



Land Off Storridge Road, Westbury

Noise assessment for proposed residential development

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1.0 Introduction

- 1.1 Sharps Acoustics LLP (SAL) has been commissioned by Gladman Developments Ltd to undertake a noise assessment for a new residential development on Land off Storridge Road in Westbury.

- 1.2 The development description is:

Outline planning application for the demolition of numbers 5 and 6 Storridge Road and the erection of up to 165 dwellings (including affordable housing), with public open space, structural planting, landscaping, sustainable drainage system (SuDS) and vehicular access point. All matters reserved except for means of access.

Site description

- 1.3 The site is bounded by the West Wiltshire Trading Estate (WWTE) to the north west and Glenmore Farm Stables to the east which has outline planning permission for residential development of up to 145 dwellings. To the south and west are existing houses on Hawkeridge Park, The Ham and Storridge Road. The site and surrounding area are shown in Figure A1 in Appendix A.
- 1.4 This report contains an analysis of relevant national and local planning and noise policy and guidance; provides details of noise survey work carried out; details of surveyed levels; explains how these predicted levels have been increased to demonstrate an absolute worst possible case; provides details of worst case predicted noise levels around the site; and analyses these to provide a detailed assessment of the potential impact of noise from the industrial estate on occupiers of the proposed development.

Background

- 1.5 SAL previously advised in relation to an application at this site for a scheme which included dwellings within land to the north of the current application within its scope. That application, for a scheme which proposed development further north within the application site than that proposed through the current application, was refused on appeal (PINS appeal reference APP/Y3940/W/24/3340811).
- 1.6 In his decision, the Inspector stated that, in his view, the proposed internal and external noise levels would be acceptable (and that these levels were achievable with the proposed scheme design) stating:

"It is common ground, and I agree, that acceptable, ie below LOAEL, internal noise levels could be achieved within all proposed residential properties with windows closed, subject to control of the specification of the windows by condition. However, an area in dispute between the main parties is whether or not expecting the residents of some of the proposed properties to need to close their windows in order to achieve this suitable noise environment, ie to minimise and mitigate the noise above the LOAEL thresholds in accordance with policy and guidance, is an acceptable approach."

- 1.7 The levels referred to are presented in paragraphs 2.54 to 2.55 below.
- 1.8 However, the Inspector referred to two key concerns in his decision to refuse the appeal, which were:
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- He found that, to meet the agreed internal noise levels, windows to some of the dwellings would need to be closed. This, the Inspector said, would result in “a general feeling of airlessness” which he said would not be acceptable.
- He considered that the assessment had not fully considered the mitigation which would be required to take account of possible future increases in noise from the WWTE, contrary to the requirements of the “agent of change” principle.

Open or closed windows

- 1.9 In relation to the use of closed windows as a suitable noise mitigation measure, the Inspector stated that:

“It is therefore clear that policy and guidance, whilst not always supportive, does not explicitly prevent the use of closed windows as part of the mitigation strategy relating to noise pollution. However, the effect such a strategy might have on the living conditions of future occupants must be carefully considered. For example, the number of closed windows and affected rooms and dwellings, how long and the frequency that they need to be closed, and the general feeling of airlessness that it could create.”

- 1.10 He concluded:

“It has been demonstrated that the appeal site has the capacity to accommodate the proposed noise mitigation works in the sense of the noise bunds and other physical requirements within the layout. However, as set out above, the proposed development proposes residential units on parts of the appeal site where noise from the WWTE would require closed windows to create an acceptable internal environment. This would create unacceptable internal living conditions for future occupiers.”

- 1.11 Wiltshire Council officers have stated that, in their opinion, noise levels in every living room or bedroom at this development should be assessed with windows open. Therefore, in this case, the new scheme has been designed to achieve this aim.

Agent of Change / possible future increase in noise from WWTE

- 1.12 In addition to considering noise from the existing operations at WWTE, our previous assessment considered what might occur if operators at the WWTE were to expand their operations as much as was feasible and realistic, to consider an absolute worst case. This point was considered at the appeal and the Inspector found that, since there were no restrictions on the uses which might occur at the WWTE, noisier uses could be introduced than those which we had assumed. Whilst acknowledging that there would be a constraint on the possible uses due to there being existing dwellings in the area, he judged that the previous assessment had not fully taken account of the possible increase in noise which could occur and, thus, the assessment had failed to meet the requirements in the NPPF to consider the agent of change principle. In relation to this, he stated:

"It has not therefore been satisfactorily demonstrated that the proposal would not create potential future risks to the operation of the WWTE with regard to noise pollution and the agent of change principle."

Changes to proposed development

- 1.13 Significant changes have therefore been made to the scale of the proposed development, the scheme design and the approach to the assessment. These changes are:
- The area of land to be developed for housing has been reduced, with the northern-most portion removed.
 - A row of dwellings (a barrier block) is now placed along the northern boundary of the proposed layout, to provide noise screening.
 - The layout and orientation of the proposed dwellings have been designed to ensure that living rooms and bedrooms can be sited facing away from the WWTE, so far as possible.
 - Instead of designing to levels known or assumed (as a worst case) to be present at the WWTE, the level of noise from the WWTE has been artificially increased to the point where, if it were to increase any further, there would be an adverse effect at existing dwellings. We have then used that emission level to predict "worst theoretical case" levels at the proposed development.
- 1.14 The proposed layouts have been discussed with the Council, and they have requested that some alternative design options be considered in relation to the design of the barrier block to the north of the site. These alternatives have also been considered within this assessment.

Venom night club

- 1.15 Our previous assessment considered noise from Venom night club, which is a venue located within WWTE, some 500m from the northernmost boundary of this application site in some detail and we found that no noise mitigation was required within that scheme design.
- 1.16 The noise impact of this venue was considered at the appeal and the Inspector found that:

"Indoor events at the nightclub do not result in harmful levels of noise above background noise levels on the appeal site. The outdoor events could cause some level of harmful noise pollution, particularly because loud music can be particularly harmful to well being through, for example, bass music and its particular location in the octave range. However, this is strictly controlled to up to three events per year. In addition, the nightclub's licensing restrictions control the noise from the nightclub and, in effect, provide the Council with the ability to prevent the nightclub creating any more noise than it does from its current operations. Therefore, whilst there could be some harm to the living conditions of the future occupiers, this would be extremely limited due to the infrequency of the events."

- 1.17 Given this finding and bearing in mind that the closest dwelling is some 100m further away from the club than previously proposed, further assessment of the noise impact of Venom nightclub has been scoped out of this assessment.

2.0 Policy and Guidance

NPPF

- 2.1 The Government's overarching policy in relation to planned development is contained in the National Planning Policy Framework (NPPF).

- 2.2 Paragraph 187 of the NPPF advises that planning policies and decisions should:

"... contribute to and enhance the natural and local environment by ... preventing new and existing development from contributing to, being put at unacceptable risk from ... noise pollution."

- 2.3 Paragraph 198 of the NPPF states that Planning policies and decisions should ensure that any:

"... 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:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life ..."

- 2.4 The NPPF does not provide prescriptive advice on how to avoid noise from giving rise to significant adverse impacts on health and quality of life. Therefore, it is necessary to consider advice in other guidance documents. This advice is discussed below.

- 2.5 In relation to the statement in paragraph 198 of the NPPF about significance, there is a footnote stating:

"See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)". This is the NPSE – discussed below.

- 2.6 Paragraph 200 of the NPPF discusses the responsibilities of the "agent of change", stating that:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

NPSE

- 2.7 The Noise Policy Statement for England was prepared by DEFRA and is dated March 2010.
- 2.8 Paragraph 1.5 of the NPSE states that the advice within the document applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.
- 2.9 The NPSE, paragraph 2.12, explains that the WHO defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”.
- 2.10 The Noise Policy Aims of the NPSE (NPSE paragraphs 2.22 to 2.24) can be summarised as follows:
- avoid significant adverse impacts on health and quality of life...;
 - mitigate and minimise adverse impacts on health and quality of life...; and
 - where possible, contribute to the improvement of health and quality of life.
- 2.11 The NPSE makes a distinction between “quality of life”, which is a subjective measure, and “health”, which refers to physical and mental well-being.
- 2.12 The latest WHO Guidelines (Environmental Noise Guidelines for the European Region, 2018) explain that impacts that may result from noise such as annoyance and sleep disturbance are considered to be “critical health outcomes” and that quality of life, well-being and mental health are “important health outcomes”. Sleep disturbance is also referred to as having an effect on quality of life.
- 2.13 The NPSE introduces the concepts of the “no observed effect level” (NOEL); the “lowest observed adverse effect level” (LOAEL); and a “significant observed adverse effect level” (SOAEL).
- 2.14 It is the last of these criteria – the SOAEL – that is the level above which significant adverse effects on health and quality of life occur. As can be seen from paragraphs 2.3 and 2.10 above, this criterion equates to the first aim of the NPSE and the policy requirement in the NPPF.
- 2.15 The second aim of the NPSE is to mitigate and minimise adverse impacts between LOAEL and SOAEL.
- 2.16 The NPSE does not provide noise guideline values or limits above which SOAEL occurs. Indeed, the document advises that it is not possible to have a single objective noise-based measure that defines SOAEL (NPSE paragraph 2.22). Therefore, it is necessary to refer to other advisory documents in order to seek to define such levels.
- 2.17 The NPSE highlights the importance of considering noise impacts in their proper context, stating:
- “There is a need to integrate consideration of the economic and social benefit of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors.”*
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PPG - Noise

- 2.18 This "Planning Practice Guidance note – Noise" was released on 6th March 2014 and has been updated since, most recently, in relation to noise, in July 2019.
- 2.19 The PPG reinforces the concept of LOAEL and SOAELs discussed above and seeks to define a person's perception at these different effect levels. It describes what is meant by levels below the LOAEL (at the NOEL and NOAEL) under the heading, "How can it be established whether noise is likely to be a concern?", as follows:
- "At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment."* Paragraph: 005 Reference ID: 30-005-20190722. Revision date: 22 07 2019
- 2.20 NPPG describes the NOAEL as:
- "noise can be heard, but does not cause any change in behaviour, attitude or other physiological response ...", whereas at a LOAEL, "noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance."*
- 2.21 Noise levels below the LOAEL are described as *"present and not intrusive"* whereas levels above the LOAEL but below the SOEAL are described as *"present and intrusive"*.
- 2.22 A "significant" effect is described as *"present and disruptive"* resulting in *"a material change in behaviour, attitude or other physiological response ..."*.
- 2.23 The PPG provides a hierarchy of planning actions required for different perceptions and effects of noise. Between LOAEL and SOAEL the recommended action is to mitigate noise and reduce to a minimum. At SOAEL the action recommended is to avoid. These are the same terms used in the NPPF and NPSE. The NPPF, NPSE and NPPG do not ascribe noise levels to any of the effects discussed within the three documents. Therefore, it is necessary to consider other guidance which attributes noise levels to health effects such as annoyance during the day or sleep disturbance at night.
- 2.24 The PPG also gives further consideration relating to mitigating the impact of noise on residential developments and considers that noise may be partially off-set if residents of the dwellings have access to:
- A relatively quiet façade (containing windows to habitable rooms as part of their dwelling)

- A relatively quiet external amenity space for their sole use such as a balcony which is generally considered as desirable
- A relatively quiet nearby external space for use by a number of residents as part of the amenity of their dwellings and / or
- A relatively quiet external, publicly accessible amenity space that is nearby (e.g. within a 5 minute walk).

2.25 The PPG also provides additional guidance in relation to what is required from the “agent of change” in the circumstances described in Paragraph 187 of the NPPF. It states that the “agent of change” must:

“clearly identify the effects of existing businesses that may cause a nuisance (including noise, but also dust, odours, vibration and other sources of pollution) and the likelihood that they could have a significant adverse effect on new residents/users.”

2.26 The Guidance suggests that this applies not only to the activities which are occurring at the time of the application, but also to future permitted activities, even if these are not currently occurring. Proper account must be taken of what might realistically happen at a site in future. The agent of change must:

“define clearly the mitigation being proposed to address any potential significant adverse effects that are identified”.

2.27 Although the guidance suggests that the steps to be taken by the agent of change may not prevent all complaints, it is intended that a satisfactory living environment is achieved and that the risk of a statutory nuisance being found is mitigated.

Local planning policy

2.28 The Wiltshire Core Strategy Development Plan (Adopted January 2015) provides the Council’s overarching planning policy framework for Wiltshire for the period up to 2026. This document replaced the South Wiltshire Core Strategy and a number of policies from the former district council’s local plans, including one Policy in the North Wiltshire Local Plan 2011 which specifically dealt with noise.

