# Noise Impact Assessment

55 – 57 Liverpool Road North, Maghull

Reference: 50-942-R1-1

Date: September 2023

# NOISE IMPACT ASSESSMENT

55 – 57 Liverpool Road North
Maghull

Prepared for:

**AK Building Contractors (Merseyside) Ltd**

**Report Ref: 50-942-R1-1**
**Date Issued: 19th September 2023**

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## QUALITY ASSURANCE

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|---|---|---|---|
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| **DATE** | 19th September 2023 | | |
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# EXECUTIVE SUMMARY

## BACKGROUND

| | |
|---|---|
| **Site Address** | 55 - 57 Liverpool Rd N, Maghull, Liverpool L31 2HF |
| **National Grid Reference** | E 337374 N 402493 |
| **Proposed Development** | Proposed conversion of existing office unit to mixed-use development across three floors with associated access and landscaping. |
| **Report Objectives** | The objectives of this report are to:<br>• Identify, measure and assess the potential impact of any existing noise sources in the immediate vicinity of the Site upon proposed residential receptors.<br><br>The report follows current and relevant British Standards to provide a robust assessment. |

## ASSESSMENT

| | |
|---|---|
| **Surveys Completed** | An unattended road traffic sound survey has been conducted for both Liverpool Road North and Westway.<br><br>An unattended background and ambient sound survey has been conducted to capture patron sound from the public house located to the south of the site. This location is also representative of the existing background sound climate. |
| **Assessments** | A 3D noise model has been constructed to assess road traffic and patron sound impact across the site and incident upon all facades and floors. Noise levels have been assessed in accordance with BS 8233:2014.<br><br>It was noted that an external public house seating area is established to the south of the proposed development. As such, worst-case assumptions have been made with all seating full and people talking with raised voices. |
| **Mitigation Requirements** | The assessment determined that higher specification glazing would be required to control internal noise levels across certain facades. A whole dwelling ventilation system is assumed to be installed across the site in accordance with Part F.<br><br>The assessment has shown that a full overheating assessment is required as the opening of windows is not a suitable method for the mitigation of overheating due to unacceptable noise levels.<br><br>Fixed plant noise limits have been set for any newly proposed fixed plant items.<br><br>Recommendations of appropriate sound insulation between rooms has also been provided as per Approved Document E. |

## 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 AK Building Contractors (Merseyside) Limited to undertake a Noise Impact Assessment for a proposed conversion of existing offices to a mixed-use development at 55 to 57 Liverpool Road North in Maghull, 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 convert an existing office building to a mixed-use scheme comprising of 6 residential units across three floors, with office spaces to be retained on the ground floor.

The key sources of sound impacting upon the Site is road traffic sound associated with, Liverpool Road North and Westway and patron noise associated with the Public House external seating area to the south of the site.

## 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 8233:2014 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

### 2.3.1. NOISE CRITERIA LIMITS

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

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

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

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

BS 8233 goes on to recommend noise levels for gardens:

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

BS 8233 goes on to say:

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

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

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

> *1.9 The ventilation strategy in this approved document relies on a combination of all of the following.*
>
> *a. Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms and kitchens), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.*
>
> *b. Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.*
>
> *c. Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).*
>
> *1.10 Ventilation may be delivered through natural ventilation, mechanical ventilation or a combination of both.*
>
> *1.11 The ventilation systems in this approved document are examples of systems that comply with Part F of the Building Regulations. Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance.*

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

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

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

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

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

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

> *3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).*
>
> *3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.*
>
> *a. 40dB $L_{Aeq,T,}$ averaged over 8 hours (between 11pm and 7am).*
> *b. 55dB $L_{AFmax,}$ more than 10 times a night (between 11pm and 7am).*
>
> *3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants'*
>
> *Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.*
>
> *NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020)*

## 2.6. 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 Liverpool Road North and Westway. As such, E3P carried out a 24-hour Calculation of Road Traffic Noise (CRTN) measurement for both roads. Alongside road traffic noise, an external seating area associated with a public house was also noted and a full weekday weekend ambient and background sound survey was conducted to account for this noise source.

## 3.2. ROAD TRAFFIC SOUND MEASUREMENT – LIVERPOOL ROAD NORTH

E3P have undertaken a road traffic sound survey in accordance with the procedure given in Calculation of Road Traffic Noise (CRTN) during a typical weekday period, over a full 24 hours. The survey was undertaken during the following period:

- 15:00 Wednesday 6th September 2023 to 15:00 Thursday 7th September 2023.

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

- Noise Measurement Position 1 (NMP1): Located out of a 2nd floor window of the existing building, on the eastern boundary of the site approximately 19 m from the roadside edge. The microphone was located at a height of approximately 7 m above ground level and in facade conditions. Sound sources consisted of road traffic along Liverpool Road North.

Table 3.1 details the measured sound pressure levels.

