E2 Consultants Ltd
3b South Park Way
Wakefield
WF2 0XJ

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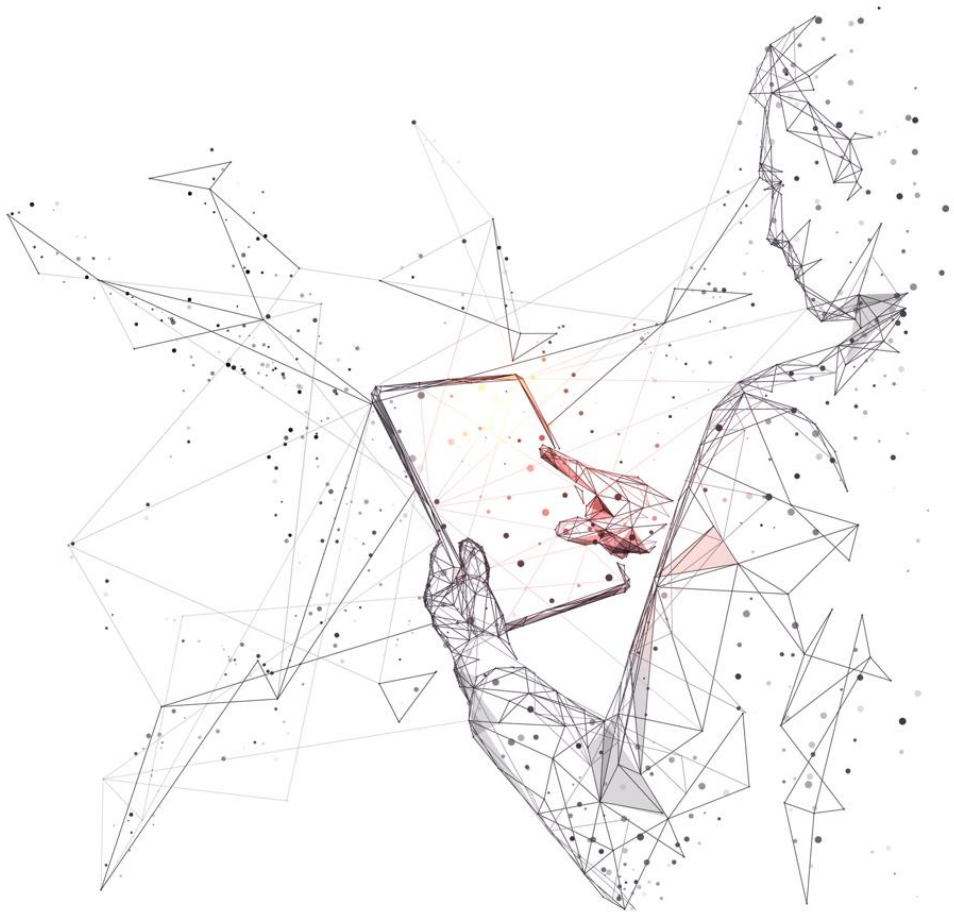

NOISE IMPACT ASSESSMENT OF 51-55 WATERSIDE ROAD, BARTON-UPON-HUMBER, DN18 5BG

JAMES FLITTON

E2 HOUSE,
41 Business Park,
S Park Way,
Wakefield
WF2 0XJ

E2 Consultants Ltd
3b South Park Way
Wakefield
West Yorkshire
WF2 0XJ

Contents

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3b South Park Way
Wakefield
West Yorkshire
WF2 0XJ

1.0 Introduction

1.1. Background

1.1.1 E2 Consultants have been commissioned to provide a Residential Planning Noise Assessment to support a planning application for a residential development at 51-55 Waterside Road, Barton-upon-Humber, DN18 5BG, to be referred to hereafter as “the site”. 51-55 Waterside Road, Barton-upon-Humber, DN18 5BG has been identified as a potential site for residential development. The development proposes 28 residential dwellings, (including gardens and some garages).

1.1.2 The site is a 2 acres brownfield site located in Barton-upon-Humber. To the north and south of the site are existing residential properties, to the west is an industrial area and to the east is the B1218, with a Tesco Superstore carpark and store facing the proposed site location.

1.1.3 The key sources of noise impacting upon the site are Waterside Road to the eastern boundary of the proposed site and industrial noise on the western boundary. The noise source is plant located at the rear of the adjacent site, Jacobs.

1.1.4 This assessment has been undertaken with due regard to the supplied planning layout shown in
Figure A1 of Appendix III.

1.2. Limitations

1.2.1 Further limitations of this report are presented in Appendix I.

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2. Assessment Methodology

2.1. National Planning Policy Framework

2.1.1 National Planning Policy Framework [1] states that 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-taking should take account of the acoustic environment and in doing so consider:

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

2.1.2 In line with the Explanatory Note of the Noise Policy Statement for England [2], this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever 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:

2.1.3 This is the level of noise exposure below which no effect at all on health or quality of life can be detected. Table 1summarises the noise exposure hierarchy, based on the likely average response.

Table 1: Noise exposure hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No effect	No observed effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	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. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. 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 adverse effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude, or other physiological response and/or an inability to mitigate effect of noise leading to psychological, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable adverse effect	Prevent

2.1.4 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 particular situation.

2.1.5 These factors include:

- 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 – this is because people tend to be more sensitive to noise at night as they are trying to sleep. 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; and

- The spectral content and general character of the noise. The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.

2.1.6 More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be taken into account, 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. Further information on ventilation can be found in the Building Regulations.

- If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

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2.2. British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings

2.2.1. Noise Criterion Limits

The scope of this standard [3] is the provision of 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 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 ambient noise levels in dwellings from external noise sources should not exceed the values given in Table 2.

Table 2: BS8223 Recommended indoor ambient noise level limits.

Activity	Location	Limit $L_{Aeq,T}$ (dB)	
		Daytime (07:00-23:00)	Night-time (23:00-07:00)
Suitable resting/sleeping conditions	Living Room	35	-
	Bedroom	35	30
Dining	Dining room	40	-

2.2.2 BS8233 goes on to recommend noise levels for external amenity spaces (i.e., gardens, balconies etc.). According to BS8233;

> *"It is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,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."*

2.2.3 BS8233 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."*

2.2.4. Ventilation Requirements

Where a partially open window cannot be relied upon to provide an adequate level of facade sound insulation, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 of BS8233 states:

> *"The Building Regulations' supporting documents on ventilation [4, 5, 6] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However,*

windows may remain openable for rapid or purge ventilation, or at the occupant's choice.

Alternatively, acoustic ventilation units (see 7.7.2) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

Section 7.7.2 states:

"NOTE 5: If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

2.3.0 Building Regulations Approved Document O: Overheating

Approved Document O of the Building Regulations 2010 Overheating (ADO) [7] concerns ventilation and overheating requirements in dwellings. Requirement O1(2)(a) concerns the maximum acceptable noise levels in homes during overheating scenarios. These represent a 10 dB relaxation on the noise levels set out in BS8233 [3] and WHO [8] Guidelines that apply in non-overheating scenarios. Table 3 sets out these limits.