2.29 That saved policy is NE18 “Noise and Pollution”, which states:

“Development will only be permitted where it would not generate, or itself be subject to, harm upon public health or cause pollution to the environment by the emission of excessive noise, light intrusion, smoke, fumes, other forms of air pollution, heat, radiation, effluent or vibration.”

2.30 In addition to this, the Plan contains Core Policy 57 “Ensuring high quality design and place shaping” which states:

“A high standard of design is required in all new developments, including extensions, alterations, and changes of use of existing buildings. Development is expected to create a strong sense of place through drawing on the local context and being complementary to the locality. Applications

for new development must be accompanied by appropriate information to demonstrate how the proposal will make a positive contribution to the character of Wiltshire through:

...

vii. having regard to the compatibility of adjoining buildings and uses, the impact on the amenities of existing occupants, and ensuring that appropriate levels of amenity are achievable within the development itself, including the consideration of privacy, overshadowing, vibration, and pollution (e.g. light intrusion, noise, smoke, fumes, effluent, waste or litter)"

Relevant guidance and standards – industrial noise

- 2.31 It is possible to apply objective standards to the assessment of noise and the design of new dwellings. Such guideline values are given in the World Health Organisation (WHO) document "Guidelines for Community Noise", 1999, and within British Standard (BS) 8233:2014 'Guidance on sound insulation and noise reduction for buildings' (BS 8233) which is principally intended to assist in the design of new dwellings.
- 2.32 There is a degree of ambiguity, overlap, and scope for interpretation, within BS8233 and BS4142. Professional judgment is required in applying the inter-twining provisions of these two documents in a way which accords with national planning policy and practice as well as technical guidance. Relevant sections from the two sources of guidance described below to illustrate these overlaps and to explain how SAL consider that they should be interpreted.

BS8233

- 2.33 BS8233 provides recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.
- 2.34 BS8233 contains guidance on desirable external and internal noise levels for new residential developments but notes that the specified "desirable" levels are intended to apply to noise without a specific character. It suggests that:

"Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate."

- 2.35 It does not state what those lower limits should be but suggests using the methods in BS4142 to rate industrial noise, advising at 6.5.2:

"Where industrial noise affects residential or mixed residential areas, the methods for rating the noise in BS 4142 should be applied."

- 2.36 Section 7.7 of the standard provides guidance on levels to be achieved within dwellings in a table setting out “desirable” internal noise levels for “noise without a specific character”. This is reproduced as Table 2.1 below.

Table 2.1 Internal design guideline for noise from BS8233: 2014

Activity	Location	Period	
		Day (0700 to 2300 hours)	Night (2300 to 0700 hours)
Resting	Living Room	35dB $L_{Aeq, 16hr}$	-
Dining	Dining Room	40dB $L_{Aeq, 16hr}$	
Sleeping	Bedroom	35dB $L_{Aeq, 16hr}$	30dB $L_{Aeq, 8hr}$

- 2.37 BS8233 advises that:

"Where a development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal targets may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

And

"These levels are based on annual average data and do not have to be achieved in all circumstances."

- 2.38 In relation to outdoor areas and external amenity areas (gardens and patios), BS8233 suggests that,

"... 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."

- 2.39 However, the standard recognises the need to consider noise alongside other factors such as, *"the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met"*. It advises that where design standards in paragraph 2.36 above cannot be achieved for these traditional amenity spaces then, if a residential development is desirable and in a high noise area, it should, *"be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

BS4142

- 2.40 BS4142 describes a method for rating and assessing sound of an industrial or commercial nature, which includes, in Section 1.1 of the standard:

"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 premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site."

2.41 The industrial or commercial sound is assessed outside of an existing or proposed dwelling or premises used for residential purposes. BS4142 does not consider internal spaces in terms of its numerical assessment.

2.42 The procedure contained in BS4142 begins by quantifying the "specific sound level", which is the measured or predicted level of sound from the source in question over a one-hour period for the daytime or a 15-minute period for the night-time. Daytime and night-time are not defined in BS4142, but the standard notes that they are typically taken to be 0700 to 2300 hours for daytime, and 2300 to 0700 hours for night-time.

2.43 The scope of BS4142 states:

"This standard is applicable to the determination of the following levels at outdoor locations:

a) rating levels for sources of sound of an industrial and/or commercial nature; and

b) ambient, background and residual sound levels,

for the purposes of: ...

... assessing sound at proposed new dwellings or premises used for residential purposes."

2.44 BS4142 contains advice about how to apply a character correction (or "penalty") to a specific industrial or commercial sound to arrive at a rating level which takes account of both their level and character. This enables acoustic features which increase the significance of impact (when compared to sound without specific character) to be considered.

2.45 BS4142 advises that, when considering the introduction of a new noise sensitive receptor to an existing industrial / commercial sound source, one should:

"Measure the background sound at the intended location of any new noise-sensitive receptor(s) in the absence of any specific sound."

2.46 However, and of critical importance, it goes on to advise that:

"Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it should be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in

addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation.” [emphasis added]

2.47 Hence, BS4142:

- Provides a method for rating industrial or commercial sounds so that they can be compared to sounds without specific character in Table 2.1 above.
- Provides a method for assessing background noise levels against which to assess industrial sounds which may occur in future, but which are not currently in operation and which may affect a proposed new residential use. (The responsibility for noise mitigation in this situation will depend on which party is the “agent of change”. The Government has provided guidance in relation to this online).
- Directs the assessor to consider other guidance in addition to or instead of BS4142 where the industrial or commercial sound is extant and forms part of the acoustic environment.

2.48 Where new residential development is proposed adjacent to an industrial or commercial site, the following steps should be taken:

- Measurement of the industrial noise at the proposed site and application of a penalty in accordance with the approach in BS4142.
- Where the industrial or commercial noise is extant, recognising that this forms a component of the acoustic environment. The assessment would then need to:
 - use other guidance and criteria (from BS8233) in addition to or as an alternative to guidance in BS4142, with the levels rated (by adding penalties as recommended in BS4142) to enable a comparison with levels in Table 2.1 above to provide design targets for desirable internal levels; and
 - compare predicted rated levels with guidance on external levels in paragraph 2.36 above, bearing in mind that, if the development is desirable and in a high noise area, it should not be prohibited, even if levels are above those provided as guideline levels.

Summary of guidance on commercial and industrial noise

2.49 BS8233 is the primary source of guidance and assessment criteria for noise effects on proposed new residential developments. BS4142 provides a method for considering the penalties which may be applied to account for sounds with a specific, intrusive character to allow these to be assessed against the guidance in BS8233, which is intended only for sounds without a specific character.

2.50 Noise levels within proposed habitable rooms of dwellings arising from activities at a nearby commercial or industrial site can be reduced to an acceptable level by the introduction of windows and alternative means of ventilation (to enable windows to remain closed) with appropriate acoustic specifications.

2.51 Higher noise levels in external amenity areas (such as residential gardens) from commercial or industrial sites (even those above the upper recommended guideline value from BS8233) should not necessarily

- result in a refusal of planning permission. If the development is otherwise desirable, provided it has been designed to achieve the lowest practicable levels in external amenity spaces, it may be allowed. In such circumstances, where there are residual high levels in external amenity areas, provision of alternative quiet areas nearby would be likely to partially offset this.
- 2.52 It follows, therefore, that where new residential development is proposed adjacent to an industrial or commercial site, the steps described in 2.47 above should be taken.
- 2.53 Since the dominant noise sources in this situation are from the industrial and commercial premises at the West Wiltshire Trading Estate, this is the approach taken in this assessment for these sources.
- 2.54 The target levels for internal spaces reached using this approach, and which were agreed by the Planning Inspector in the appeal were:
- | | |
|--|---------------------|
| Noise in living rooms with windows open (daytime): | 28dB, $L_{Aeq,16h}$ |
| Noise in bedrooms with windows open (night time): | 23dB, $L_{Aeq,8h}$ |
| Noise in gardens (daytime): | 43dB, $L_{Aeq,16h}$ |
- 2.55 Internal noise levels with an open window would be 13dB lower than levels outside the window. Therefore, the target noise levels for external noise would need to be:
- | | |
|---|---------------------|
| Noise outside living rooms with windows open (daytime): | 41dB, $L_{Aeq,16h}$ |
| Noise outside bedrooms with windows open (night time): | 36dB, $L_{Aeq,8h}$ |
| Noise in gardens (daytime): | 43dB, $L_{Aeq,16h}$ |
- 2.56 This approach and these target levels were agreed to be suitable for use as LOAEL values at the previous appeal.

3.0 Noise survey work

- 3.1 Noise survey work was carried out at the site. Measurements on the site were made at the following locations (as shown on Figure A2 in Appendix A):
- MP1 – On the west boundary of the site near to Welton Bibby Baron HGV loading bays
 - MP2 – On the west boundary of the site adjacent to Copart
 - MP3 – On the east boundary of the site
- 3.2 Note that other survey work was also conducted at a number of other locations in connection with the previous application, but since no dwellings are now proposed in the northern part of the site, the results from those locations are not relevant in this case, so have not been reported in this assessment.

- 3.3 Noise measurements at position MP1 were conducted between approximately 13:00 hours on Thursday 3rd August and 09:00 hours on Thursday 10th August 2023. Noise measurements at position MP2 were conducted between approximately 08:30 hours on Friday 25th August and 12:00 hours on Thursday 31st August 2023. Noise measurements at MP3 were conducted between approximately 1410 hours and 1430 hours on Thursday 31st August 2023.
- 3.4 At each measurement position the measurement microphone was mounted on a tripod approximately 1.5m above ground level in free field conditions.
- 3.5 The recording equipment used for the survey was Norsonic 140 Class 1 sound level meters which were calibrated before and after each survey with no significant drift. All sound level meters and calibrators are factory calibrated bi-annually and annually, respectively.
- 3.6 Further attended measurements made offsite during visits to nearby businesses and close to nearby businesses were also conducted using Norsonic 140 and 01dB Fusion Class 1 sound level meters. Calibration checks were carried out before and after each use with no drift.

Weather Conditions

- 3.7 The weather conditions during the attended and unattended measurements of industrial and commercial noise were mostly dry with a slight breeze. Over some periods the weather conditions were wet with wind speeds above 10mph, however, analysis of the data suggests that this has not adversely impacted the measured noise levels, apart from between approximately 01:00 hours and 23:45 hours on the 5th August. Noise levels measured during this period have been removed from the results.

Survey Results

- 3.8 The L_{Aeq} , L_{A10} , L_{A90} and L_{AFmax} results for position MP1, MP2 and MP3 are presented in Table 3.1 below and shown graphically in Figure B1 and B2 in Appendix B for measurement position MP1 and MP2.

Table 3.1: Summary of noise survey results

Position	Period	Sound Pressure Level dB		
		$L_{Aeq,T}$	L_{AFmax}	$L_{A90,T}$
MP1	Daytime (0700 to 2300 hours) 3 rd to 10 th August ⁽¹⁾	42	84	34
	Night-time (2300 to 0700 hours) 3 rd to 10 th August	38	73	31
MP2	Daytime (0700 to 2300 hours) 25 th to 31 st August	43	89	39
	Night-time (2300 to 0700 hours) 25 th to 31 st August	39	70	30
MP3	Daytime (1425 to 1430 hours) 31 st August	41	55	39

Note (1) – Periods of unsuitable weather conditions removed from data

- 3.9 For information purposes it can be noted:

- Measurements of sound level were all made with the A-weighting, which is a filter applied to the sound level meter to simulate the frequency response of the human ear, which is more sensitive to high frequency sound than low.
- L_{Aeq} is the equivalent continuous noise level which is a method of averaging the varying noise level over the measurement period into a single figure value. The L_{Aeq} has the same sound energy as the fluctuating level over that period. The L_{Aeq} is also known as the “ambient level” and in BS4142 the L_{Aeq} in the absence of the proposed development sound is known as the “residual level”.
- L_{Amax} is the highest level within the measurement period.
- L_{A90} is the noise level exceeded for 90% of the time and is referred to as the background noise level.

Description of Noise Climate

- 3.10 During the attended aspects of the surveying, the noise levels at position MP1 were predominantly controlled by faint plant noise emanating from the direction of the West Wiltshire Trading Estate and birdsong. At position MP2 the noise levels were predominantly controlled by plant noise emanating from the direction of SPC, with occasional broadband reverse alarms also audible emanating from the direction of Copart, and occasional tonal reverse alarms and faint bangs emanating from the direction of Baltic Pine.
- 3.11 In addition to the above, occasional planes and trains were noted. Also, intermittent vehicles were noted on Storridge Road and were audible in the south-west corner of the site.