TABLE 3.1 MEASURED ROAD TRAFFIC SOUND LEVELS – LIVERPOOL ROAD NORTH (FAÇADE CONDITIONS)

| MEASUREMENT START TIME | MEASURED SOUND PRESSURE LEVELS (dB) | | | |
|---|---|---|---|---|
| | $L_{Aeq,T}$ | 10th Highest $L_{Amax,fast}$ | $L_{A90,T}$ | $L_{A10,T}$ |
| 15:00 | 67.0 | N/A | 59.5 | 67.7 |
| 16:00 | 66.4 | | 60.0 | 68.0 |
| 17:00 | 66.2 | | 59.8 | 67.9 |
| 18:00 | 67.3 | | 59.3 | 68.5 |
| 19:00 | 71.3 | | 58.5 | 68.8 |
| 20:00 | 65.8 | | 56.6 | 66.6 |
| 21:00 | 63.6 | | 53.0 | 65.2 |
| 22:00 | 60.2 | | 48.7 | 62.9 |
| 23:00 | 59.2 | 77.8 | 45.8 | 61.2 |
| 00:00 | 54.0 | | 43.0 | 56.7 |
| 01:00 | 51.1 | | 39.1 | 51.6 |
| 02:00 | 51.4 | | 41.2 | 51.9 |
| 03:00 | 51.9 | | 39.8 | 52.6 |
| 04:00 | 53.7 | | 41.6 | 55.1 |
| 05:00 | 59.4 | | 45.7 | 61.1 |
| 06:00 | 62.3 | | 52.1 | 65.9 |
| 07:00 | 66.0 | N/A | 58.5 | 68.6 |
| 08:00 | 66.8 | | 60.5 | 69.1 |
| 09:00 | 65.4 | | 58.8 | 68.0 |
| 10:00 | 65.1 | | 58.4 | 67.5 |
| 11:00 | 65.2 | | 58.5 | 67.8 |
| 12:00 | 64.8 | | 58.6 | 67.3 |
| 13:00 | 66.0 | | 58.2 | 67.2 |
| 14:00 | 64.7 | | 58.5 | 67.2 |
| **Derived Daytime Noise Level, $L_{Aeq,16hr}$** | | | | **66.3** |
| **Derived Night-time Noise Level, $L_{Aeq,8hr}$** | | | | **57.3** |

## 3.3. ROAD TRAFFIC SOUND MEASUREMENT – WESTWAY

E3P have undertaken a road traffic sound survey in accordance with the procedure given in CRTN during a typical weekday period, over a full 24 hours. The survey was undertaken during the following period:

- 15:00 Wednesday 6th September 2023 to 15:00 Thursday 7th September 2023.

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

- Noise Measurement Position 2 (NMP2): Located out of a 2nd floor window of the existing building, on the northern boundary of the site approximately 4 m from the roadside edge. The microphone was located at a height of approximately 7 m above ground level and in facade conditions. Sound sources consisted of road traffic along Westway.

Table 3.2 details the measured sound pressure levels.

TABLE 3.2 MEASURED ROAD TRAFFIC SOUND LEVELS – WESTWAY (FAÇADE CONDITIONS)

| MEASUREMENT START TIME | MEASURED SOUND PRESSURE LEVELS (dB) | | | |
|---|---|---|---|---|
| | $L_{Aeq,T}$ | 10th Highest $L_{Amax,fast}$ | $L_{A90,T}$ | $L_{A10,T}$ |
| 15:00 | 67.8 | N/A | 58.9 | 71.1 |
| 16:00 | 68.1 | | 59.7 | 70.8 |
| 17:00 | 67.8 | | 59.7 | 70.9 |
| 18:00 | 67.6 | | 58.3 | 70.8 |
| 19:00 | 69.7 | | 57.3 | 70.6 |
| 20:00 | 68.6 | | 54.5 | 67.8 |
| 21:00 | 62.2 | | 50.0 | 65.4 |
| 22:00 | 60.0 | | 44.9 | 61.8 |
| 23:00 | 57.6 | 80.1 | 38.8 | 59.7 |
| 00:00 | 52.1 | | 35.9 | 55.1 |
| 01:00 | 50.3 | | 35.0 | 50.4 |
| 02:00 | 48.2 | | 34.7 | 48.4 |
| 03:00 | 51.1 | | 35.2 | 51.7 |
| 04:00 | 53.6 | | 36.1 | 52.9 |
| 05:00 | 58.9 | | 41.0 | 59.3 |
| 06:00 | 63.9 | | 47.7 | 65.4 |
| 07:00 | 67.3 | N/A | 57.2 | 71.2 |
| 08:00 | 68.7 | | 60.8 | 72.3 |
| 09:00 | 67.9 | | 57.9 | 70.9 |
| 10:00 | 66.9 | | 57.2 | 70.2 |
| 11:00 | 67.3 | | 57.4 | 70.7 |
| 12:00 | 65.9 | | 57.8 | 69.8 |
| 13:00 | 67.1 | | 57.4 | 70.0 |
| 14:00 | 77.1 | | 55.8 | 70.7 |
| **Derived Daytime Noise Level, $L_{Aeq,16hr}$** | | | | **69.2** |
| **Derived Night-time Noise Level, $L_{Aeq,8hr}$** | | | | **57.5** |

## 3.4. UNATTENDED BACKGROUND AND AMBIENT SOUND SURVEY

E3P has conducted a full weekday and weekend ambient and background Sound Survey in order to quantify the existing levels of background and ambient sound at a position considered representative of the closest proposed residential receptors. This location was also used to gather ambient sound data associated with the Public Houses' beer garden.

The survey was carried out over the following period:

- 15:00 Thursday 7th August to 13:00 Monday 11th August 2023.

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

- Noise Measurement Position 3 (NMP3): Located out of a 2nd floor window of the existing building, on the southern boundary, with line of sight to the beer garden area. The microphone was located at a height of approximately 7 m above ground level and in facade conditions. Sound sources here were dominated by road traffic sound along Liverpool Road North and patron sound from the beer garden when in use.

