



e3p

Noise and Vibration Impact Assessment

4B Albany Road, Chorlton

Reference: 50-780-R1-2

Date: March 2023



NOISE AND VIBRATION IMPACT ASSESSMENT

4B Albany Road
Chorlton

Prepared for:

Bowsall Developments Limited

Report Ref: 50-780-R1-2

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	4B Albany Road, Chorlton M21 0AW
National Grid Reference	E 381779 N 394270
Proposed Development	Proposed residential development comprising of 40no. apartments within a single block along with access and associated car parking and landscaping.
Report Objectives	The objectives of this report are to: Identify, measure and assess the potential impact of any existing noise and vibration sources in the immediate vicinity of the Site upon proposed residential receptors. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	A road traffic sound survey, in accordance with the shortened measurement procedure given in Calculation of Road Traffic Noise, has been completed for Albany Road with consideration of early morning rush hour movements. E3P have undertaken attended measurements of more than 20 tram pass-bys to ascertain source noise levels over an hour period and for a typical tram. This coincided with vibration measurements. Additionally, E3P attended the southern boundary with the commercial premises to ascertain any potential noise impact.
Assessments	A 3D noise model has been constructed to assess road traffic and tram pass-bys across the site and incident upon facades. Road and tram traffic is assessed in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019. Consideration is also given to car park usage to the south which was noted to be the primary source of sound. Tram vibration was found to be suitably low and not perceptible.
Mitigation Requirements	The assessment has found that higher specification glazing is required for windows along Albany Road and the tramline. Additionally, mechanical ventilation is needed that provides background ventilation and mitigates overheating for apartments that front Albany Road or the tram line. The 1.8 m high close boarded fence should be extended to protect east facing terraces.

CONCLUSIONS

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



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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Bowsall Developments Limited to undertake a Noise Impact Assessment for a proposed residential development at a site at 4B Albany Road in Chorlton, 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 demolish the existing industrial building and construct 40 residential apartments within a single four storey block along with access, car parking and landscaping.

The key sources of sound impacting upon the Site is road traffic associated with Albany Road, the passing of trams along the line to the east and potential commercial sound from the south.

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

-  Site Layout - Appraisal (Drawing Number 2100-P-01G) dated 8th August 2022.

1.3. LIMITATIONS

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

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



2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

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

The national planning policy framework states that planning policies and decisions should aim to:

- ✿ Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- ✿ Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- ✿ Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- ✿ Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

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

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

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

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



The “observed effect levels” are as follows:

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

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

TABLE 2.1 NOISE EXPOSURE HIERARCHY

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



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

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

More specific factors to consider when relevant:

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

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

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

1.9 The ventilation strategy in this approved document relies on a combination of all of the following.

- a. Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms and kitchens), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.*
- b. Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.*
- c. Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).*

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



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

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

1. **Natural ventilation with background ventilators and intermittent extract fans** (guidance suitable only for less airtight dwellings) - Ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. For the purposes of this approved document, natural ventilation refers to a ventilation strategy using background ventilators and intermittent extract ventilation.
2. **Continuous mechanical extract ventilation** - Mechanically driven ventilation that continuously extracts indoor air and discharges it to the outside.
3. **Mechanical ventilation with heat recovery** - A mechanically driven ventilation system that both continuously supplies outdoor air to the inside of the dwelling and continuously extracts indoor air and discharges it to the outside. For the purposes of this approved document, the guidance for mechanical ventilation with heat recovery applies to centralised or decentralised supply and extract systems, with or without heat recovery.

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

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

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

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

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

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

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

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



2.5. BRITISH STANDARD BS 8233:2014+A1:2019 – 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. 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.