Table 3: Internal noise level limits in overheating scenarios

Location	Time	Noise limits in overheating conditions
Bedroom	Daytime (07:00-23:00)	$L_{Aeq,16h}$ 45 dB
	Night (23:00-07:00)	$L_{Aeq,8h}$ 40 dB L_{AFmax} 55 dB not exceeded more than 10 times per night

2.4.0 World Health Organisation's (WHO) Guidelines for Community Noise

The WHO Guidelines for Community Noise [8] offer advice with regard to setting noise criteria applicable to sleep disturbance. Section 4.2.3 specifies:

"If the noise is not continuous, L_{Amax} or SEL are used to indicate the probability of noise-induced awakenings. Effects have been observed at individual L_{Amax} exposures of 45 dB or less. Consequently, it is important to limit the number of noise events with a L_{Amax} exceeding 45 dB."

The guidelines go on to state:

"At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax}, so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB."

2.4.1 The sound insulation performance value of 15 dB for a façade containing a partially open window accords with the guidance offered in BS8233 [3]. The guidelines reference a study by Vallet & Vernet [9], which concluded that:

"For a good sleep, it is believed than indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night."

2.4.2 Accordingly, this assessment has utilised the 10th highest measured maximum noise level from the night-time period and allows for an assessment of a typical maximum noise level in determining façade sound insulation performance.

2.5. Professional Practice Guidance on Planning & Noise 2017

Professional Practice Guidance (ProPG) on Planning and Noise [10] has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The guidance encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. It aims to complement Government planning and noise policy and guidance. In particular, it strives to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process.
- Encourage the process of good acoustic design in and around new residential developments.
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments.
- Improve understanding of how to determine the extent of potential noise impact and effect; and
- Assist the delivery of sustainable development.

2.5.1 This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

2.5.2 The two sequential stages of the overall approach are:

Stage 1 – an initial noise risk assessment of the proposed development site

It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced.

Stage 2 – a systematic consideration of four key elements

Element 1 – Demonstrating a “Good Acoustic Design Process”

It is imperative that acoustic design is considered at an early stage of the development control process. A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally and externally. Good acoustic design should

avoid “unreasonable” acoustic conditions and prevent “unacceptable” acoustic conditions.

Element 2 – observing internal “Noise Level Guidelines”.]

Table 4:ProPG internal noise level guidelines (additions to BS8233 show in bold)

Activity	Location	Daytime (07:00-23:00)	Night (23:00-07:00)
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,fast}$[4]
NOTE 1: The table provides recommended internal LAeq target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.			
NOTE 2: The internal LAeq target levels shown in the table are based on the existing guidelines issued by the WHO [8] and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g., 1 hour, may be used, but the level should be selected to ensure consistency with the internal LAeq target levels recommended in the table.			
NOTE 3: These internal LAeq target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year’s Eve.			
NOTE 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g., bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB LAmax,F more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability, and regularity of noise events.			
NOTE 5: Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed. However, any façade openings used to provide whole dwelling ventilation (e.g., trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal LAeq target levels should not normally be exceeded, subject to the further advice in Note 7.			
NOTE 6: Attention is drawn to the requirements of the Building Regulations.			
NOTE 7: Where development is considered necessary or desirable, despite external noise levels above the WHO Guidelines [8], the internal LAeq target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal LAeq levels start to exceed the internal LAeq target levels by more than 5 dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number			

of rooms affected has been kept to a minimum. Once internal LAeq levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.

Element 3 – undertaking an "External Amenity Area Noise Assessment".
BS8233 [3] provides the following advice:

> *"If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended. The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50-55 dB LAeq,16hr. These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."*

2.5.3 Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space then that impact may be partially offset if the residents are provided, through the design of the development or the planning process, with access to:

- a relatively quiet facade or a relatively quiet externally ventilated as part of their dwelling; and/or
- a relatively quiet alternative or additional external amenity space for sole use by a household; and/or
- a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or
- a relatively quiet, protected, publicly accessible, external amenity space that is nearby.

Element 4 – consideration of "Other Relevant Issues"

- compliance with relevant national and local policy.
- magnitude and extent of compliance with ProPG.
- likely occupants of the development.
- acoustic design v unintended adverse consequences; and
- acoustic design v wider planning objectives.

2.5.4 Following the above stages, including the initial site risk assessment and full assessment, a recommendation to the decision maker is determined as follows:

- Grant without noise conditions; or
- Grant with noise conditions; or
- Avoid (significant adverse effects); or
- Prevent (unacceptable adverse effects).

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3.0 Surveys

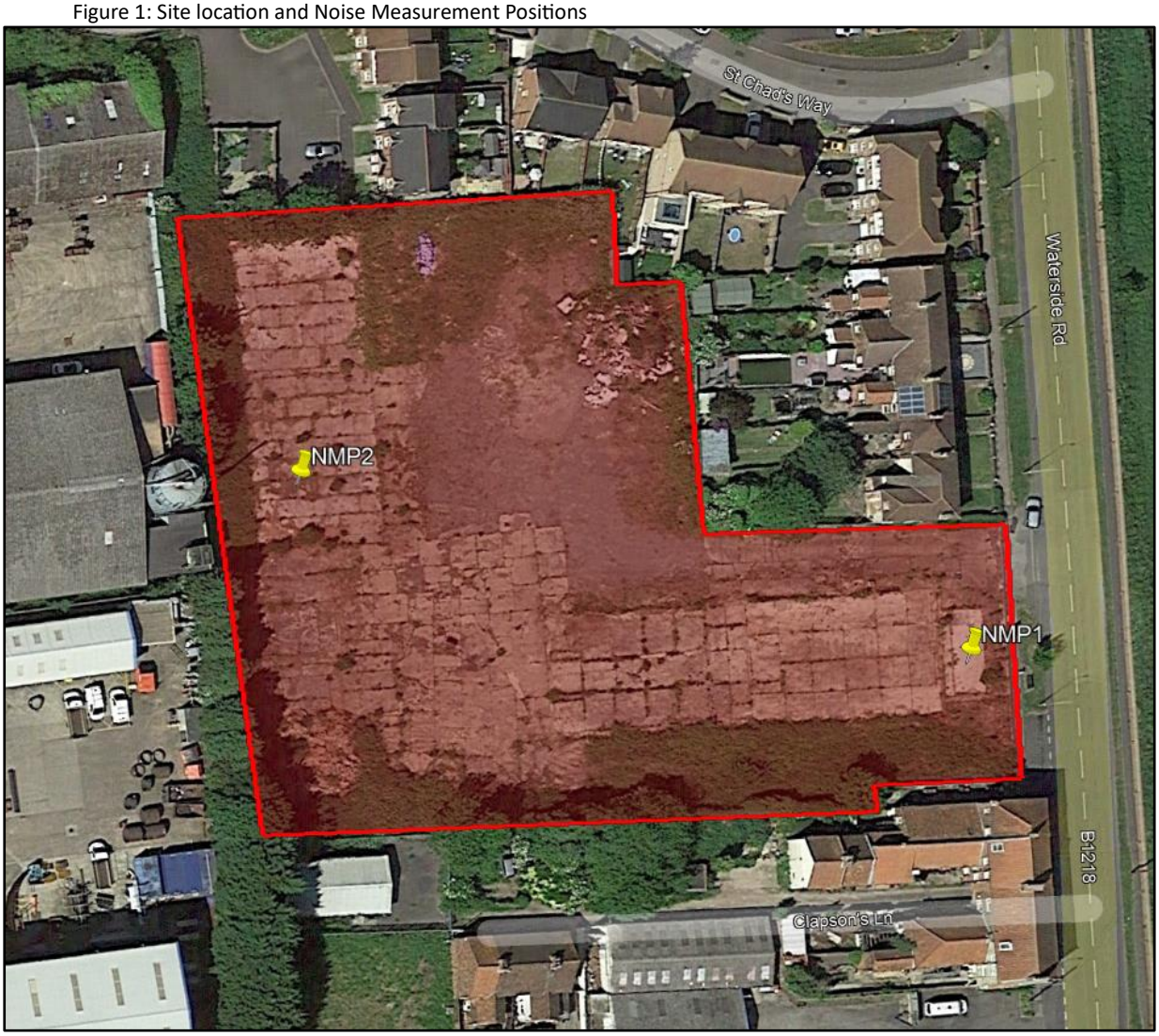
3.1. Background and Ambient Noise Survey

