



e3p

Noise Impact Assessment

Brassey Street, Middleton

Reference: 50-655-R1-1

Date: September 2022



NOISE IMPACT ASSESSMENT

Brassey Street
Middleton

Prepared for:

Rochdale Metropolitan Borough Council

Report Ref: 50-655-R1-1

Date Issued: 27th September 2022

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QUALITY ASSURANCE

PROJECT NUMBER	50-655		
VERSION	Version 1		
REMARKS	Draft for Comment		
DATE	27th September 2022		
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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Boarshaw Road, Middleton, M24 6AR
National Grid Reference	E 387506 N 406553
Proposed Development	Proposed erection of a three-storey apartment building with associated landscaping and parking.
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 to provide a robust assessment.

ASSESSMENT

Surveys Completed	An attended road traffic sound survey has been conducted for Boarshaw Road. Attended measurements have been undertaken for the nearby working men's club during a Saturday and Friday evening and night-time period.
Assessments	A 3D noise model has been constructed to assess the impact of road traffic sound and sound associated with the nearby working men's club across the site and incident upon all facades and floors. Road traffic sound impact and sound associated with the working men's club is assessed in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019 Live music sound from the nearby working men's club has also been assessed using guidance developed by the Institute of Acoustics relating to noise from pubs and clubs. This guidance has been used to mitigate any potential disturbance to residents due to low frequency noise present in live music. Noise rating (NR) curves have also been used to assess internal noise levels. NR 25 has been set as the criteria. It was noted that external seating areas relating to the working men's club were also present. As such worst-case assumptions have been made with all seating full and people talking with raised voices.
Mitigation Requirements	The assessment determined that higher specification glazing would be required to control internal noise levels for all apartments. A whole dwelling ventilation system is required for all apartments in the form of System 3 ventilation.

CONCLUSIONS

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



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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Rochdale Metropolitan Borough Council to undertake a Noise Impact Assessment for a proposed development at land Brassey Street in Middleton, 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 intends to construct a three-storey residential apartment block with associated access, landscaping, and parking.

The key sources of sound impacting upon the Site is road traffic sound associated with Boarshaw Road, music breakout noise from the work men's club and patrons using external seating areas.

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. 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.

2.4. BRITISH STANDARD BS 8233:2014 – 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. INSTITUTE OF ACOUSTICS (IOA) – NOISE FROM PUBS AND CLUBS PHASE 1 (OCTOBER 2005)

The scope of this guidance is to provide methods in which noise from pubs and clubs can be assessed. Several methods are suggested. E3P have adopted the method for assessing low frequency sound which can be found in section 2.3.2 of the document.

Based on laboratory experiments with real and simulated low-frequency noise, Moorhouse et al. derived a proposal for a UK low-frequency noise criterion. Their test sounds were typical of the kind of noise complained of by Noise from pubs and clubs Davies et al 26 UK low-frequency noise sufferers and so did not include music. Nevertheless, following the promising results of McCulloch, both DIN 45680 and the proposed UK variant should be investigated further as assessment techniques for pub and club noise.

The Moorhouse proposed method is as follows: Record L_{eq} , L_{10} and L_{90} in the third octave bands between 10Hz and 160Hz. If the L_{eq} taken over a time when the noise is said to be present, exceeds the values in Table 5 it may indicate a source of LFN that could cause disturbance.

If the noise occurs only during the day then 5dB relaxation may be applied to all third octave bands. If the noise is steady then a 5dB relaxation may be applied to all third octave bands.

A noise is considered steady if either of the conditions a. or b. below is met:

- $L_{10}-L_{90} < 5\text{dB}$*
- the rate of change of sound pressure level (Fast time weighting) is less than 10dB per second where the parameters are evaluated in the third octave band which exceeds the reference curve values (Table 5) by the greatest margin*

TABLE 2.3 PROPOSED REFERENCE CURVE FOR EVALUATING LOW-FREQUENCY NOISE (TABLE 5)

1/3 Octave band frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Unweighted L_{eq} (dB)	95	87	79	71	63	56	49	43	42	40	38	36	34

