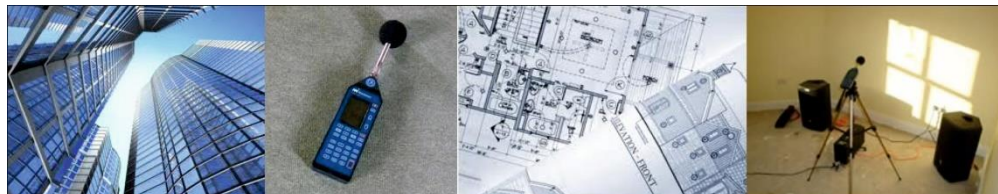


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BATTERY STORAGE FACILITY BURGHFIELD ROAD READING RG30 3RA

ACOUSTIC DESIGN SPECIFICATION
v.2

Client:

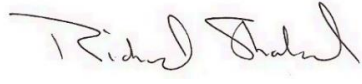
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2nd April 2023
Ref: M5293

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Project Reference	M5293
Issue No.	2
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Date	2 nd April 2023

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1. SUMMARY

- 1.1 An assessment of noise has been undertaken at Burghfield Road, Reading, RG30 3RA to consider the potential impact of the Battery Storage Facility. The facility will offer additional power to the national grid during peak periods of demand, which is generally during day or evening periods only.
- 1.2 Ambient noise levels have been measured at a representative location close to residential properties, and this exercise indicates that the background noise level, $L_{A90,5mins}$, would typically fall to levels of 42 dB(A) during the daytime period of (07.00 – 23.00 hrs), and 36 dB(A) during the night-time period (23.00 – 07.00 hrs).
- 1.3 Calculations of noise radiating from the attenuated equipment have predicted noise levels of 26 dB(A) during the daytime and night-time at 1m from the facade of the nearest residential properties some 150m away.
- 1.4 Based on these attenuated noise levels, the requirements of Policy EN17 of the Reading Borough Local Plan will be met.
- 1.5 A further assessment of the predicted noise, in absolute terms, indicates that levels would be significantly below the British Standard 8233 guidelines for residential occupation during both the day and night.
- 1.6 Consideration of noise affecting adjacent commercial buildings indicates that residual levels from the Battery Storage Facility would be comfortably below BS8233 guideline values.
- 1.7 It is therefore concluded that the proposed installation of the Battery Storage Facility, with attenuated noise sources, would not have a significant adverse impact on the neighbouring properties.

2. INTRODUCTION

- 2.1 An assessment has been undertaken by Ian Sharland Limited on behalf of Renepower, to assess the impact of noise emanating from a proposed battery storage facility on neighbouring properties.
- 2.2 The proposed location of the facility is situated to the west of Burghfield Road, north from Holybrook Farm and south from residential properties within Lea Close . Figure 1 indicates the location of the site, and the proposed compound within. The aerial photograph also indicates the nearest noise sensitive receptors (NSRs).
- 2.3 The facility will comprise the following noise sources (as shown in Figure 2):
- 8 Battery Storage Containers,
 - 2 Inverters,
 - 1 Step up / down Transformers,
 - 1 Substation.
- 2.4 Given the locality of residential properties to the site it is necessary to assess if emitted noise will have any adverse impact. Consideration should also be given to any adjacent commercial neighbours.
- 2.5 The objectives of the present exercise may therefore be summarised as follows:
- (a) To determine the existing ambient noise levels in the area,
 - (b) To determine the likely noise emitted from the new facility,
 - (c) Where appropriate, to recommend forms of noise control that will limit emissions to an acceptable level,
 - (d) To assess the emitted noise in accordance with relevant standards.
- 2.6 This report describes the work conducted on each of those objectives and summarises the conclusions that can be drawn from the results.