Noise Measurements, Observations and Discussions with adjacent businesses

- 3.12 To conduct a detailed assessment of noise which is currently present at the proposed development site and that which may be present in the future, measurements, discussions and observations were conducted at or close to each business shown in Figure A1 in Appendix A.
- 3.13 Noise levels measured at the adjacent businesses are presented in Table B1 and B2 in Appendix B with on-times for week day and weekend periods, respectively. Octave band data is presented in Table B3 in Appendix B. The location of each of the businesses are shown relative to the development site in Figure A1 in Appendix A.

4.0 Predicted noise levels

Based on measured levels

- 4.1 Noise source levels and on times for day and night (as set out in Section 3.0 above and Tables B1 and B2 in Appendix B) were input to a computer noise model, SoundPLAN along with topographical data and other relevant data in relation to ground conditions and source heights. The model used ISO9613-2 ‘Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation’ (ISO 9613) to predict sound attenuation in the area and across the site.

4.2 Embedded noise mitigation within the model is:

- A 3m bund and 3m screen, as shown in Figure A3.
- All private gardens to be surrounded by 1.8m of a suitable design to screen noise (such as timber fences or masonry walls).

4.3 The scenarios listed in Table 4.1 below were modelled to predict sound propagation across the open development site. Graphics showing the outputs from each are in Figures (as listed in Table 4.1) in Appendix C. Contours are shown at 1.5m above ground level for daytime levels and 4m above ground level for night time levels.

Table 4.1: Modelled scenarios – open site, as measured

Scenario	Graphical output
Typical weekday daytime noise levels – open site	Figure C1
Typical night time noise levels – open site	Figure C2

4.4 Table 4.2 below compares the values in Figures C1, C2 and C3 with measured data from site survey work.

Table 4.2: Comparison of measured and predicted noise levels

Position	Period	L _{Aeq,T} , dB	
		Measured	Predicted
MP1	Daytime (0700 to 2300 hours) 3 rd to 10 th August ⁽¹⁾	42	40
	Night-time (2300 to 0700 hours) 3 rd to 10 th August	38	30
MP2	Daytime (0700 to 2300 hours) 25 th to 31 st August	43	47
	Night-time (2300 to 0700 hours) 25 th to 31 st August	39	35
MP5	Daytime (1425 to 1430 hours) 31 st August	41	42

Note (1) – Periods of unsuitable weather conditions removed from surveyed data

4.5 Modelled noise levels generally show good agreement with measured noise levels, other than for in two situations:

- At night, at MP1 and MP2, the predicted noise level from industrial sound is below the measured noise level. This is due to the fact that, at night, noise from other sources dominates in these

locations. Audio recordings made during the night show that the dawn chorus (and in particular seagull calls) has the greatest impact on overall night time levels.

- During the day at MP2, the measured levels were below those which are predicted. This is due to the model containing a greater level of noise from the cooling towers and AHU which operate at SPC which was shut down during our long term survey work. If this plant were not included in the model, the measured and predicted noise levels from the Trading Estate would match well.

Realistic worst case levels

- 4.6 Noise levels have been predicted at the proposed development based on three alternative proposed development layouts. These layouts are labelled as Options 1, 2 and 3. Option 1 is the layout which has been developed to ensure that no windows to habitable rooms would be exposed to noise levels above the target levels with windows open. Options 2 and 3 are variations on Option 1 with alterations to the barrier block to introduce gaps and to vary its height; the Council requested that these alterations are tested to provide them with information in relation to the potential effects (beneficial or adverse) which would arise as a result of design alterations.
- 4.7 Details and drawings of these layouts are to be provided outside of this report.
- 4.8 The noise model was re-run for each of the layouts, with embedded noise mitigation (as shown in Figure A1) as follows:
- A 3m bund and 3m screen.
 - All private gardens to be surrounded by 1.8m of a suitable design to screen noise (such as timber fences or masonry walls).
- 4.9 Figures D1 to D9 in Appendix D show the resultant output predicting anticipated noise levels if WWTE was operating at capacity, based on our previous assessment work.
- 4.10 Table 4.3 below provides a summary of the assessment outcomes for each of the three design options, comparing the predicted noise levels in Appendix D with the target noise levels shown in paragraph 2.55 above, based on SAL's view of a realistic worst case scenario. The outcomes shown assume that all bedrooms and living rooms would have open windows.

Table 4.3: Predicted assessment outcome for each design option – realistic worst case

Option	Internal day	Internal night time	Gardens
1	All levels below target for all options	All levels below target for all options	Noise in all garden areas would be below 43dB, LAeq,16h during the day for all three options
2			
3			

Theoretical worst case noise levels

4.11 Wiltshire Council have requested that the assessment considers a theoretical increase in level from the WWTE, which it considers could theoretically occur in the future. Since there is no way to predict what operations might be introduced in such circumstances, SAL approach to this is as follows:

- Consider how much noise levels could increase at WWTE before there would be an adverse effect at existing nearby dwellings, when assessed using BS4142 on existing residents.
- Increase the level from WWTE such that it reaches a level above which there would be an adverse effect at existing dwellings and use that emission level and use that to predict "worst theoretical case" levels at the proposed development.

4.12 Based on the initial assessment methodology from BS4142, an adverse effect would occur when the rating level (the level above background noise level) is greater than 5dB above background noise (subject to context). Background noise levels (accepted by the Council for the adjacent Glenmore Farm development) are:

Day	40dB, L_{A90}
Night	36dB, L_{A90}

4.13 The levels which could therefore occur from WWTE without causing an adverse effect would therefore be:

Day	45dB, $L_{Aeq,T}$
Night	41dB, $L_{Aeq,T}$

4.14 From Figures C1 and C2, it can be seen that the highest noise levels from WWTE at existing nearby dwellings are:

Day	40dB, $L_{Aeq,T}$
Night	38dB, $L_{Aeq,T}$

4.15 Subtracting the figures on 4.14 from the figures in 4.13, it can be seen that the highest level increases that could theoretically occur without resulting in an adverse effect due to noise at existing dwellings are 5dB during the day and 3dB at night.

4.16 We have added 5dB to existing daytime noise levels and 3dB to existing night time levels to arrive at a prediction of the theoretical worst case noise levels which could occur in future, if new noisy activities were to operate at WWTE without resulting in an adverse noise impact at existing dwellings. Figures E1 to E9 in Appendix E show the resultant noise levels with this additional noise added. The same output is shown, zoomed in, in Appendix F so that the locations of the dwellings at which the target levels are exceeded can be seen more clearly (as can the degree of exceedance).

5.0 Assessment of impact

5.1 Table 5.1 below provides a summary of the predicted levels for each of the three design options, comparing the predicted noise levels with the target noise levels shown in paragraph 2.55 above.

Table 5.1: Predicted assessment outcome for each design option – theoretical worst case

Option	Internal day	Internal night time	Gardens
1	6 living rooms with windows 0-1dB above target 2 living rooms with windows 1-2dB above target	4 bedrooms with windows 0-1dB above target	Noise in all garden areas would be below 43dB, $L_{Aeq,16h}$ during the day for all three options
2	7 living rooms with windows 0-1dB above target 2 living rooms with windows 1-2dB above target	2 bedrooms with windows 0-1dB above target 3 bedrooms with windows 1-2dB above target	
3	6 living rooms with windows 0-1dB above target 2 living rooms with windows 1-2dB above target	4 bedrooms with windows 0-1dB above target 1 bedroom with windows 1-2dB above target	

Context

- 5.2 Noise impacts should be considered in context. The NPSE advises that adverse environmental effects must be considered alongside the economic or social benefit of a proposal and that noise should not be treated in isolation without taking into account other related factors.
- 5.3 Worst case predicted internal noise levels, with the least optimal design (in relation to noise) would result in seven living rooms and 3 bedrooms experiencing noise from WWTE of up to 30dB and 25dB, $L_{Aeq,T}$. These are very low levels of noise.
- 5.4 To help to understand these levels in context, SAL have carried out a Google Search of “noise levels”. I have reproduced the descriptions given for noise at different levels from three of the top searches in Table 5.2 below along with the target internal noise levels recommended in BS8233: 2014 as “desirable” to avoid sleep disturbance and the measured levels and the worst case predicted noise levels in this case.

Table 5.2: Noise levels and descriptions – Google Search

Level, dB, $L_{Aeq,T}$	Description
20	Whispering at 5 feet ¹
	Leaves rustling, mosquito buzzing ²
	Whisper, rustling leaves ³
25	Worst case internal noise level in a bedroom at night with a window open

30	Soft whisper ¹
	Whispering ²
	Quiet rural area ³
	Guideline level to avoid sleep disturbance at night (BS8233 and World Health Organisation)
	Worst case internal noise level in a living room at night with a window open
35	Guideline level to avoid annoyance indoors during the day (BS8233 and World Health Organisation)
40	Quiet office or residential area, light rain ²
	Library, bird calls (44 dB); lowest limit of urban ambient sound ³
50	Rainfall ¹
	Moderate rainfall, refrigerator ²
	Quiet suburb, conversation at home ³

Sources: ¹ <https://noiseawareness.org/info-center/common-noise-levels/>

² <https://lexiehearing.com/us/library/decibel-examples-noise-levels-of-common-sounds>

³ <https://www.iacacoustics.com/blog-full/comparative-examples-of-noise-levels>

- 5.5 A 3dB change in noise level is the minimum perceptible by the human ear. All exceedances of the target levels would be between 0 and 2dB above desirable target levels. The detriment to amenity as a result of noise from a theoretical worst case noise at the WWTE at the worst case bedroom or living room with the window open would be negligible in SAL judgement.

6.0 Conclusions

- 6.1 A previous housing scheme at this site was refused on appeal due to concerns about the need to close windows to control internal noise levels to a desirable level and because it was felt that noise from the WWTE could potentially increase to a greater extent than had been assessed. As a result of these concerns, the scheme has been significantly redesigned, with the development layout now including a reduced site area and the introduction of a barrier block along the northern edge.
- 6.2 This noise assessment considers the revised design. Extensive survey work, modelling, and comparison against nationally recognised guidance including the NPPF, NPSE, PPG-Noise, BS8233 and BS4142, the assessment has found that, under realistic worst-case operating conditions at the WWTE, all proposed dwellings would achieve internal noise levels below the Lowest Observed Adverse Effect Level with Council's requirement for assessment with windows open. Garden areas across all layout options would also achieve levels comfortably below the 43dB $L_{Aeq,16h}$ target.
- 6.3 In response to the Planning Inspector's previous concerns, the revised scheme eliminates reliance on closed windows for achieving acceptable internal conditions and now incorporates orientation and layout changes that ensure habitable rooms are sited on the quietest façades wherever possible. In addition, the assessment has explicitly addressed the Agent of Change principle by modelling a theoretical uplift in WWTE noise levels up to the point at which adverse effects would begin to occur at existing dwellings.

Even under this highly conservative scenario, only very marginal exceedances of target internal levels (up to 2dB) were predicted for a small number of rooms, and these levels remain extremely low in absolute terms and below thresholds associated with sleep disturbance or meaningful behavioural change.

- 6.4 When considered in context, the residual noise effects predicted for the proposed development are negligible. The assessment shows that the site can be developed without imposing unreasonable restrictions on existing businesses at the WWTE and without exposing future residents to significant adverse noise impacts. On this basis, the proposed development is considered acoustically acceptable and compliant with national and local planning policy requirements relating to noise.

