



Noise Impact Assessment

Laystall Street, Manchester

Reference: 50-194-R1-3

Date: February 2021



NOISE IMPACT ASSESSMENT

Laystall Street
Manchester

Prepared for:

The logo for McCauls, consisting of the word 'McCauls' in a white sans-serif font, underlined with a thin green line, all contained within a black rectangular box.

McCauls

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E3P

Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

+ 44 (0) 161 707 9612
<https://e3p.co.uk>

Registered in England
CRN: 807255262

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PREPARED BY	L Faulkner	L Faulkner	L Faulkner
QUALIFICATIONS	BSc (Hons), PGDip, MIOA	BSc (Hons), PGDip, MIOA	BSc (Hons), PGDip, MIOA
SIGNATURE			
CHECKED BY	S. Cox	S. Cox	S. Cox
QUALIFICATIONS	BSc, MSc, PIEMA, MEnvSc, CEnv	BSc, MSc, PIEMA, MEnvSc, CEnv	BSc, MSc, PIEMA, MEnvSc, CEnv
SIGNATURE			
AUTHORISED BY	L Faulkner	L Faulkner	L Faulkner
QUALIFICATIONS	BSc (Hons), PGDip, MIOA	BSc (Hons), PGDip, MIOA	BSc (Hons), PGDip, MIOA
SIGNATURE			



EXECUTIVE SUMMARY

BACKGROUND

Site Address	Laystall Street, Manchester M1 2JZ
National Grid Reference	E 384974 N 398271
Proposed Development	Proposed residential development across nine storeys with refurbishment of adjacent listed building for offices with associated landscaping.
Report Objectives	The objectives of this report are to: Identify, measure and assess the potential impact of any existing noise sources in the immediate vicinity of the Site upon proposed residential receptors. The report follows current and relevant British Standards to provide a robust assessment.

ASSESSMENT

Surveys Completed	Attended source noise measurements have been undertaken for the surrounding sources including for fixed plant and noise break-out associated with Presbar Diecasting to the south and Urban Exchange to the north. Consideration has been given to other fixed plant items at Urban Exchange, that were not measurable at the time, via analysis of the associated planning application. Furthermore, E3P have relied upon readily available traffic data for Great Ancoats Street given the highway works currently underway.
Assessments	A 3D noise model has been constructed to assess commercial sound and road traffic sound impact across the site and incident upon all facades and floors. The operational noise from Presbar and Urban Exchange were noted to be steady state and was not distinguishable, either in level or character, from the residual ambient noise level and so consideration has been given to the criteria in BS 8233:2014. This is considered for balconies and habitable rooms as well as for the proposed office space. The assessments determined an exceedance, with windows open, for multiple living rooms and bedrooms.
Mitigation Requirements	A Mechanical Ventilation with Heat Recovery system is proposed for all apartments and, as such, is more than sufficient for the requirements within this report. The report determined that the noise break-out from the proposed system would be sufficiently low as to no cause adverse impact.

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 McCaul's to undertake a Noise Impact Assessment for a proposed residential development on land off Laystall Street in Manchester, which also includes for the refurbishment of the Listed Building into office space, 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

McCaul's intend to construct a nine-storey residential apartment block to replace existing redundant buildings and current public parking and to refurbish the listed building in the northern area of the site for office use.

The key sources of sound impacting upon the Site is fixed plant sound and noise break-out associated with Presbar Diecasting to the south and the Urban Exchange retail development to the north, both of which have plant items running 24/7. Furthermore, traffic from Great Ancoats Street is audible at certain points within the Site with minimal traffic flows along the surrounding local roads.

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

- ✳ Ground Floor Plan 1383/L 1001.
- ✳ First Floor Plan 1383/L 1002.
- ✳ Second Floor Plan 1383/L 1003.
- ✳ Third Floor Plan 1383/L 1004.
- ✳ Fourth-Seventh Floor Plans 1383/L 1005; and
- ✳ Eight Floor Plan 1383/L 1006.

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. LOCAL PLANNING REQUIREMENTS – MANCHESTER CITY COUNCIL'S PLANNING & NOISE TECHNICAL GUIDANCE DOCUMENT (2015)

2.3.1. ACHIEVING SUITABLE INTERNAL NOISE LEVELS

Section 3.6.1.1 sets out the following noise levels to be achieved for residential developments:

- ✳ Bedrooms (Night-time - 23:00 to 07:00): 30dB L_{Aeq} and individual noise events should not normally exceed 45 dB (L_{Amax}).
- ✳ Living Rooms (Day time 07:00 to 23:00): 35 dB (L_{Aeq}).
- ✳ Gardens and terraces (daytime) 55 dB (L_{Aeq}).

Section 5.3.1.3.1.2 of the document states the following with regards to maintaining internal ambient noise levels when it desired to keep windows closed but provide adequate ventilation:

"Occupants should be provided with a supply of fresh air in habitable rooms without having to open windows (whilst also having the option to do this for purge ventilation, or at the occupant's discretion.

Where ambient noise levels are high a scheme of ventilation will need to be provided that does not compromise the acoustic attenuation afforded by glazing. This may come in the form of individual window trickle vents or acoustic trickle vents."

For schemes that are affected by existing industrial noise, it is common for Local Authorities to request an assessment is carried out in line with BS 4142:2014 to assess the impact on proposed residential receptors. It is also common for the assessment to give an initial estimate of an adverse impact where the measured specific noise level (and subsequent rating level) of industrial noise affecting the site is higher than the background sound level.

However, this assessment is often made redundant through good design since the final outcome of such an assessment is entirely dependent on the context of the site, which BS 4142:2014 states should consider the following:



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

- i) facade insulation treatment;*
- ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- iii) acoustic screening."*

Manchester City Council requires any new development to secure good internal and outdoor acoustic conditions, as above. This effectively enforces good design and ensures that appropriate façade insulation treatment and ventilation measures are offered to future occupants of the development. In line with BS 4142:2014, if design measures that secure good internal and/or outdoor acoustic conditions are incorporated into a development, the result of an assessment of existing industrial noise would likely indicate a low impact.

2.4. BS 4142: 2014 '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.

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

2.5.1. 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.

2.5.2. 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.