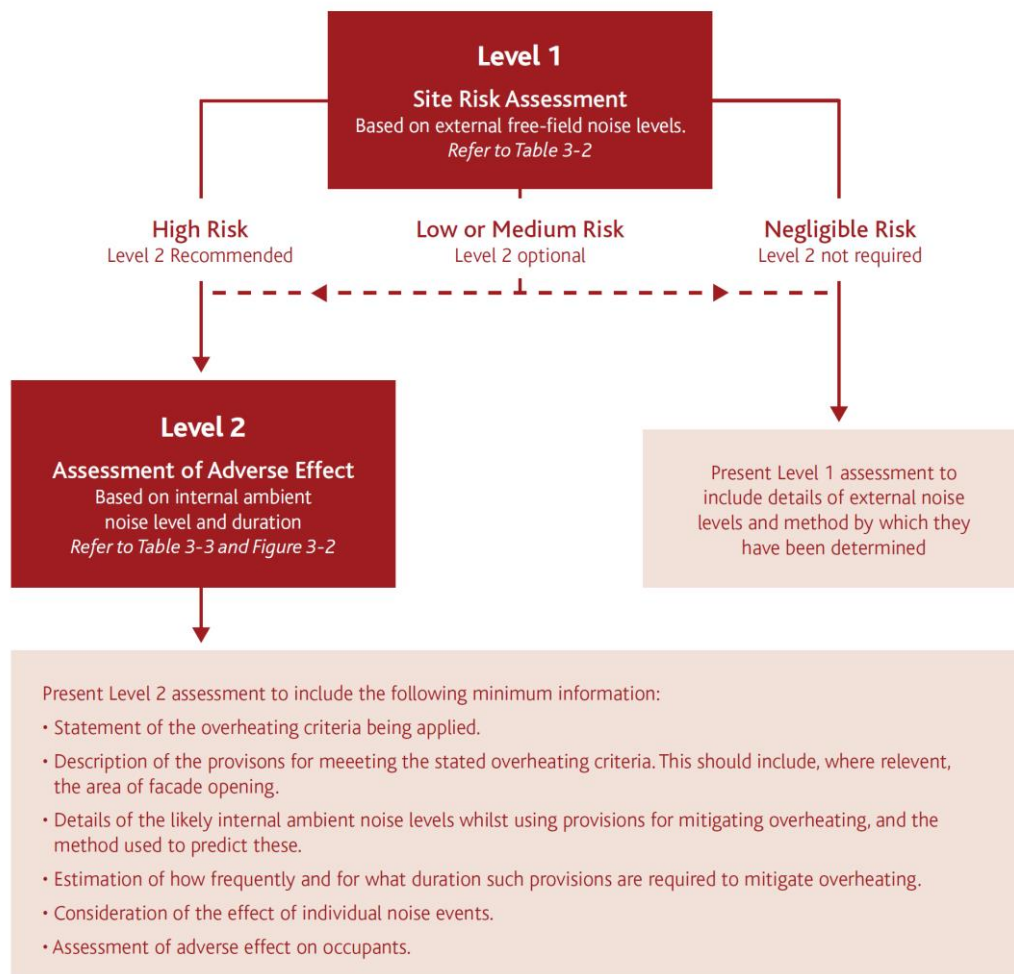


2.6. INSTITUTE OF ACOUSTICS AND ASSOCIATION OF NOISE CONSULTANTS (2020) ACOUSTICS VENTILATION AND OVERHEATING: RESIDENTIAL DESIGN GUIDE

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 2.4 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 2.5 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



2.7. 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 $L_{Aeq,8hr}$ or an external level of 45 dB $L_{Aeq,8hr}$. 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

The measurement positions are detailed in Figure 1 of Appendix II.

3.1. SOUND CLIMATE

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

It was noted that the main source of sound was road traffic sound associated with Baorshaw Road. As such, E3P carried out a shortened road traffic sound measurement in accordance with the guidance given in Calculation of Road Traffic Noise (CRTN). Alongside road traffic noise, music breakout noise and patrons using external seating areas associated with the nearby working men's club were also present.

3.2. ROAD TRAFFIC SOUND MEASUREMENT – BOARSHAW ROAD

E3P has conducted an attended road traffic sound measurement in accordance with the shortened measurement procedure given in CRTN. The survey was carried out over the following periods:

📍 10:00-13:00 Thursday 7th September 2022.

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

📍 Noise Measurement Position 1 (NMP1): Located at the eastern boundary of the site approximately 4.5 m from the nearside edge of Boarshaw Road. The microphone was located at a height of 1.5 m above ground level and in free-field conditions.

A summary of the measured sound pressure levels from the Road Traffic Noise Survey is presented in Table 3.1.

TABLE 3.1 SUMMARY OF MEASURED NOISE LEVELS FOR NMP1 – BOARSHAW ROAD

MEASUREMENT START	MEASURED SOUND PRESSURE LEVELS (dB)			
	L _{Aeq,1hr}	10th Highest L _{Amax,fast}	L _{A10,1hr}	L _{A90,1hr}
10:00	62.8	78.7	67.6	46.4
11:00	66.8		68.4	46.6
12:00	63.4		67.9	48.3
Derived daytime noise level, L _{Aeq,16hr}				65.0
Derived night-time noise level, L _{Aeq,8hr}				56.5



3.3. LIVE MUSIC SOUND SURVEY – BOARSHAW WORKING MENS CLUB

E3P have undertaken observations on site to determine any impact from live music sound breakout from the nearby Boarshaw Working Men's Club.

The survey was undertaken during the following periods:

- 🔊 21:00 - 00:00 Friday 9th September 2022.
- 🔊 21:00 - 00:00 Saturday 17th September 2022.

Note that on Friday 9th September no noise break-out from the working men's club was present. A further survey on Saturday 17th of September was carried out to check if break-out noise occurred on a weekend when the venue may be at it's busiest. Live music was found during this survey and details of this break-out noise are detailed below.

The following noise measurement position was chosen for the live music sound Survey:

- 🔊 Noise Measurement Position 2 (NMP2): Located to the east of the site approximately 30 m from the entrance of the working men's club. The microphone was located at a height of 1.5 m above ground level and in free-field conditions.

Measurements at closer distances were attempted but due to patrons located in external seating areas talking to the surveyor a decision was made to conduct the survey at a greater distance allowing for an accurate representation of the existing sound climate.

Music could be heard throughout the survey and consisted of breakout noise when the entrance door was opened. Road traffic sound was also present, but music was clearly audible when there were lulls in the traffic. Music stopped or was turned down significantly at 23:50.

E3P also noted external seating being used throughout the survey. It was noted that there was space for approximately 36 people seated around six tables. This information will be used to inform a worst-case scenario within the noise model.

Due to road traffic sound impacting upon the measurements of any breakout noise associated with the Boarshaw working men's club, the data has been processed and a section of the measured data isolated for assessment where road traffic was not present, and music clearly audible with the entrance door to the club open.

Table 3.2 details the measured broadband and octave band data of this selected period.

