Land at Barons Cross Garage, Barons Cross Road, Barons Cross, Leominster (HR6 8RS)

Noise Impact Assessment

September 2023

MÜLLER
PROPERTY GROUP

Noise Impact Assessment

Conod's Yard/Barons Cross Garage, Leominster

Reference: 50-792-R1-2

Date: May 2023

NOISE IMPACT ASSESSMENT

Conod's Yard/Barons Cross Garage
Leominster

Prepared for:

Muller Property Group

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Conod's Yard/Barons Cross Garage, Leominster, HR6 8RS
National Grid Reference	E 347830, N 258574
Proposed Development	Outline planning application for the demolition of existing buildings; construction of an 84-bed care home (use class C2) with all matters to be considered for approval except landscape at 'Barons Cross Garage, Barons Cross Road, Barons Cross, Leominster (HR6 8RS).
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. • Identify and assess the potential impact of any proposed noise sources associated with the proposed development upon existing and proposed residential receptors. The report follows current and relevant British Standards to provide a robust assessment.

ASSESSMENT

Surveys Completed	An attended road traffic sound survey has been conducted for Barons Cross Road and Monkland Road. An unattended weekday and weekend background and ambient sound survey has been conducted at a location considered representative of the nearest existing and proposed noise sensitive receptors
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 and in any external amenity areas. Plant limits have been set for any fixed plant associated with the development based on measured backgrounds. Road traffic sound has been assessed in accordance with the criterion set out in in BS 8233:2014.
Mitigation Requirements	The assessment determined that higher specification glazing is required to control internal noise levels along certain facades. A whole dwelling ventilation system is required for all apartments in accordance with Building Regulations. Fixed plant noise limits have been set on any proposed fixed plant items to protect the proposed and existing noise sensitive receptors

CONCLUSIONS

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

TABLE OF CONTENTS

1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Muller Property Group to undertake a Noise Impact Assessment for a proposed construction of a care home on land at Conod's Yard/Barons Cross Garage in Leominster, 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.

The assessment will also determine any potential sources of sound relating to the proposed development and provide any mitigation measures required to prevent potential impact on the existing surrounding noise sensitive receptors.

1.2. PROPOSED DEVELOPMENT

Muller Strategic Projects Ltd intend to demolish any existing buildings and construct an 84-bed care home (use class C2) with all matters to be considered for approval except landscape.

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

- Proposed Site Plan (DP(0)001 Rev D.

The key sources of sound impacting upon the Site is road traffic sound associated with Barons Cross Road and Monkland Road.

1.3. LIMITATIONS

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

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

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

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

Planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
- limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

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

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

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

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

The "observed effect levels" are as follows:

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

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

TABLE 2.1 NOISE EXPOSURE HIERARCHY

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

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

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

More specific factors to consider when relevant:

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

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

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

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

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

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

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

Tonality

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

Impulsivity

- +3 dB: where the impulsivity is just perceptible.

- +6 dB: where the impulsivity is clearly perceptible; and
- +9 dB: where the impulsivity is highly perceptible.

Intermittency

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

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

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

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

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

2.4.1. NOISE CRITERIA LIMITS

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

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

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

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

BS 8233 goes on to recommend noise levels for gardens:

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

BS 8233 goes on to say:

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

2.5. 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.*

2.6. 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)

2.7. 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 $L_{Aeq,8\,hr}$ or an external level of 45 dB $L_{Aeq,8\,hr}$. It also recommends that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB should be limited where possible.

3. SURVEY RESULTS

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

3.1. SOUND CLIMATE

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

It was noted that the main source of sound was road traffic sound associated with Barons Cross Road and Monkland Road. As such, E3P carried out an attended road traffic measurement.

3.2. ROAD TRAFFIC SURVEY – BARONS CROSS ROAD

E3P has conducted an attended road traffic sound measurement in accordance with the shortened measurement procedure given in Calculation of Road Traffic Noise (CRTN). The survey was carried out over the following periods:

- 11:50 - 14:50 Wednesday 8th February 2023.