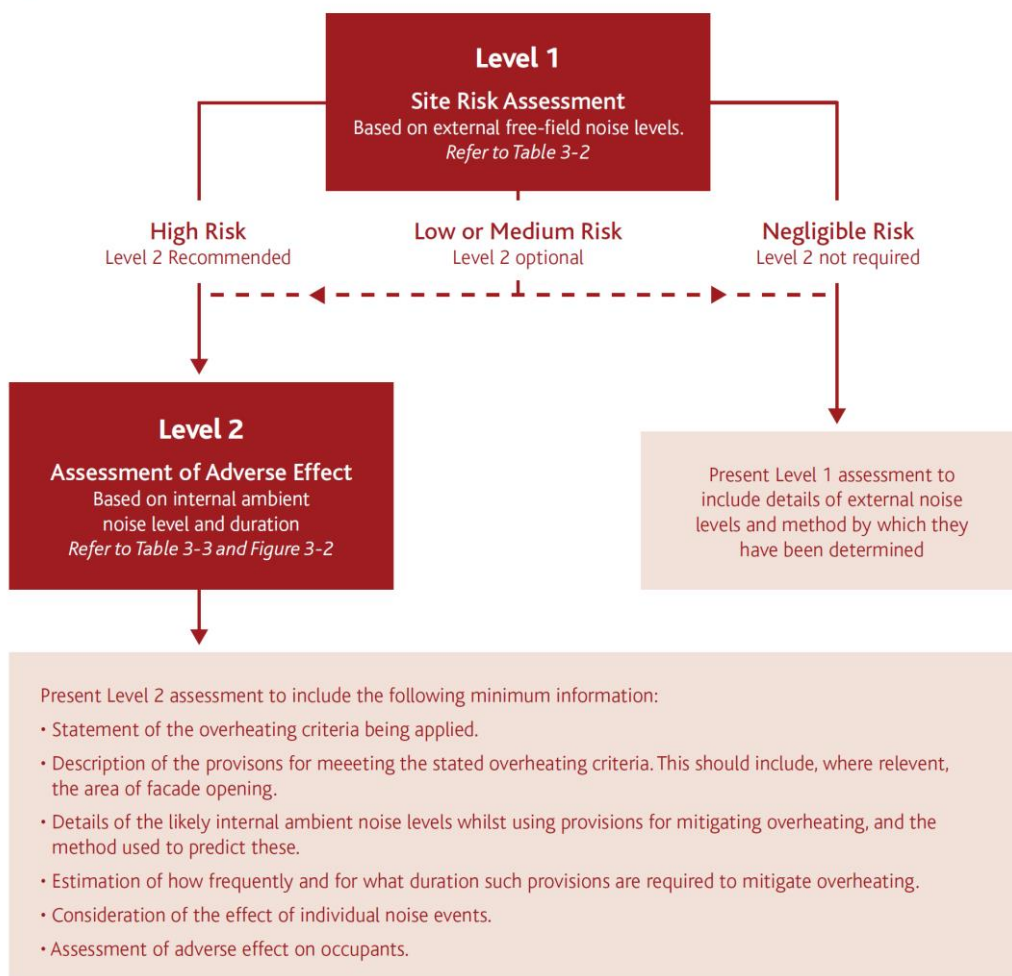


2.6. INSTITUTE OF ACOUSTICS AND ASSOCIATION OF NOISE CONSULTANTS (2020) ACOUSTICS VENTILATION AND OVERHEATING: RESIDENTIAL DESIGN GUIDE

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

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

DIAGRAM 2.1 TWO LEVEL NOISE ASSESSMENT PROCEDURE – OVERHEATING CONDITION



A level 1 risk assessment is based on external free-field noise levels with the assumption of a partially opened window in use for mitigation of overheating. A level 1 assessment is appropriate for scenarios where the risk to a development is deemed 'Negligible'. 'Low' and 'Medium' risk sites only require a level 2 assessment on an optional basis in order to give further confidence in the suitability of internal noise conditions.

The noise levels suggested in Table 2.3 and 2.4 assume a steady road traffic noise source but can be adapted for other transport sources.



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

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

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

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

INTERNAL AMBIENT NOISE LEVEL AT FAÇADE LOCATIONS			EXAMPLE OF OUTCOMES
$L_{Aeq,T}$ during 07:00 - 23:00	$L_{Aeq,8hr}$ during 23:00 - 07:00	Individual noise events during 23:00 - 07:00	
>50 dB	>42 dB	Normally exceeds 65 dB $L_{AF,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time
Increasing noise levels			Increasing the likelihood of impact on reliable speech communication during the day or sleep disturbance at night



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 fixed plant sound associated with Presbar Diecasting to the south and, to a lesser extent, Urban Exchange to the north. Road traffic sound was intermittently audible from Great Ancoats Street, but a single lane system was in use with considerable queuing traffic. As such, E3P have relied upon 2018 traffic flow data, readily available from Department for Transport - Road traffic statistics. The flows are 24-hour and so are considered worst-case.

With regards Urban Exchange, given the current pandemic and the fact that multiple condensers and Air Handling Units (AHU) are observed at the rear of the building, it was assumed that some were not operational at the time of the survey. As such, E3P have relied upon measured data and information given in the Noise Assessment associated with the external plant items.

Traffic along Ducie Street, Pigeon Street and Laystall Street was minimal with no more than 20 cars every hour, well below the 50 cars per hour requirement for Calculation of Road Traffic Noise.

Given the current restrictions, E3P have drawn upon knowledge of the site immediately adjacent during typical conditions by way of a Noise Assessment undertaken by Hann Tucker Associates as part of the consented site at Lomax Street. The following was noted regarding the sound climate:

During both daytime and night-time weekday and weekend periods the dominant noise source was noted to be external fixed plant items serving the adjacent industrial unit (Presbar Diecastings), evidenced by the relatively constant background sound levels across periods. Noise from road traffic on the A665 was noted to elevate ambient noise levels during rush hour periods, however noise from pedestrians walking to and from the football match on the Friday night did not appear to have a noticeable effect on overall noise levels.

$L_{A_{fmax}}$ noise levels were generally noted to be caused by cars passing the site at speed along Ducie Street, for both weekday and weekend night-time periods.

A review of the data indicates that noise levels are generally lower during weekend periods.

As such, it is considered that the dominant sources of sound have been accounted for in Presbar, Urban Exchange and Great Ancoats Street.

3.2. COMMERCIAL SOUND MEASUREMENTS

E3P has undertaken attended measurements of all fixed plant items, currently operational, commercial sound associated with Presbar and Urban Exchange during daytime and night-time periods. The surveys were carried out over the following time periods:

- 📅 Wednesday 22nd July 2020 between 12:30 and 13:30; and



Monday 27th July 2020 between 05:00 and 06:00.

During the site walkovers, a HGV delivery was noted at the rear of Urban Exchange, however, the trailer was reversed up to the loading dock and no discernible noise was audible, indeed, fixed plant noise from the Site was dominant in between traffic movements along Great Ancoats Street.

The following noise measurement positions were attended during the above times:

- Noise Measurement Position 1 (NMP1): Located adjacent to the most easterly plant items along the boundary of Presbar Diecasting. The main source here was perceived to be noise break-out from the louvres. The microphone was in free-field conditions at a height of 1.5 m above ground level.
- Noise Measurement Position 2 (NMP2): Located 1 m from the blower at the roadside. The microphone was in free-field conditions at a height of 1.5 m above ground level.
- Noise Measurement Position 3 (NMP3): Located 2 m from the tabletop fans on the façade of Presbar. The microphone was in free-field conditions at a height of 1.5 m above ground level.
- Noise Measurement Position 4 (NMP4): Located adjacent to the pipe work and exhaust, located on the roof, where a steady state sound was audible. It is not possible to exactly pinpoint the source, but it is assumed to be the exhaust to inform a worst-case assessment. The microphone was in free-field conditions at a height of 1.5 m above ground level; and
- Noise Measurement Position 5 (NMP5): Located 1 m from the north east façade of the listed building with full line of sight to the bank of AHUs at Urban Exchange which is assumed to be the source of sound measured as they were operational. The microphone was in façade conditions at a height of 1.5 m above ground level

