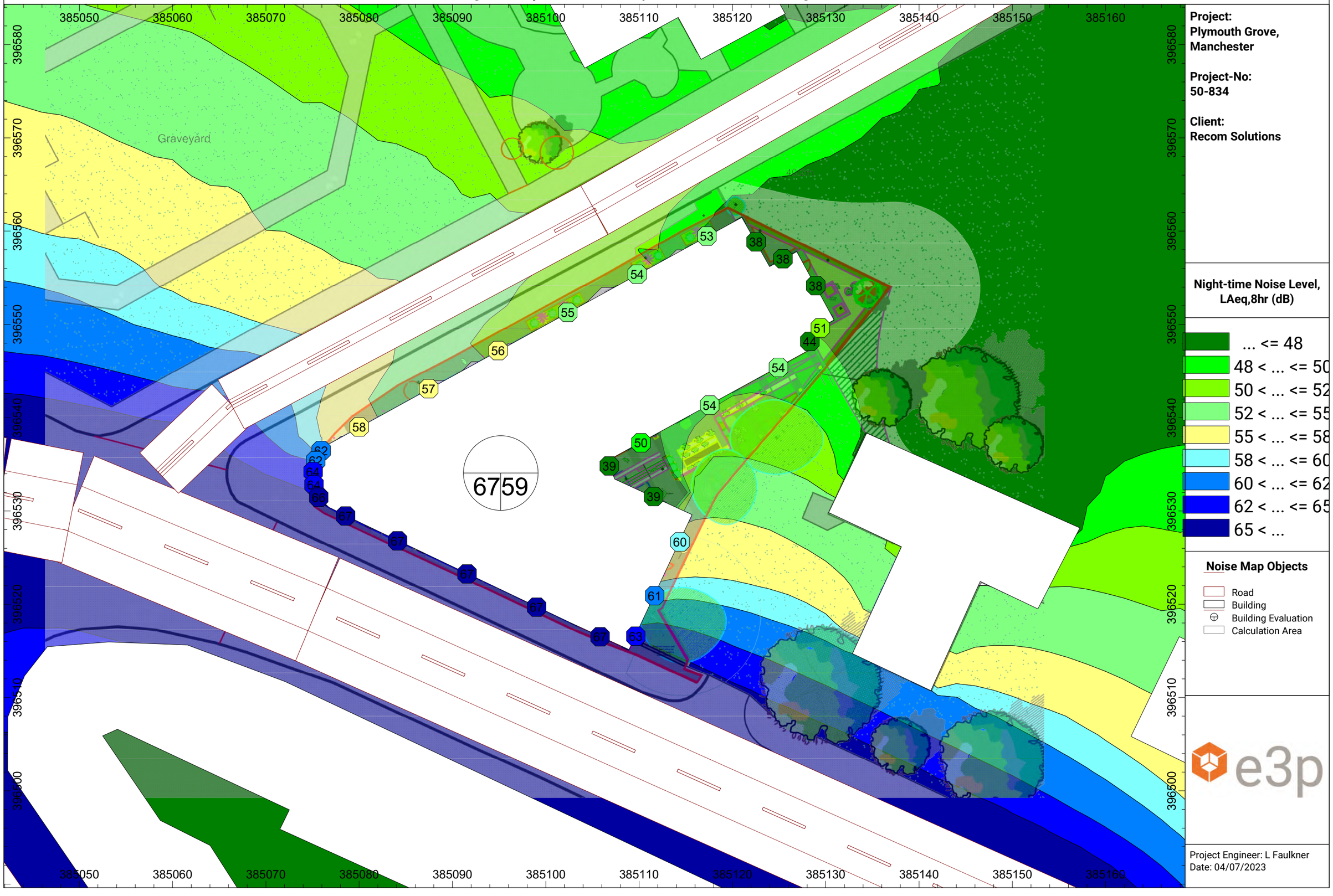
Client:
Recom Solutions

N

e3p

Project Engineer: L Faulkner
Date: 04/07/2023

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



Project:
Plymouth Grove, Manchester

Project-No:
50-834

Client:
Recom Solutions