Table 3.3 details the range of measured background and ambient sound levels. The daytime levels correspond to the $L_{A90,1hr}$ and the night-time levels to the $L_{A90,15mins}$.

TABLE 3.3 RANGE OF MEASURED BACKGROUND AND AMBIENT SOUND PRESSURE LEVELS

| DATE | ASSESSMENT PERIOD | RANGE OF MEASURED BACKGROUND SOUND LEVELS, $L_{A90,T}$ (dB) | RANGE OF MEASURED AMBIENT SOUND LEVEL, $L_{Aeq,T}$ (dB) |
|---|---|---|---|
| **THURSDAY 7th SEPTEMBER 2023** | Day (15:00 – 23:00) | 52.4-56.0 | 56.7-62.4 |
| | Night (23:00 – 07:00) | 40.6-53.4 | 47.8-59.7 |
| **FRIDAY 8th SEPTEMBER 2023** | Day (07:00 – 23:00) | 49.5-55.8 | 56.5-61.0 |
| | Night (23:00 – 07:00) | 30.8-49.6 | 46.1-58.0 |
| **SATURDAY 9th SEPTEMBER 2023** | Day (07:00 – 23:00) | 49.1-55.3 | 55.8-63.4 |
| | Night (23:00 – 07:00) | 36.9-52.2 | 49.0-59.6 |
| **SUNDAY 10th SEPTEMBER 2023** | Day (07:00 – 23:00) | 44.8-55.3 | 53.7-60.7 |
| | Night (23:00 – 07:00) | 35.9-50.8 | 46.7-63.0 |
| **MONDAY 11th SEPTEMBER 2023** | Day (07:00 – 13:00) | 52.7-54.1 | 59.8-61.9 |

The full hourly data set can be found in Appendix II of this report.

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

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 | CALIBRATION DUE DATE |
|---|---|---|---|---|
| NMP1 | Sound Level Meter | 01dB Fusion | 12039 | 30/07/2025 |
| | Pre-amplifier | 01dB Pre22 | 1805124 | |
| | Microphone | GRAS 40CE | 330832 | |
| | Calibrator | 01dB Cal31 | 87281 | 26/01/2024 |
| NMP2 & 3 | Sound Level Meter | 01dB Fusion | 14616 | 29/06/2024 |
| | Pre-amplifier | 01dB Pre22 | 20951 | |
| | Microphone | GRAS 40CD | 494264 | |
| | Calibrator | Cirrus CR 515 | 99206 | 03/08/2024 |

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. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2023 MR2, to determine the impact of noise from road traffic and patron sound.

The following inputs have been included in the model:

- Proposed Plans (Ground Floor, First Floor and Second Floor internal layouts) dated received 18th September 2023.
- Liverpool Road North and Westway are calibrated using NMP1 and NMP2 respectively.
- Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- Existing buildings are included.
- A reflection order of 2 has been used in all calculations.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

Apart from road traffic sound, the other main sources of sound impacting upon the proposed development is an outdoor seating area associated with a public house both located to the immediate south of the proposed development. The proposed development has no external terraces, balconies or external spaces to be used for relaxation, within the design and, as such, BS 8233:2014 is considered the most appropriate as the residents impacted will be inside.

A methodology for assessing and calculating the noise from small or medium sized crowds is proposed by Hayne, Rumble and Mee (2006), which has been applied to noise from patrons using the external seating area associated with the public house to the south and compared to the highest hourly measured levels over the weekend. Hayne et al (2006) state that the A-weighted sound power level of crowd noise is a function of the following variables:

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

The public house is noted to close at midnight three days a week and so the external seating area associated with the pub has only been assessed during the daytime and night-time periods.

Currently there is outside seating for 72 patrons. The seating area is inputted as individual point sources, accounting for 36 people each, having a conversation with raised voices. A total of 18-point sources are inputted to account for 36 people all talking, in tables of 4, with raised voices for 100% of the hour. This allows for a 2-way conversation between 72 people.

A sound pressure level of 66 dB for raised speaking, at 1 m, is used and factored up to 2 people via a simple 10 log (number of people) calculation. This results in a sound power level of 79 dB per table of 4 people. No directivity correction is applied.

The measured highest daytime 1-hour $L_{Aeq,}$ during the times the public house is open, was found to be 61 dB and the highest night-time 15-minute $L_{Aeq}$ between 23:00 and 00:00 when the public house is open within the night-time period was found to be 59 dB as such the model has been calibrated to reflect these levels. Therefore, the assessment can be considered worst case.

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

## 4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

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

## 4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards 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 29 dB $R_W$ ($C_t$:-1;$C_{t,r}$ -4). The primary noise impact here is road traffic for northern facades and noise from external seating area for southern facades, with road traffic sound likely dominant at all facades and, as such, the $C_{t,r}$ correction is applied which accounts for road traffic. 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 (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. The highest predicted day and night façade levels here are 67 dB and 59 dB respectively. As such, higher specification glazing will be required for certain facades.

It is also important to consider the maximum noise levels during the night-time period. The 10th highest measured level along Liverpool Road North was 75 dB $L_{Amax,fast}$. When considering a sound reduction of 29 dB for standard glazing, this results in an internal noise level of 46 dB, 1 dB above the criterion.

The 10th highest measured level along Westway was 78 dB $L_{Amax,fast}$. When considering a sound reduction of 31 dB for standard glazing, this results in an internal noise level of 47 dB, 3 dB above the criterion.