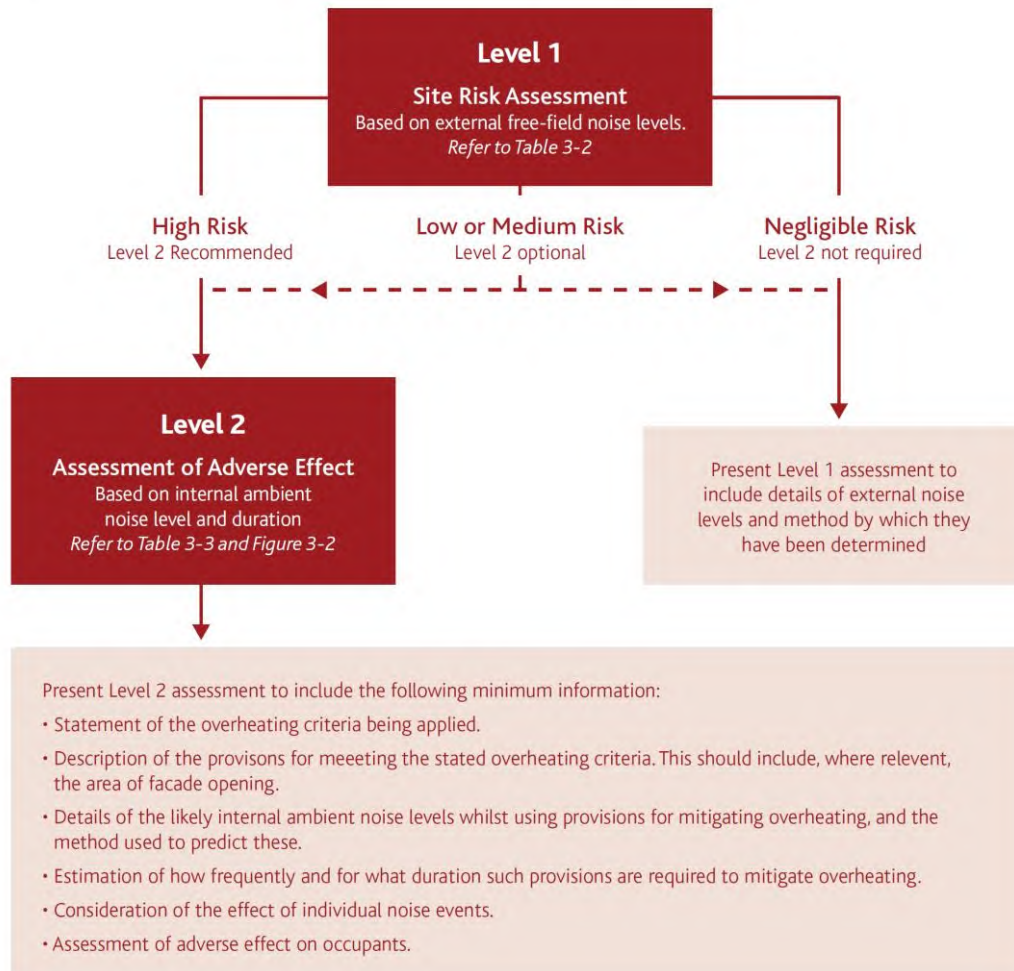
2.7. INSTITUTE OF ACOUSTICS AND ASSOCIATION OF NOISE CONSULTANTS (2020) ACOUSTICS VENTILATION AND OVERHEATING: RESIDENTIAL DESIGN GUIDE

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
<i>Increasing noise levels</i>			Increasing the likelihood of impact on reliable speech communication during the day or sleep disturbance at night
≤35 dB	≤30 dB	Do not normally exceeds $L_{AF,max}$ 45 dB more than 10 times a night	Noise can be heard but does not cause any change in behaviour



3. SURVEY RESULTS

3.1. ROAD TRAFFIC SOUND MEASUREMENT – ALBANY ROAD

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

🕒 12:15-15:15 Tuesday 31st January 2023.

The survey was completed at the following position:

📍 Noise Measurement Position 1 (NMP1): Located 4 m from the edge of Albany Road in free-field conditions. The microphone was set at a height of 1.5 m above local ground level and had full line of sight to the road.

E3P also attended site between 05:55 and 10:00 to determine the potential impact of rush hour traffic along Albany Road as well as capture any potential commercial sound. However, it was noted that traffic was limited until after 08:30/09:00 and so the captured levels between 12:15-15:15 are considered robust and have been used to calculate the daytime and night-time noise levels in accordance with CRTN and the TRL Document.

Table 3.1 details the measured sound pressure levels.

TABLE 3.1 MEASURED ROAD TRAFFIC SOUND LEVELS – ALBANY ROAD

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)			
	L _{Aeq,T}	10th Highest L _{Amax,fast}	L _{A90,T}	L _{A10,T}
12:15	63.1	77.4	49.7	67.7
13:15	62.6		48.6	66.4
14:15	61.4		47.7	66.0
Derived Daytime Noise Level, L _{Aeq,16hr}				63.7
Derived Night-time Noise Level, L _{Aeq,8hr}				55.4

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

3.2. TRAM TRAFFIC SOUND MEASUREMENT

E3P have undertaken an attended tram pass-by sound measurement during a typical weekday period. It is noted that three separate Metrolink lines (Brown, Pink and Blue) resulting in around 26 trams per hour. Upon review of the Metrolink timetable, trams run from 05:00 to 23:49. Accordingly, this translates to approximately 480 daytime trams and 115 night-time trams.