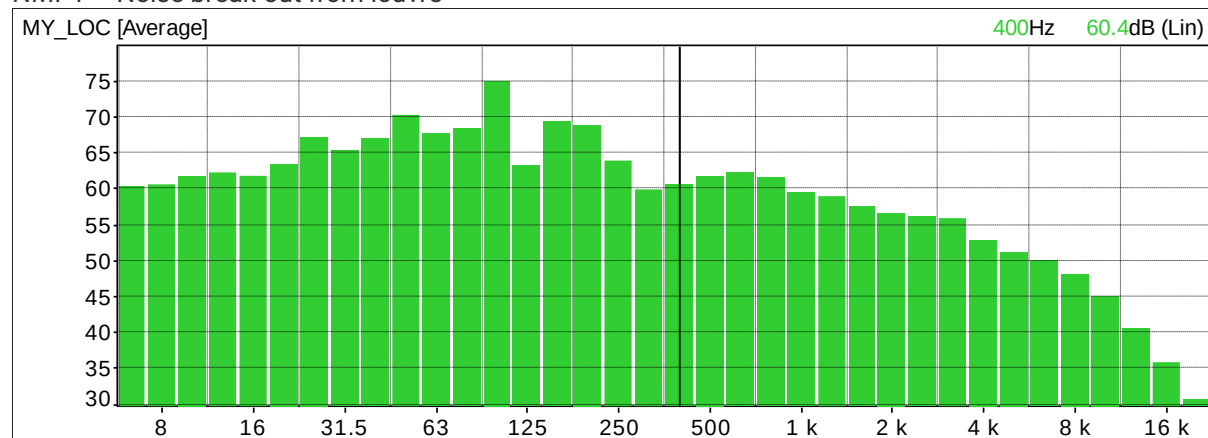
TABLE 3.1 WORST-CASE MEASURED SOURCE NOISE LEVELS

POSITION	SOURCE	MEASURED NOISE LEVEL, $L_{Aeq,T}$ (dB)	DISTANCE TO SOURCE (m)	ASSUMED ON-TIME IN 1-HOUR/15-MINUTE PERIOD (seconds)
NMP1	Noise break-out from louvre and nearby plant items	69.9	4	3600/900
NMP2	Blower	72.2	1	3600/900
NMP3	Tabletop fans	70.1	2	3600/900
NMP4	Exhaust and pipes	74.7	approx. 3	3600/900
NMP5	AHUs at Urban Exchange	51.9	30	3600/900

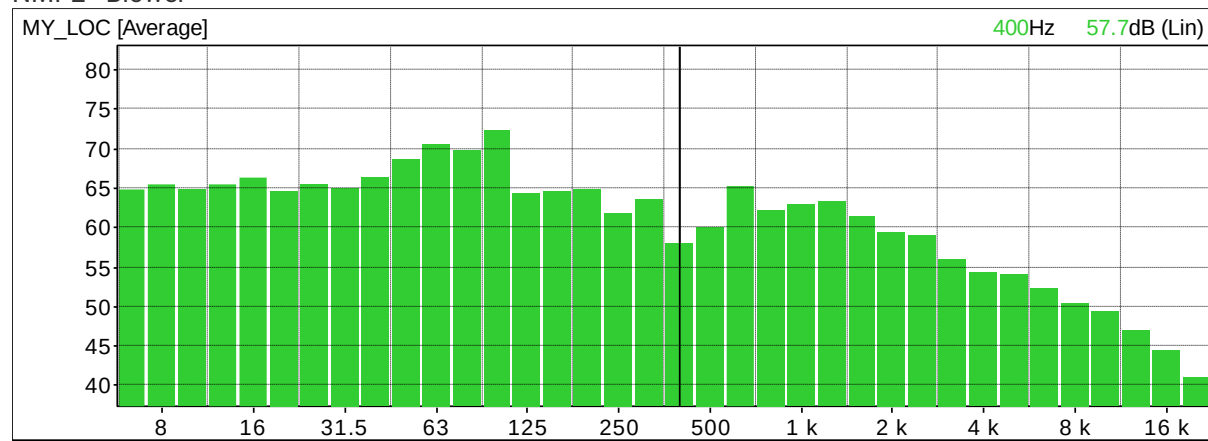
A tonal analysis was undertaken for all measurements with no tones present for any piece of equipment. Spectral time histories are shown below in order.



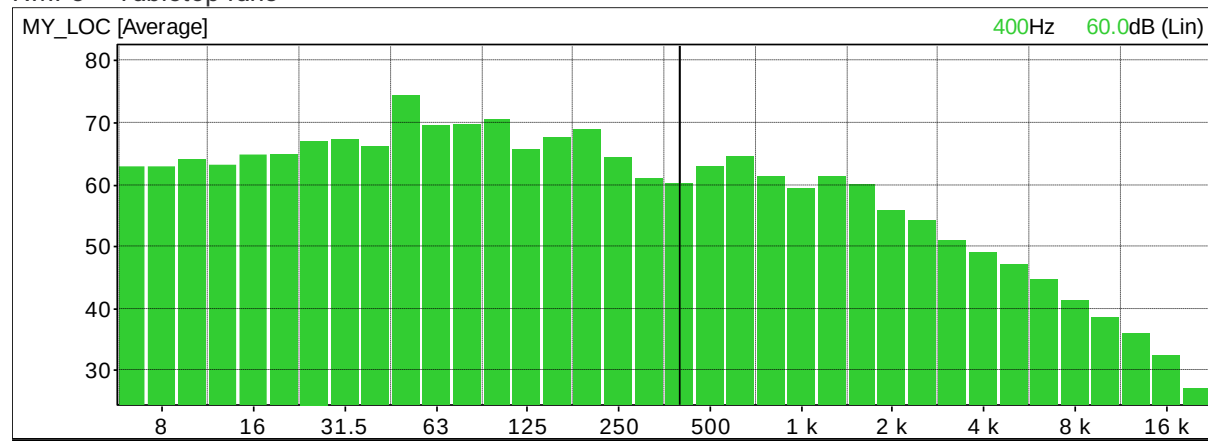
NMP1 – Noise break-out from louvre



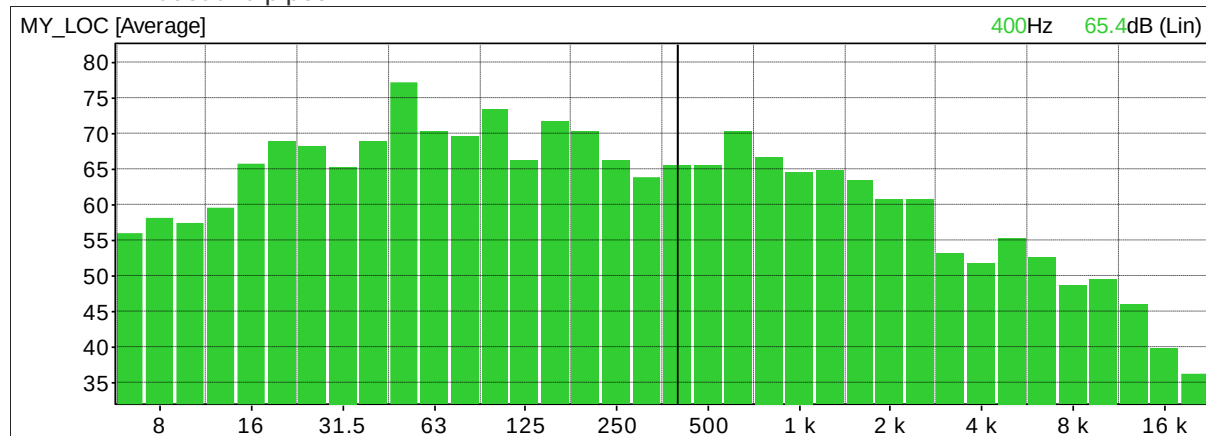
NMP2 - Blower



NMP3 – Tabletop fans



NMP4 – Exhaust and pipes



No spectral history is shown for the AHUs at Urban Exchange as traffic noise from Great Ancoats Street partially influenced the noise due to the low level of noise from the source.