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

- Noise Measurement Position 1 (NMP1): Located to the north of the site approximately 5 m from the nearside edge of Barons Cross Road. The microphone was located at a height of 1.5 m above ground level and in free-field conditions.

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

TABLE 3.1 SUMMARY OF MEASURED NOISE LEVELS FOR NMP1 – BARONS CROSS ROAD

MEASUREMENT START	MEASURED SOUND PRESSURE LEVELS (dB)			
	$L_{Aeq,1hr}$	10th Highest $L_{Amax,fast}$	$L_{A10,1hr}$	$L_{A90,1hr}$
11:50	67.1	84.6	71.6	45.9
12:50	66.7		71.3	44.9
13:50	66.7		71.1	46.5
Derived daytime noise level, $L_{Aeq,16hr}$				**68.3**
Derived night-time noise level, $L_{Aeq,8hr}$				**59.5**

3.3. ROAD TRAFFIC SURVEY – MONKLAND ROAD

E3P has conducted an attended road traffic sound measurement in accordance with the shortened measurement procedure given in Calculation of Road Traffic Noise (CRTN). The survey was carried out over the following periods:

- 11:50 - 14:50 Wednesday 8th February 2023.

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

- Noise Measurement Position 2 (NMP2): Located to the south of the site approximately 4 m from the nearside edge of Monkland Road. The microphone was located at a height of 1.5 m above ground level and in free-field conditions.

A summary of the measured sound pressure levels from the Road Traffic Noise Survey is presented in Table 3.2.

TABLE 3.2 SUMMARY OF MEASURED NOISE LEVELS FOR NMP2 – MONKLAND ROAD

MEASUREMENT START	MEASURED SOUND PRESSURE LEVELS (dB)			
	$L_{Aeq,1hr}$	10th Highest $L_{Amax,fast}$	$L_{A10,1hr}$	$L_{A90,1hr}$
11:50	67.8	83.9	72.9	43.4
12:50	67.8		72.7	44.7
13:50	68.4		73.1	46.1
Derived daytime noise level, $L_{Aeq,16hr}$				**69.9**
Derived night-time noise level, $L_{Aeq,8hr}$				**60.9**

3.4. UNATTENDED BACKGROUND AND AMBIENT SOUND SURVEY

E3P have undertaken an unattended background and ambient sound survey in a position considered representative of the closest noise sensitive receptors located to the south-west of the site on Hopyard Close. This position is also representative of the background sound levels at the proposed development.

The survey was carried out over the following time periods:

- 15:00 Wednesday 8th February to 11:00 Monday 13th February 2023.

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

- Noise Measurement Position 3 (NMP3): Located close to the south-western boundary of the site adjacent to the nearest noise sensitive receptors on Hopyard Close. The microphone of the sound level meter was set at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of road traffic on the local road network.

Table 3.3 details the measured background sound levels. The daytime levels correspond to the $L_{A90,1hr}$ and the night-time levels to the $L_{A90,15mins}$. The full data set is available upon request.

TABLE 3.3 MEASURED BACKGROUND SOUND PRESSURE LEVELS

DATE	TIME PERIOD	RANGE OF MEASURED BACKGROUND SOUND LEVELS, $L_{A90,T}$ (dB)	MEDIAN MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)
Wednesday 8th February 2023	Daytime	28.6-44.7	38.4
	Night-time	19.2-41.6	23.7
Thursday 9th February 2023	Daytime	29.1-47.0	42.1
	Night-time	19.1-42.0	21.6
Friday 10th February 2023	Daytime	26.9-48.3	43.7
	Night-time	17.2-36.4	20.2
Saturday 11th February 2023	Daytime	24.9-44.0	41.2
	Night-time	16.3-35.0	**19.1**
Sunday 12th February 2023	Daytime	25.9-42.8	38.7
	Night-time	19.6-40.2	25.1

The levels highlighted bold above are the lowest measured median levels to be used in the assessment to inform a worst-case assessment.