TABEL 3.2 MEASURED BREAKOUT MUSIC NOISE

FREQUENCY (Hz)	31.5	63	125	250	500	1k	2k	4k	8k	L _{Aeq,T}
Measured Source Noise Level, L _{eq} (dB)	48.2	51.3	53.0	39.8	35.9	36.9	36.3	29.2	24.3	42.8

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.



TABLE 3.3 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
NMP1 & 2	Sound Level Meter	01dB Fusion	14226	01/12/2023
	Pre-amplifier	01dB Pre22	2135072	
	Microphone	GRAS 40CD	470570	
	Calibrator	01dB Cal31	87281	03/02/2023

The sound level meter was field calibrated on site using the above-mentioned calibrators 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 2022 MR1, to determine the impact of noise from road traffic sound.

The following inputs have been included in the model:

- ✳ Site Plan – ‘apartment draft proposal’ date received 16th June 2022.
- ✳ Boarshaw Road is calibrated using NMP1.
- ✳ 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 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

Currently on the internal layout provided, E3P is not aware of any external amenity areas that are present in the design of the proposed development. As such no external assessment is required.

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. It is noted from the provided plans that windows will only be located on the eastern and western facades as such consideration will only be given to these façades.

The highest predicted day and night façade levels here are 67 dB and 58 dB respectively. As such, higher specification glazing will be required for eastern facades. Western facades are shielded from Boarshaw Road and will benefit from acceptable internal noise levels, due to road traffic, with standard thermal double glazing but may be subject to additional assessment for music from the working mens club.



It is also important to consider the maximum noise levels during the night-time period. The 10th highest measured level along Boarshaw Road was 79 dB $L_{Amax,fast}$. When considering a sound reduction of 31 dB for standard glazing, this results in an internal noise level of 48 dB, 3 dB above the criterion. As such, standard thermal double glazing will not be sufficient to attenuate maximum noise level events from road traffic noise along the eastern facades.

Details of what glazing is required will be outlined in section 6 of this report.

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. The allowable external noise levels in order to achieve the criteria with windows open is 48 dB during the day and 43 dB during the night.

As can be seen in Figures 2 and 3, eastern facades will experience an exceedance of the criteria, both day and night due to road traffic sound. As such, a whole dwelling ventilation system, that does not rely on open windows, will be required to provide the necessary ventilation for all apartments located on the eastern façade.

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 dwelling ventilation to control the overheating, not accounting for ventilation requirements, 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 due to a medium risk level.

As can be seen from the Figures, eastern facades exceed these criteria resulting in between medium to high risk levels during the day and night. As such, a Level 2 Assessment has been undertaken for these apartments. Apartments located on the western façade fall below the criteria and as such a level 2 assessment is not required for these apartments.



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. The anticipated internal levels with a partially open window (13 dB attenuation) to control overheating would be, worst case, 54 dB during the day and 45 dB at night, with overheating design case L_{AFmax} levels up to 66 dB.

Considering these levels on the AVO diagrams, these levels are above the "SOAEL" level, and above a level at which noise causes a material change in behaviour. As such, the apartments located on the eastern façade are considered to have a high risk of overheating and the quieter facades are not available for ventilation, a mechanical system is required for these apartments that front Boarshaw Road. This will be either System 3 or System 4 ventilation.

The exact requirements are detailed in Section 6.0.

At this stage of the assessment apartments located on the western façade do not require whole system ventilation or higher specification glazing. However, section 5 details the assessment of live music and patron noise from the nearby working men's club. Sound from this source affects the eastern façade specifically and as such mitigation measures are discussed here.



5. LIVE MUSIC AND CROWD NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2022 MR1, to determine the impact of noise from live music breakout and patron sound.

The following inputs have been included in the model:

- ✳ Site Plan – ‘apartment draft proposal’ date received 16th June 2022.
- ✳ Breakout noise from the working men’s club has been input as a vertical area source at the entrance of the building. A sound power level of 81 dB has been calculated from the measured level and applied to the vertical area source.
- ✳ 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 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.

A methodology for assessing and calculating the noise from small or medium sized crowds is proposed by Hayne, Rumble and Mee (2006), which has been applied to noise from patrons using the external seating area associated with the working men’s club. Hayne et al (2006) state that the A-weighted sound power level of crowd noise is a function of the following variables:

- ✳ An individual’s voice effort.
- ✳ The total number of people in the crowd.
- ✳ Whether the crowd are synchronised or random with time, which can affect the maximum noise levels (L_{Amax}).
- ✳ Whether the crowd is directional or has a diffused orientation.

Currently there is outside seating for 36 patrons. The seating area is inputted as individual point sources, accounting for 36 people each, having a conversation with raised voices. A total of 6-point sources are inputted to account for 18 people all talking, in tables of 6, with raised voices for 100% of the hour. This allows for a 2-way conversation between 36 people.

A sound pressure level of 66 dB for raised speaking, at 1 m, is used and factored up to 3 people via a simple $10 \log$ (number of people) calculation. This results in a sound power level of 79 dB per table of 6 people. No directivity correction is applied.

The working men’s club is licensed to open until 01:00 and so the assessment will cover both the daytime and night-time periods.

Figures 4 and 5 determine the noise levels across the Site during the daytime and night-time periods, respectively, due to live music and patron sound.



5.1. INTERNAL NOISE LEVEL ASSESSMENT – ABSOLUTE LEVELS

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 31 dB. 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 (31 dB) to the relevant criterion for day (35 dB) and for night (30 dB). As such, any facades subject to noise levels higher than 66 dB during the day and/or 61 dB during the night will require higher specification glazing. It is noted from the provided plans that windows will only be located on the eastern and western facades as such consideration will only be given to these façades.