3.1.1 A background and ambient noise survey over an entire weekend and weekday period has been completed. The dominant noise source at the site is road traffic noise, primarily from Waterside Road and unidentified plant noise from the neighbouring industrial estate, assumed to be from Jacobs. The noise survey took place over the following period:

- 6th December 2023 @10:55 – 8th December 2023 @13:38

3.1.2 Positions NMP1 and NMP2 are shown in Figure 1. The unattended logger positions were chosen to be representative of the noise levels at the facades of the proposed buildings.

Figure 1: Site location and Noise Measurement Positions



3.1.3 A summary of the measured sound pressure levels is presented in Table 5 & *Anomalous data set, not used in calculations in this assessment due to unexpected rainfall

Table 6. Unexpected weather conditions caused anomalies in the results. The survey data for the hours (10:22-23:00) of the 6th of December 2023 and night-time hours (00:00-07:00) of the 7th of December have been used to complete the assessment.

Table 5: Summary of measured noise levels NMP1

Date	Period	Average levels, $L_{Aeq,T}$ (dB)	Range of background levels, L_{A90} (dB)	Maximum night level, $L_{AFmax,1min}$ (dB)
6/12/2023	Daytime (10:55-23:00)	54	37-52	-
	Night (23:00-07:00)	44	31-45	66
7/12/2023	Daytime (07:00-23:00)	56	45-61	-
	Night (23:00-07:00)*	45	25-48	66
8/12/2023	Daytime (07:00-13:38)*	56	48-53	-

*Anomalous data set, not used in calculations in this assessment due to unexpected rainfall

Table 6: Summary of measured noise levels NMP2

Date	Period	Average levels, $L_{Aeq,T}$ (dB)	Range of background levels, L_{A90} (dB)	Maximum night level, $L_{AFmax,1min}$ (dB)
6/12/2023	Daytime (11:15-23:00)	55	38-52	-
	Night (23:00-07:00)	47	34-51	55
7/12/2023	Daytime (07:00-23:00)*	58	40-52	-
	Night (23:00-07:00)*	60	29-50	88
8/12/2023	Daytime (07:00-13:48)*	65	48-53	-

*Anomalous data set, not used in calculations in this assessment due to unexpected rainfall

3.2. Noise Survey Conditions

3.2.1 The weather conditions during the noise surveys can be found in

Table 7. Historical data was obtained from Wunderground.com and confirmed with audio recordings from the survey.

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Table 7: Weather Conditions

Date	Period	Weather	Wind speed	Effect on survey
6/12/2023	Daytime (11:15-23:00)	The weather conditions conducive towards the measurement of environmental noise, dry	6mph	No effect
	Night (23:00-07:00)	The weather conditions conducive towards the measurement of environmental noise, dry	13mph	No effect
7/12/2023	Daytime (07:00-23:00)	The weather conditions were not conducive towards the measurement of environmental noise, raining	20mph	Removed data set from assessment
	Night (23:00-07:00)	The weather conditions were not conducive towards the measurement of environmental noise, raining	16mph	Removed data set from assessment
8/12/2023	Daytime (07:00-13:48)	The weather conditions were not conducive towards the measurement of environmental noise, raining	15mph	Removed data set from assessment

4.0 Residential Planning Noise Assessment

4.0.1 In order to accurately assess noise propagation across the site, a 3D noise model has been constructed using the modelling software CadnaA. The following assumptions, inputs and considerations have been included in the model:

- Terrain data taken from DEFRA Data Services Platform [11]
- Planning layout drawing as described in Section 1
- Existing buildings that provide shielding from any of the noise sources
- Measurement positions NMP1 and NMP2 have been used to successfully calibrate the model.
- A reflection order of 2 has been used in all calculations.
- Building heights are assumed to be 7m high, in keeping with surrounding residential dwellings.
- Noise levels generated using ISO 9613-1 [12] and ISO 9613-2 [13] as incorporated into CadnaA software.

4.1. Internal Noise Impact for Proposed Dwellings (Non-overheating scenarios)

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4.1.1 In order to accurately determine the noise level within habitable rooms, noise levels at the façades have been calculated in the noise model for the proposed layout.

4.1.2 Table 13 of BS6262-2 [14] suggests that a standard double-glazing unit with configuration 4mm glass/12mm cavity/4mm glass affords a sound insulation performance in the order of R_w 29 dB; however, this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+ Ctr' correction, has a sound insulation performance of approximately R_w + Ctr 25 dB and so this value, along with the attenuation values for further glazing configurations, has been used to determine internal noise levels.

4.1.3 BS8233 [3] also recommends that a partially open window provides approximately 15 dB attenuation, and this value is also used in the following.

4.1.4 In order to achieve the noise criteria stated within the BS8233 and WHO Guidelines [8] for bedrooms and living areas, a range of glazing specifications are required. Figure 3 of Appendix III presents the minimum glazing sound insulation performance required to achieve the WHO's noise criteria across each façade. **Error! Reference source not found.**Table 8 relates this to a typical glazing configuration and ventilation strategy for achieve this.

Table 8: Typical glazing configuration and sound insulation requirements

Sound insulation performance $R_w + C_{tr}$ (dB)	Typical glazing configuration (mm)	Ventilation strategy
<15	4/12/4	Natural ventilation/openable windows
25	4/12/4	Natural ventilation/openable windows

4.2. Overheating noise assessment

4.2.1 Analysis of the noise model indicates that open windows can be relied upon to provide cooling in overheating scenarios across the site, as the noise limits of ADO [7] are not exceeded as indicated in Figure A5 in Appendix III.