3. SURVEY OF AMBIENT NOISE LEVELS

- 3.1 To assess the ambient background noise levels, a noise survey was undertaken at a representative location of the nearest residential properties.
- 3.2 A Rion NL-52 sound level meters was set up with the microphone attached to extendable light stand at a height of 1.5m above ground in free field conditions at the following location, see Figure 3 – Monitoring Location).
- P1 - North of 2 Holybrook Farm.
- 3.3 The equipment was calibrated before and after the measurements were taken and showed no significant variation.
- 3.4 The survey ran through Friday 7th September until Tuesday 11th October 2022.
- 3.5 The weather conditions during the survey were as follows:

Date	Ave Temp °C	Rainfall mm	Ave Wind Speed m/s	Prevailing Wind Direction
Friday 07/10	16	0.0	5.5 – 7.9	SW
Saturday 08/10	13	1.0	0.3 – 1.5	W
Sunday 09/10	15	0.0	5.5 – 7.9	S
Monday 10/10	13	3.0	5.5 – 7.9	N
Tuesday 11/10	13	2.0	0.3 – 1.5	E

Table 3.1 – Weather Conditions During Survey

- 3.6 The meter was configured to measure 5-minute samples of the following acoustic parameters:
- L_{Aeq}** The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.
- L_{Amax}** The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).
- L_{A90}** A statistical parameter, representing the A-weighted noise level exceeded for 90% of each sample period. This gives a measure of the underlying noise and is commonly used to describe the ambient background noise.
- 3.7 The variation of measured noise levels is shown graphically in Figure 4.

- 3.8 The key measurements for this exercise are the values of the background noise levels recorded. The levels were found to fall to the following minimum typical values taken as the 90th percentile over the survey duration:

Period	Typical Value L _{A90}
07.00 – 23.00	42 dB(A)
23.00 – 07.00	36 dB(A)

Table 3.2 – Assessed Values of Background Noise

- 3.9 Section 6 of this report will discuss these noise levels, in respect of appropriate targets for limiting new noise emissions.

4. PREDICTION OF FACILITY NOISE

4.1 The proposal for the Battery Storage Facility involves the installation of the four main noise sources – Inverters, chillers with the battery containers, step up/down transformers and substation.

4.2 Predicted façade noise levels have been based on the typical equipment, generating the following sound power levels³:

- 8 Battery Containers including chillers – each rated at 88 dB(A) L_{WA}
- 2 Inverters – each rated at 76 dB(A) L_{WA}
- 1 Step up/down Transformers – each rated at 75 dB(A) L_{WA}
- 1 Substation – rated at 84 dB(A) L_{WA} .

4.3 The frequency levels of sound power associated with each item are as follows:

Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Battery Containers	dB	94	88	87	85	83	79	74	73
Inverters	dB	84	75	75	73	71	67	64	62
Step up/down Transformers	dB	89	81	75	71	69	65	60	46
Power Transformer	dB	96	87	83	80	79	76	72	65

Table 4.1 – Source Sound Power Levels

4.4 The equipment will require the following levels of attenuation (if incorporated with acoustic fencing), the detailed engineering of which is to be determined:

- Battery Containers: -26 dB,
- Inverters: -9 dB,
- Transformers: -6 dB,
- Substation: -13 dB.

4.5 The equipment will be installed with an acoustic fence around the perimeter of the compound constructed as a boarded timber fence⁴ to a height of 4m.

4.6 The distance from the compound to the nearest noise sensitive receptors (NSR) are shown in Table 4.2.

³ Base noise levels to be confirmed during detailed design and final plant selections

⁴ The specification of the barrier would be 25mm thick timber boarded panels, butt-edged with a 25mm thick x 200mm wide cover strip fixed behind each joint. Fence must be designed to avoid air-gaps along bottom edge, and between panels and vertical posts.

Receptor	Distance from Compound (m)
R1 – Lea Close	150
R2 – 2 Holybrook Farm	155
R3 – Holybrook Farm Buildings	165
R4 – 1 Holybrook Farm	175
R5 – Rangewood Avenue	195
R6 – Holybrook Farm	220

Table 4.2 – Distances of NSRs to Compound

4.7 INoise V2020 noise mapping software has then been used to provide predictions of noise emanating from the compound to the facade of both residential and commercial buildings. The software follows the methodology of BS EN ISO 9613: 2007 Acoustics - 'Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels'. Figures 5 & 6 provides an extract from the model for the attenuated noise at 1.5m (ground floor) & 4.5m (1st floor) above ground respectively.