The survey was undertaken during the following period:

🕒 10:00-12:00 Tuesday 31st January 2023.

The survey was completed at the following position:



- Noise Measurement Position 2 (NMP2): Located 3 m from the closest rail in free-field conditions. The microphone was set at a height of 1.5 m above local ground level and had full line of sight to the tram line.

Table 3.2 details the measured sound pressure levels.

TABLE 3.2 MEASURED ROAD TRAFFIC SOUND LEVELS – METROLINK

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)			
	L _{Aeq,T}	10th Highest L _{Amax,fast}	L _{A90,T}	L _{A10,T}
10:00	69.1	88.4	48.8	62.9
11:00	69.1		48.6	63.4
Derived Daytime Noise Level, L _{Aeq,16hr}				69.1
Derived Night-time Noise Level, L _{Aeq,8hr}				62.2

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

3.3. COMMERCIAL SOUND MEASUREMENT

E3P have undertaken attended commercial measurements along the southern boundary to quantify the sources of sound and capture any noise from the premises. During the surveys, however, it was noted that the only source of sound was occasional movement of vehicles associated with vehicle garage where cars would be moved from the car park into the garage and vice versa. This sound source was not notable over road and tram sound and, as such, is not considered further.

However, to inform a robust assessment, a car park source will be included assuming a certain amount of vehicles movements in an hour to inform a worst-case assessment.

The survey was undertaken during the following period:

- 12:45-15:45 Tuesday 31st January 2023.
- 06:00-10:00 Wednesday 1st February 2023.

The survey was completed at the following position:

- Noise Measurement Position 3 (NMP3): Located on the southern site boundary with clear line of sight to the commercial, Albany Road and the tram line in free-field conditions. The microphone was set at a height of 1.5 m above local ground level.

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 AT TIME OF SURVEY
NMP1 and NMP2	Sound Level Meter	01dB Fusion	12039	30th June 2023
	Pre-amplifier	01dB Pre22	1805124	
	Microphone	GRAS 40CE	330832	
	Calibrator	01dB Cal31	87281	18th January 2024
NMP3	Sound Level Meter	Norsonic Nor145	14529152	18th June 2023
	Pre-amplifier	Norsonic Nor1209	22293	
	Microphone	Norsonic Nor1227	332220	
	Calibrator	Norsonic Nor1255	125525208	8th June 2023

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

3.4. TRAM VIBRATION SOURCE MEASUREMENT

E3P have undertaken attended vibration measurements of tram pass-bys over a 2 hour period, capturing approximately 60 tram pass-bys.

The highest measured vibration level, in all axis, was 0.125 mm/s. For the vast majority of pass-bys, levels did not exceed the vibration floor of 0.025 mm/s.

This falls below the criterion of 0.14 mm/s below which vibration is unlikely to be perceptible even in the most sensitive situations. Accordingly, no further consideration to tram vibration is given.

TABLE 3.4 VIBRATION MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE AT TIME OF SURVEY
VMP1	Vibration Meter	Vibrocock V9000	2329	8th April 2023



4. 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, tram pass-bys and car park usage.

The following inputs have been included in the model:

- ✳ Site Layout.
- ✳ The car park is inputted as a parking lot assuming 10 movements in an hour. No night-time operations were noted on site and, as such, the parking lot only applied to the daytime period.
- ✳ 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.
- ✳ Soft ground correction is set at 0.
- ✳ A reflection order of 1 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, tram pass-bys and car park usage.

4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

E3P note that terraces are proposed at all floor levels, with external terraces at ground level adjacent to open green space and roof terraces at 1st, 2nd and 3rd floors.

Noise levels in these areas vary. However, terraces located on eastern and western facades are subject to daytime noise levels of between 64 and 66 dB. However, given that these areas are classed as balconies, the typical design range of 50-55 dB is not considered appropriate. As such, the lowest practicable levels should be achieved and measures are discussed in Section 5.0.

E3P note that Ryebank Fields and Longford Park are within a 10-minute walk of the site and are considered acceptable provision for relaxation space for residents in the absence of a suitably quiet terrace.

4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards internal noise levels, E3P has assumed a standard glazing specification of 4 mm glass/20 mm air space/4 mm glass affords sound insulation performance in the order of 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 weighted for rail traffic is 28 dB and so these value has been used to calculate internal noise levels for road and tram noise break in. The recently published AVO has found that a common reduction for an open window is 13 dB based on research undertaken. As such, a figure of 13 dB is applied here.