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

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

TABLE 3.3 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
All	Sound Level Meter	01dB Fusion	12039	21st June 2021
	Pre-amplifier	01dB Pre22	1805124	
	Microphone	GRAS 40CE	330832	
	Calibrator	01dB Cal31	87281	25th February 2021

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



4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2019 MR1, to determine the impact of noise from commercial sound and road traffic sound. Fixed plant items not measured at Urban Exchange have been inputted into the noise model as point sources at heights as observed on site and using sound power levels derived from the Noise Assessment submitted in relation to Urban Exchange.

The following inputs have been included in the model:

- ✿ Fixed plant items are inputted as point sources.
- ✿ The consented scheme at Lomax Street is not included in the assessment to inform a worst-case assessment.
- ✿ Site elevations have initially 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 Licence v3.0.
- ✿ A reflection order of 2 has been used in all calculations.
- ✿ Noise levels generated using ISO 9613-1 and ISO 9613-2 "Acoustics – Attenuation of sound during propagation outdoors" as incorporated into CadnaA software.

The main source of sound impacting upon the proposed development is steady state sound due to fixed plant items which were not distinguishable, either in level or character, from the residual ambient noise level and so consideration has been given to the criteria in BS 8233:2014. This is considered for balconies and habitable rooms as well as for the proposed office space.

Indeed, BS 8233:2014 provides a precedence for this, as follows in relation to design ranges for criteria:

Noise levels generally apply to steady sources, such as those due to road traffic, mechanical services or continuously running plant, and should be the noise level in the space during normal hours of occupation but excluding any noise produced by the occupants and their activities.

4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

Upon review of the detailed drawings, it is determined that the only external amenity areas associated with the Site are assumed to be located on the northern façade of the eight floor apartments number 82 and 83 and on the western boundary of the ground floor associated with apartments 4, 6 and 8.

Noise levels at these areas are predicted to be 54 dB on the ground floor and 48 dB on the eight floor, both of which fall below the upper criterion given in BS 8233:2014 and the recommended criterion given in the MCC Guidance.

As such, it is predicted that the No Observed Adverse Effect Level (NOAEL) is achieved in the external amenity areas with the following commentary:

"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."



4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards internal noise levels, E3P has assumed a standard glazing specification of 4 mm glass/20 mm air space/4 mm glass which affords a sound insulation performance in the order of 35 dB R_w (C_{tr} -1; C_{tr} -4). The primary noise impact here is fixed plant noise and, as such, no correction is applied to the glazing reduction. The AVO Guide suggests an open window would afford a reduction of 13 dB.

The model has been used to predict façade noise levels at all floor levels and orientations. Only facades with windows have been assessed. To determine any requirements for mitigation, E3P has added the reduction provided by the glazing (35 dB) to the relevant criterion for day (35 dB) and for night (30 dB). As such, any facades subject to noise levels higher than 70 dB during the day and/or 65 dB during the night will require higher specification glazing. The highest predicted day and night façade levels here are 57 dB and 56 dB respectively. As such, standard glazing is sufficient across the Site. Furthermore, a glazing specification that achieves, minimum, 26 dB R_w would be sufficient.

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. Worst case facades are subject to noise levels of up to 57 dB during the day and 56 dB during the night. As such, these exceed the internal ambient noise level criteria, by 9 dB and 13 dB respectively, and a whole dwelling ventilation system, that does not rely on open windows, will be required to provide the necessary ventilation. This applies to all facades and windows subject to noise levels in excess of 48 dB during the day and 43 dB during the night. Appendix III details the output external noise levels for all apartments. The following apartments will experience an exceedance with windows open for ventilation:

- ✚ Ground – 1, 2, 5 and 7 to 9.
- ✚ 1st floor – 10, 11 and 15 to 19.
- ✚ 2nd floor – 20, 21 and 24 to 29.
- ✚ 3rd floor – 30 to 32 and 34 to 39.
- ✚ 4th floor – 40 to 42 and 44 to 49.
- ✚ 5th floor – 50 to 52 and 54 to 59.
- ✚ 6th floor – 60 to 62, 65 and 67 to 69.



- ✳ 7th floor – 70 to 72, 75 and 77 to 79; and
- ✳ 8th floor – 80 to 83, 85 and 87 to 89.

4.2.2. OVERHEATING CONDITION

E3P has undertaken a level 1 assessment in accordance with the AVO Guide and adopted the noise levels outlined for negligible and low risk. Any plots that pass this test will not require whole house ventilation to control the overheating, 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 53 dB during the day and 48 dB during the night. Any facades experiencing higher noise levels than these may be subject to an optional level 2 assessment.

As can be seen from Appendix II, several facades exceed these criteria resulting in low risk during the day and medium risk during the night. As such, a Level 2 Assessment is considered optional but has been undertaken.

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, 44 dB during the day and 42 dB at night.

Considering these levels on the AVO diagrams, these levels are below the “SOAEL” level during the day but meet the level for the SOAEL for certain bedrooms at night.

As such, a means of mitigating overheating will be required for certain apartments due to the high risk of overheating and the unacceptable internal noise levels. As such, the following apartments will need a system capable of providing thermal comfort or controlling overheating, such as System 3 or 4 in accordance with the Building Regulations Approved Document Part F:

- ✳ Ground – 2, 5 and 8.
- ✳ 1st floor – 11, 15 and 18.
- ✳ 2nd floor – 20, 21, 25, 28 and 29.
- ✳ 3rd floor – 31, 32, 35, 38 and 39.
- ✳ 4th floor – 40, 41, 44, 45, 46, 48 and 49.
- ✳ 5th floor – 50, 51, 54, 55, 56 and 58.
- ✳ 6th floor – 60, 61, 62 and 69.
- ✳ 7th floor – 70, 71, 72 and 79; and
- ✳ 8th floor – 80, 81, 85, 87 and 89.



Given the expected internal noise levels for the remaining apartments, below 40 dB during the day and 35 dB during the night, allowing for a 5 dB relaxation, in accordance with BS 8233:2014, when mitigating overheating, it is recommended that a whole house ventilation system in accordance with System 1 or 2 of Building Regulations Part F be installed at the remaining apartments to provide the necessary background ventilation without the need for it to provide a means to control overheating. The system will need to provide a means of ventilation without the need for opening windows. Windows are to remain openable for purge ventilation and to mitigate overheating.