The equipment outlined in Table 3.4 was used for the noise survey.

TABLE 3.4 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	LAST CALIBRATION DATE
NMP1 and NMP3	Sound Level Meter	01dB Fusion	14226	01/12/2021
	Pre-amplifier	01dB Pre22	2135072	
	Microphone	GRAS 40CD	470570	
	Calibrator	01dB Cal31	87281	02/08/2023
NMP2	Sound Level Meter	01dB Fusion	14616	29/06/2022
	Pre-amplifier	01dB Pre22	20951	
	Microphone	GRAS 40CD	494264	
	Calibrator	01dB Cal31	87281	02/08/2023

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

4. ROAD TRAFFIC SOUND IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2022 MR1, to determine the impact of noise from road traffic sound.

The following inputs have been included in the model:

- Proposed Site Plan Rev D.
- Barons Cross Road is calibrated using NMP1, Monkland Road is calibrated using NMP2.
- The proposed 2 m high close boarded perimeter fence is included in the noise model.
- Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- Existing buildings are included.
- E3P understand the external amenity areas are to be located in the northwest area of the site and as such these areas will be assessed.
- A reflection order of 2 has been used in all calculations.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

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

4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

The noise model has been used to predict noise levels at the amenity areas which are to be used for relaxation. E3P note allotments and a central garden/courtyard area which are both shielded from the road with noise levels of up to 55 dB achieved in these areas.

However, patio areas are also noted on northern and eastern elevations with noise levels of up to 66 dB achieved in these areas. Given these levels and the compact nature of the areas, acoustic barriers here are not likely to be suitable. Considering the residents have access to the central areas and allotments with acceptable noise levels, acoustic mitigation measures are not considered to be warranted for these areas.

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 31 dB R_W. The primary noise impact here is road traffic sound likely dominant at all facades and, as such, the $C_{t,r}$ correction is applied which accounts for road traffic or lower frequency sound. 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. To determine any requirements for mitigation, E3P has added the reduction provided by the glazing (25 dB) to the relevant criterion for day (35 dB) and for night (30 dB).

As such, any facades subject to noise levels higher than 60 dB during the day and/or 55 dB during the night will require higher specification glazing. As can be seen in Figures 2 and 3, facades bounding Barons Cross Road and Monkland Road exceed these limits. As such, higher specification glazing will be required for these facades. Glazing requirements are discussed further in section 5.

Consideration must also be given to maximum noise levels generated by road traffic along Barons Cross Road and Monkland Road. The 10th highest maximum noise level has been used and distance corrected to the closest plot. The maximum noise level at the worst affected facades would be 78 dB and 74 dB .

Internal maximum noise levels of 45 dB L_{Amax} should also not be exceeded. The sound insulation performance achieved by standard glazing (31 dB) has been added to the 45 dB maximum internal noise level limit. As, such facades subject to maximum noise levels above 76 dB will require higher specification glazing.

As shown above the worst affected facade is subject to levels higher than 76 dB L_{Amax}. Therefore, higher specification glazing would be required to mitigate against maximum noise levels generated by road traffic from Barons Cross Road.

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.
It is assumed that the developer would be installing a whole dwelling ventilation system in accordance with Part F of the Building Regulations across the site. It is assumed Natural Ventilation (formerly system 1 ventilation) is not appropriate for these dwellings as this option is to less airtight dwellings only.

Where background ventilators form part of the system, consideration is required to the sound reduction provided by these when in the open position and, as such, are discussed in Section 5.0.

4.2.1. OVERHEATING CONDITION

E3P has considered the potential impact of noise, internally, should windows be opened to mitigate overheating, as per the criteria stipulated in ADO. Any plots/facades that pass this test can open windows for this without resulting in unacceptable internal noise levels. Those that fail the test would be subject to a Part O Overheating Assessment by a suitably qualified consultant.

Part O only applies to bedrooms at night in relation to the average 8-hour noise level and 10th highest maximum noise level.