The highest predicted day and night façade levels here are 63 dB for both periods. As such, higher specification glazing will be required for western facades. Eastern facades are shielded from the working men's club and will benefit from acceptable internal noise levels when considering noise from the working men's club.

Details of what glazing is required will be outlined in section 6 of this report. This will be subject to further assessment based on the frequency content of the sound as shown in Sections 5.2 and 5.3.

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.

5.1.1. 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. The allowable external noise levels in order to achieve the criteria with windows open is 48 dB during the day and 43 dB during the night.

As can be seen in Figures 2 and 3, eastern and western facades will experience an exceedance of the criteria, both day and night due to live music and patron noise from the working men's club. As such, a whole dwelling ventilation system, that does not rely on open windows, will be required to provide the necessary ventilation for all apartments.



5.1.2. 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 dwelling ventilation to control the overheating, not accounting for ventilation requirements, 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 due to a medium risk level.

As can be seen from the Figures, western facades exceed these criteria resulting in between medium to high risk levels during the day and night. As such, a Level 2 Assessment has been undertaken for these apartments. Apartments located on the eastern façade fall below the criteria and as such a level 2 assessment is not required for these apartments.

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. The anticipated internal levels with a partially open window (13 dB attenuation) to control overheating would be, worst case, 50 dB during the day and 50 dB at night, with overheating design case L_{AFmax} levels up to 70 dB.

Considering these levels on the AVO diagrams, these levels are above the "SOAEL" level, and above a level at which noise causes a material change in behaviour. As such, the apartments located on the eastern façade are considered to have a high risk of overheating and the quieter facades are not available for ventilation, a mechanical system is required for these apartments. This will be either System 3 or System 4 ventilation.

The exact requirements are detailed in Section 6.0.



5.2. NR CURVE ASSESSMENT – LIVE MUSIC

As well as the average measured source noise levels, it is important to consider any frequency content of the live music that has the potential to impact the residents. The most comprehensive assessment would be to consider internal NR Curves.

As such, NR25 has been used as the applicable criteria for the apartments. The measured sound levels from the source survey have been distance corrected to the closest facade.

Table 5.1 below details the measured source noise levels, details the reduction provided by 4 / 20 / 4 glazing, calculates the internal source noise and then compares to NR 25. The measured source noise levels have been distance corrected to the closest façade.

TABLE 5.1 NR CURVE ASSESSMENT – LIVE MUSIC

FREQUENCY (Hz)	31.5	63	125	250	500	1k	2k	4k	8k
Measured Source Noise Level, L_{eq} (dB)	61.1	64.2	65.9	52.8	48.8	49.8	49.2	42.1	37.2
Sound Reduction from Glazing (dB)	21*	21*	21	17	25	35	37	31	31
Predicted Internal Noise Level, L_{eq} (dB)	40.1	43.2	44.9	35.8	23.8	14.8	12.2	11.1	6.2
NR25 (dB)	72	55.2	43.7	35.2	29.2	25	21.9	19.5	17.7
Difference, +/- (dB)	-31.9	-12.0	1.2	0.6	-5.4	-10.2	-9.7	-8.4	-11.5

*Note that data is not available at these frequencies, so assumptions have been made and the sound reduction from the 125 Hz band applied.

As shown above, there are exceedances of NR 25 in the 125 Hz and 250 Hz octave bands. As such, higher specification glazing is required. Consideration to this exceedance will be further investigated in section 5.3.

Details of the required higher specification glazing will be provided in section 6.0.



5.3. LOW FREQUENCY NOISE (LFN) ASSESSMENT – LIVE MUSIC

Low frequency noise content from live music must also be considered. As such E3P has used criteria set out in the Institute of Acoustics '*Control of Noise from pubs and clubs*'.

The source of sound is not steady and can occur in both the day and night-time periods. As such a relaxation of 5 dB to the criteria is not applied as per the IOA guidance.

Table 5.2 details the measured low frequency content and compares this to the relevant criteria. The measured source noise levels have been distance corrected to the closest façade.

TABLE 5.2 LOW FREQUENCY NOISE ASSESSMENT

FREQUENCY (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Measured Source Noise Level, L_{eq} (dB)	48.9	50.4	51.4	52.7	58.8	53.5	54.9	58.2	58.0	61.3	62.2	63.4	47.2
Partially open Window reduction (dB)	13	13	13	13	13	13	13	13	13	13	13	13	13
Predicted Internal Noise Level, L_{eq} (dB)	35.9	37.4	38.4	39.7	45.8	40.5	41.9	45.2	45.0	48.3	49.2	50.4	34.2
Criteria – Table 5 from IOA Guidance	95	87	79	71	63	56	49	43	42	40	38	36	34
Difference, +/- (dB)	-59.1	-49.6	-40.6	-31.3	-17.2	-15.5	-7.1	2.2	3.0	8.3	11.2	14.4	0.2

As shown in the table above there are exceedances between 50 Hz and 160 Hz of up to 14 dB. This is an indication of disturbance when windows are open. The assessment above assumes an open window. With windows closed levels in these frequency bands would be reduced significantly. Standard double glazing is assumed at this stage of the assessment.

Table 5.3 carries out the above assessment for the octave bands where exceedances have occurred.



TABLE 5.3 LOW FREQUENCY ASSESSMENT WITH STANDARD DOUBLE GLAZING

FREQUENCY (Hz)	63	125
Measured Source Noise Level, L_{eq} (dB)	64.2	65.9
Sound Reduction from Glazing (dB)	21*	21
Predicted Internal Noise Level, L_{eq} (dB)	43.2	44.9
Criteria – Table 5 from IOA Guidance	42	36
Difference, +/- (dB)	1.2	8.9

*Note that data is not available at these frequencies, so assumptions have been made and the sound reduction from the 125 Hz band applied.