4.8 The results of the predictions are as follows:

Receptor	Predicted Facade Noise Level (Attenuated) L _{Aeq,T} dB	
	Ground Floor	Upper Floor
R1 – Lea Close	26	26
R2 – 2 Holybrook Farm	25	n/a
R3 – Holybrook Farm Buildings	25	n/a
R4 – 1 Holybrook Farm	24	n/a
R5 – Rangewood Avenue	23	23
R6 – Holybrook Farm	23	24

Table 4.3 – Predicted Noise Levels

5. PLANNING POLICY & CRITERIA OF ACCEPTABILITY

5.1 National Planning Policy Framework (July 2021)

- 5.1.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.
- 5.1.2 Planning law requires that applications for planning permission be determined in accordance with the development plan unless material considerations indicate otherwise. The National Planning Policy Framework must be taken into account in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.
- 5.1.3 The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.
- 5.1.4 Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):
- a) an economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.
 - b) a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
 - c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.
- 5.1.5 These objectives should be delivered through the preparation and implementation of plans and the application of the policies in this Framework; they are not criteria against which every decision can or should be judged. Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

5.1.6 So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development.

5.1.7 Paragraph 185 of the NPPF states:

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

- a) mitigate and reduce to 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 life⁵*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

5.1.8 The Framework continues:

187. 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.

188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

⁵ Refers here to the NPSE, discussed in Section 4.2 of this report.

5.2 Noise Policy Statement for England (March 2010)

- 5.2.1 The document "Noise Policy Statement for England" sets out the following vision for on-going noise policy:

"Promote good health and quality of life through the effective management of noise within the context of Government policy on sustainable development."

- 5.2.2 This vision should be achieved through the following Noise Policy Aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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."

- 5.2.3 To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- **NOEL** - No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level there is no detectable effect on health and quality of life due to the noise.

- **LOAEL** - Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. Where levels lie between the LOAEL and SOAEL, the Statement requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, as set out in the NPPF.

- **SOAEL** - Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It notes, however, that "it is not possible to have a single objective noise-based measure that describes SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times."

- 5.2.4 Paragraph 2.7 states that "... the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications."

- 5.2.5 This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme, taking into account the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly, it may be appropriate in some cases

for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance to the development as a whole.

- 5.2.6 The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development... This does not mean that such adverse effects cannot occur."

- 5.2.7 Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change. An indication of the numerical definition of LOAEL may be derived from the following guidance.

5.3 DHCLG Guidance Note, 'Noise' (July 2019)

- 5.3.1 The Department of Housing Communities and Local Government provided further guidance to support the NPPF. The section, Noise, published in July 2019 advises:

When is noise relevant to planning?

Noise needs to be considered when development may create additional noise or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

Can noise override other planning concerns?

It can, where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern.

How can noise impacts be determined?

Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

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

In line with the Explanatory note of the Noise Policy Statement for England, 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. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.

What are the observed effect levels?

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

Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.

How can it be established whether noise is likely to be a concern?

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.

As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.

5.3.2 Table 5.1 summarises the noise exposure hierarchy, based on the likely average response:

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 stress, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Table 5.1 – Noise Exposure Hierarchy

5.3.3 The guidance further advises:

What factors influence whether noise could be a concern?

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

These factors include:

- the 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 a new noise making source, how the noise from it relates to the existing sound environment.
- for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise.
- the spectral content of the noise (i.e., whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e., whether or not the noise contains particular tonal characteristics or other particular features), and.
- the local arrangement of buildings, surfaces and green infrastructure, and the extent to which it reflects or absorbs noise.

More specific factors to consider when relevant include:

- the cumulative impacts of more than one source of noise.
- whether any 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 (and the effect this may have on living conditions). 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.
- In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.
- Noise Action Plans (where these exist), and the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations should be considered. Defra's website has information on Noise Action Plans and Important Areas. Local authority environmental health departments will also be able to provide information about Important Areas.
- the effect of noise on wildlife. Noise can adversely affect wildlife and ecosystems. Consideration needs to be given to the potential effects of noisy

- development on international, national, and locally designated sites of importance for biodiversity.
- where 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.
- some commercial developments including restaurants, hot food takeaways, night clubs and public houses can have impacts, not least because activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the noise that may be made by customers in the vicinity.