Appendix A: Figures

Figure A1: Site and surrounding area

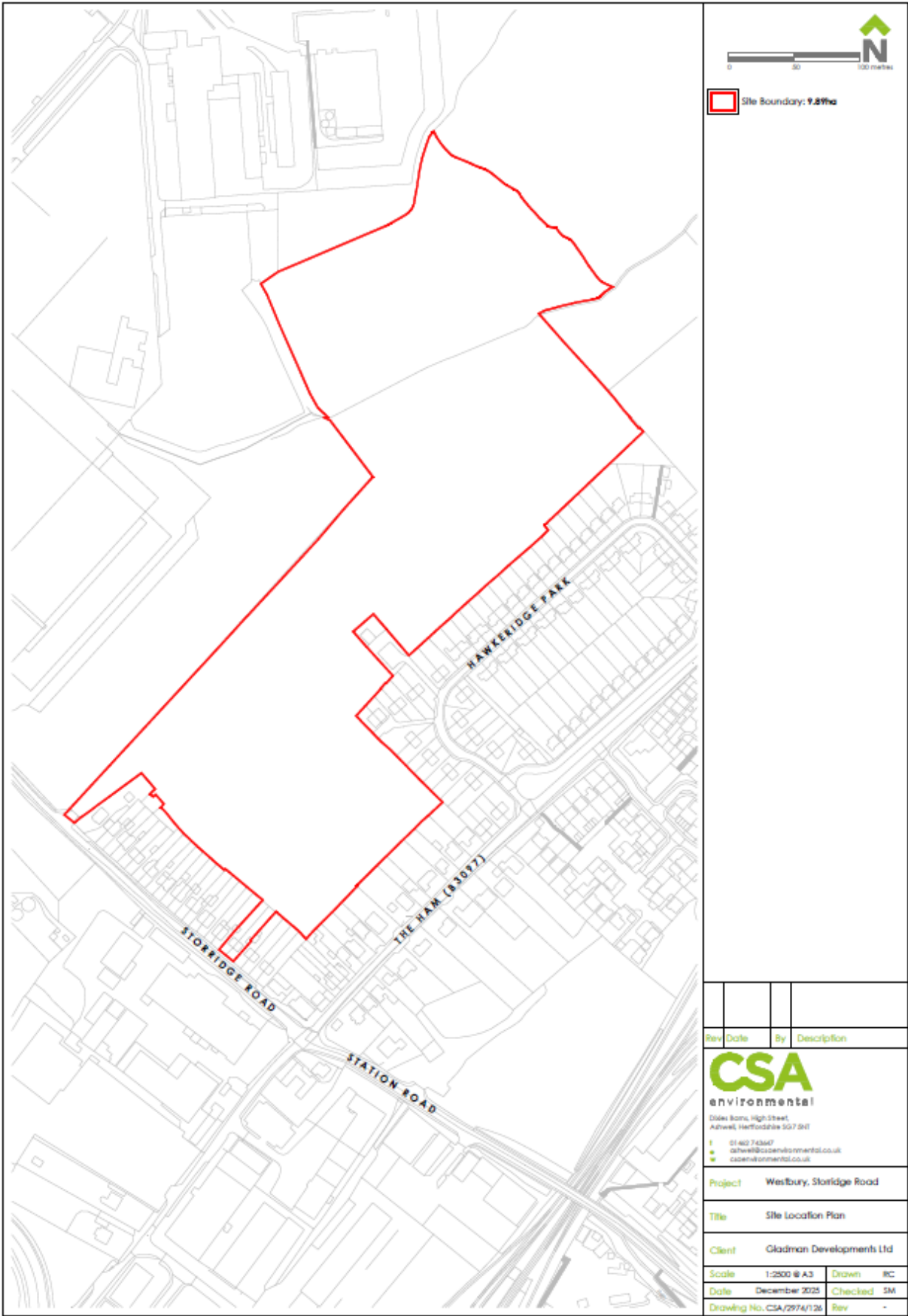
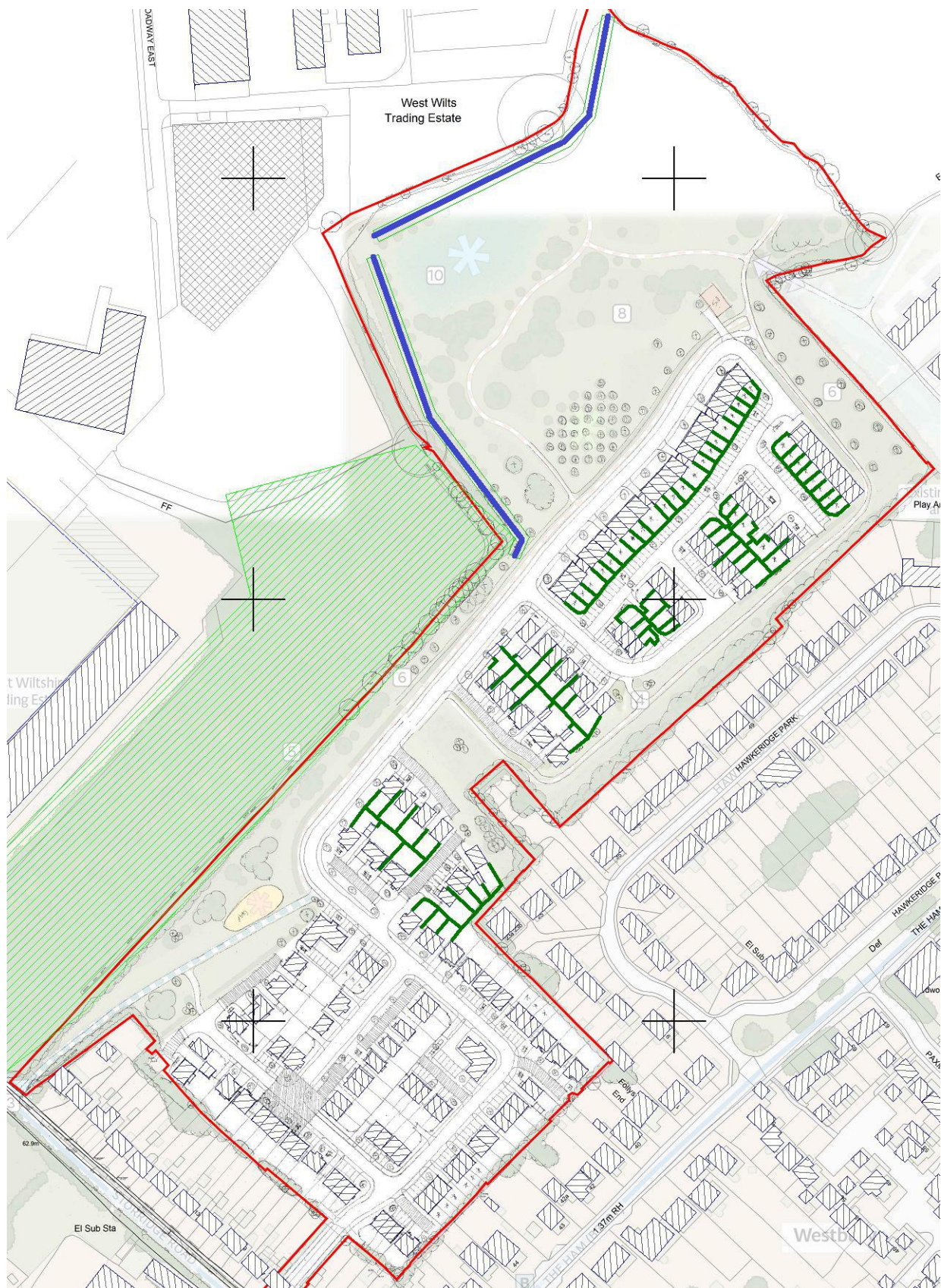


Figure A2: Measurement Positions



Figure A3: Plan showing location of screening at northern boundary of the site (3m fence and 3m bund shown in blue and 1.8m garden fences shown in green)



Appendix B: Measured Noise Data

Location		Date		Time		Weather		Noise Level (dB)		Notes	
Site A		2023-01-15		08:00		Clear		65		Background noise	
Site B		2023-01-15		12:00		Clear		70		Traffic noise	
Site C		2023-01-15		16:00		Clear		75		Construction noise	
Site D		2023-01-16		09:00		Clear		68		Background noise	
Site E		2023-01-16		13:00		Clear		72		Traffic noise	
Site F		2023-01-16		17:00		Clear		78		Construction noise	
Site G		2023-01-17		08:30		Clear		66		Background noise	
Site H		2023-01-17		12:30		Clear		71		Traffic noise	
Site I		2023-01-17		16:30		Clear		76		Construction noise	
Site J		2023-01-18		09:30		Clear		69		Background noise	
Site K		2023-01-18		13:30		Clear		73		Traffic noise	
Site L		2023-01-18		17:30		Clear		79		Construction noise	
Site M		2023-01-19		08:45		Clear		67		Background noise	
Site N		2023-01-19		12:45		Clear		71		Traffic noise	
Site O		2023-01-19		16:45		Clear		77		Construction noise	
Site P		2023-01-20		09:15		Clear		68		Background noise	
Site Q		2023-01-20		13:15		Clear		72		Traffic noise	
Site R		2023-01-20		17:15		Clear		78		Construction noise	
Site S		2023-01-21		08:00		Clear		65		Background noise	
Site T		2023-01-21		12:00		Clear		70		Traffic noise	
Site U		2023-01-21		16:00		Clear		75		Construction noise	
Site V		2023-01-22		09:00		Clear		68		Background noise	
Site W		2023-01-22		13:00		Clear		72		Traffic noise	
Site X		2023-01-22		17:00		Clear		77		Construction noise	
Site Y		2023-01-23		08:30		Clear		66		Background noise	
Site Z		2023-01-23		12:30		Clear		71		Traffic noise	
Site AA		2023-01-23		16:30		Clear		76		Construction noise	
Site AB		2023-01-24		09:30		Clear		69		Background noise	
Site AC		2023-01-24		13:30		Clear		73		Traffic noise	
Site AD		2023-01-24		17:30		Clear		79		Construction noise	
Site AE		2023-01-25		08:45		Clear		67		Background noise	
Site AF		2023-01-25		12:45		Clear		71		Traffic noise	
Site AG		2023-01-25		16:45		Clear		77		Construction noise	
Site AH		2023-01-26		09:15		Clear		68		Background noise	
Site AI		2023-01-26		13:15		Clear		72		Traffic noise	
Site AJ		2023-01-26		17:15		Clear		78		Construction noise	
Site AK		2023-01-27		08:00		Clear		65		Background noise	
Site AL		2023-01-27		12:00		Clear		70		Traffic noise	
Site AM		2023-01-27		16:00		Clear		75		Construction noise	
Site AN		2023-01-28		09:00		Clear		68		Background noise	
Site AO		2023-01-28		13:00		Clear		72		Traffic noise	
Site AP		2023-01-28		17:00		Clear		77		Construction noise	
Site AQ		2023-01-29		08:30		Clear		66		Background noise	
Site AR		2023-01-29		12:30		Clear		71		Traffic noise	
Site AS		2023-01-29		16:30		Clear		76		Construction noise	
Site AT		2023-01-30		09:30		Clear		69		Background noise	
Site AU		2023-01-30		13:30		Clear		73		Traffic noise	
Site AV		2023-01-30		17:30		Clear		79		Construction noise	
Site AW		2023-01-31		08:45		Clear		67		Background noise	
Site AX		2023-01-31		12:45		Clear		71		Traffic noise	
Site AY		2023-01-31		16:45		Clear		77		Construction noise	
Site AZ		2023-02-01		09:15		Clear		68		Background noise	
Site BA		2023-02-01		13:15		Clear		72		Traffic noise	
Site BB		2023-02-01		17:15		Clear		78		Construction noise	
Site BC		2023-02-02		08:00		Clear		65		Background noise	
Site BD		2023-02-02		12:00		Clear		70		Traffic noise	
Site BE		2023-02-02		16:00		Clear		75		Construction noise	
Site BF		2023-02-03		09:00		Clear		68		Background noise	
Site BG		2023-02-03		13:00		Clear		72		Traffic noise	
Site BH		2023-02-03		17:00		Clear		77		Construction noise	
Site BI		2023-02-04		08:30		Clear		66		Background noise	
Site BJ		2023-02-04		12:30		Clear		71		Traffic noise	
Site BK		2023-02-04		16:30		Clear		76		Construction noise	
Site BL		2023-02-05		09:30		Clear		69		Background noise	
Site BM		2023-02-05		13:30		Clear		73		Traffic noise	
Site BN		2023-02-05		17:30		Clear		79		Construction noise	
Site BO		2023-02-06		08:45		Clear		67		Background noise	
Site BP		2023-02-06		12:45		Clear		71		Traffic noise	
Site BQ		2023-02-06		16:45		Clear		77		Construction noise	
Site BR		2023-02-07		09:15		Clear		68		Background noise	
Site BS		2023-02-07		13:15		Clear		72		Traffic noise	
Site BT		2023-02-07		17:15		Clear		78		Construction noise	
Site BU		2023-02-08		08:00		Clear		65		Background noise	
Site BV		2023-02-08		12:00		Clear		70		Traffic noise	
Site BV											