The model has been used to predict façade noise levels at ground, first and second floors. In order to determine any requirements for mitigation, E3P has added the reduction provided by the glazing (25 dB for road or 28 dB for trams) 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 along Albany Road or higher than 63 dB during the day and/or 58 dB during the night along the tram line will require higher specification glazing.

Table 4.1 below details the worst-case noise levels, by façade, across all floors and determines if higher specification glazing is required. Where both sources impact a façade, the lower limit for road traffic is applied.

TABLE 4.1 HIGHER SPECIFICATION GLAZING REQUIREMENTS

FACADE	ASSESSMENT PERIOD	WORST-CASE PREDICTED NOISE LEVEL, $L_{Aeq,T}$ (dB)	APPLICABLE EXTERNAL NOISE LIMIT, $L_{Aeq,T}$ (dB)	HIGHER SPECIFICATION GLAZING REQUIRED?
EAST	Daytime	66	63	Yes
	Night-time	60	58	Yes
	Night-time $L_{Amax,fast}$	79	74	Yes
SOUTH EAST	Daytime	61	63	No
	Night-time	54	58	No
	Night-time $L_{Amax,fast}$	77	74	Yes
SOUTH	Daytime	58	60	No
	Night-time	52	55	No
	Night-time $L_{Amax,fast}$	72	74	No
WEST	Daytime	64	60	Yes
	Night-time	59	55	Yes
	Night-time $L_{Amax,fast}$	71	74	No
NORTH	Daytime	53	60	No
	Night-time	47	55	No
	Night-time $L_{Amax,fast}$	68	74	No

As can be seen, eastern, south eastern and western facades will require higher specification glazing. The exact reduction and example configurations are given in Section 5.0.

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

4.2.1. VENTILATION CONDITION

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



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

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

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

As can be seen from the Figures, all facades will experience an exceedance during the daytime and night-time periods. As such, all apartments will require a whole dwelling ventilation system, in accordance with the requirements of Building Regulations, that considers noise ingress at the facade as, when windows are opened for ventilation, the internal ambient noise levels are not considered acceptable and exceed the required criterion. Section 5.0 discusses the requirements and provides necessary advice.

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

4.2.2. OVERHEATING CONDITION

E3P has undertaken a level 1 assessment in accordance with the AVO Guide and adopted the noise levels outlined for negligible and low risk. Any plots that pass this test will not require whole house ventilation to control the overheating as external noise levels would be sufficiently low enough that an open window can provide the overheating mitigation without compromising internal noise levels. As such, the allowable façade noise levels are 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 the Figures, the northern facing apartments overlooking the car parking area fall below these limits and, as such, a Level 2 Assessment is not required, and the opening of windows is considered acceptable in order to mitigate overheating.

However, all other facades will experience an exceedance of these levels and, as such, an overheating assessment is completed. The Good Homes Alliance method has determined a high risk of overheating. Additionally, consideration is required to internal noise levels should windows be opened to mitigate overheating. Table 4.2 details the expected levels and whether these fall below or exceed the SOAEL and whether they are above a level at which noise causes a material change in behaviour.



TABLE 4.1 OVERHEATING ASSESSMENT

FACADE	ASSESSMENT PERIOD	WORST-CASE PREDICTED NOISE LEVEL, $L_{Aeq,T}$ (dB)	INTERNAL NOISE LEVELS WITH WINDOWS OPEN, $L_{Aeq,T}$ (dB)	ABOVE SOAEL (50 dB day, 42 dB night and 65 dB MAX)?
EAST	Daytime	66	53	Yes
	Night-time	60	47	Yes
	Night-time $L_{Amax,fast}$	79	66	Yes
SOUTH EAST	Daytime	61	50	No
	Night-time	54	41	No
	Night-time $L_{Amax,fast}$	77	64	No
SOUTH	Daytime	58	47	No
	Night-time	52	42	No
	Night-time $L_{Amax,fast}$	72	59	No
WEST	Daytime	64	51	Yes
	Night-time	59	46	Yes
	Night-time $L_{Amax,fast}$	71	58	No
NORTH	Daytime	53	40	No
	Night-time	47	34	No
	Night-time $L_{Amax,fast}$	68	55	No

As shown, easter and western facades will experience unacceptable noise levels with internal noise levels exceeding the SOAEL and above a level that causes material change in behaviour.