In order to achieve the required internal ambient noise levels, any background ventilators, where required, must achieve at least 25 dB $D_{n,e,w}$ in the open position. This level of reduction is likely to be achieved by a standard background ventilator. The number of background ventilators per room will be dependent on the requirements given in Building Regulations Part F.

4.3. PROPOSED OFFICE SPACE

It is understood that the listed building is to be refurbished for office space. As such, consideration to internal noise levels is required due to the surrounding sound sources.

With regards internal noise levels, it has been confirmed that the client is proposing the use of single-glazed Histoglass to reglaze the windows in the listed building. As such, E3P has assumed a standard single glazing specification of 6 mm float glass with mastic seal to timber sub frame providing a performance in the order of 30 dB R_w ($C_{t,-1}; C_{t,r} -4$). The primary noise impact here is fixed plant noise and, as such, no correction is applied to the glazing reduction. The AVO Guide suggests an open window would afford a reduction of 13 dB.

The model has been used to predict façade noise levels at all floor levels and orientations. Only facades with windows have been assessed.

To determine any requirements for mitigation, E3P has added the reduction provided by the glazing (30 dB) to the design criterion for open plan office space (45 - 50 dB) as given in BS 8233:2014. As such, any facades subject to noise levels higher than 75 dB during the day will require higher specification glazing. The highest predicted day façade levels here is 55 dB at the northern 1st and 2nd floor windows. As such, the proposed single glazed units are sufficient for the proposed office spaces.

Ventilation is expected to be natural via an open window. With a partially open window, internal noise levels are expected to be 42 dB, worst case. This falls below the typical design range for open plan offices and, as such, is considered an acceptable means of ventilation.



5. MITIGATION

5.1. FAÇADE INSULATION

5.1.1. WHOLE DWELLING VENTILATION

The previous section determined that a whole dwelling ventilation system would be required for most apartments. Following discussions, it is understood that a Mechanical Ventilation with Heat Recovery (MVHR) system is to be installed in all apartments.

As such, this would satisfy the requirements for the assessment. The system proposed as a Nuaire MVHR. As part of the system, louvres are proposed above all habitable room windows on all elevations. Given this and the mechanical nature of the unit, it is important to consider noise associated with the unit and its potential for internal impact from the unit itself and impact from noise break-out from the louvres.

The data sheet provided for the system provides the following sound specifications. There is potential for two power curves to be used and, as such, the curve with the highest noise output is considered here:

TABLE 5.1 NOISE OUTPUT OF MVHR UNIT

MAXIMUM POWER CONSUMPTION	FREQUENCY (Hz)	63	125	250	500	1k	2k	4k	8k	dBA @ 3 m
71	Breakout ($L_{eq,T}$)	33.5	32.5	35.5	33.5	25.5	20.5	12.5	8.5	33

The above is quoted as case-radiated and does not consider any ducting. Given the unit will be located in a cupboard or enclosed elsewhere and not in a habitable room, the level of 33 dB at 3 m will be much lower and likely inaudible in the closest habitable room, indeed, the levels will fall below the 26 dB or 30 dB L_{Aeq} limits prescribed in Approved Document F for internal mechanical services.

When considering the louvres, again, the actual level at the louvre will be much lower with absorption of the ducting, sound reduction due to bends and the termination of the duct at a grille will result in very low levels of noise break-out at the louvre. When considering the equivalent noise level at 1 m (43 dB) and a minimal sound reduction of 10 dB to allow for the above, external noise at the proposed windows as a result of the louvres is likely to be no more than 33 dB. So, when considering an open window, internal noise levels from the louvres due to external break-in will be no more than 20 dB, some 10 dB below the criterion and likely inaudible.

As well as the A-weighted average sound pressure levels, E3P have also considered the linear Noise Rating Curves to determine whether there would be adverse impact. The linear sound pressure levels are shown in Table 5.1 for each frequency. These levels, when compared to NR Curves, achieve NR30 (applicable to private dwellings) at 3 m from the unit, not accounting for any sound reduction of the cupboard/housing. As such, it is likely that NR 25 or lower is achieved.



6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by McCaul's to undertake a Noise Impact Assessment for a proposed residential development at land off Laystall Street in Manchester.

Attended source noise measurements have been undertaken for the existing commercial premises to the south of the Site. Furthermore, E3P have relied upon Department for Transport data for Great Ancoats Street.

A 3D noise model has been constructed to assess noise associated with the surrounding fixed plant items and road traffic sound associated with Great Ancoats Street.

The assessment has considered external and internal noise levels across the development. Acceptable external noise levels are predicted for the proposed external areas. Furthermore, the assessment determined that standard thermal double glazing would be sufficient in controlling internal noise levels.

In order to control internal noise levels when considering ventilation and mitigating overheating, whole dwelling ventilation systems have been recommended for certain apartments. However, an MVHR system is proposed for all apartments and, thus, satisfies the requirements of this report. The report determined that the noise break-out from the proposed system would be sufficiently low as to no cause adverse impact.