Figure B1: Measurement Position MP1

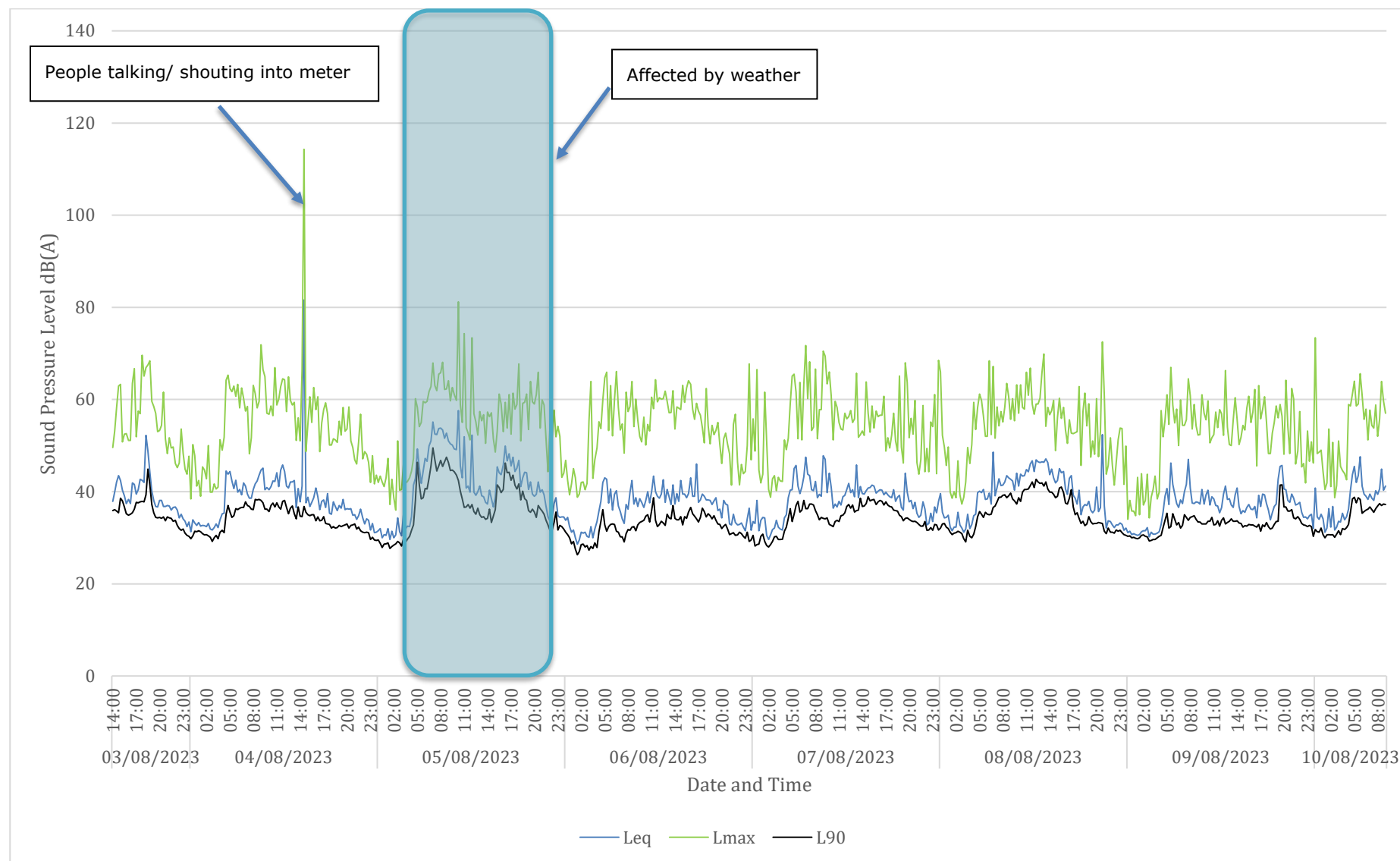


Figure B2: Measurement Position MP2

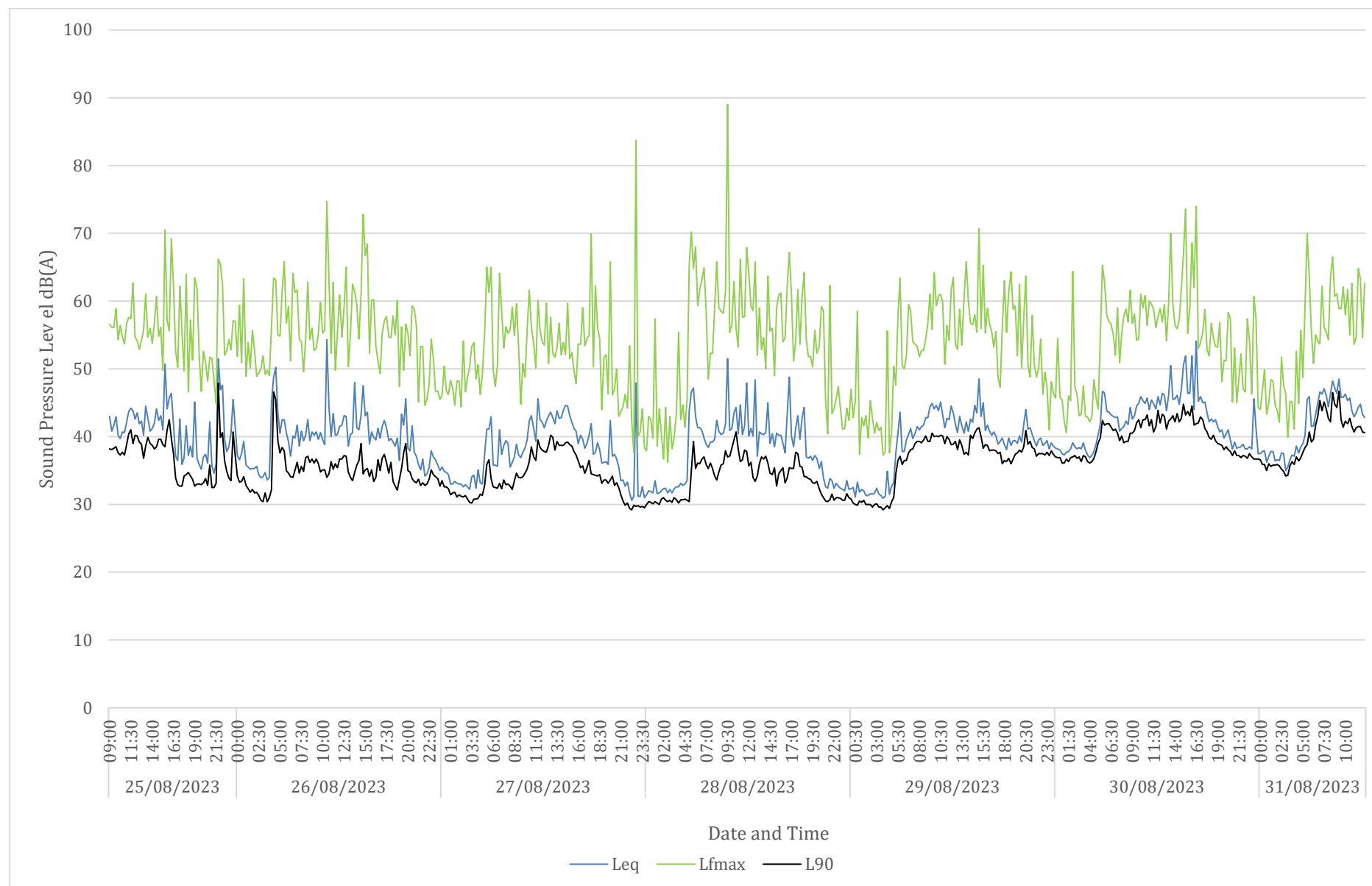


Table B1: Weekday Noise Levels and source on times at adjacent premises

Premises	Source	Measured/ Library Data	On time (hours or number of events)		Sound Pressure Level dB(A)	
			Typical Daytime (07:00 to 23:00 hours)	Typical Night-time (23:00 to 07:00 hours)		
Apollo Motor Company	Plant associated with STL Oven	Measured	4 hours	0	L _{Aeq,T}	70 @ 4m
	Jet wash	Measured	5 hours	0	L _{Aeq,T}	75 @ 4m
	Vacuum	Measured	5 hours	0	L _{Aeq,T}	63 @ 8m
Welton Bibby Baron	Plant associated with Compressor Rooms	Measured	16 hours	8 hours	L _{Aeq,T}	70 @ 12m
	HGV internal unload	Library data	18 HGV	2 HGV	L _w	84
	HGV external unload	Library data	18 HGV	2 HGV	L _w	94
	HGV manoeuvre	Library data	26 HGV	5 HGV	L _{w/m}	61
Copart	Wheeled Loader loading car onto HGV car transporter	Measured	2 hours (4no. transporters)	0	L _{Aeq,T}	73 @ 6m
	Wheeled loader manoeuvre with horn	Measured	108no. movements	0	SEL	82 @ 2m
	Wheeled loader pick up and put down vehicle	Measured	4 hours	0	L _{Aeq,T}	72 @ 5m
	Compressor operation	Measured	3 hours	0	L _{Aeq,T}	74 @ 4m
	Van manoeuvre	Library data	46 vans	0	L _{w/m}	57
Baltic Pine	Mechanical Plant	Measured	9 hours	1 hour	L _{Aeq,T}	69 @ 4m
	HGV manoeuvre	Library data	5 HGV	1 HGV	L _{w/m}	61
	HGV external unload	Library data	5 HGV	1 HGV	L _w	94
	Diesel forklift	Library data	2.5 hours	0.5 hours	L _w	100

Premises	Source	Measured/ Library Data	On time (hours or number of events)		Sound Pressure Level dB(A)	
			Typical Daytime (07:00 to 23:00 hours)	Typical Night-time (23:00 to 07:00 hours)		
	Van movements	Library data	5 Vans	1 Vans	L _{w/m}	57
Spectra	Mechanical plant	Measured	9.5 hours	0 hours	L _{Aeq,T}	66 @ 11m
	Internal workshop	Library data	9.5 hours	0 hours	L _p	85
SPC Europe	Mechanical plant	measured	16 hours	8 hours	Daytime L _{Aeq,T}	49 @ 60m ⁽¹⁾
					Night-time L _{Aeq,T}	49 @ 60m ⁽¹⁾
	HGV manoeuvre	Library data	9 HGV	1 HGV	L _{w/m}	61
	HGV unload	Library data	9 HGV	1 HGV	L _w	90
	Diesel forklift	Library data	16 hours	8 hours	L _w	100
	Jet wash	Measured	11 hours	1 hour	L _{Aeq,T}	75 @ 4m
Empty Premises (Outlined for Occupation by SPC Europe)	HGV manoeuvre	Library data	2 HGV	0	L _{w/m}	61
	HGV external unload	Library data	2 HGV	0	L _w	94
	Diesel forklift	Library data	10 hours	0	L _w	100
	Van manoeuvre	Library data	10 vans	0	L _{w/m}	57
	Van Loading	Library data	10 vans	0	L _{WA}	66
Rygor Group	Van manoeuvre	Library data	2 vans	0	L _{w/m}	57

Note ⁽¹⁾ – SPC declined noise measurements on their premises, therefore measurements conducted on proposed site of Cooling Towers and high level AHU

Note ⁽²⁾ – mechanical plant sources doubled to represent additional production facility

Table B2: Weekend Noise Levels and source on times at adjacent premises

Premises	Source	Measured/ Library Data	Typical on time (hours or number of events) Daytime (07:00 to 23:00 hours)	Level dB(A)	
Baltic Pine	Mechanical Plant	Measured	4 hours	L _{Aeq,T}	69 @ 4m
	HGV manoeuvre	Library data	3 HGV	L _{w/m}	61
	HGV external unload	Library data	3 HGV	L _w	94
	Diesel forklift	Library data	2.5 hours	L _w	100
	Van Movements	Library data	3 Vans	L _{w/m}	57
Empty Premises (Outlined for Occupation by SPC Europe)	HGV manoeuvre	Library data	2 HGV	L _{w/m}	61
	HGV external unload	Library data	2 HGV	L _w	94
	Diesel forklift	Library data	10 hours	L _w	100
	Van manoeuvre	Library data	10 vans	L _{w/m}	57
	Van Loading	Library data	10 vans	L _{WA}	66
SPC Europe	HGV manoeuvre	Library data	9 HGV	L _{w/m}	61
	HGV unload	Library data	9 HGV	L _w	90
	Diesel forklift	Library data	9 hours	L _w	100
	Jet wash	Measured	11 hours	L _{Aeq,T}	75 @ 4m
	Car Park	Library data	1 arrival and 1 departure from every space	Assessed using the Bavarian car park noise method ⁽¹⁾	
Rygor Group	Van Movements	Library data	2 Vans	L _{w/m}	57

(1) The 6th revised edition of the parking lot study "Recommendations for the Calculation of Sound Emissions of Parking Areas, Motorcar Centers and Bus Stations as well as of Multi-Storey Car Parks and Underground Car Parks" published by the Bavarian Landesamt für Umwelt