4.3. External Amenity

4.3.1 The predicted noise levels in the gardens of the new properties will be up to 54 dB for the plots 15-21 with the proposed 1.8m high fencing at the end of the gardens, Figure A6 in Appendix III.

4.3.2 It is possible to reduce noise levels by increasing the height of areas of the proposed fencing to 2.1m high, shown in Figure A 7 in Appendix III. Due to the proximity of the industrial noise source, Plot 16 is unable to achieve noise levels below 50dB across the entire external space, but noise can be mitigated to be low the upper threshold, 55dB, as set out in BS8233 [3].

4.3.3 2.1m is the maximum acceptable height of the fences before visual impact becomes an issue. These reduced noise levels are therefore considered the lowest practicable for the plots. In order to achieve the necessary noise screening from the fences they should be free from gaps and holes and constructed of any suitable material with a surface density of >10 kg/m2. For example, 18mm plywood would be suitable.

4.3.4 As discussed in Element 3 of ProPG [10], the impact of higher external noise levels can be partially offset if there is an alternative, relatively quiet external amenity area nearby that is open to residents. The Humber Bridge Park Walk is located within 5 minutes' walk of the site and Dam Road Playground is 8 minutes' walk of the site, which will provide a relatively tranquil amenity space for residents.

4.3.5 BS8233 [3] also suggests that development should not be prohibited as a result of high noise levels in the external amenity areas, as residents will often prefer to have a private external area with a slightly higher noise level than to not have a private external area at all.

4.3.6 Consequently, it is thought that the proposed external amenity noise levels, with the proposed mitigation measures in place, will be suitable for their intended use.

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5.0 Conclusion

5.0.1 An environmental noise surveys have been completed to quantify the prevailing noise environment, dominated by road traffic noise from Waterside Road and unidentified plant noise coming from the adjacent industrial estate, assumed to be coming from Jacobs.

5.0.2 This noise survey has been used to develop a 3D computer model of noise propagation across the site including all significant noise sources and with full topography, and to inform a scheme of mitigation measures required to ensure a commensurate level of protection against noise for future occupants.

5.0.3 Accordingly, appropriate consideration has been given towards the mitigation measures required to ensure that the internal ambient noise level requirements set out in BS8233 [3] can be met for the development. A range of double-glazing configurations from R_w + Ctr <15 dB to R_w + Ctr 25 dB would be required to control noise break in from external sources and achieve the requirements of BS8233 and ADO.

5.0.4 None of the plots are predicted to exceed the noise levels set out in Approved Document O Overheating for bedrooms at night. Open windows can be relied upon as the standard means of cooling for overheating scenarios in these locations.

5.0.5 It is recommended to install 2.1m garden fences to plots 15-23, as shown in Figure A 7 Appendix III, to control external ambient noise levels. This will reduce noise levels to the lowest practicable levels. The Humber Bridge Park Walk is located within 5 minutes' walk of the site and Dam Road Playground is 8 minutes' walk of the site, which will provide a relatively tranquil amenity space for residents.

5.0.6 The assessment is based upon robust and worst-case assumptions and demonstrates that, in principle and subject to the incorporation of the identified mitigation measures, there should be no adverse impact at the proposed or dwellings as a result of existing noise. The site is suitable for the promotion of residential development.

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Wakefield
West Yorkshire
WF2 0XJ

6.0 Credentials

Name	Title	Credentials
James Flitton BSc AMIOA	**Acoustic Consultant**	**CSCS Professionally Qualified person**
		Associate Member Institute of Acoustics
		IOA Diploma in Acoustics & Noise Control
		Affiliate Member of IDE
		Affiliate Member of IOR
Signed		

Appendix I – Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

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3b South Park Way
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West Yorkshire
WF2 0XJ

Appendix II – Survey Instrumentation

Manufacturer Calibration Certificate

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3. All tests are traceable in accordance with ISO/IEC 17025.

This model of sound level meter submitted for periodic testing successfully completed the applicable pattern-evaluation tests given in IEC 61672-2. The pattern approval certificate is available at www.nti-audio.com/XL2.

Sound Level Meter

Manufacturer	NTi Audio		
Type	XL2-TA	S/N	A2A-22077-F0
Firmware	V4.71		
Microphone Model	M2230		
Preamplifier	MA220	S/N	11392
Microphone Capsule	MC230A	S/N	A24696
Performance class	Class 1		
Customer Inventory Nr.			

Customer

Crimson Remote Services Ltd
7 Hicks Grove
Thoresby Vale
Edwinstowe
Nottinghamshire

Date 07 February 2023

Certificate UK-23-018

Results **PASSED**
(for detailed report see next pages)

Operator [redacted]
David Young

NTi Audio UK Ltd • Office 33C Julians Road • Stevenage
Hertfordshire, SG1 3ES, UK • uk@nti-audio.com

E2 Consultants Ltd
3b South Park Way
Wakefield
West Yorkshire
WF2 0XJ

Manufacturer Calibration Certificate

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3. All tests are traceable in accordance with ISO/IEC 17025.

This model of sound level meter submitted for periodic testing successfully completed the applicable pattern-evaluation tests given in IEC 61672-2. The pattern approval certificate is available at www.nti-audio.com/XL2.

Sound Level Meter

Manufacturer	NTi Audio		
Type	XL2-TA	S/N	A2A-21300-E0
Firmware	V4.71		
Microphone Model	M2230		
Preamplifier	MA220	S/N	13799
Microphone Capsule	MC230A	S/N	A23497
Performance class	Class 1		
Customer Inventory Nr.			

Customer

Crimson Remote Services Ltd
38 Potter Street
Worksop
Nottinghamshire
S80 2AQ

Date 12 July 2023

Certificate UK-23-084

Results **PASSED**
(for detailed report see next pages)

Operator [redacted]
David Young

NTi Audio UK Ltd • Office 33C Julians Road • Stevenage
Hertfordshire, SG1 3ES, UK • uk@nti-audio.com

E2 Consultants Ltd
3b South Park Way
Wakefield
West Yorkshire
WF2 0XJ

NTi AUDIO

Manufacturer Calibration Certificate

The following instrument has been tested and calibrated to the manufacturer specifications.
The calibration is traceable in accordance with ISO/IEC 17025 covering all instrument functions.