As such, the allowable façade noise levels are 53 dB $L_{Aeq,8hr}$ over the night time period and a maximum level of 68 dB $L_{Amax,fast}$. These levels are set based on a sound reduction of 13 dB provided by a partially open window.

As can be seen from the Figures and Section 4.2, both the northern and eastern facades experience an exceedance of the above criterion. As such an overheating assessment will be required for these facades.

4.2.2. PROPOSED FIXED PLANT NOISE LIMITS

At the time of submission, details of proposed fixed plant items were unknown. As such, the following recommendations have been made:

- Any fixed plant items associated with the proposed commercial units should be located within the site and not located at facades which face noise sensitive receptors.

- The resultant rating level from the cumulative impact of all proposed fixed plant items must not exceed the existing typical background sound levels which were found to be 19 dB, accounting for the above proposed noise levels, at the closest receptors.

It is assumed that any fixed plant items proposed would have a low noise level and most likely will consist of A/C units. Considering the typical noise levels of these units and the surrounding existing usage, the impact of these would be negligible.

Where this is not the case, it is recommended that an acoustician is involved to ensure the plant to be installed will not adversely affect the receptors.

5. MITIGATION

5.1. FAÇADE INSULATION AND VENTILATION

The previous section determined that certain facades would require higher specification glazing and a whole dwelling ventilation system due to the impact of noise internally and ventilation requirements. Specifically, the following plots require these glazing specifications:

- Northern façade along Barons Cross Road 33 Rw (31 Rw + Ctr), Example glazing (4 / 12 / 6).
- Western and South-eastern façade 27 Rw + Ctr, Example glazing (4 / 10 / 4).
- Eastern façade along Monkland Road 32 Rw + Ctr Example glazing (6 / 12/ 10).

Figure 4 details the location of the above.

The system should be in line with the requirements of Approved Document Part F, Volume 1: Dwellings.

It is assumed that this would be continuous mechanical extract ventilation as the dwellings are not likely to be suitable for natural ventilation. This will consist of either a central extract system, individual room extract fans or a combination of both.

Additionally, background ventilators should satisfy the requirements of ADF and, in order to achieve the required internal ambient noise levels, must achieve a reduction of at least that of the glazing specified for each facade, which is at most 32 dB $D_{n,e,w} + C_{tr}$ in the open position. This level of reduction is likely to be achieved by a standard background ventilator.

6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Muller Property Group to undertake a Noise Impact Assessment for a proposed care home at land off Barons Cross Road in Leominster.

An attended road traffic sound survey has been conducted for Barons Cross Road and Monkland Road.

An unattended weekday weekend background and ambient sound survey has been conducted at a location considered representative of the nearest existing and proposed noise sensitive receptors.

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 and in any external amenity areas.

The assessment determined that higher specification glazing would be required to control internal noise levels along certain facades. A whole dwelling ventilation system is required for all plots.

Limits have been set on any proposed fixed plant items to protect the proposed and existing noise sensitive receptors.

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

END OF REPORT

APPENDIX I
GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

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

ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L_{90} is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
FIGURES