As such, higher specification glazing will be required for facades with line of sight to Westway and Liverpool Road North to attenuate maximum noise level events from road traffic noise. Figure 4 details the facades where maximum noise levels are above the external criteria of 74 dB.

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

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.

### 4.2.2. 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, all apartments experience an exceedance of the above criterion. As such a full overheating assessment will be required for all apartments and should be completed by a suitably qualified consultant.

# 5. MITIGATION

## 5.1. FAÇADE INSULATION

The previous section determined that a whole dwelling ventilation system in accordance with Part F would be installed across the site as it is assumed natural ventilation is not appropriate for these dwellings.

The assessment has shown that higher specification glazing will be required for certain facades. Figures 5.1 and 5.2 below detail where higher specification glazing is required and what specific glazing is needed to control internal noise levels.

FIGURE 5.1 LOCATION OF HIGHER SPECIFICATION GLAZING (FIRST FLOOR)

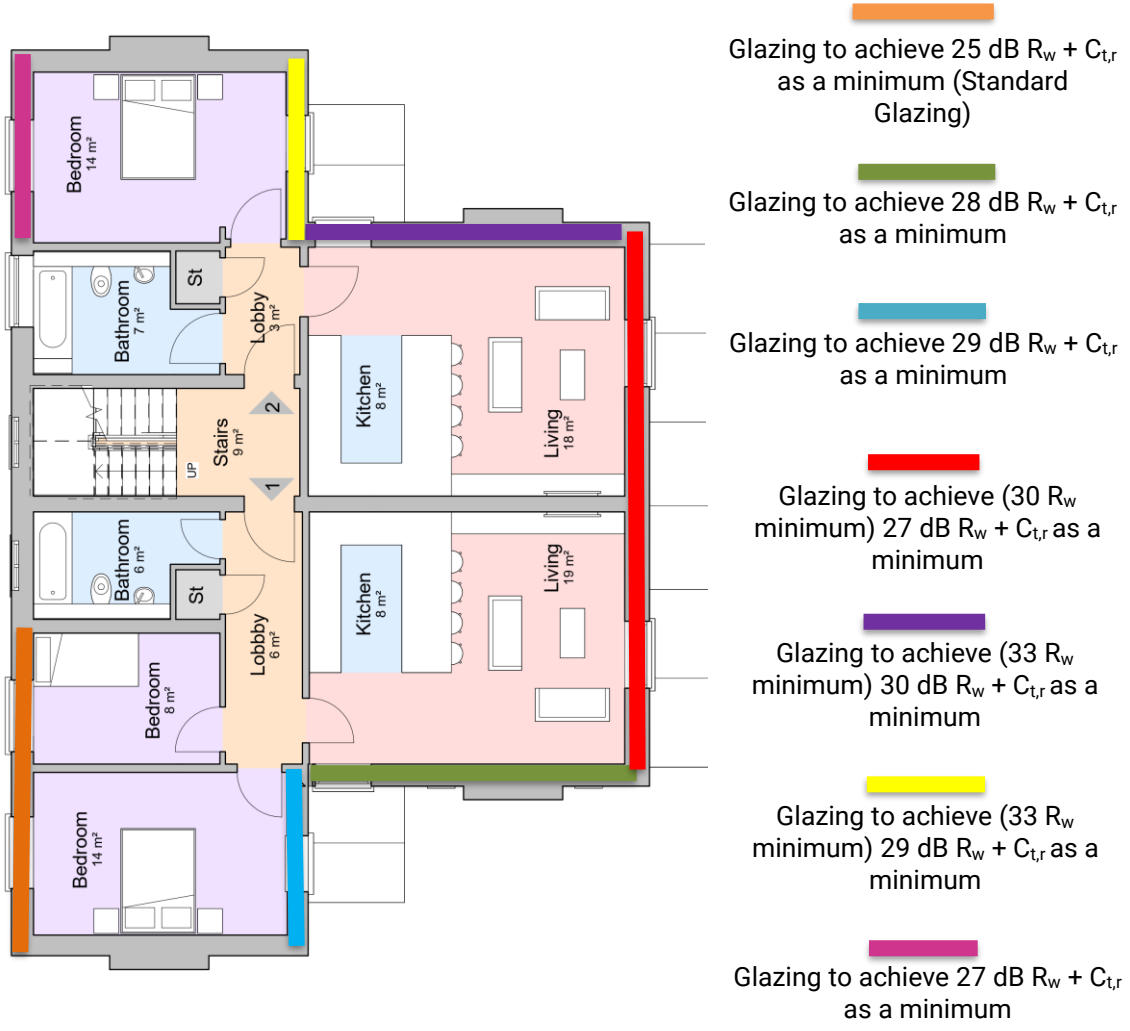
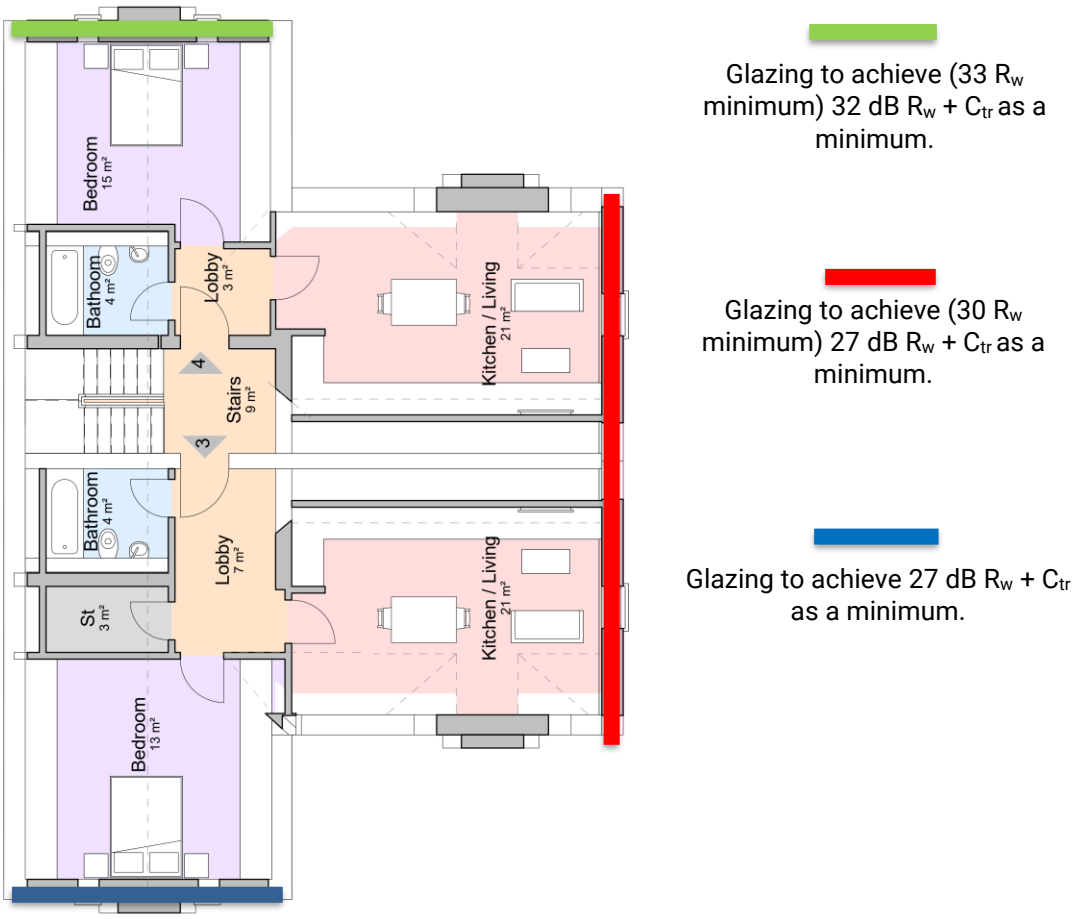