When proposed developments could include activities that would be covered by the licensing regime, local planning authorities will need to consider whether the potential for adverse noise impacts will be addressed through licensing controls (including licence conditions). Local planning authorities should not however presume that licence conditions will provide for noise management in all instances and should liaise with the licensing authority.

Can planning policies include noise standards?

Plans may include specific standards to apply to various forms of proposed development and locations in their area. Care should be taken, however, to avoid these being applied as rigid thresholds, as specific circumstances may justify some variation being allowed.

What factors are relevant if seeking to identify areas of tranquillity?

For an area to justify being protected for its tranquillity, it is likely to be relatively undisturbed by noise from human sources that undermine the intrinsic character of the area. It may, for example, provide a sense of peace and quiet or a positive soundscape where natural sounds such as birdsong or flowing water are more prominent than background noise, e.g., from transport.

Consideration may be given to how existing areas of tranquillity could be further enhanced through specific improvements in soundscape, landscape design (e.g., through the provision of green infrastructure) and/or access.

How can the risk of conflict between new development and existing businesses or facilities be addressed?

Development proposed in the vicinity of existing businesses, community facilities or other activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme.

In these circumstances the applicant (or 'agent of change') will need to 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. In doing so, the agent of change will need to take into account not only the current activities that may cause a nuisance, but also those activities that businesses or other facilities are permitted to carry out, even if they are not occurring at the time of the application being made.

The agent of change will also need to define clearly the mitigation being proposed to address any potential significant adverse effects that are identified. Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects but can help to achieve a satisfactory living or working environment and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring).

It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints.

How can planning address the adverse effects of noise sources, including where the 'agent of change' needs to put mitigation in place?

This will depend on the type of development being considered the type of noise involved and the nature of the proposed location. In general, for developments that are likely to generate noise, there are 4 broad types of mitigation:

- engineering: reducing the noise generated at source and/or containing the noise generated.
- layout: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission using screening by natural or purpose-built barriers, or other buildings.
- using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and.
- mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building.

For noise sensitive developments, mitigation measures can include avoiding noisy locations in the first place; designing the development to reduce the impact of noise from adjoining activities or the local environment; incorporating noise barriers; and optimising the sound insulation provided by the building envelope. It may also be possible to work with the owners/operators of existing businesses or other activities in the vicinity, to explore whether potential adverse effects could be mitigated at source. Where this is the case, it may be necessary to ensure that these source-control

measures are in place prior to the occupation / operation of the new development. Where multiple development sites would benefit from such source control measures, developers are encouraged to work collaboratively to spread this cost. Examples of source control measures could include increased sound proofing on a building (e.g., a music venue) or enclosing an outdoor activity (e.g., waste sorting) within a building to contain emissions.

Care should be taken when considering mitigation to ensure the envisaged measures do not make for an unsatisfactory development.

Are there further considerations relating to mitigating the impact of noise on residential developments?

Noise impacts may be partially offset if residents have access to one or more of:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling.
- a relatively quiet external amenity space for their sole use, (e.g., a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects.
- 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, external publicly accessible amenity space (e.g., a public park or a local green space designated because of its tranquillity) that is nearby (e.g., within a 5-minute walking distance).

5.4 Reading Local Plan

5.4.1 Reading Borough Local Plan adopted 2019 confirms the following policy for noise generating equipment.

EN17: NOISE GENERATING EQUIPMENT

Where noise generating equipment is proposed, the noise source specific⁷ level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.

4.2.92 The Local Plan proposals will see a high level of development within Reading. Reading is a densely populated town with many new planning developments taking place. Residents live in close proximity to commercial activities, therefore it is important to minimise background creep in order to protect the noise environment and maintain quality of life for people living and working in the town. The negative impact of

⁷ The noise source specific level is the measured noise level, as opposed to the rating level, which is the specific level with correction factors included.

environmental noise on health is becoming better understood (for example WHO 1999, 2009 and 2011⁸).