Table B3: Modelled Octave Band Data

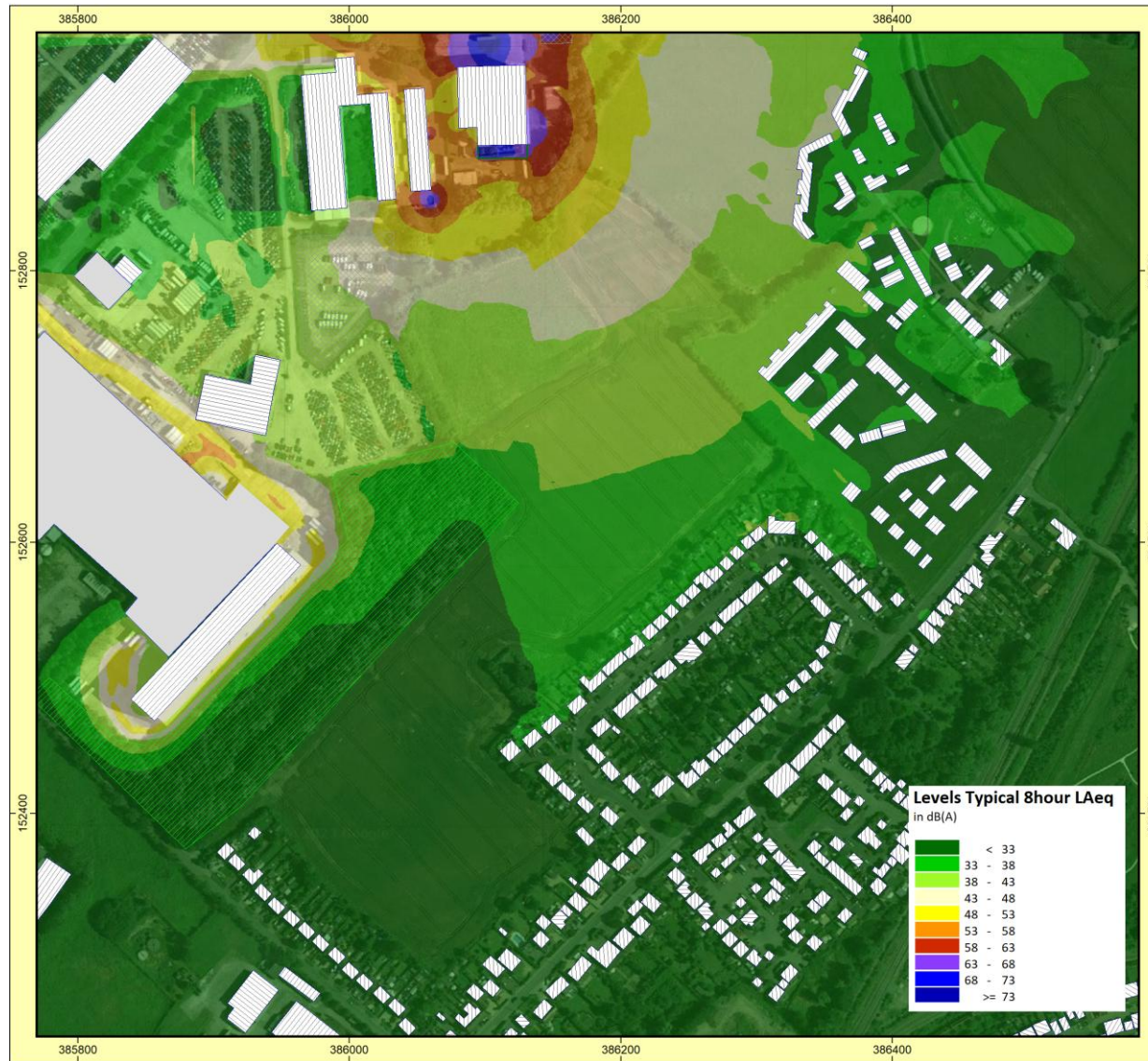
Premises	Source	Octave Band Sound Pressure Level Spectra (Hz) dB at distance specified in Table B.1							
		63	125	250	500	1k	2k	4k	8k
Apollo Motor Company	Plant associated with STL Oven	70	76	73	65	64	63	58	48
	Jet wash	68	65	61	63	63	68	69	69
	Vacuum	67	59	54	61	55	54	55	50
Welton Bibby Baron	Plant associated with Compressor Rooms	67	74	71	67	65	61	57	50
Copart	Wheeled Loader loading car onto HGV car transporter	84	72	70	68	69	67	62	55
	Wheeled loader manoeuvre	70	71	68	70	67	64	56	49
	Wheeled loader pick up and put down vehicle	73	69	67	69	67	64	62	51
	Compressor operation	74	75	72	69	68	66	63	66
Baltic Pine	Mechanical Plant	68	71	63	67	62	61	59	50
Spectra	Mechanical plant	74	75	68	62	57	55	54	42
SPC Europe	Mechanical plant daytime	63	56	54	48	43	39	39	32
	Mechanical plant night-time	48	39	36	36	34	30	31	31
	Jet wash	68	65	61	63	63	68	69	69

Appendix C: Predicted noise level contours – open site

Figure C1: Typical weekday daytime noise levels – open site



Figure C2: Typical night time noise levels – open site



Appendix D: Predicted noise levels for different design options – realistic worst case