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

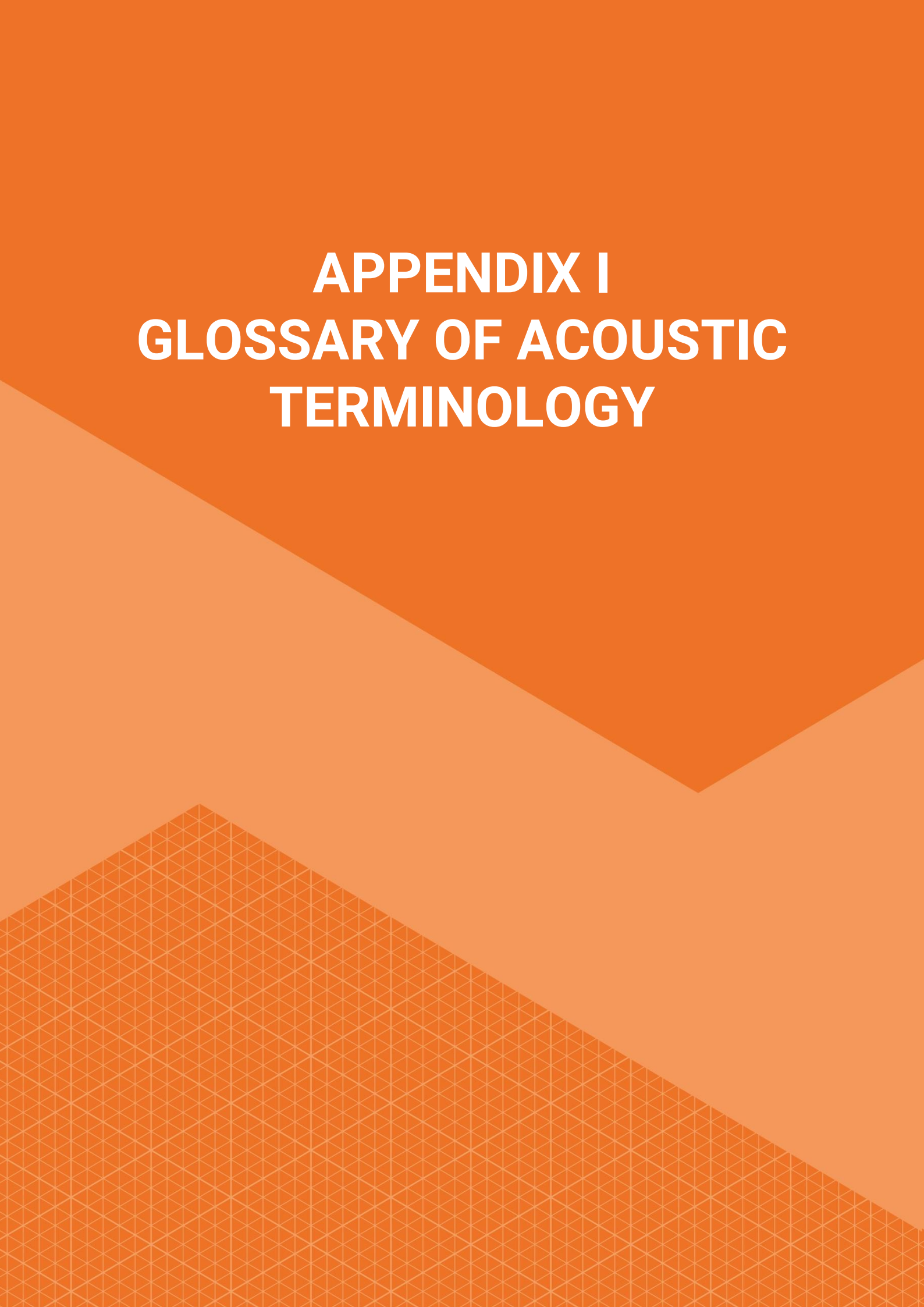
END OF REPORT



APPENDIX I

GLOSSARY OF ACOUSTIC

TERMINOLOGY

The background of the page is composed of several geometric shapes in shades of orange. A large, dark orange shape occupies the top right. A lighter orange shape is on the left, partially overlapping the dark one. In the bottom left corner, there is a triangular area filled with a fine, light-colored grid pattern. The overall design is modern and minimalist.

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 INTERNAL NOISE LEVEL ASSESSMENT

TABLE A.1 DAYTIME FAÇADE AND INTERNAL NOISE LEVEL ASSESSMENT

STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,16hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
G	1	North	42	14	-21	29	-6
	1	East	44	16	-19	31	-4
	2	South	39	11	-24	26	-9
	3	East	39	11	-24	26	-9
	4	West	40	12	-23	27	-8
	5	East	45	17	-18	32	-3
	6	West	42	14	-21	29	-6
	7	East	40	12	-23	27	-8
	8	West	54	26	-9	41	+6
	9	North	41	13	-22	28	-7
1ST	10	North	42	14	-21	29	-6
	10	East	44	16	-19	31	-4
	11	South	40	12	-23	27	-8
	12	East	40	12	-23	27	-8
	13	West	40	12	-23	27	-8
	14	West	42	14	-21	29	-6
	15	East	46	18	-17	33	-2
	16	West	44	16	-19	31	-4
	17	East	41	13	-22	28	-7
	18	West	54	26	-9	41	+6
	19	North	42	14	-21	29	-6
2ND	20	North	44	16	-19	31	-4
	20	East	47	19	-16	34	-1
	21	South	40	12	-23	27	-8
	22	East	42	14	-21	29	-6
	23	West	41	13	-22	28	-7
	24	West	46	18	-17	33	-2
	25	East	46	18	-17	33	-2
	26	West	47	19	-16	34	-1
	27	East	42	14	-21	29	-6
	28	West	54	26	-9	41	+6
	29	North	44	16	-19	31	-4



STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,16hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
3RD	30	North	46	18	-17	33	-2
	30	East	48	20	-15	35	0
	31	South	41	13	-22	28	-7
	32	East	46	18	-17	33	-2
	33	West	42	14	-21	29	-6
	34	West	47	19	-16	34	-1
	35	East	46	18	-17	33	-2
	36	West	48	20	-15	35	0
	37	East	42	14	-21	29	-6
	38	West	51	23	-12	38	+3
	39	North	45	17	-18	32	-3
4TH	40	North	48	20	-15	35	0
	40	East	50	22	-13	37	+2
	41	South	43	15	-20	30	-5
	42	East	49	21	-14	36	+1
	43	West	41	13	-22	28	-7
	44	West	50	22	-13	37	+2
	45	East	47	19	-16	34	-1
	46	West	51	23	-12	38	+3
	47	East	43	15	-20	30	-5
	48	West	51	23	-12	38	+3
	49	North	46	18	-17	33	-2
5TH	50	North	50	22	-13	37	+2
	50	East	51	23	-12	38	+3
	51	South	44	16	-19	31	-4
	52	East	51	23	-12	38	+3
	53	West	40	12	-23	27	-8
	54	West	50	22	-13	37	+2
	55	East	47	19	-16	34	-1
	56	West	51	23	-12	38	+3
	57	East	44	16	-19	31	-4
	58	West	51	23	-12	38	+3



STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,16hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
	59	North	47	19	-16	34	-1
6TH	60	North	52	24	-11	39	+4
	60	East	54	26	-9	41	+6
	61	South	46	18	-17	33	-2
	62	East	52	24	-11	39	+4
	63	West	40	12	-23	27	-8
	64	West	40	12	-23	27	-8
	65	East	48	20	-15	35	0
	66	West	42	14	-21	29	-6
	67	East	45	17	-18	32	-3
	68	West	44	16	-19	31	-4
	69	North	50	22	-13	37	+2
7TH	70	North	53	25	-10	40	+5
	70	East	55	27	-8	42	+7
	71	South	48	20	-15	35	0
	72	East	53	25	-10	40	+5
	73	West	41	13	-22	28	-7
	74	West	41	13	-22	28	-7
	75	East	48	20	-15	35	0
	76	West	42	14	-21	29	-6
	77	East	47	19	-16	34	-1
	78	West	44	16	-19	31	-4
	79	North	51	23	-12	38	+3
8TH	80	North	54	26	-9	41	+6
	80	East	57	29	-6	44	+9
	81	South	53	25	-10	40	+5
	82	North	54	26	-9	41	+6
	83	West	44	16	-19	31	-4
	83	North	53	25	-10	40	+5
	84	West	44	16	-19	31	-4
	85	East	50	22	-13	37	+2
	86	West	44	16	-19	31	-4



STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,16hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
	87	East	49	21	-14	36	+1
	88	West	47	19	-16	34	-1
	89	North	53	25	-10	40	+5