- Device Type: **Class 1 Sound Calibrator CAL200**
- Serial Number: **19829**

- Date of Calibration: **20 November 2023**
- Certificate Number: **45250-19829-CAL200**
- Results: **PASSED**
  (for detailed report see next page)

Tested by: D.Young

Signature: [redacted]

NTi Audio UK Ltd, Office 33C Jullans Road, Stevenage, Hertfordshire, SG1 3ES Tel No: +44 (0) 1438 870632
email: uk@nti-audio.com Web: www.nti-audio.com. VAT Number 314751712

1/2

Crimson Remote Services Ltd
7 Hicks Grove
Edwinstowe
Nottinghamshire
NG21 9SP

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Appendix III – Figures

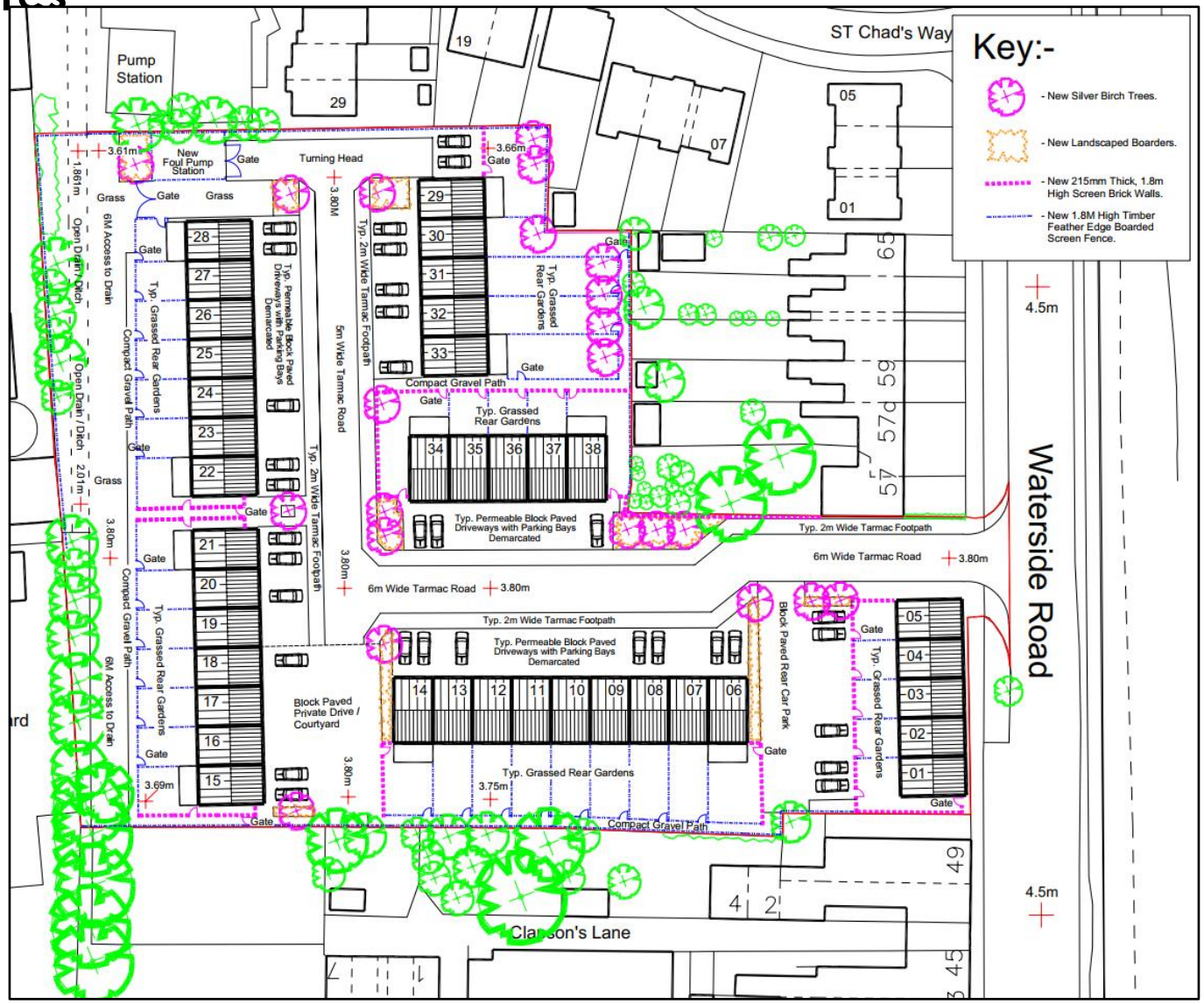

Figure A1: Site Plan

Figure A2: Daytime $L_{Aeq,16hr,}$ Ground Floor Glazing and Ventilation Strategy

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Nottinghamshire
NG21 9SP

Figure A3: Night-time $L_{Aeq,8hr}$, First Floor Glazing and Ventilation Strategy

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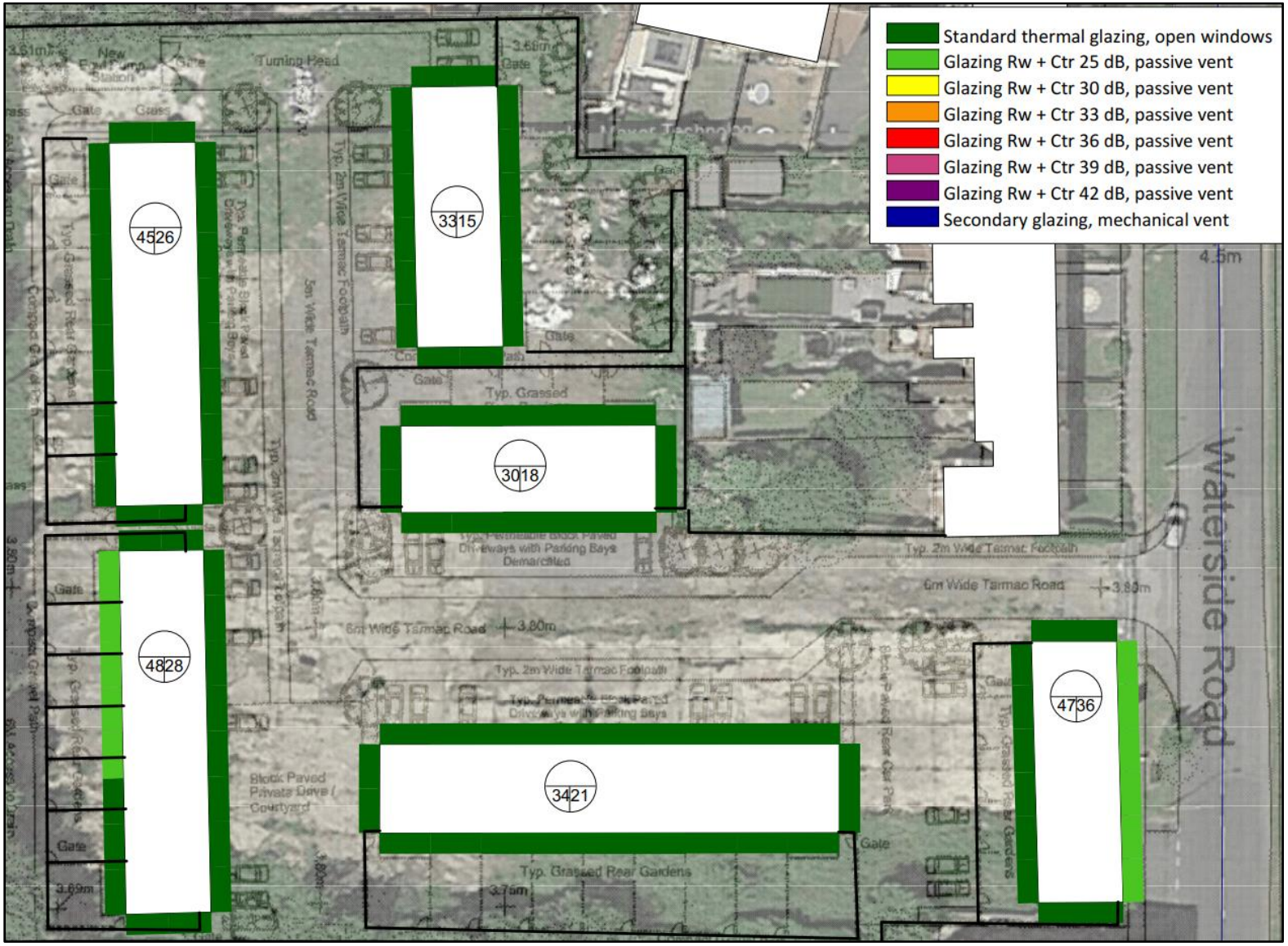