A 1 dB exceedance would not be perceptible to the human ear. As such this is a good indication that disturbance due to low frequency noise from live music would not occur when windows are closed in the 63 Hz octave band.

However, with standard double glazing installed exceedances within the 125 Hz band occur. As such higher specification glazing will be required. The table below details the required sound reduction of the glazing units to mitigate against the low frequency noise source.

TABLE 5.4 LOW FREQUENCY ASSESSMENT WITH HIGHER SPECIFICATION GLAZING

FREQUENCY (Hz)	63	125
Measured Source Noise Level, L_{eq} (dB)	64.2	65.9
Sound Reduction from Glazing (dB)	23	30
Predicted Internal Noise Level, L_{eq} (dB)	41.2	44.9
Criteria – Table 5 from IOA Guidance	42	36
Difference, +/- (dB)	-0.8	-0.1

Details on higher specification glazing will be given in section 6.0.



6. MITIGATION

6.1. FAÇADE INSULATION

The previous section determined that both eastern and western facades would require higher specification glazing and whole dwelling ventilation. Specifically, the following glazing specifications are required, per bedroom and living space, along with details on whole dwelling ventilation.

The worst-case required glazing is chosen per bedroom. For example, where glazing needed due to night-time noise is higher than for daytime periods, the night-time requirements are recommended. Low frequency noise has also been considered when specifying the glazing on the western facade due to the proximity to the working men's club.

Eastern facades:

- ✳ Required Sound reduction **35 R_w dB** – 10 / 6 to 20 / 4 (Example glazing) and **System 3 (continuous mechanical extract)**
- ✳ Glazing of 35 R_w dB is required to control internal levels due to maximum noise level events from Boarshaw road. This glazing would also be sufficient at mitigation average noise levels.

Western Facades:

- ✳ Required Sound reduction **36 R_w dB** – 10 / 12 / 12 (Example glazing) and **System 3 (continuous mechanical extract)**
- ✳ Glazing of 36 R_w dB is required to control internal levels due to the presence of low frequency music sound. Octave band sound reduction levels should meet the levels in Table 6.1. This glazing would also be sufficient at mitigation average noise levels.

TABLE 6.1 EXAMPLE GLAZING – MINIMUM REQUIREMENTS FOR WESTERN APARTMENTS

FREQUENCY (Hz)	63	125	250	500	1k	2k	4k
SOUND REDUCTION (dB)	23	30	32	38	36	40	49

Figure 6 highlights the facades that require higher specification glazing. The above glazing units would achieve the required reduction due to average noise levels as well as those resulting from maximum instantaneous noise levels. It is also recommended that a glazier is consulted to ensure any system installed achieves the above reduction as a minimum.

Due to the impact of noise internally, all apartments will require system 3 ventilation. System 3 is a Mechanical Extract Ventilation (MEV). The system must have a feature that provides rapid cooling or thermal comfort settings so that occupiers need not open a window to mitigate against overheating.

Where background ventilators form part of the system, the reduction provided by the vent in the open position should, at least, match the attenuation provided by the glazing unit.



7. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Rochdale Metropolitan Borough Council to undertake a Noise Impact Assessment for a proposed residential development at land off Brassey Street in Middleton.

An attended road traffic sound survey has been conducted for Boarshaw Road. Attended measurements have been undertaken for the nearby working men's club.

A 3D noise model has been constructed to assess the impact of road traffic sound and sound associated with the nearby working men's club across the site and incident upon all facades and floors.

Road traffic sound impact and sound associated with the working men's club is assessed in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019

Live music sound from the nearby working men's club has also been assessed using guidance developed by the Institute of Acoustics relating to noise from pubs and clubs. This guidance has been used to mitigate any potential disturbance to residents due to low frequency noise present in live music. Noise rating curves have also been used to assess internal noise levels. NR 25 has been set as the criteria.

It was noted that external seating areas relating to the working men's club were also present. as such worst-case assumptions have been made with all seating full and people talking with raised voices.

The assessment determined that higher specification glazing would be required to control internal noise levels for all apartments. A whole dwelling ventilation system is required for all apartments in the form of system 3 ventilation.

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 or sound relating to the working men's club.

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.
L₁₀ and L₉₀	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 Measurement Positions