TABLE A.2 NIGHT-TIME FAÇADE AND INTERNAL NOISE LEVEL ASSESSMENT

STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,8hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
G	1	North	41	13	-17	28	-2
	1	East	48	20	-10	35	+5
	2	South	54	26	-4	41	+11
	3	East	36	8	-22	23	-7
	4	West	38	10	-20	25	-5
	5	East	52	24	-6	39	+9
	6	West	42	14	-16	29	-1
	7	East	46	18	-12	33	+3
	8	West	54	26	-4	41	+11
1ST	9	North	47	19	-11	34	+4
	10	North	41	13	-17	28	-2
	10	East	48	20	-10	35	+5
	11	South	54	26	-4	41	+11
	12	East	37	9	-21	24	-6
	13	West	40	12	-18	27	-3
	14	West	42	14	-16	29	-1
	15	East	53	25	-5	40	+10
	16	West	44	16	-14	31	+1
	17	East	47	19	-11	34	+4
	18	West	54	26	-4	41	+11
2ND	19	North	48	20	-10	35	+5
	20	North	42	14	-16	29	-1
	20	East	49	21	-9	36	+6
	21	South	54	26	-4	41	+11



STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,8hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
	22	East	39	11	-19	26	-4
	23	West	41	13	-17	28	-2
	24	West	46	18	-12	33	+3
	25	East	53	25	-5	40	+10
	26	West	47	19	-11	34	+4
	27	East	47	19	-11	34	+4
	28	West	54	26	-4	41	+11
	29	North	49	21	-9	36	+6
3RD	30	North	44	16	-14	31	+1
	30	East	50	22	-8	37	+7
	31	South	54	26	-4	41	+11
	32	East	44	16	-14	31	+1
	33	West	42	14	-16	29	-1
	34	West	47	19	-11	34	+4
	35	East	53	25	-5	40	+10
	36	West	48	20	-10	35	+5
	37	East	47	19	-11	34	+4
	38	West	51	23	-7	38	+8
	39	North	49	21	-9	36	+6
4TH	40	North	46	18	-12	33	+3
	40	East	53	25	-5	40	+10
	41	South	54	26	-4	41	+11
	42	East	47	19	-11	34	+4
	43	West	41	13	-17	28	-2
	44	West	50	22	-8	37	+7
	45	East	53	25	-5	40	+10
	46	West	51	23	-7	38	+8
	47	East	47	19	-11	34	+4
	48	West	51	23	-7	38	+8
	49	North	49	21	-9	36	+6
5TH	50	North	48	20	-10	35	+5
	50	East	53	25	-5	40	+10



STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,8hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
	51	South	53	25	-5	40	+10
	52	East	48	20	-10	35	+5
	53	West	40	12	-18	27	-3
	54	West	50	22	-8	37	+7
	55	East	53	25	-5	40	+10
	56	West	51	23	-7	38	+8
	57	East	48	20	-10	35	+5
	58	West	51	23	-7	38	+8
	59	North	48	20	-10	35	+5
6TH	60	North	48	20	-10	35	+5
	60	East	54	26	-4	41	+11
	61	South	52	24	-6	39	+9
	62	East	49	21	-9	36	+6
	63	West	39	11	-19	26	-4
	64	West	39	11	-19	26	-4
	65	East	48	20	-10	35	+5
	66	West	41	13	-17	28	-2
	67	East	48	20	-10	35	+5
	68	West	44	16	-14	31	+1
	69	North	49	21	-9	36	+6
7TH	70	North	48	20	-10	35	+5
	70	East	55	27	-3	42	+12
	71	South	51	23	-7	38	+8
	72	East	49	21	-9	36	+6
	73	West	39	11	-19	26	-4
	74	West	39	11	-19	26	-4
	75	East	48	20	-10	35	+5
	76	West	41	13	-17	28	-2
	77	East	48	20	-10	35	+5
	78	West	44	16	-14	31	+1
	79	North	50	22	-8	37	+7
8TH	80	North	49	21	-9	36	+6



Laystall Street, Manchester

Noise Impact Assessment

February 2021

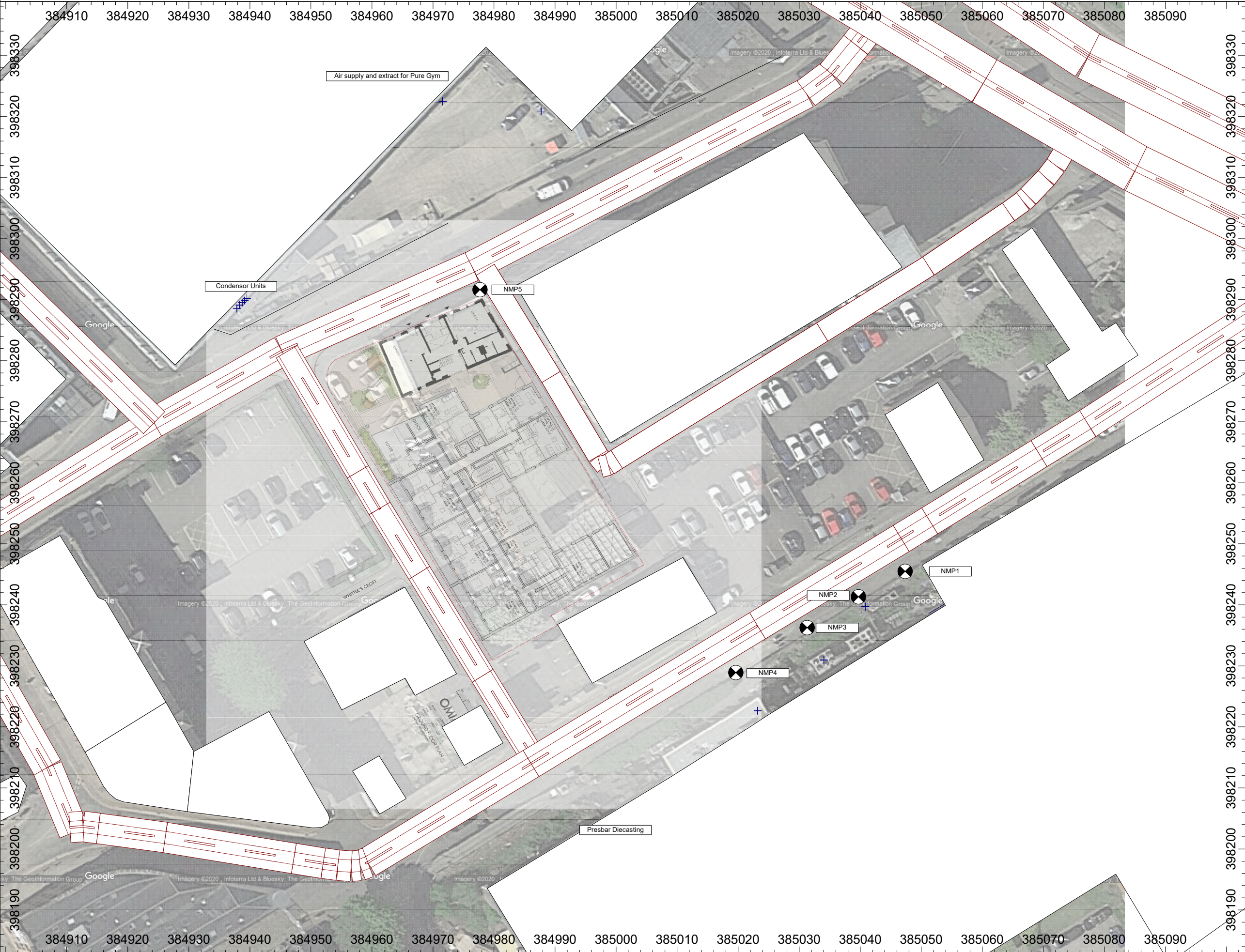
STOREY	APARTMENT	WINDOW ORIENTATION	EXTERNAL NOISE LEVEL, $L_{Aeq,8hr}$ (dB)	INTERNAL WITH WINDOWS CLOSED (dB)	DIFF WITH CRITERION (dB)	INTERNAL WITH WINDOWS OPEN (dB)	DIFF WITH CRITERION (dB)
	80	East	55	27	-3	42	+12
	81	South	54	26	-4	41	+11
	82	North	48	20	-10	35	+5
	83	West	41	13	-17	28	-2
	83	North	47	19	-11	34	+4
	84	West	41	13	-17	28	-2
	85	East	49	21	-9	36	+6
	86	West	42	14	-16	29	-1
	87	East	49	21	-9	36	+6
	88	West	46	18	-12	33	+3
	89	North	52	24	-6	39	+9