Figure 1 - Noise Measurement Positions

Project:
Conod's Yard/Barons Cross Garage, Leominster

Project-No:
50-792

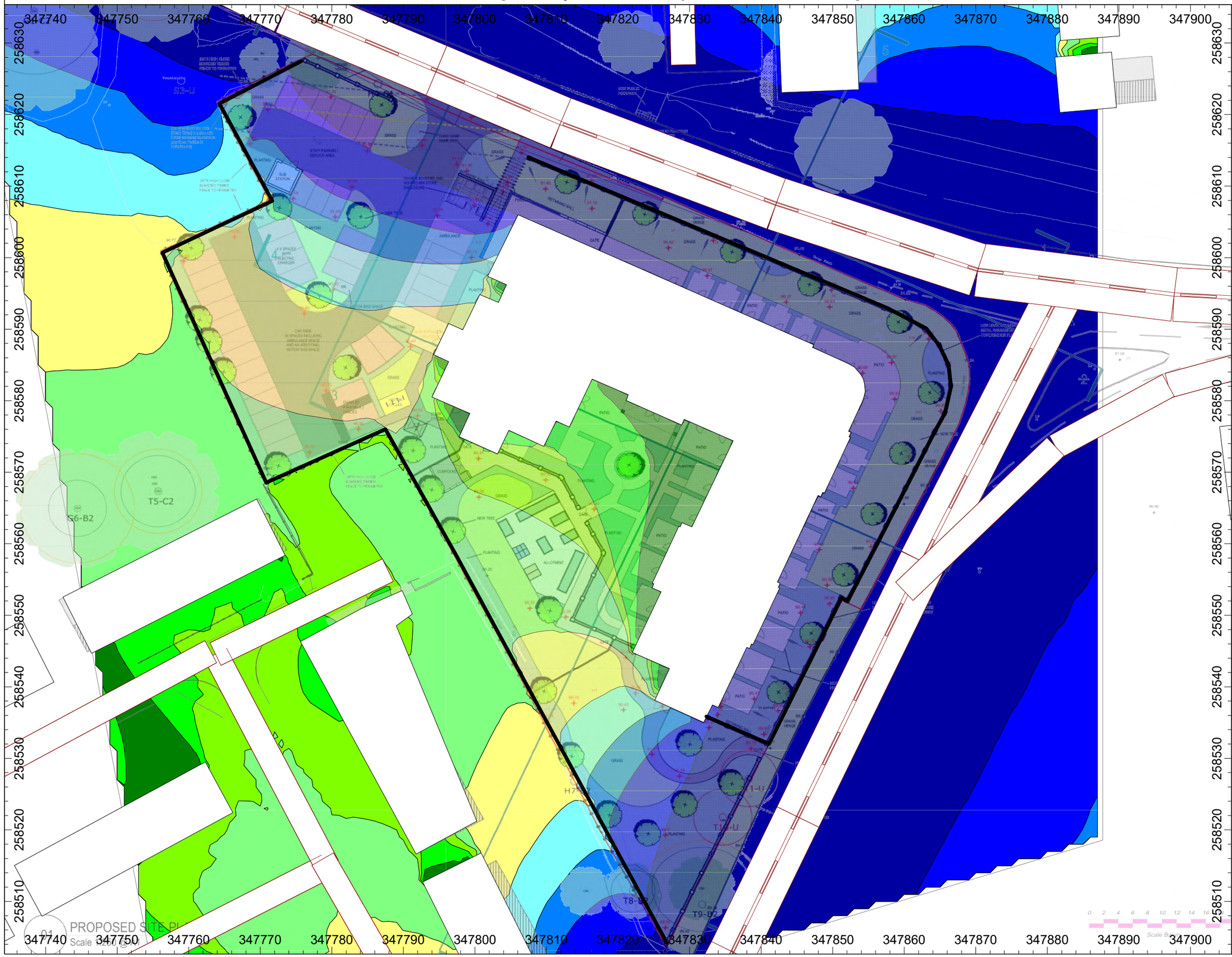
Client:
Muller Property Group

N

e3p

Project Engineer: Melissa Bailey
Date: 30/03/2023

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



Project:
Conod's Yard/Barons Cross G
Leominster

Project-No:
50-792

Client:
Muller Property Group

Daytime Noise Level, LAeq,16hr (dB)