As such, a means of providing ventilation and mitigating overheating is required for these apartments. A standard dMEV system is acceptable for southern, south western and northern apartments in accordance with Approved Document F (ADF).

The exact requirements on a façade-by-façade basis are detailed in Section 5.1.



5. MITIGATION

5.1. FAÇADE INSULATION

The previous section determined that certain apartments would require higher specification glazing and mechanical ventilation.

The worst-case required glazing is chosen per facade. For example, where a glazing needed due to night-time noise is higher than for daytime periods, the night-time requirements are recommended.

TABLE 6.1 GLAZING REQUIREMENTS

PLOT	REQUIRED GLAZING REDUCTION (dB)	EXAMPLE GLAZING (GLASS/AIR SPACE/GLASS) (mm)	WHOLE DWELLING VENTILATION SYSTEM
East	34 dB Rw (31 Rw + C _t)	8 / 16 / 6	Mechanical that mitigates overheating
South East	32 dB Rw (28 Rw + C _t)	6 / 16 / 4	Mechanical that mitigates overheating
South	28 dB Rw + C _t	4 / 20 / 4	dMev (ADF compliant)
West	29 dB Rw + C _{tr}	8 / 16 / 6	Mechanical that mitigates overheating
North	25 dB Rw + C _{tr}	4 / 20 / 4	dMev (ADF compliant)

Figure 4 details the location of the glazing and ventilation requirements

The above glazing units would achieve the required reduction due to average noise levels as well as those resultant 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.

In order to achieve the required internal ambient noise levels, any background ventilators must achieve the same but preferably more reduction as achieved by the glazing in relation to the D_{n,e,w} in the open position. The number of background ventilators per room will be dependent on the requirements given in Building Regulations Part F. Where comfort cooling is required to mitigate overheating an M&E consultant or similar should be sought out to provide mitigation measures to control 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.

5.2. BARRIERS

The previous section determined that noise levels in terrace areas can range between 64 and 66 dB. These are not considered the lowest practicable levels and, as such, it is recommended that these terrace areas include a sealed balustrade, wherever possible, so as to achieve the lowest practicable levels. As noted in Section 4.1, however, E3P note that Ryebank Fields and Longford Park are within a 10-minute walk of the site and are considered acceptable provision for relaxation space for residents in the absence of a suitably quiet terrace.



Furthermore, and in order to protect ground floor terraces and the open space between the development and railway, an additional grid noise map has been run with the proposed 1.8 m high close boarded fence, proposed along the northern boundary, extended along the eastern and partially southern boundary.

As can be seen, with the barrier in place, noise levels are reduced to be less than 55 dB in this area and at ground floor terraces.

The close boarded fence must be free from holes, be sealed at the base and have a minimum mass of 10 kg/m².



6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Bowsall Developments in order to undertake a Noise and Vibration Impact Assessment for a proposed residential development at 4B Albany Road in Chorlton.

Attended road traffic measurements have been undertaken along Albany Road in accordance with CRTN. E3P have also conducted attended tram pass-by measurements and attended the southern boundary to ascertain any impact from the commercial premises to the south. Vibration from the tram line was found to be below perceptibility.

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

The assessment has recommended higher specification glazing and mechanical whole dwelling ventilation system for certain apartments due to the impact of sound internally due to road traffic and trams. The 1.8 m high close boarded fence should be extended to protect east facing terraces.

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

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

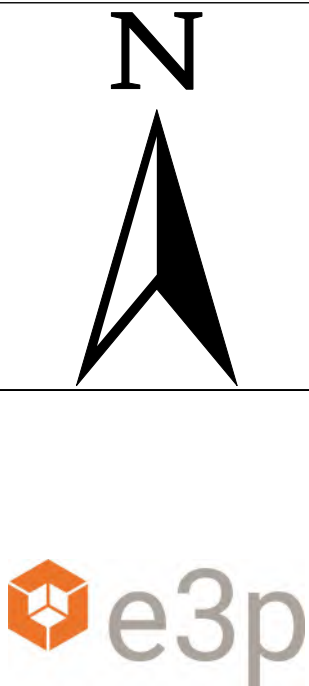
Figure 1 - Site Layout and Noise and Vibration Measurement Positions