Project:
Brassey Street, Middleton

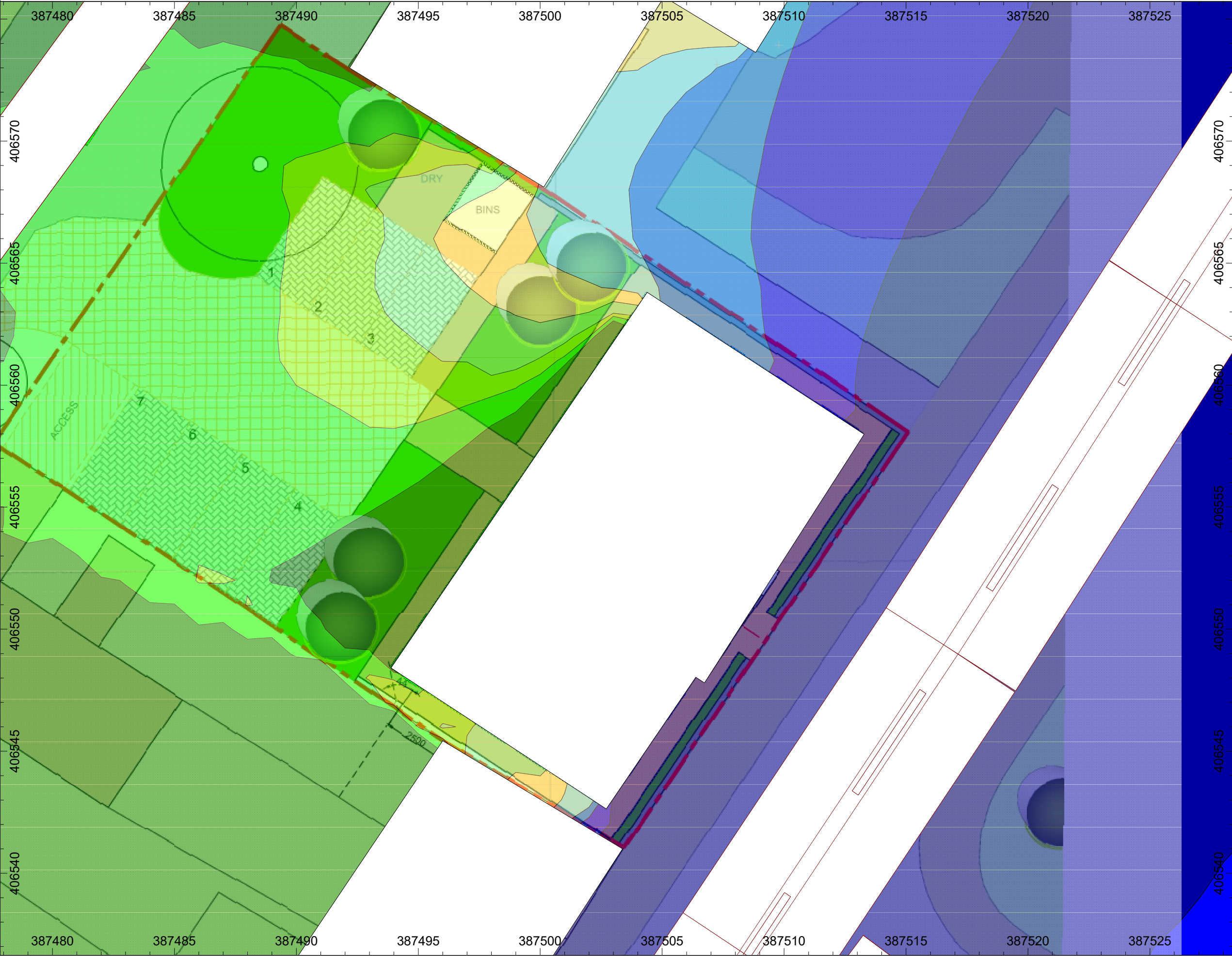
Project-No:
50-655

Client:
Rochdale Metropolitan
Borough Council



Project Engineer: Scott Boughton
Date: 26/09/2022

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



Project:
Brassey Street, Middleton

Project-No:
50-655

Client:
Rochdale Metropolitan
Borough Council

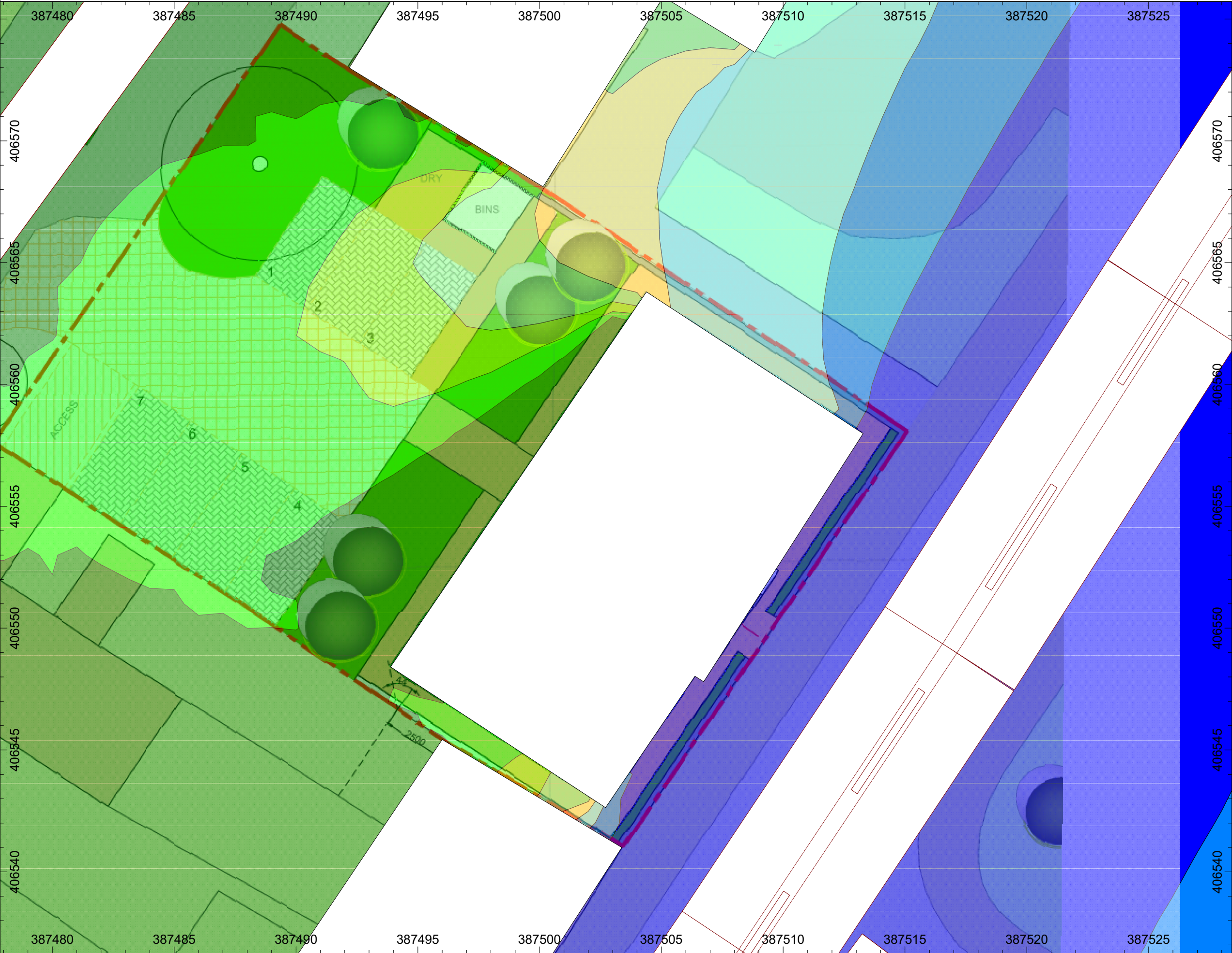
Daytime Noise Level, LAeq, 16hr (dB)	
...	<= 48
48 < ...	<= 50
50 < ...	<= 52
52 < ...	<= 56
56 < ...	<= 58
58 < ...	<= 60
60 < ...	<= 62
62 < ...	<= 65
65 < ...	