4.2.93 Planning Practice Guidance on noise states that no specific measures are required to manage the acoustic environment in situations where noise can be heard as a result of a development and there is a slight effect on the acoustic character of the area but there is no effect on the behaviour and attitude of people exposed to the noise. However, the guidance also states that:

- The cumulative impacts of more than one source of noise should be considered; and
- In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring.

4.2.94 The Council considers that the above two factors apply due to the town being densely populated and there being a high likelihood of subsequent noise generating plant being installed in a particular location. It is therefore necessary for each planning application for noisy plant to protect the acoustic environment and as far as possible prevent the increase in background noise levels because the cumulative impact of installation of noisy plant which causes an increase in background noise level is likely to lead to an adverse effect.

4.2.95 The Planning Practice Guidance on noise also states that local planning authorities may decide to develop specific standards to apply to various forms of proposed development in their area. It cautions against the implementation of fixed thresholds because specific circumstances may justify some variation being allowed. Because this policy sets a noise target in relation to the background noise level, this allows variation of the threshold with the local circumstances because it does not set an absolute noise level that the plant must achieve, it relates it to the local noise level.

4.2.96 Where the plant noise rating level does not meet this standard, the background noise will increase. When subsequent new plant is added it will be assessed against this higher background level which results in an increasing benchmark against which subsequent new plant is introduced. This leads to an incremental increase in the noise in an area each time new plant is introduced ('background creep'). This policy standard has been applied by Reading Borough Council for a number of years and experience has demonstrated it to be achievable in most cases. In addition, noise control

5.5 BS 4142:2014+A1:2019: Methods for Rating & Assessing Industrial & Commercial Sound

5.5.1 Any formal assessment of commercial noise affecting residential properties would in all likelihood be based upon the recommendations of British Standard 4142:2014+A1:2019 "Methods for rating and assessing industrial and commercial sound".

5.5.2 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime

⁸ World Health Organisation (WHO) (1999), Guidelines for Community Noise; WHO (2009), Night Noise Guidelines for Europe; WHO (2011), Burden of Disease from Environmental Noise: Quantification of healthy life years lost in Europe

(07.00 – 23.00) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1-hour sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00) only the reference time interval is 15 minutes.

- 5.5.3 Corrections of up to + 9 dB (A) are then made to this “specific sound level” if the new noise has certain acoustic features such as tonality, impulsivity, intermittency and any other sound characteristics, to give the “rating level”.
- 5.5.4 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level and consider the following.
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
 - d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

NOTE: Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

- 5.5.5 It is likely that the Local Authority would seek to avoid marginal situations at the planning stage and may try to ensure a positive likelihood that no complaints would be forthcoming. As such, they might recommend a noise target which limits the Rating Noise Level to a maximum which is as low as 5 - 10 dB(A) below the minimum background level currently experienced.
- 5.5.6 However, there are limitations to BS4142 if noise levels are very low, and in such circumstances, it may not be necessary to follow the normal guidance in order to achieve this aim. Indeed, within the Scope of the Standard, it is stated:

"The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low.

Note: for the purpose of this Standard, background noise levels below about 30 dB and rating noise level below about 35 dB are considered to be very low."

5.6 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

- 5.6.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation such as this. Typical advice is found in British Standard 8233:2014 "Guidance on Sound Insulation and Noise Reduction for buildings." Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms. This suggests:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	40 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	35 dB(A) LAeq, 16 hr	30 dB(A) LAeq, 8 hr

Table 5.2 – BS8233 Residential Criteria, Internal

- 5.6.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)⁹. Therefore the 'good' internal standards quoted above would broadly equate to the following targets immediately outside the buildings:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	48 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	53 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	48 dB(A) LAeq, 16 hr	43 dB(A) LAeq, 8 hr

Table 5.3 – BS8233 Residential Criteria, Extrapolated External

- 5.6.3 BS8233 recognises that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB, and reasonable conditions will be achieved.
- 5.6.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are perhaps 5 dB lower than stated in the table above.
- 5.6.5 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does necessarily infer, however, that the acceptability of an occupant to an absolute noise level within a building will be different if the introduction of the noise source post-dates the construction of the building. Other factors may

⁹ Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

be relevant in certain circumstances, and they are covered in large part by BS4142, discussed above.