FIGURE 5.2 LOCATION OF HIGHER SPECIFICATION GLAZING (SECOND FLOOR)




This report has also shown that the opening of windows cannot be used a suitable method for mitigating overheating within the proposed dwellings. A full overheating assessment is required and should be completed by a suitably qualified consultant.

Any trickle ventilators that are part of the whole dwelling ventilation system must achieve at least the sound reduction provided by the glazing, in the open position. Standard thermal double glazing is sufficient across the site.

## 5.2. INTERNAL SOUND INSULATION

Due to the mixed nature of the development and due to existing office spaces being converted to residential apartments consideration to sound insulation between rooms and other occupied areas is required.

Table 5.1 details the sound insulation requirements required between spaces for dwellings-houses and flats formed by material change of use as outlined in Approved Document E.

TABLE 5.1 APPROVED DOCUMENT E – SEPARATING WALL AND FLOOR CRITERIA FOR DWELLINGS AND FLATS FORMED BY MATERIAL CHANGE OF USE

| | **Airborne Sound Insulation $D_{nt,w} + C_{tr}$ dB (Minimum values)** | **Impact Sound insulation $L'_{nT,w}$ dB (Maximum values)** |
|---|---|---|
| **Dwelling-houses and flats formed by material change of use** | | |
| **Walls** | 43 | - |
| **Floors** | 43 | 64 |

Pre-completion testing should be carried out by a suitably qualified acoustician to check compliance with the above requirements.

## 5.3. PROPOSED FIXED PLANT

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 should be located within the site and not located on façades that are orientated towards the noise sensitive receptors.
- The resultant rating level from the cumulative impact of all proposed fixed plant items must not exceed the existing background sound levels, 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.

# 6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by AK Building Contractors (Merseyside) Limited to undertake a Noise Impact Assessment for a proposed conversion of existing offices to a mixed-use development at 55 to 57 Liverpool Road North in Maghull.

An unattended road traffic sound survey has been conducted for both Liverpool Road north and Westway.

An unattended background and ambient sound survey has been conducted to capture patron sound from the public house located to the south of the site. This location is also representative of the existing background sound climate.

A 3D noise model has been constructed to assess road traffic and patron sound impact across the site and incident upon all facades and floors. Noise levels have been assessed in accordance with BS 8233: 2014.

It was noted that an external public house seating area is established to the south of the proposed development. As such worst-case assumptions have been made with all seating full and people talking with raised voices.

The assessment determined that higher specification glazing would be required to controlling internal noise levels across certain facades. A whole dwelling ventilation system is assumed to be installed across the site in accordance with part F.

The assessment has shown that a full overheating assessment is required as the opening of windows is not a suitable method for the mitigation of overheating due to unacceptable noise levels.

Fixed plant noise limits have been set for any newly proposed fixed plant items.