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

- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

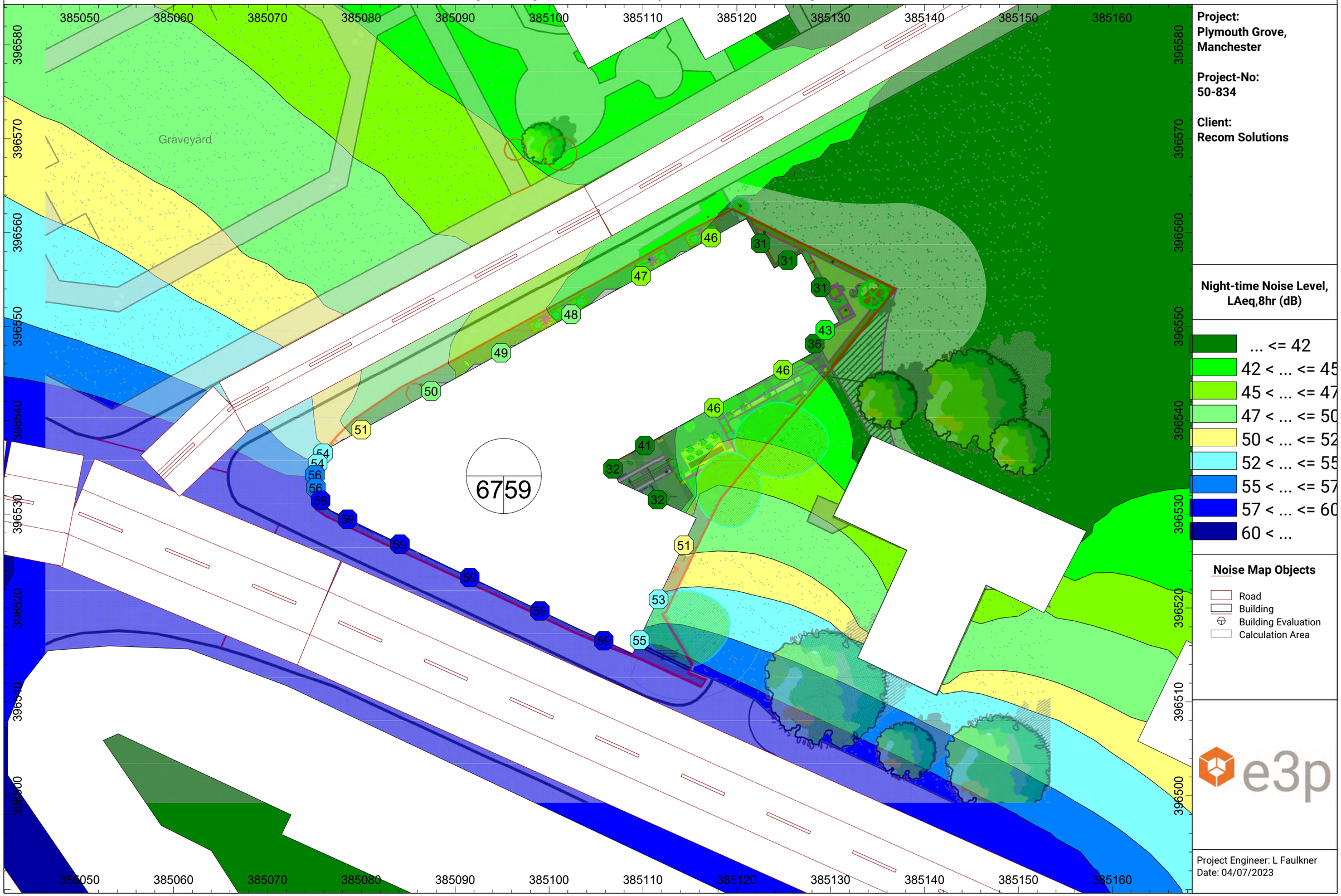
Noise Map Objects

- Road
- Building
- Building Evaluation
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 04/07/2023