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Figure A4:Glazing, Night-time L_{AMax}, First Floor Glazing and Ventilation Strategy

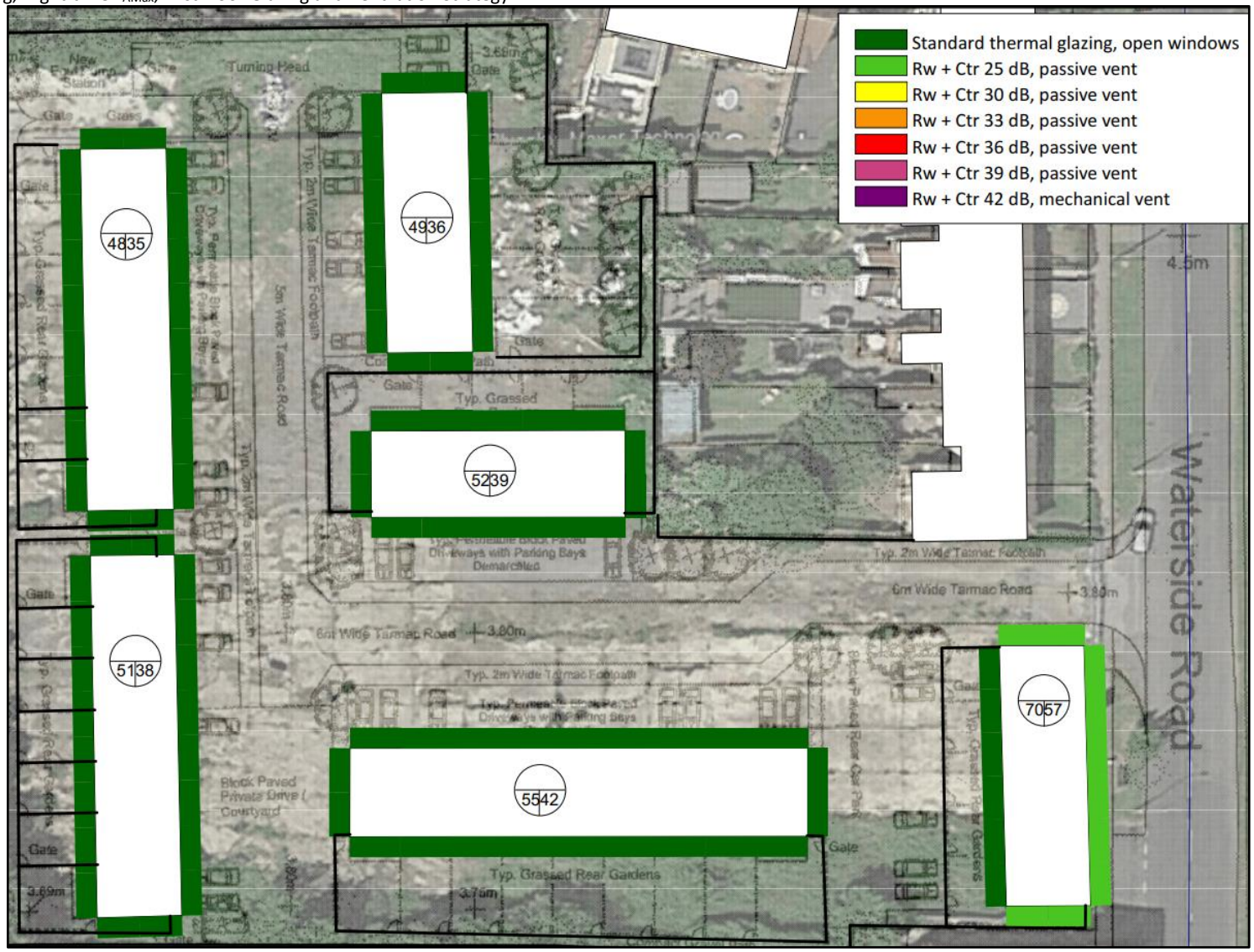

Figure A5: Overheating Strategy, Night-time L_{Aeq} and Night-time L_{Amax}