Recommendations of appropriate sound insulation between rooms has also been provided as per Approved Document E.

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

# 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
# MEASURED BACKGROUND SOUND LEVELS

TABLE A1: HOURLY AMBIENT AND BACKGROUND SOUND LEVEL DATA

| PERIOD START | AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB) | BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB) |
|---|---|---|
| 07/09/2023 15:00 | 59.8 | 54.6 |
| 07/09/2023 16:00 | 60.3 | 54.7 |
| 07/09/2023 17:00 | 61.5 | 55.7 |
| 07/09/2023 18:00 | 61.4 | 56.0 |
| 07/09/2023 19:00 | 59.6 | 54.9 |
| 07/09/2023 20:00 | 58.7 | 53.5 |
| 07/09/2023 21:00 | 56.7 | 52.4 |
| 07/09/2023 22:00 | 56.8 | 53.0 |
| 07/09/2023 23:00 | 57.4 | 52.1 |
| 08/09/2023 00:00 | 55.6 | 47.5 |
| 08/09/2023 01:00 | 50.2 | 46.8 |
| 08/09/2023 02:00 | 49.0 | 41.7 |
| 08/09/2023 03:00 | 51.0 | 47.0 |
| 08/09/2023 04:00 | 50.6 | 43.9 |
| 08/09/2023 05:00 | 56.2 | 48.3 |
| 08/09/2023 06:00 | 57.9 | 51.3 |
| 08/09/2023 07:00 | 61.0 | 54.3 |
| 08/09/2023 08:00 | 60.8 | 55.8 |
| 08/09/2023 09:00 | 60.5 | 54.8 |
| 08/09/2023 10:00 | 59.4 | 53.6 |
| 08/09/2023 11:00 | 59.5 | 53.3 |
| 08/09/2023 12:00 | 59.4 | 53.1 |
| 08/09/2023 13:00 | 59.5 | 53.7 |
| 08/09/2023 14:00 | 59.3 | 53.6 |
| 08/09/2023 15:00 | 59.4 | 54.0 |
| 08/09/2023 16:00 | 60.2 | 54.2 |
| 08/09/2023 17:00 | 59.9 | 54.4 |
| 08/09/2023 18:00 | 59.8 | 55.0 |
| 08/09/2023 19:00 | 59.9 | 55.0 |
| 08/09/2023 20:00 | 59.0 | 53.8 |
| 08/09/2023 21:00 | 57.5 | 52.1 |
| 08/09/2023 22:00 | 56.5 | 49.5 |

| PERIOD START | AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB) | BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB) |
|---|---|---|
| 08/09/2023 23:00 | 55.6 | 49.0 |
| 09/09/2023 00:00 | 56.3 | 46.4 |
| 09/09/2023 01:00 | 50.6 | 40.3 |
| 09/09/2023 02:00 | 49.8 | 37.6 |
| 09/09/2023 03:00 | 48.7 | 35.0 |
| 09/09/2023 04:00 | 49.1 | 36.9 |
| 09/09/2023 05:00 | 51.5 | 39.5 |
| 09/09/2023 06:00 | 53.6 | 44.6 |
| 09/09/2023 07:00 | 58.2 | 49.1 |
| 09/09/2023 08:00 | 58.9 | 51.4 |
| 09/09/2023 09:00 | 59.3 | 51.8 |
| 09/09/2023 10:00 | 63.4 | 53.3 |
| 09/09/2023 11:00 | 60.3 | 53.6 |
| 09/09/2023 12:00 | 59.6 | 53.7 |
| 09/09/2023 13:00 | 59.2 | 53.6 |
| 09/09/2023 14:00 | 60.5 | 54.1 |
| 09/09/2023 15:00 | 59.6 | 53.7 |
| 09/09/2023 16:00 | 60.1 | 54.7 |
| 09/09/2023 17:00 | 60.1 | 55.1 |
| 09/09/2023 18:00 | 60.3 | 55.3 |
| 09/09/2023 19:00 | 59.1 | 53.5 |
| 09/09/2023 20:00 | 58.0 | 52.8 |
| 09/09/2023 21:00 | 57.4 | 52.8 |
| 09/09/2023 22:00 | 55.8 | 52.2 |
| 09/09/2023 23:00 | 54.6 | 45.5 |
| 10/09/2023 00:00 | 53.2 | 47.5 |
| 10/09/2023 01:00 | 52.1 | 41.5 |
| 10/09/2023 02:00 | 51.1 | 39.7 |
| 10/09/2023 03:00 | 49.5 | 39.5 |
| 10/09/2023 04:00 | 50.8 | 39.0 |
| 10/09/2023 05:00 | 51.6 | 47.0 |
| 10/09/2023 06:00 | 56.2 | 46.3 |
| 10/09/2023 07:00 | 55.1 | 49.0 |