APPENDIX II

FIGURES

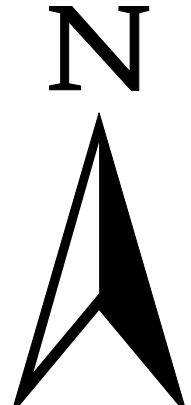
Figure 1 - Noise Survey Measurement Positions



Project:
Laystall Street,
Manchester

Project-No:
50-194

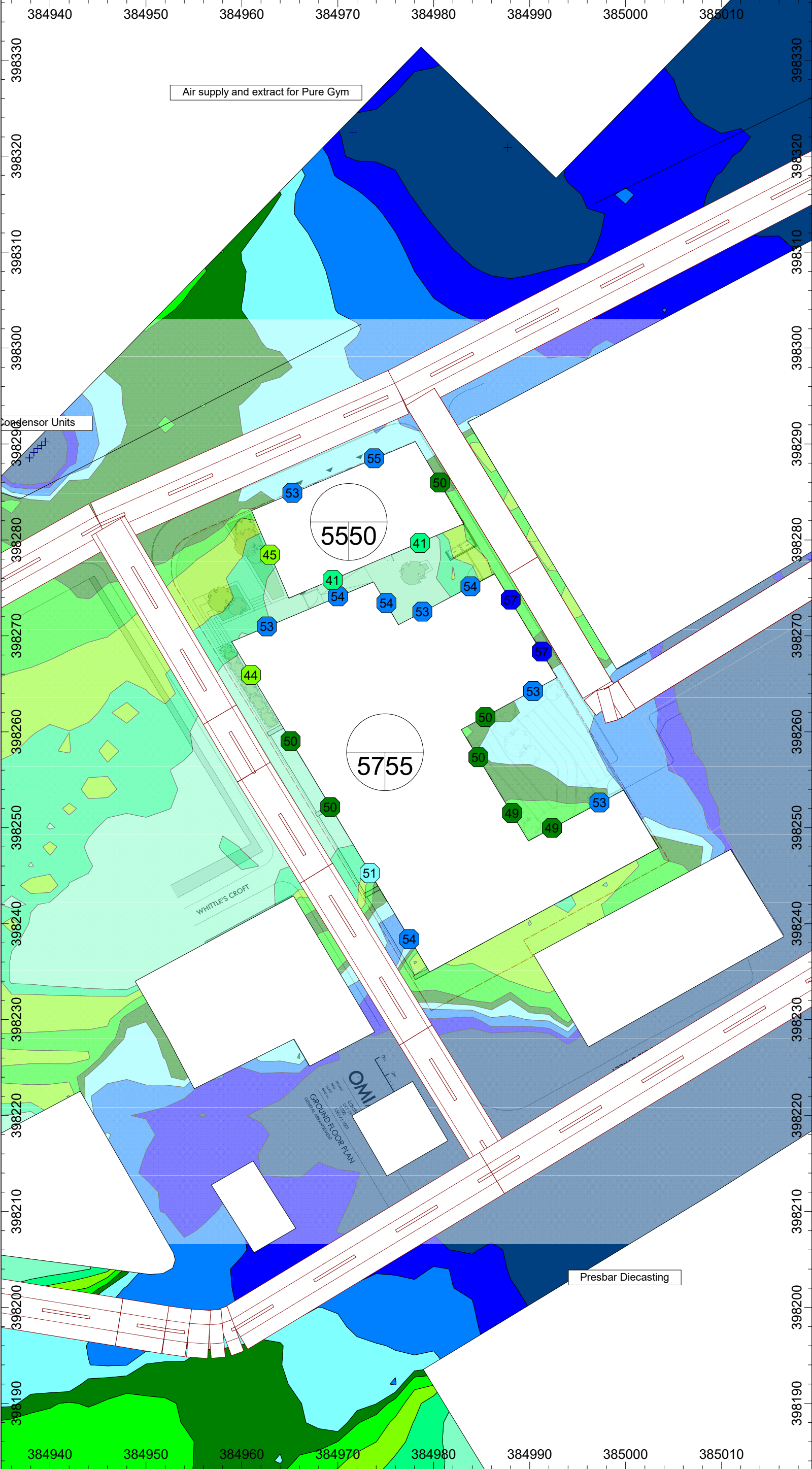
Client:
McCaul's





Project Engineer: Lee Faulkner
Date: 18/08/2020

Figure 2 - Daytime Grid Noise Map (Worst-case Facade Levels) - Grid Calculation at 1.5 m above ground level



Project:
Laystall Street, Manchester

Project-No:
50-194

Client:
McCaul's

Daytime Noise Level,
LAeq,16hr (dB)

- ... <= 40
- 40 < ... <= 43
- 43 < ... <= 45
- 45 < ... <= 48
- 48 < ... <= 50
- 50 < ... <= 53
- 53 < ... <= 55
- 55 < ... <= 58
- 58 < ...

Noise Map Objects

- + Point Source
- vert. Area Source
- Road
- Building
- Barrier
- Bridge
- Contour Line
- Building Evaluation
- Calculation Area



Project Engineer: Lee Faulkner
Date: 18/08/2020

Figure 3 - Night-time Grid Noise Map (Worst-case Facade Levels) - Grid Calculation at 3.5 m above ground level

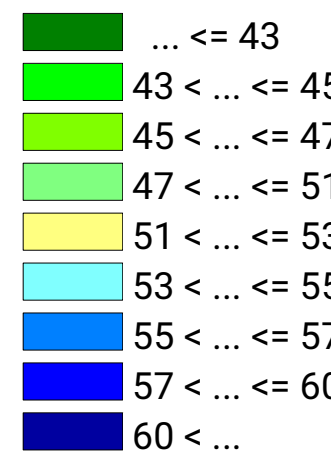


Project:
Laystall Street, Manchester

Project-No:
50-194

Client:
McCaul's

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



Noise Map Objects

- + Point Source
- vert. Area Source
- Road
- Building
- Barrier
- Bridge
- Contour Line
- Building Evaluation
- Calculation Area



Project Engineer: Lee Faulkner
Date: 18/08/2020