Project:
4B Albany Road,
Chorlton

Project-No:
50-780

Client:
Bowsall Developments
Ltd



Project Engineer: L Faulkner
Date: 22/03/2023

Client:
Bowsall Developments
Limited

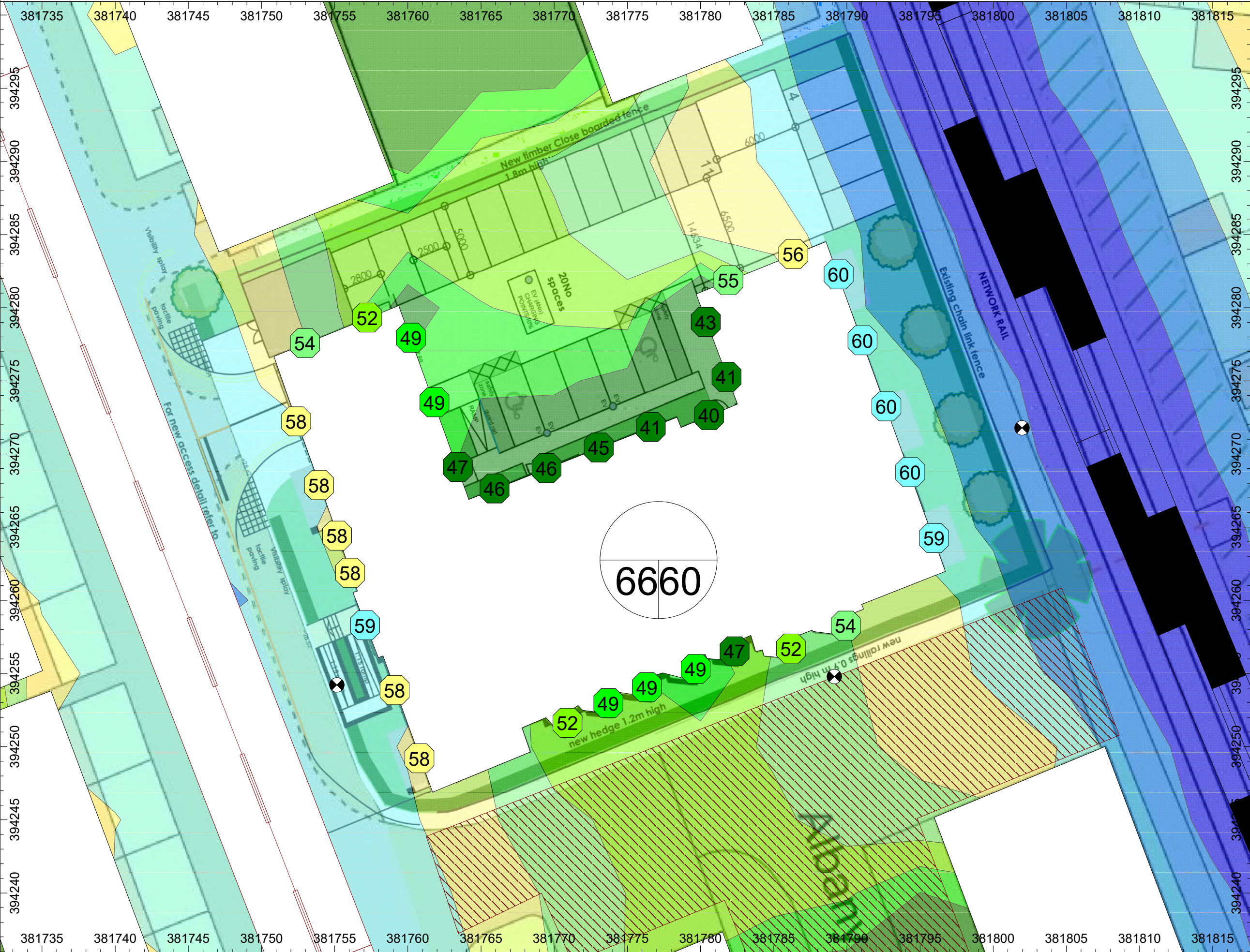
... ≤ 48
 $48 < \dots \leq 50$
 $50 < \dots \leq 52$
 $52 < \dots \leq 55$
 $55 < \dots \leq 58$
 $58 < \dots \leq 60$
 $60 < \dots \leq 62$
 $62 < \dots \leq 65$
 $65 < \dots$

-  Road
-  Parking Lot
-  Railway
-  Building
-  Contour Line
-  Receiver
-  Building Evaluation
-  Calculation Area