Figure D1: Predicted daytime noise levels, Option 1 – realistic worst case

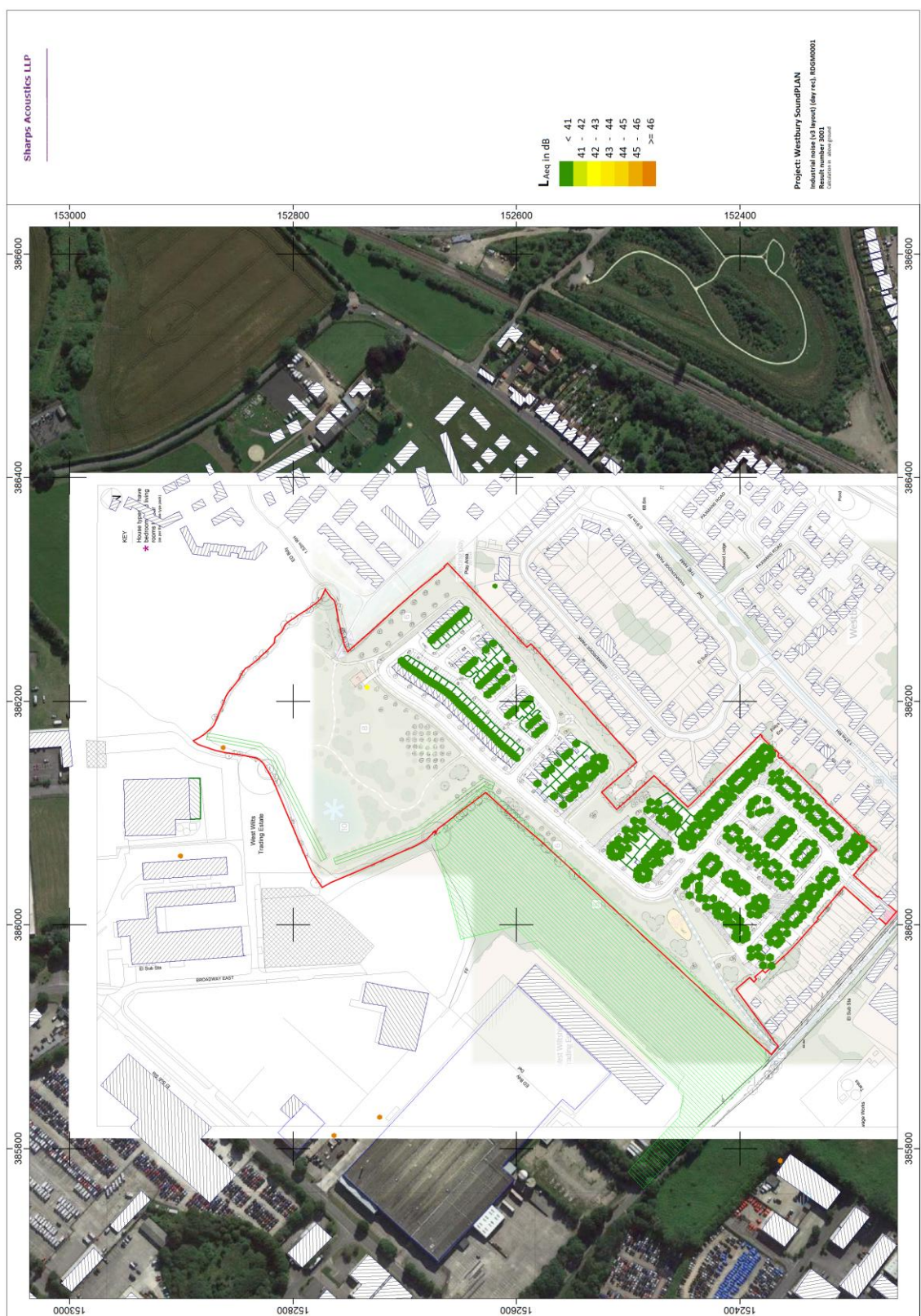


Figure D2: Predicted night time noise levels, Option 1 – realistic worst case



Figure D3: Predicted external daytime levels, Option 1 – realistic worst case

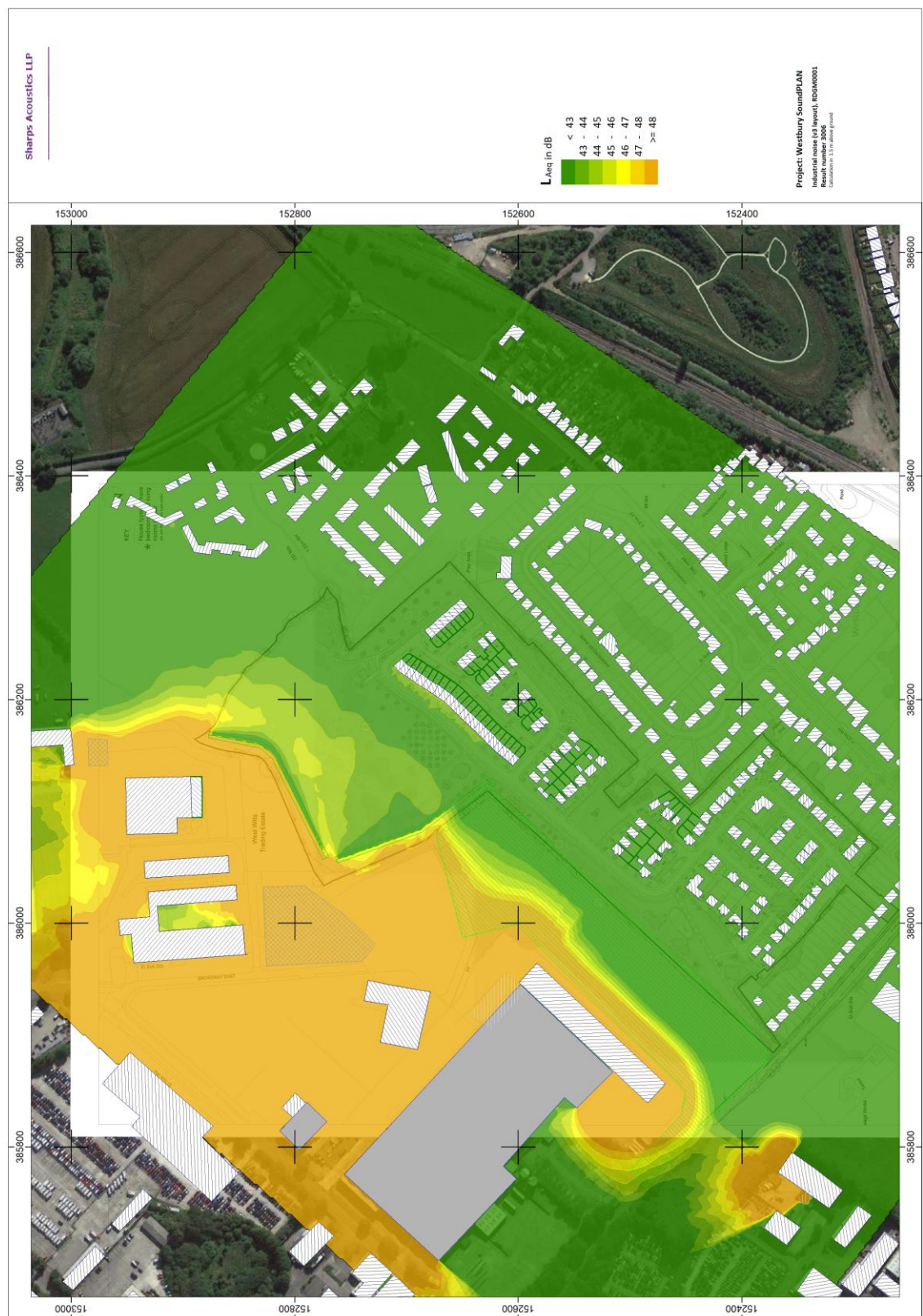


Figure D4: Predicted daytime noise levels, Option 2 – realistic worst case



Figure D5: Predicted night time noise levels, Option 2 – realistic worst case



Figure D6: Predicted external daytime levels, Option 2 – realistic worst case

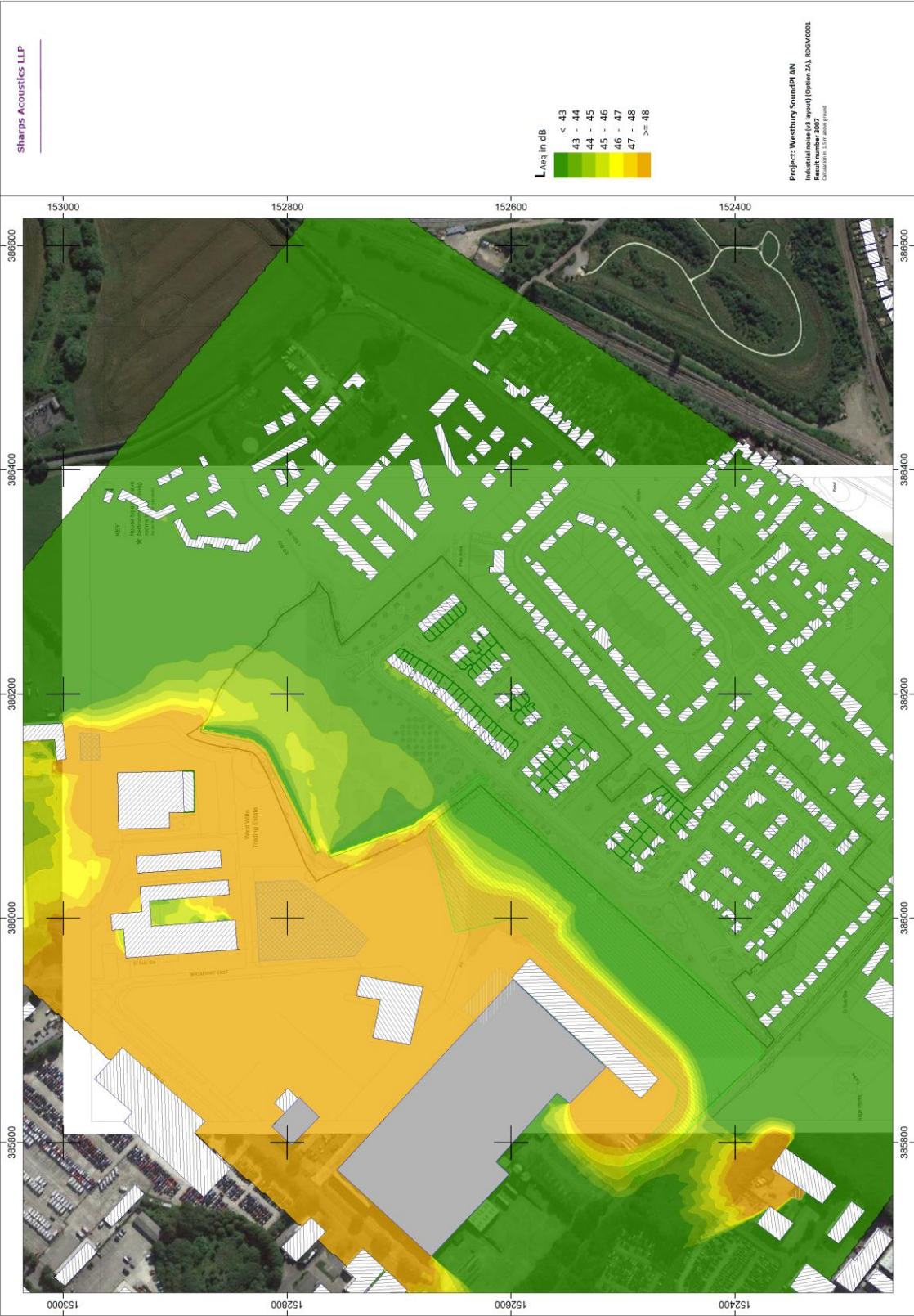


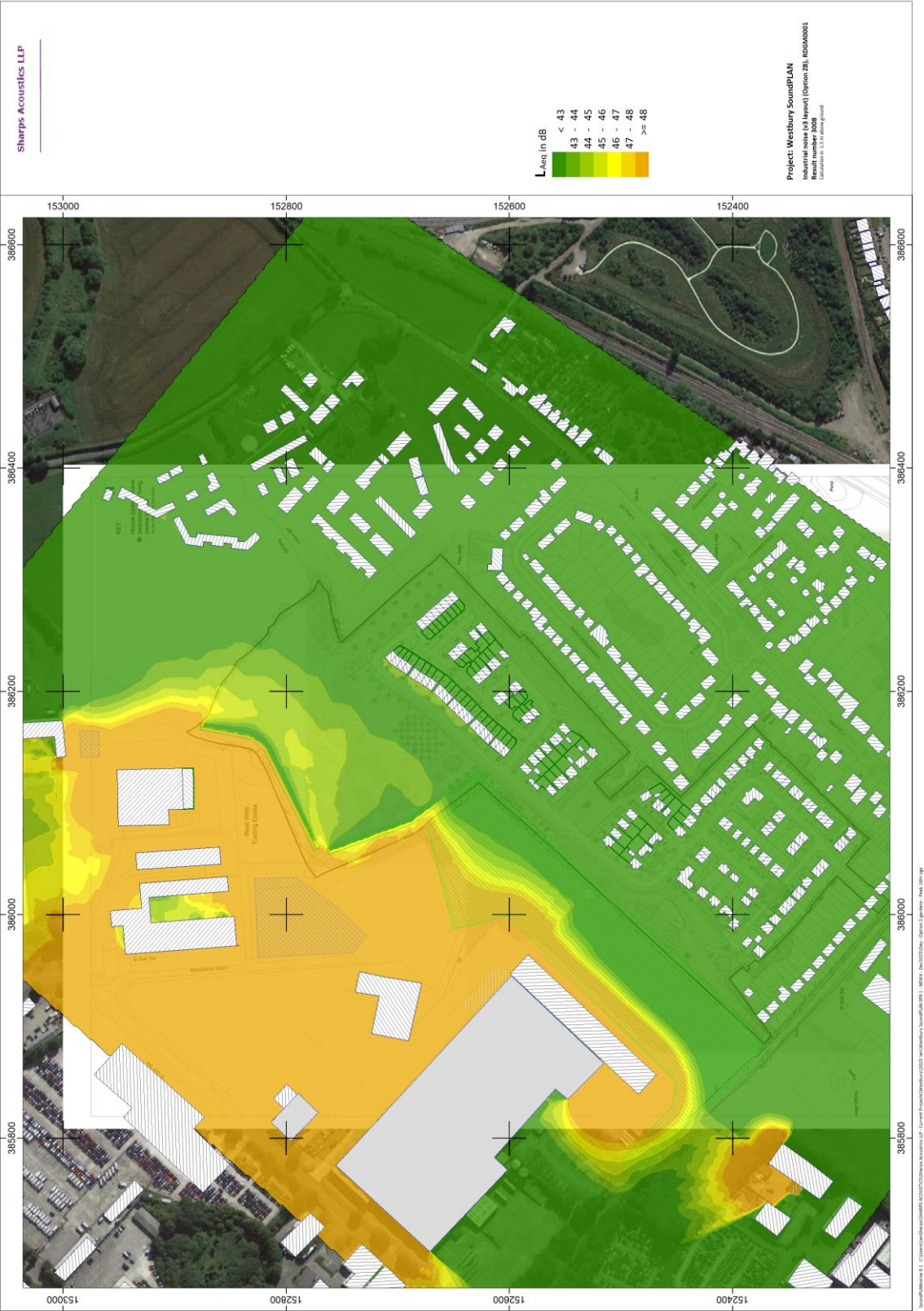
Figure D7: Predicted daytime noise levels, Option 3 – realistic worst case



Figure D8: Predicted night time noise levels, Option 3 – realistic worst case



Figure D9: Predicted external daytime levels, Option 3 – realistic worst case



Appendix E: Predicted noise levels for different design options – theoretical worst case