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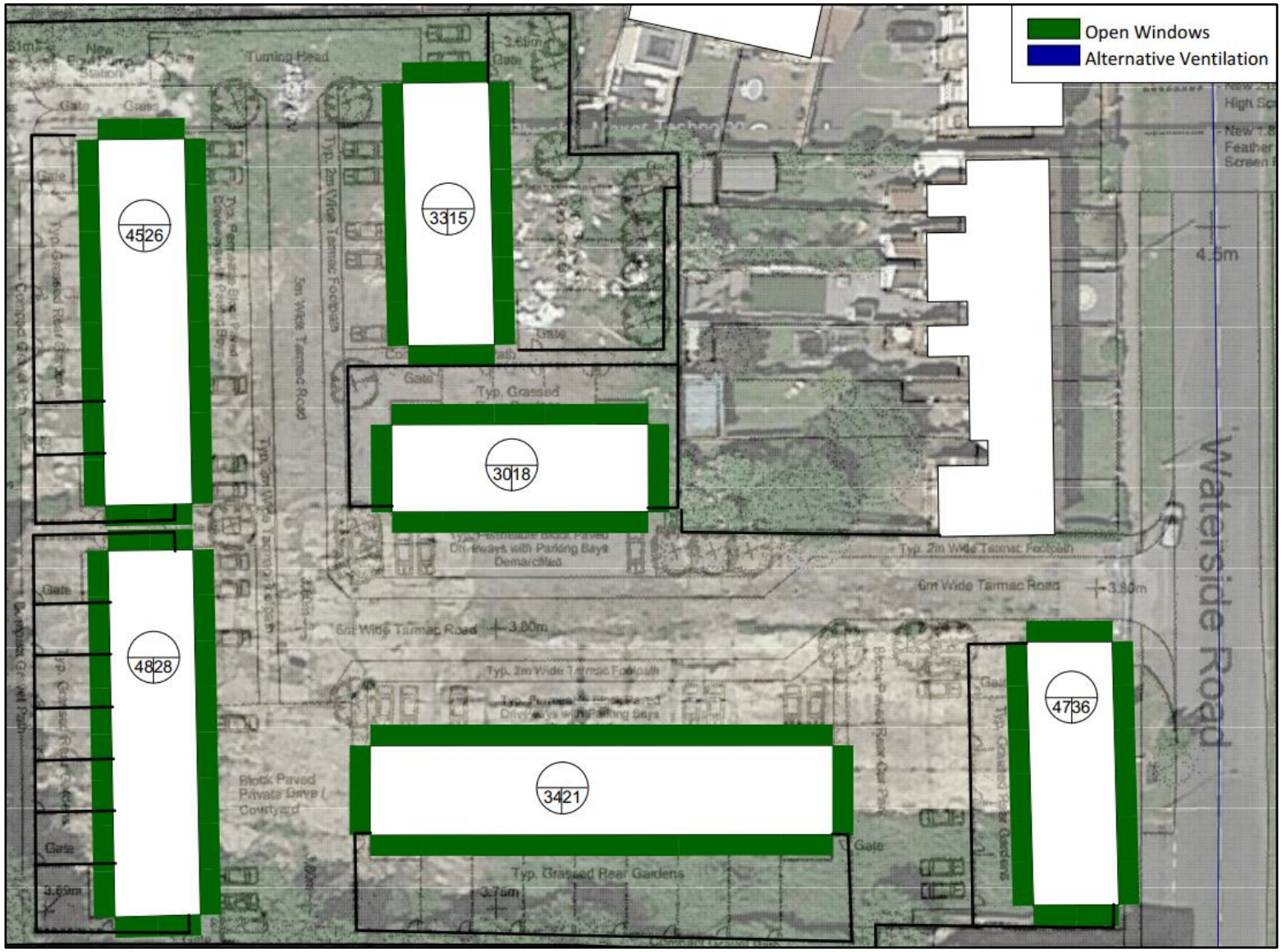

Figure A6: External Amenities - Proposed Fencing (1.8m high)

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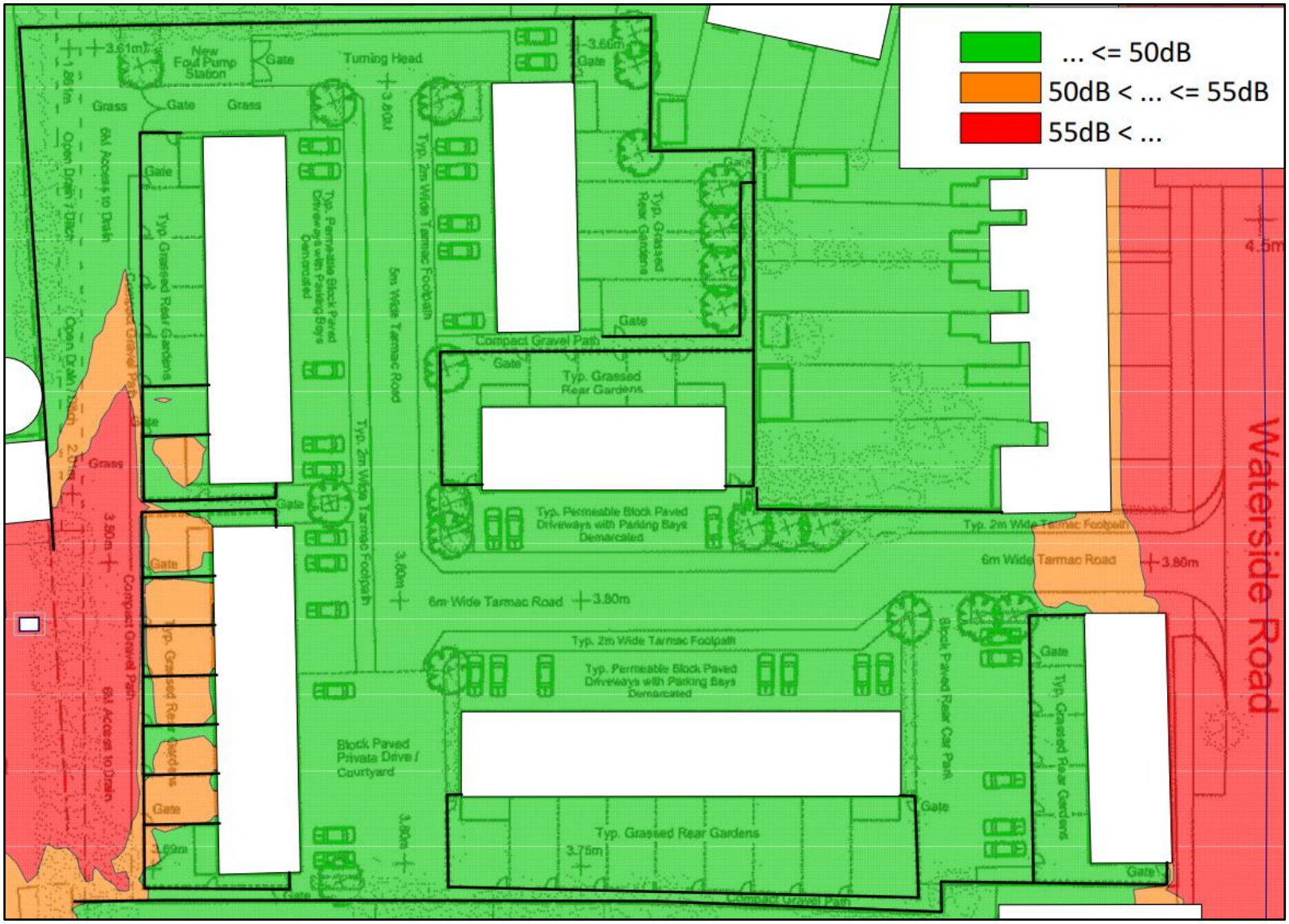