Noise Map Objects	
+	Point Source
—	vert. Area Source
□	Road
□	Building
□	Calculation Area



Project Engineer: Scott Boughton
Date: 26/09/2022

Figure 3 - Night-time Grid Noise Map - Calculation at 4.5m above ground level



Project:
Brassey Street, Middleton

Project-No:
50-655

Client:
Rochdale Metropolitan
Borough Council

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

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

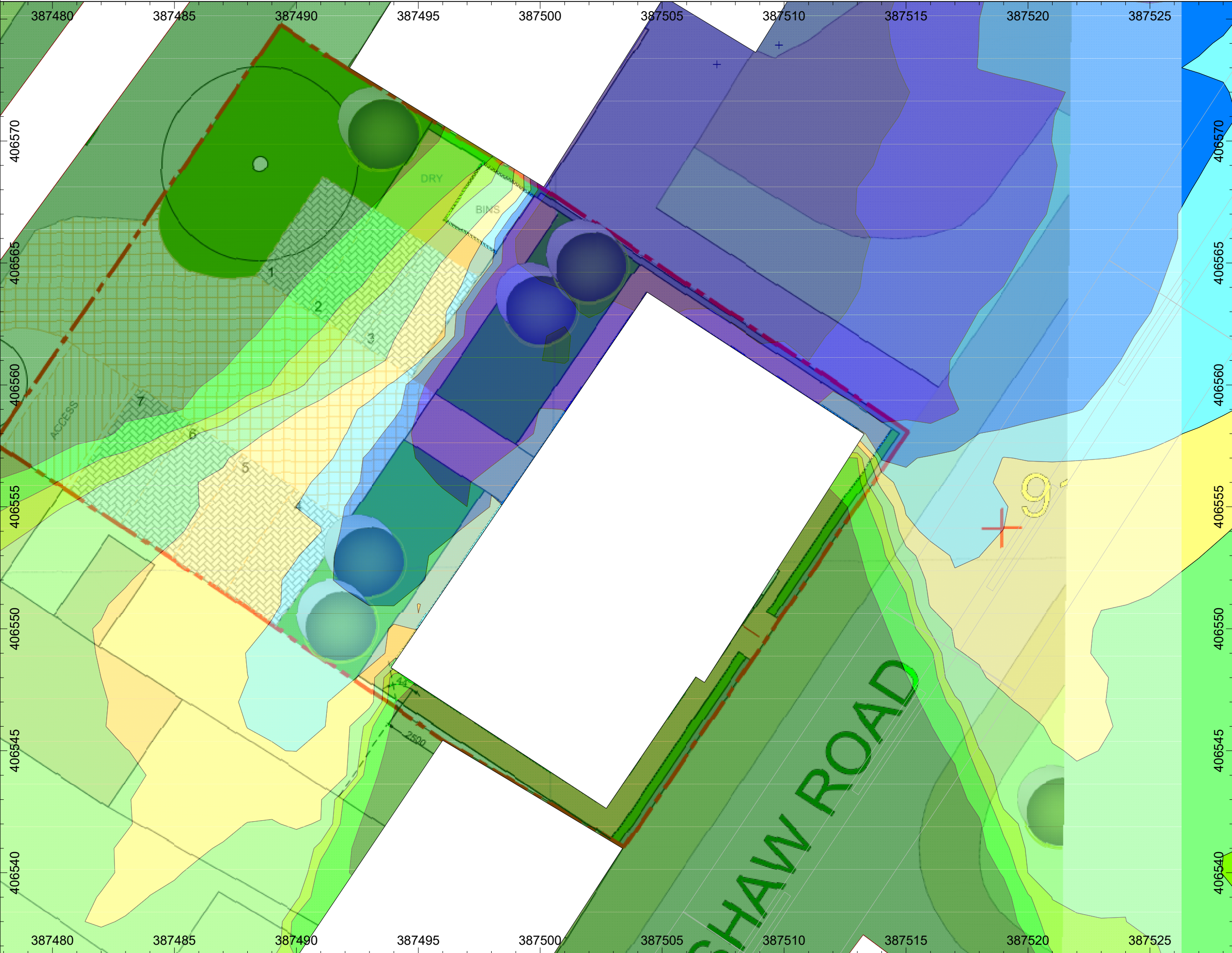
Noise Map Objects

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



Project Engineer: Scott Boughton
Date: 26/09/2022

Figure 4 - Working Men's Club - Daytime Grid Noise Map - Calculation at 1.5m above ground level