| PERIOD START | AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB) | BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB) |
|---|---|---|
| 10/09/2023 08:00 | 57.1 | 50.5 |
| 10/09/2023 09:00 | 57.3 | 50.4 |
| 10/09/2023 10:00 | 60.0 | 54.2 |
| 10/09/2023 11:00 | 60.1 | 54.8 |
| 10/09/2023 12:00 | 59.8 | 54.7 |
| 10/09/2023 13:00 | 60.2 | 55.2 |
| 10/09/2023 14:00 | 59.9 | 55.1 |
| 10/09/2023 15:00 | 59.9 | 55.3 |
| 10/09/2023 16:00 | 60.7 | 54.4 |
| 10/09/2023 17:00 | 59.3 | 53.5 |
| 10/09/2023 18:00 | 58.9 | 53.3 |
| 10/09/2023 19:00 | 59.2 | 52.4 |
| 10/09/2023 20:00 | 58.0 | 51.8 |
| 10/09/2023 21:00 | 54.5 | 47.4 |
| 10/09/2023 22:00 | 53.7 | 44.8 |
| 10/09/2023 23:00 | 57.9 | 43.6 |
| 11/09/2023 00:00 | 50.8 | 42.5 |
| 11/09/2023 01:00 | 51.5 | 46.7 |
| 11/09/2023 02:00 | 48.5 | 37.7 |
| 11/09/2023 03:00 | 49.1 | 38.6 |
| 11/09/2023 04:00 | 51.6 | 41.1 |
| 11/09/2023 05:00 | 54.8 | 43.4 |
| 11/09/2023 06:00 | 57.7 | 49.7 |
| 11/09/2023 07:00 | 61.1 | 53.6 |
| 11/09/2023 08:00 | 60.8 | 54.0 |
| 11/09/2023 09:00 | 60.4 | 52.7 |
| 11/09/2023 10:00 | 61.9 | 53.8 |
| 11/09/2023 11:00 | 59.8 | 53.9 |
| 11/09/2023 12:00 | 60.1 | 54.1 |
| 11/09/2023 13:00 | 60.2 | 54.1 |

# APPENDIX III
# FIGURES

**Figure 1 - Noise Measurement Positions**


**Project:**
**55-57 Liverpool Road North, Maghull**

**Project-No:**
**50-942**

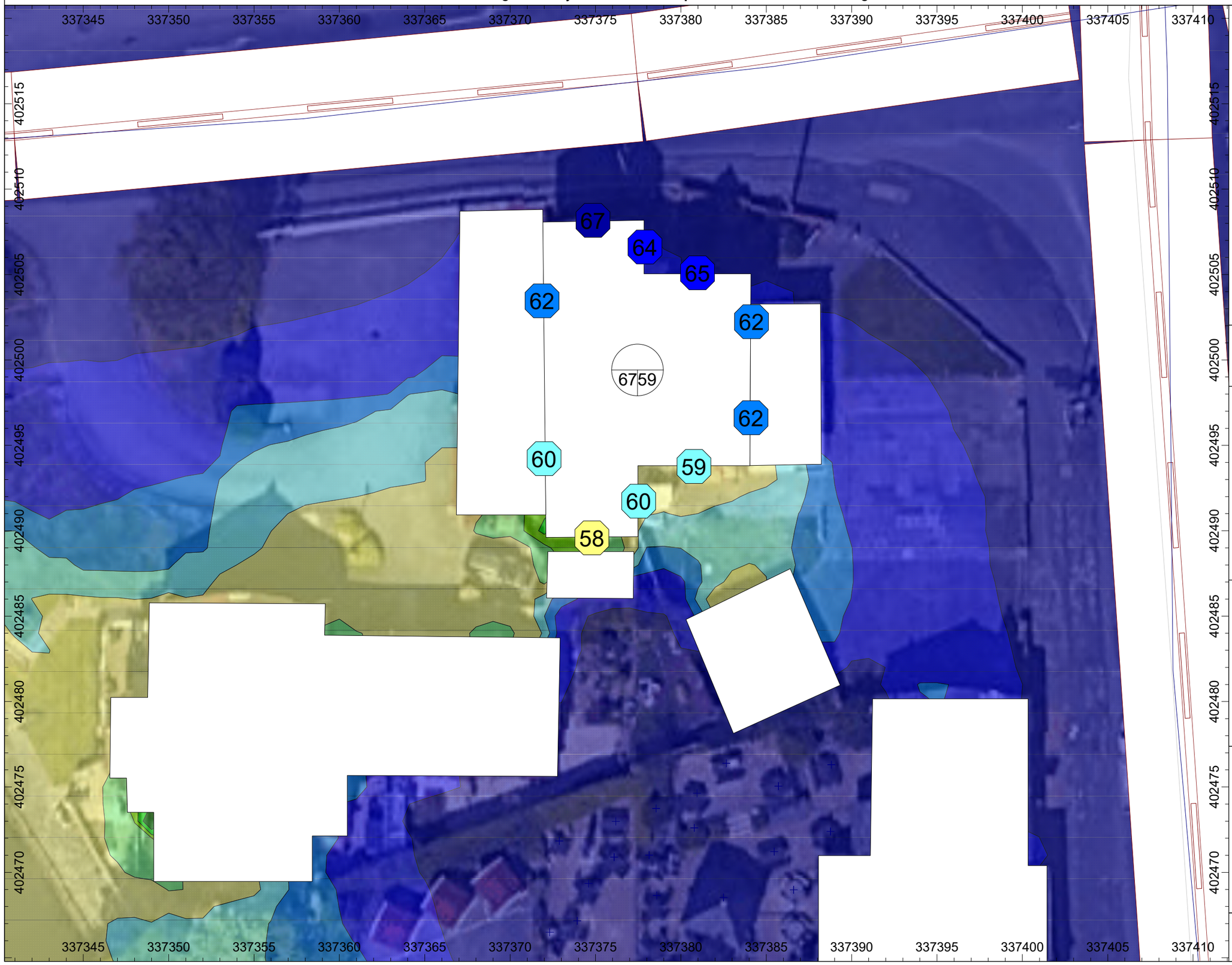
**Client:**
**AK Building Contractors (Merseyside) Ltd**