Project Engineer: L Faulkner
Date: 22/03/2023

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



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

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

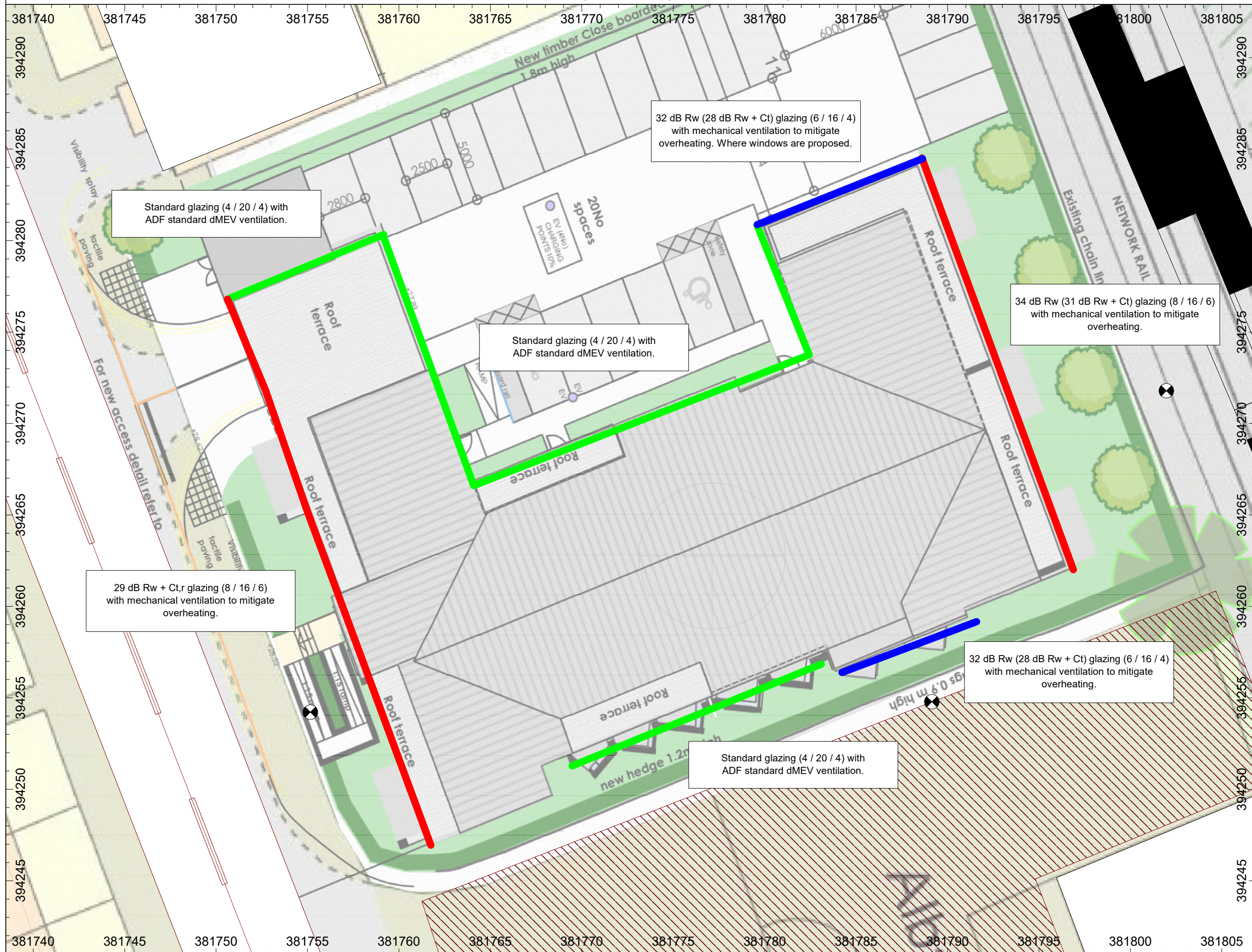
Noise Map Objects

- Road
- Parking Lot
- Railway
- Building
- Contour Line
- Receiver
- Building Evaluation
- Calculation Area



Project Engineer: L Faulkner
Date: 22/03/2023

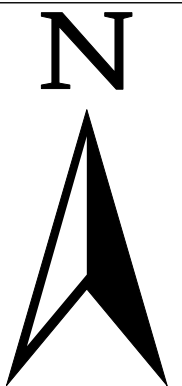
Figure 4 - Glazing and Ventilation Requirements