Figure E1: Predicted daytime noise levels, Option 1 – theoretical worst case

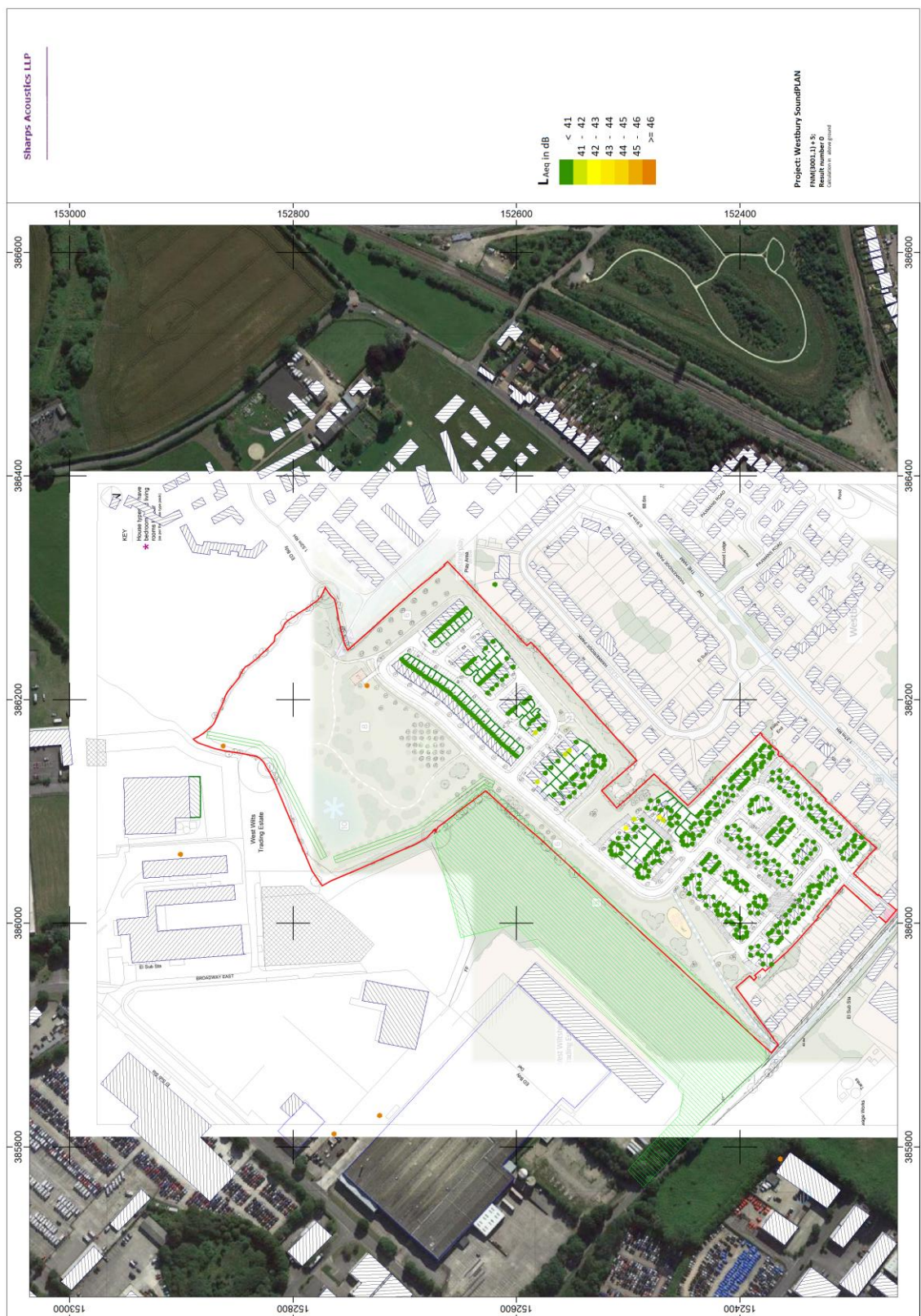


Figure E2: Predicted night time noise levels, Option 1 – theoretical worst case



Figure E3: Predicted external daytime levels, Option 1 – theoretical worst case

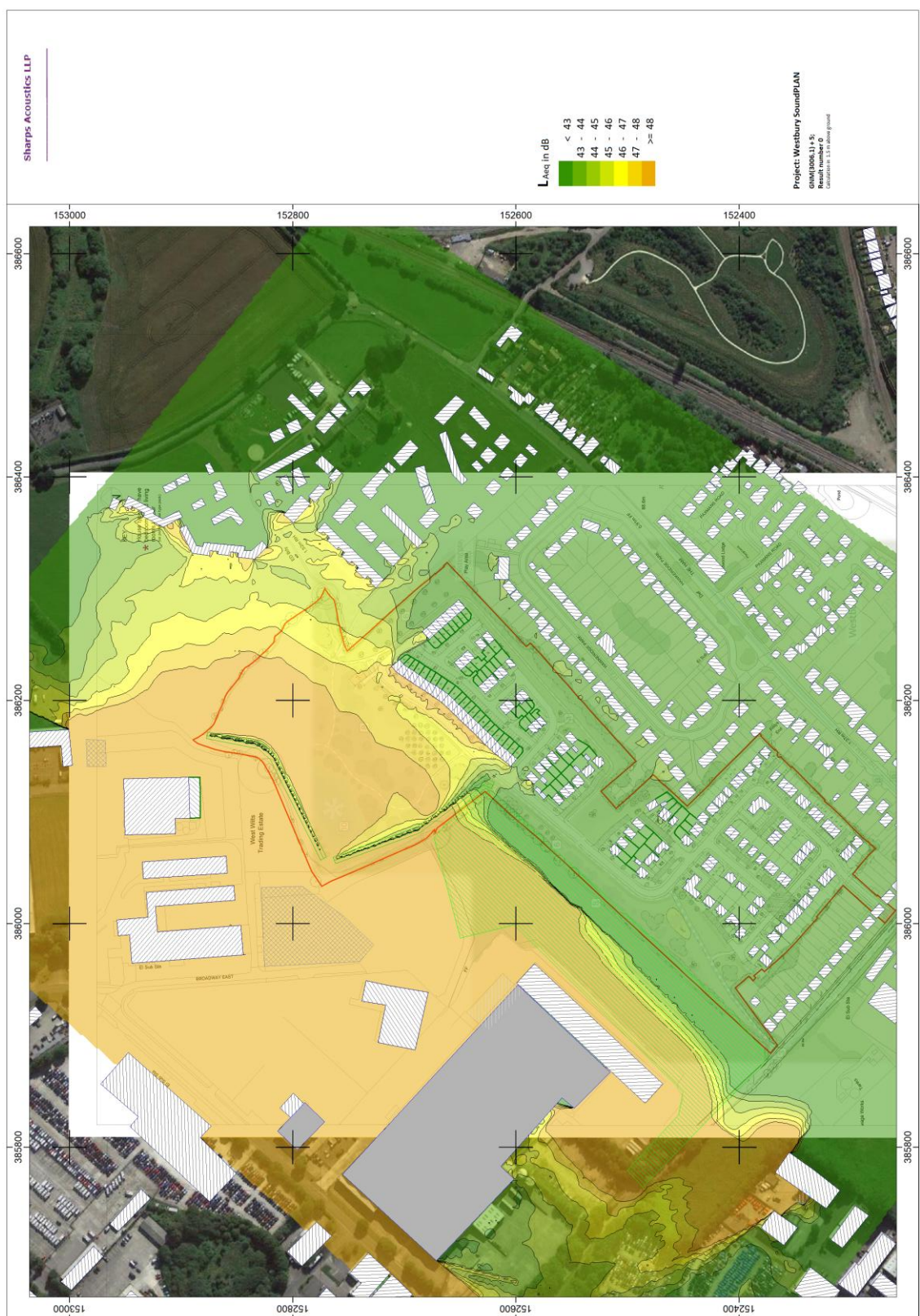


Figure E4: Predicted daytime noise levels, Option 2 – theoretical worst case



Figure E5: Predicted night time noise levels, Option 2 – theoretical worst case



Figure E6: Predicted external daytime levels, Option 2 – theoretical worst case



Figure E7: Predicted daytime noise levels, Option 3 – theoretical worst case



Figure E8: Predicted night time noise levels, Option 3 – theoretical worst case



Figure E9: Predicted external daytime levels, Option 3 – theoretical worst case



Appendix F: Predicted noise levels for different design options – theoretical worst case – zoomed in

Figure F1: Predicted daytime noise levels, Option 1 – theoretical worst case – zoomed in



Figure F2: Predicted night time noise levels, Option 1 – theoretical worst case – zoomed in

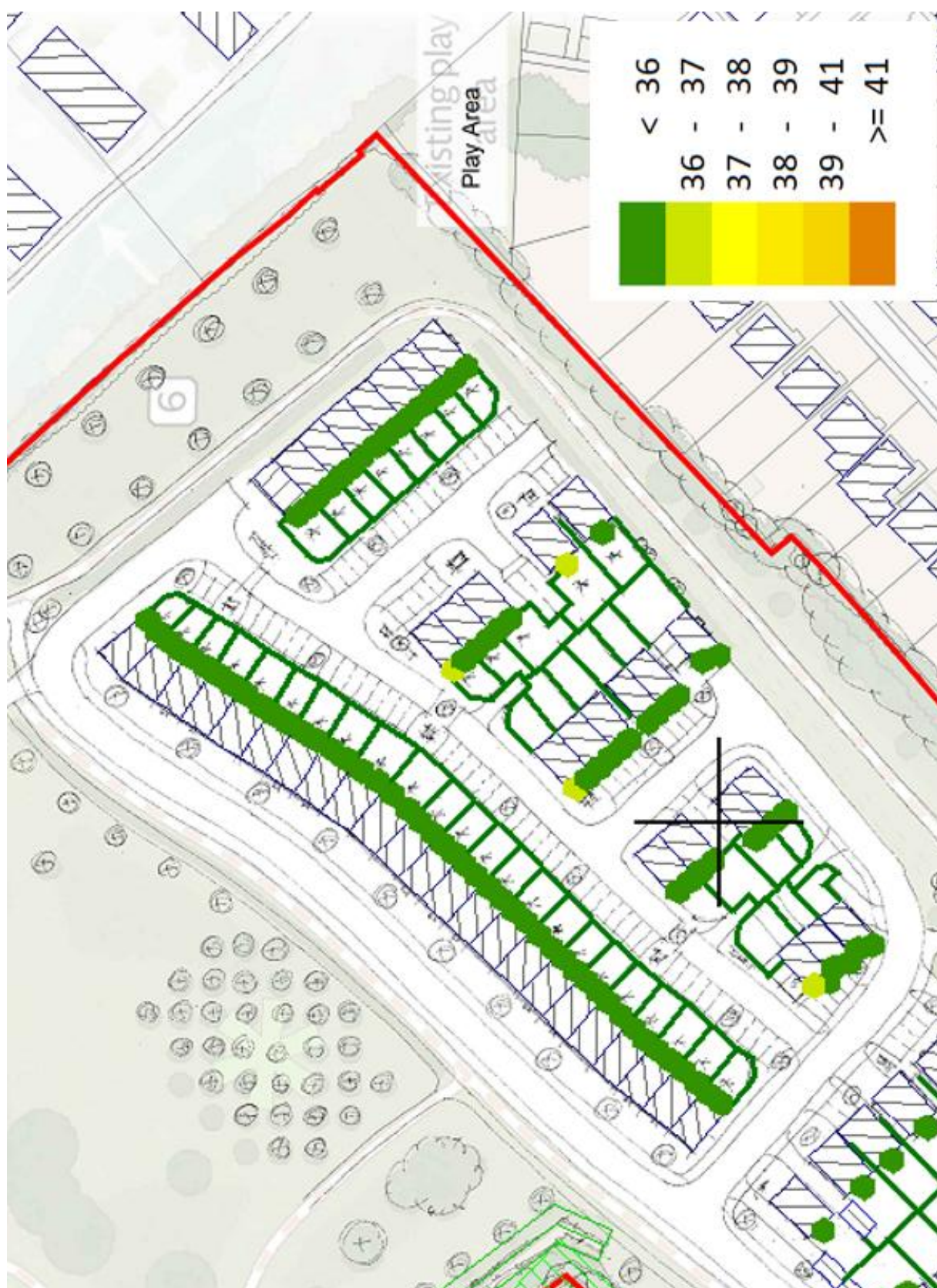


Figure F3: Predicted daytime noise levels, Option 2 – theoretical worst case – zoomed in

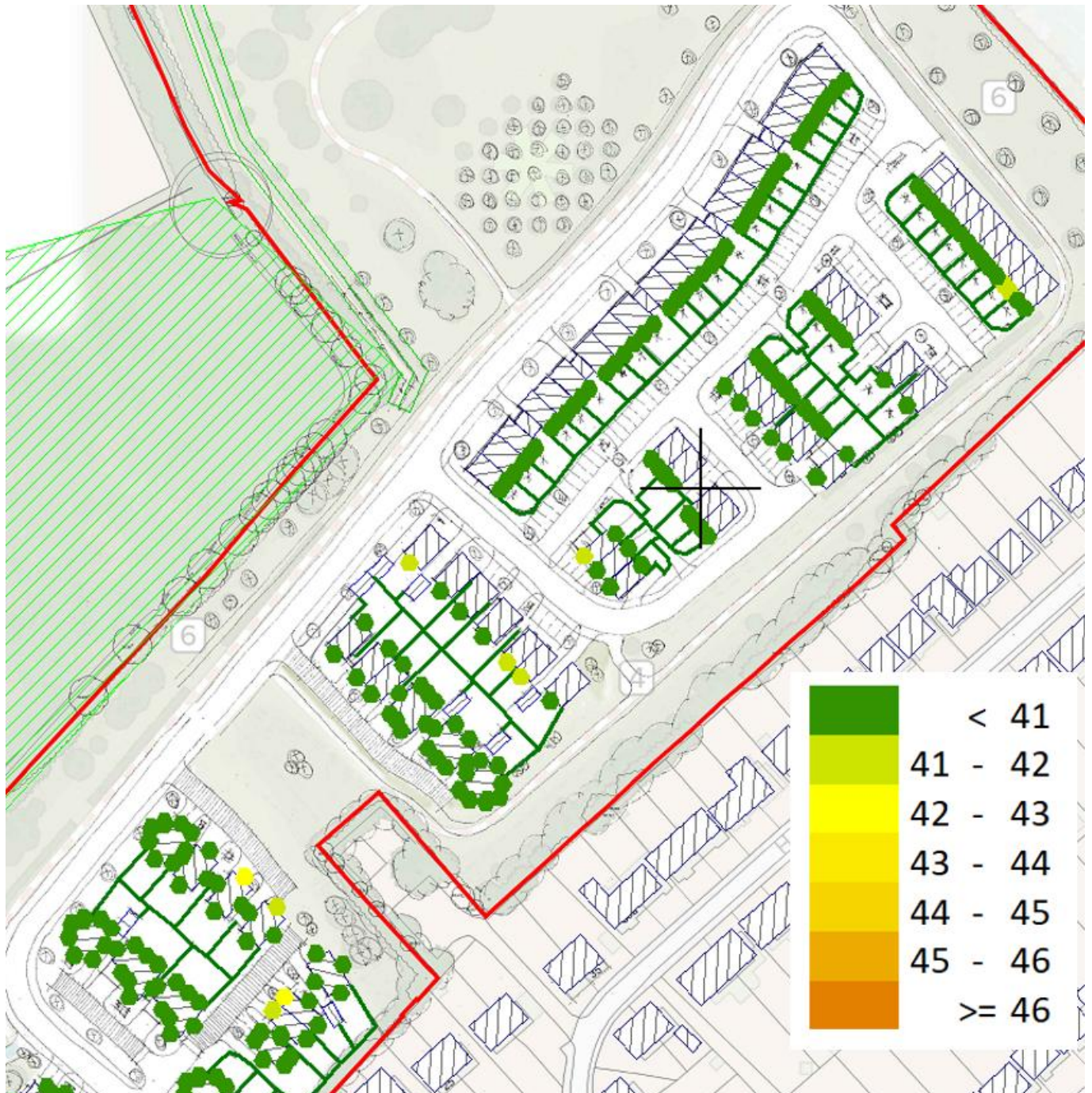


Figure F4: Predicted night time noise levels, Option 2 – theoretical worst case – zoomed in



Figure F5: Predicted daytime noise levels, Option 3 – theoretical worst case – zoomed in



Figure F6: Predicted night time noise levels, Option 3 – theoretical worst case – zoomed in