N

e3p

Project Engineer: Scott Boughton
Date: 19/09/2023

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




**Project:**
**55-57 Liverpool Road North, Maghull**

**Project-No:**
**50-942**

**Client:**
**AK Building Contractors (Merseyside) Ltd**

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

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

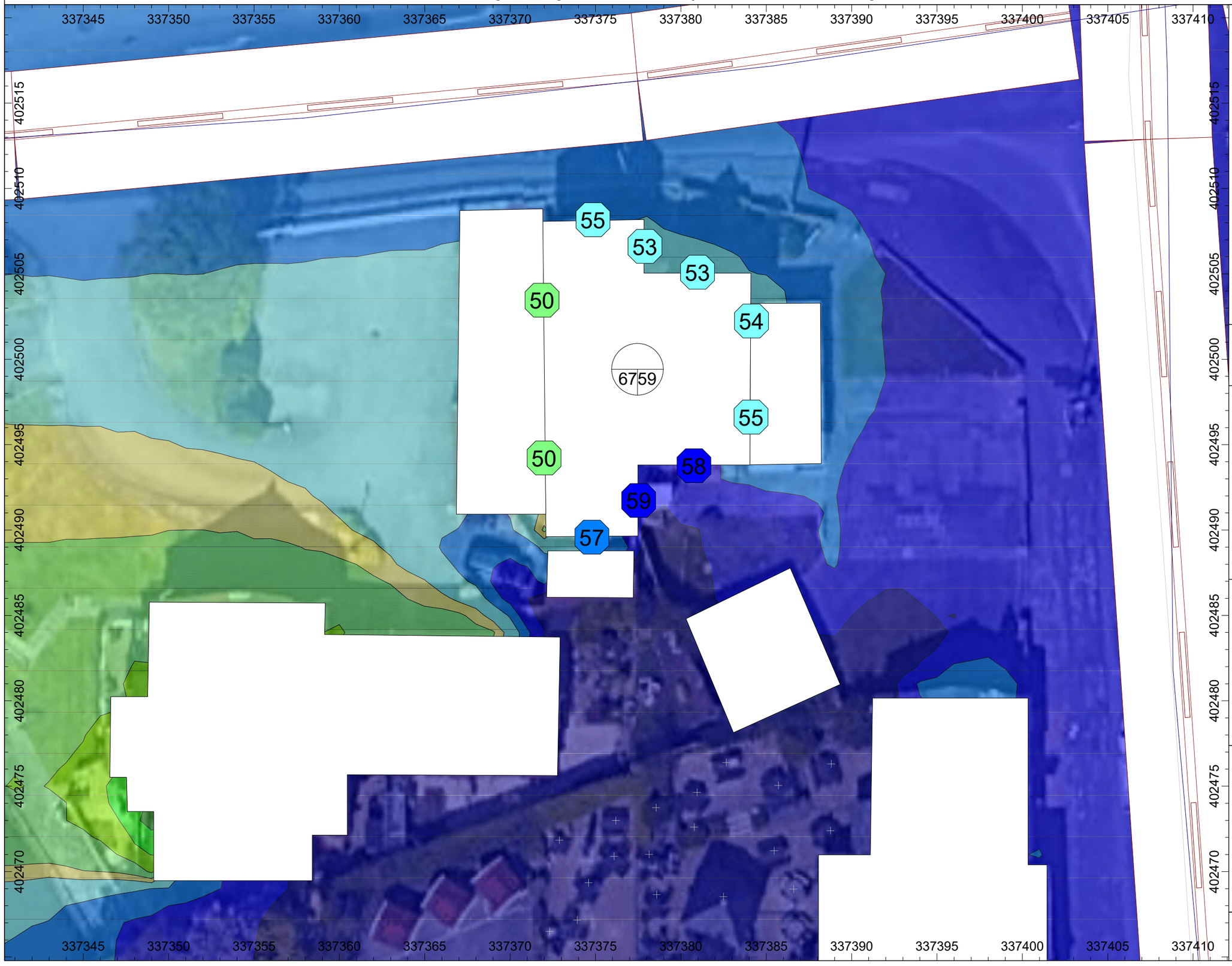
**Noise Map Objects**

- Point Source
- Line Source
- Road
- Building
- Building Evaluation
- Calculation Area

e3p

Project Engineer: Scott Boughton
Date: 19/09/2023

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




**Project:**
**55-57 Liverpool Road North, Maghull**

**Project-No:**
**50-942**

**Client:**
**AK Building Contractors (Merseyside) Ltd**

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

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

**Noise Map Objects**

- Point Source
- Line Source
- Road
- Building
- Building Evaluation
- Calculation Area

e3p

Project Engineer: Scott Boughton
Date: 19/09/2023

**Figure 4 - 10th Highest Night-time Maximum Noise Levels**


**Project:**
**55-57 Liverpool Road N, Maghull**

**Project-No:**
**50-942**

**Client:**
**AK Building Contractors (Merseyside) Ltd**

**Night-time Max Noise Level, LAf,max,1min (dB)**

... <= 74
74 < ...

**Noise Map Objects**

- Point Source
- Line Source
- Road
- Building
- Building Evaluation
- Calculation Area

e3p

Project Engineer: Scott Bought
Date: 19/09/2023