Project:
Brassey Street, Middleton

Project-No:
50-655

Client:
Rochdale Metropolitan
Borough Council

**Daytime Noise Level,
LAeq, 16hr (dB)**

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

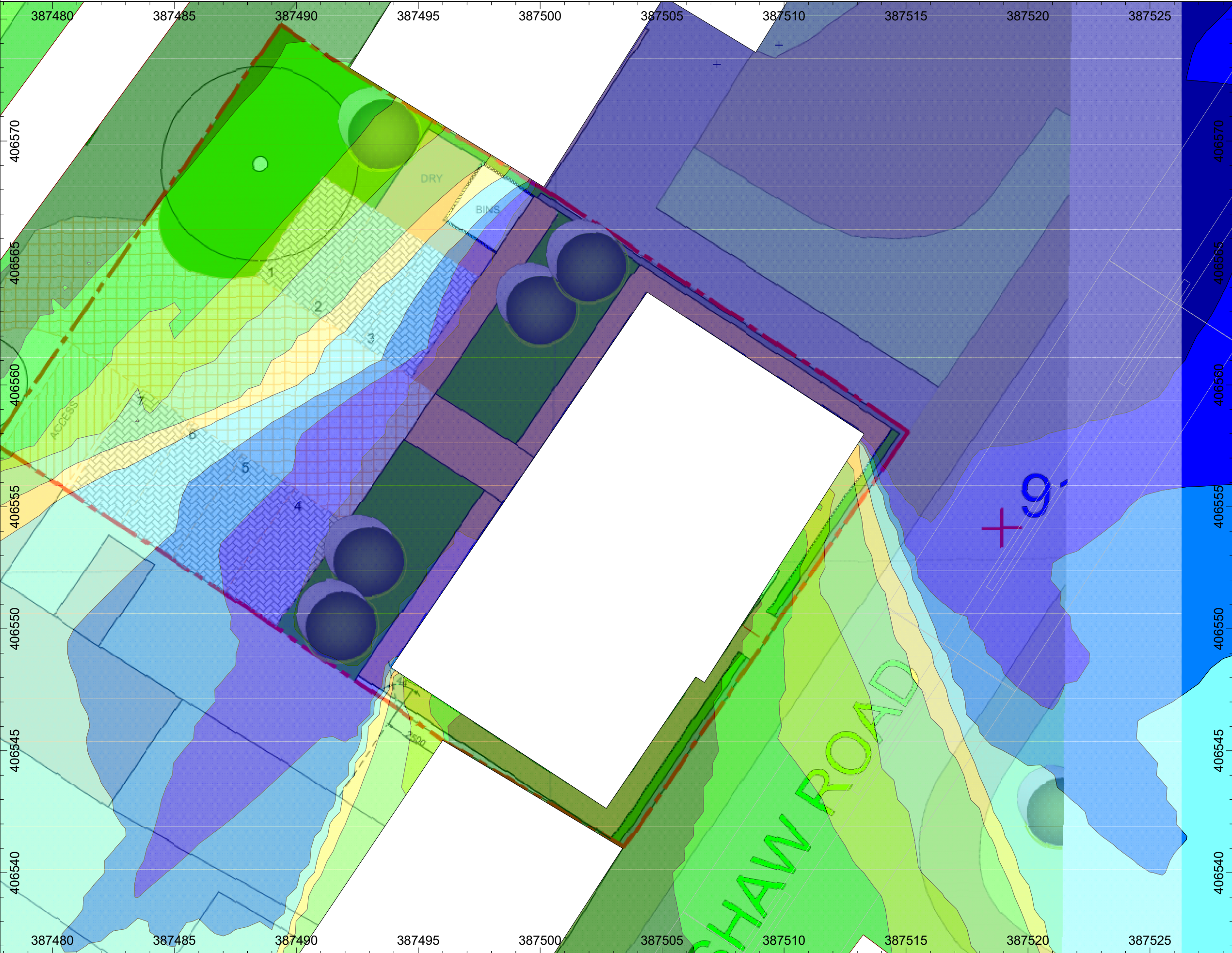
Noise Map Objects

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



Project Engineer: Scott Boughton
Date: 26/09/2022

Figure 5 - Working Men's Club - Night-time Grid Noise Map - Calculation at 4.5m above ground level



Project:
Brassey Street, Middleton

Project-No:
50-655

Client:
Rochdale Metropolitan
Borough Council

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

- ... ≤ 42
- $42 < \dots \leq 45$
- $45 < \dots \leq 47$
- $47 < \dots \leq 50$
- $50 < \dots \leq 52$
- $52 < \dots \leq 55$
- $55 < \dots \leq 57$
- $57 < \dots \leq 60$
- $60 < \dots$

Noise Map Objects

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



Project Engineer: Scott Boughton
Date: 26/09/2022

Figure 6 - Glazing and Ventilation Requirements

Project:
Brassey Street, Middleton

Project-No:
50-655

Client:
Rochdale Metropolitan
Borough Council

Project Engineer: Scott Boughton
Date: 26/09/2022

Legend:

- Any living room or bedroom windows will require glazing specification to achieve 35 dB Rw as a minimum System 3 ventiation will aslo be required for all apartments located on this facade
- Any living room or bedroom windows will require glazing specification to achieve 36 dB Rw as a minimum System 3 ventiation will aslo be required for all apartments located on this facade

Scale: 1:500

North Arrow: N

Legend: e3p

N



Project Engineer: Scott Boughton
Date: 26/09/2022