Project:
4B Albany Road,
Chorlton

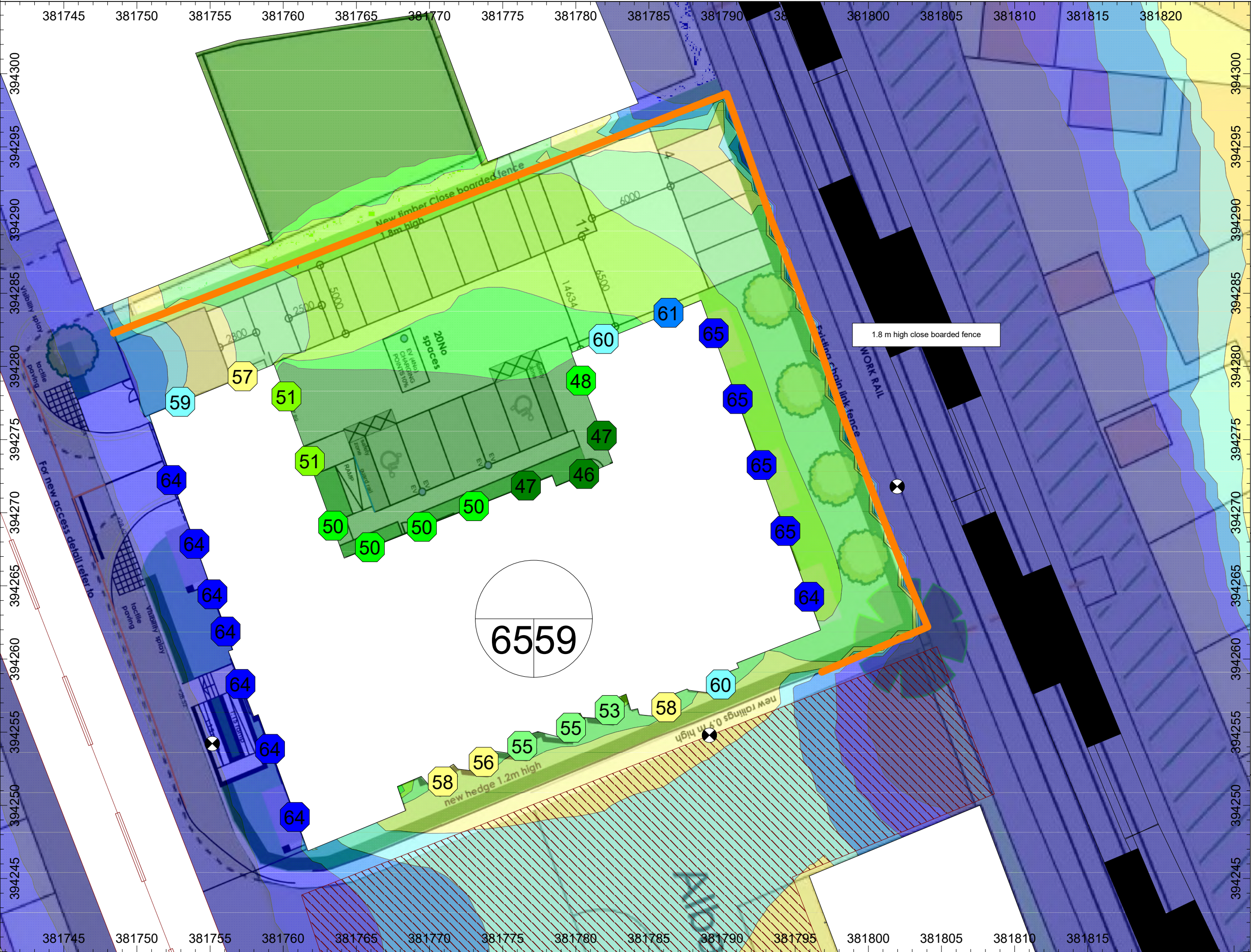
Project-No:
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Project Engineer: L Faulkner
Date: 22/03/2023

Figure 5 - Daytime Grid Noise Map with Mitigation - Calculation at 1.5 m above ground level



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Chorlton

Project-No:
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**Daytime Noise Level,
L_{Aeq},16hr (dB)**

Dark Green	... ≤ 48
Light Green	48 < ... ≤ 50
Yellow-Green	50 < ... ≤ 52
Yellow	52 < ... ≤ 55
Light Yellow	55 < ... ≤ 58
Light Blue	58 < ... ≤ 60
Medium Blue	60 < ... ≤ 62
Dark Blue	62 < ... ≤ 65
Dark Blue	65 < ...

Noise Map Objects

- Road
- Parking Lot
- Railway
- Building
- Barrier
- Contour Line
- Receiver
- Building Evaluation
- Calculation Area

e3p

Project Engineer: L Faulkner
Date: 22/03/2023