- 5.6.6 In respect of office buildings, BS8233 indicates that noise levels within private offices should not exceed 35 - 40 dB(A) L_{Aeq} . Adopting a typical loss of 13 dB(A) through an open window, this target equates to an equivalent level of 48 - 53 dB(A) L_{Aeq} externally.

5.7 World Health Organisation Guidelines

- 5.7.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise".
- 5.7.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq, t}$, and should preferably be designed below 50 dB(A) $L_{Aeq, t}$.
- 5.7.3 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) L_{Amax} inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) L_{Amax} externally.

6. ASSESSMENT OF PREDICTED NOISE LEVELS

6.1 Residential Properties

- 6.1.1 Based on the attenuation recommendations stated in Paras 4.4 & 4.5, the most onerous prediction of noise at the nearest residential receptor (Lea Close) is 26 dB(A) on both the ground floor (Living Room) during the day, and on the upper floor (Bedroom) at night.
- 6.1.2 In absolute terms, it is confirmed that such levels are 22 dB lower than the recommended standard indicated by BS8233 for daytime operation (ref. Para 5.6.2) and 17 dB lower than the equivalent night-time level.
- 6.1.3 Policy EN17 of the Reading Local Plan states,

Where noise generating equipment is proposed, the noise source specific¹⁰ level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.

- 6.1.4 Paragraph 3.8 has confirmed the measured background noise levels and Table 6.1 confirms the required noise targets based on these figures.

Period	Typical Value L _{A90}	Target Noise Levels
07.00 – 23.00	42 dB(A)	32 dB(A)
23.00 – 07.00	36 dB(A)	26 dB(A)

Table 6.1 – Target Noise Levels

- 6.1.5 It is therefore confirmed that the predicted attenuated noise levels would meet the requirements of Policy EN17.
- 6.1.6 Finally, it is confirmed that the predicted noise levels within amenity spaces linked to the NSRs will fall well below the lower threshold values offered in the WHO guidance.

6.2 Commercial Properties

- 6.2.1 It appears that there are some commercial buildings some 165m away (Holybrook Farm) to the south of the proposed compound, and the predicted noise level here is 25 dB(A).
- 6.2.2 This level is comfortably below the recommended guideline limits of BS8233 (para 5.6.6) and would meet the requirements of Policy EN17.

¹⁰ The noise source specific level is the measured noise level, as opposed to the rating level, which is the specific level with correction factors included.

7. UNCERTAINTY

- 7.1 The variability or uncertainty in each element of this noise assessment needs to be considered, the measurements themselves, the noise predictions and the assessment of likely impacts. Guidance and good practice are given within BS4142:2014 (Method of rating and assessing industrial and commercial sound) Annex B for reducing uncertainty.
- 7.2 The table below provides a discussion of the key points relating to uncertainty for this assessment:

Consideration	Comments
Complexity of the sound source and the residual acoustic environment	The noise sources emanate a relatively constant level of noise when operating, allowing for a secure assessment. As a predictive assessment, rather than an in-situ measurement, the source data provides a robust baseline for the calculation.
Measurements Location and Duration	Ambient background noise survey was conducted over a 5-day period, including daytime and night-time.
Weather Conditions	In respect of the specific measurements, weather conditions were favourable.
Instruments	All instruments used were Class 1 sound level meters, carrying valid third-party calibration. All instruments were calibrated before and after the surveys were undertaken.
Calculations	All calculations have been completed using an industry standard noise mapping software (INoise) which implements validated calculation methodologies. Open land has been modelled as soft, in line with a conservative approach in estimating ground absorption effects over distance.
Overall	It is considered that the assessment will be accurate to a level of +/- 3 dB