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



Project:
Plymouth Grove, Manchester

Project-No:
50-834

Client:
Recom Solutions

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

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

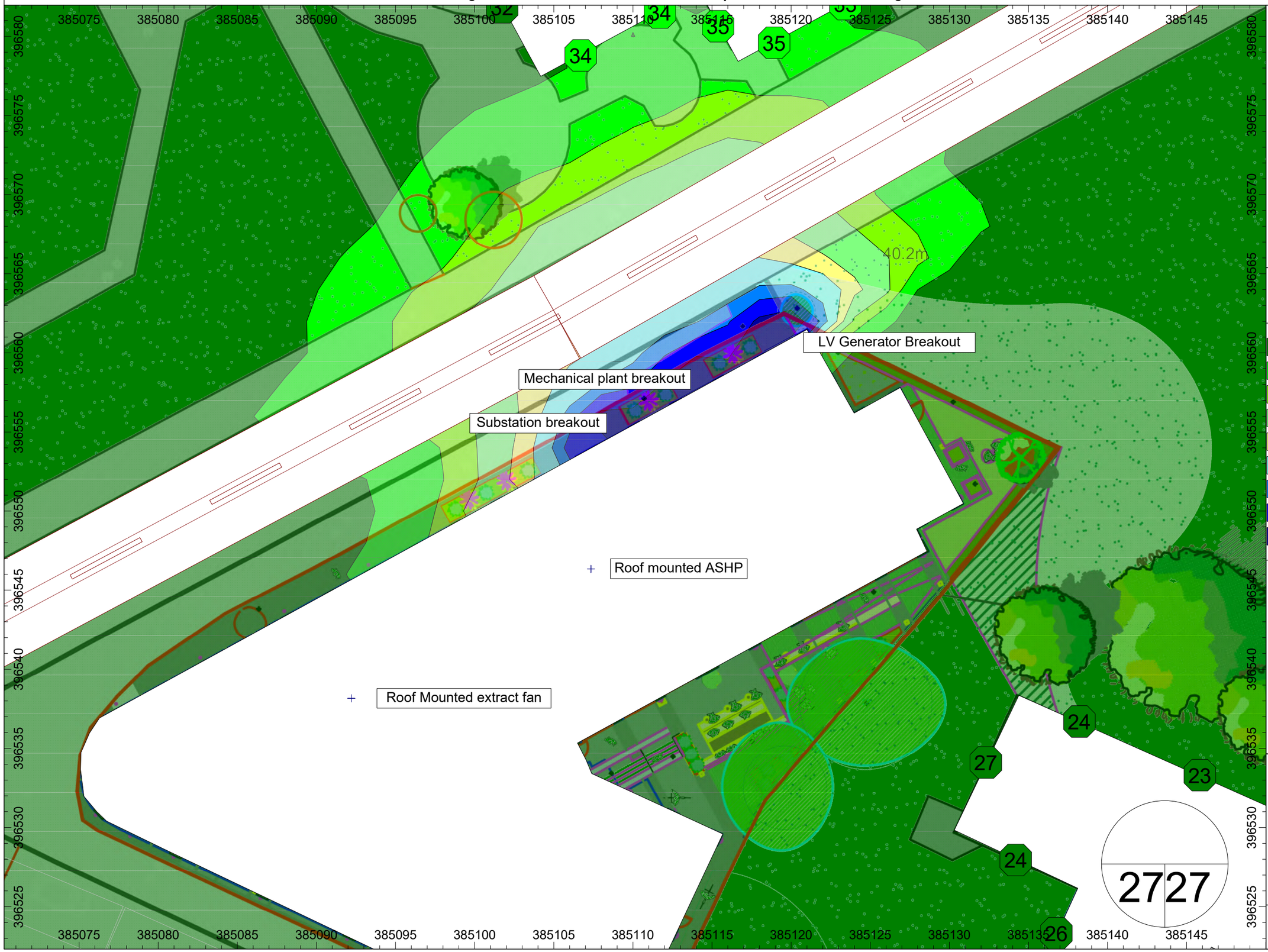
Noise Map Objects

- Road
- Building
- Building Evaluation
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 04/07/2023

Figure 4 - Plant Noise Emission Grid Noise Map - Calculation at 1.5m above ground level



Project:
Plymouth Grove, Manchester

Project-No:
50-834

Client:
Recom Solutions

Rating Level, LA,r (dB)

- ... <= 32
- 32 < ... <= 35
- 35 < ... <= 38
- 38 < ... <= 40
- 40 < ... <= 42
- 42 < ... <= 45
- 45 < ... <= 48
- 48 < ... <= 50
- 50 < ...

Noise Map Objects

- Point Source
- vert. Area Source
- Road
- Building
- Building Evaluation
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 07/07/2023