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

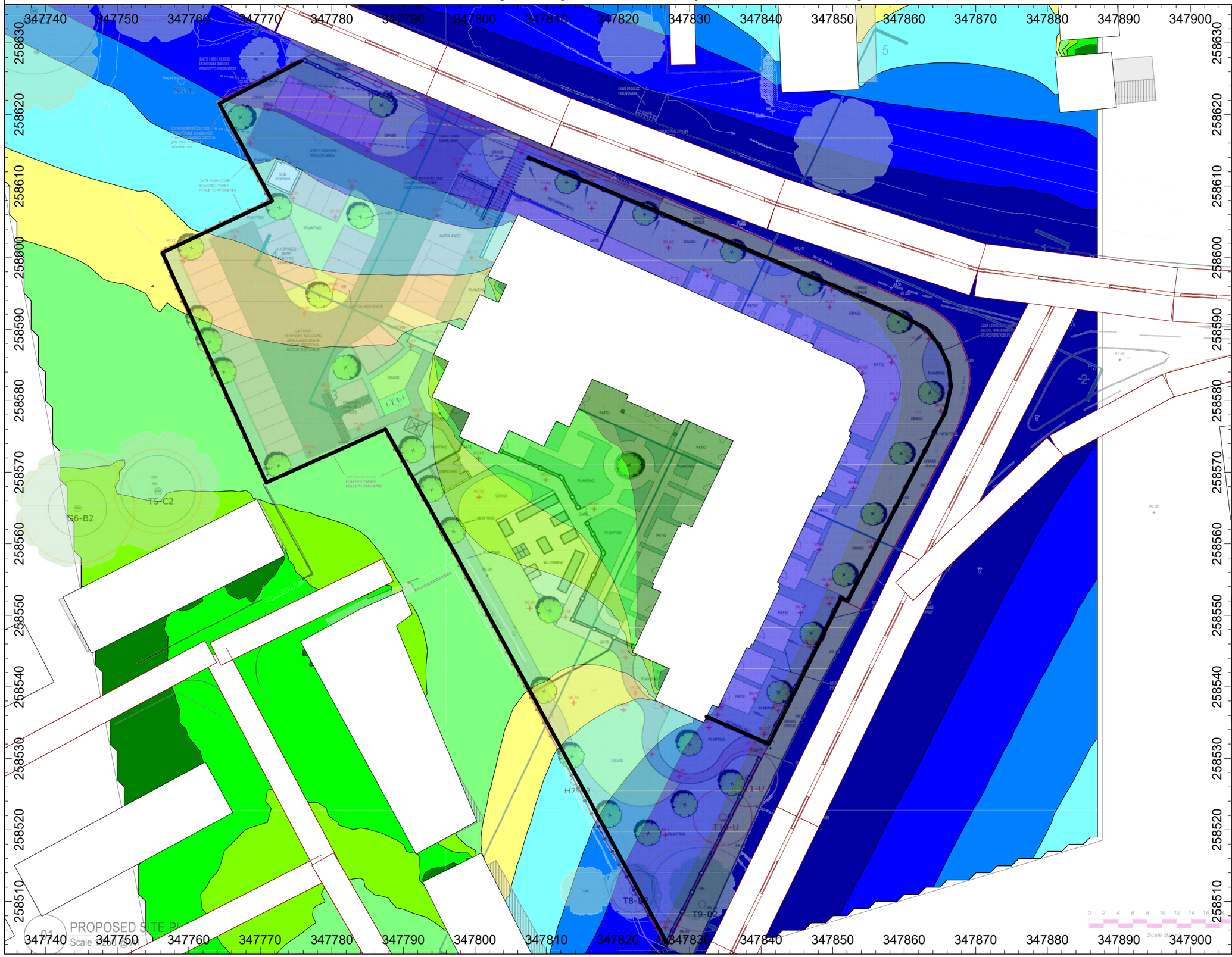
Noise Map Objects

- Road
- Building
- Barrier
- Calculation Area

e3p

Project Engineer: Melissa Bailey
Date: 30/03/2023

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



Project:
Conod's Yard/Barons Cross G
Leominster

Project-No:
50-792

Client:
Muller Property Group

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

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

Noise Map Objects

- Road
- Building
- Barrier
- Calculation Area

e3p

Project Engineer: Melissa Bailey
Date: 30/03/2023

Figure 4 - Facades Requiring Higher Spec Glazing

Project:
Conod's Yard/Barons Cross Garage, Leominster

Project-No:
50-792

Client:
Muller Strategic Projects Ltd

N

e3p

Project Engineer: L Faulkner
Date: 26/09/2023

MÜLLER