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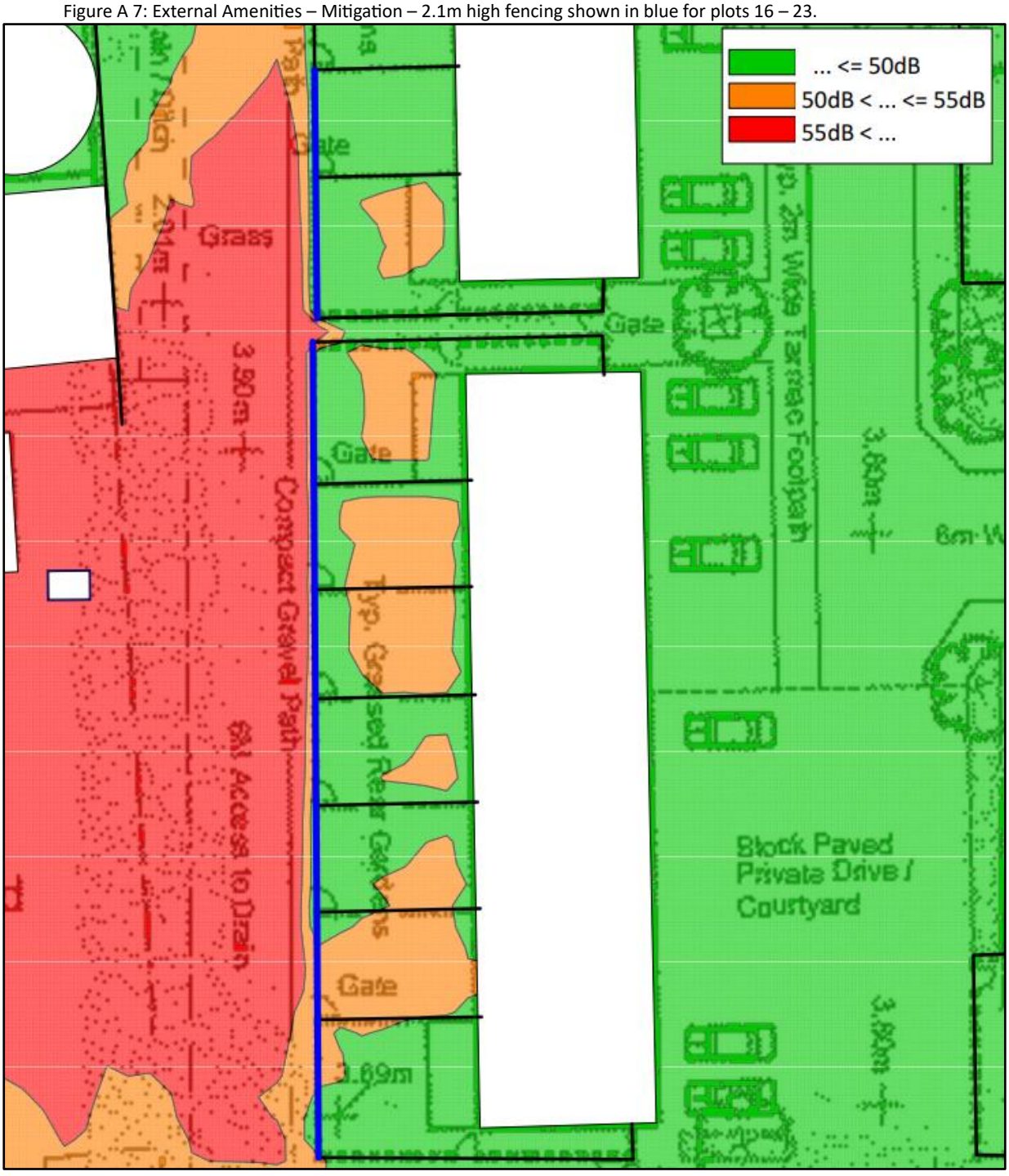
Figure A 7: External Amenities – Mitigation – 2.1m high fencing shown in blue for plots 16 – 23.



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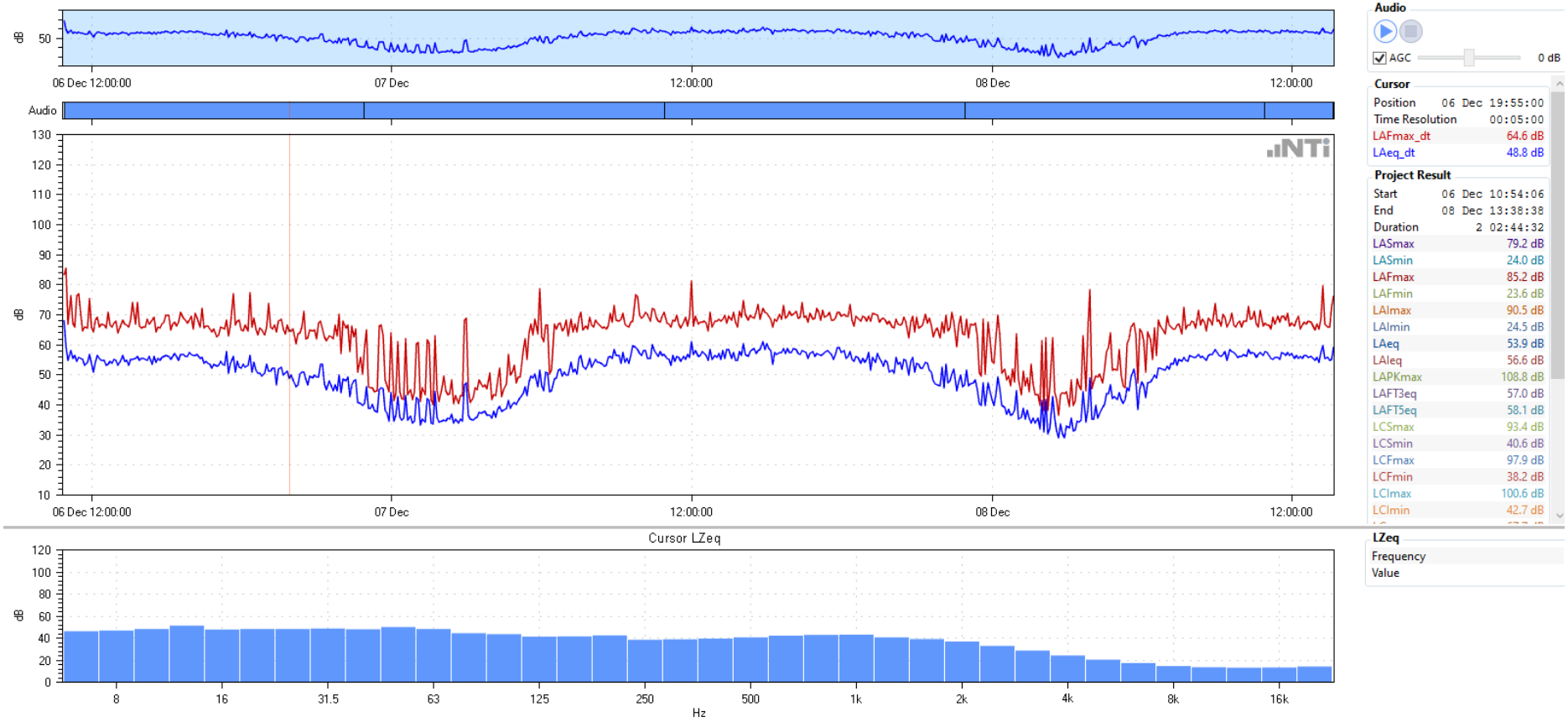
Appendix IV – Measured Data Charts
Roadside data set



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Rear Site data Set