FIGURE 1 – SITE LOCATION

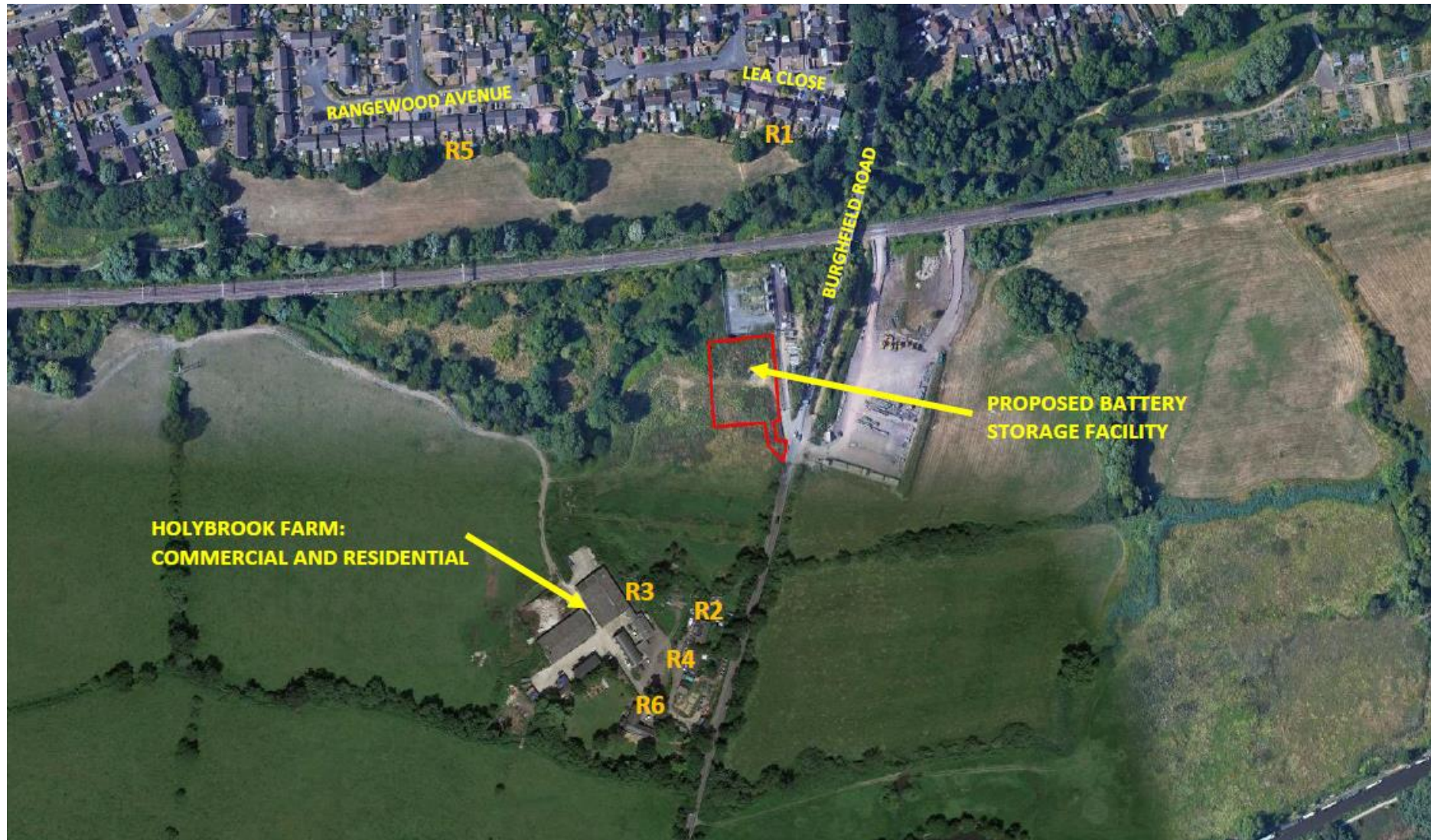


FIGURE 2 – PROPOSED SITE LAYOUT

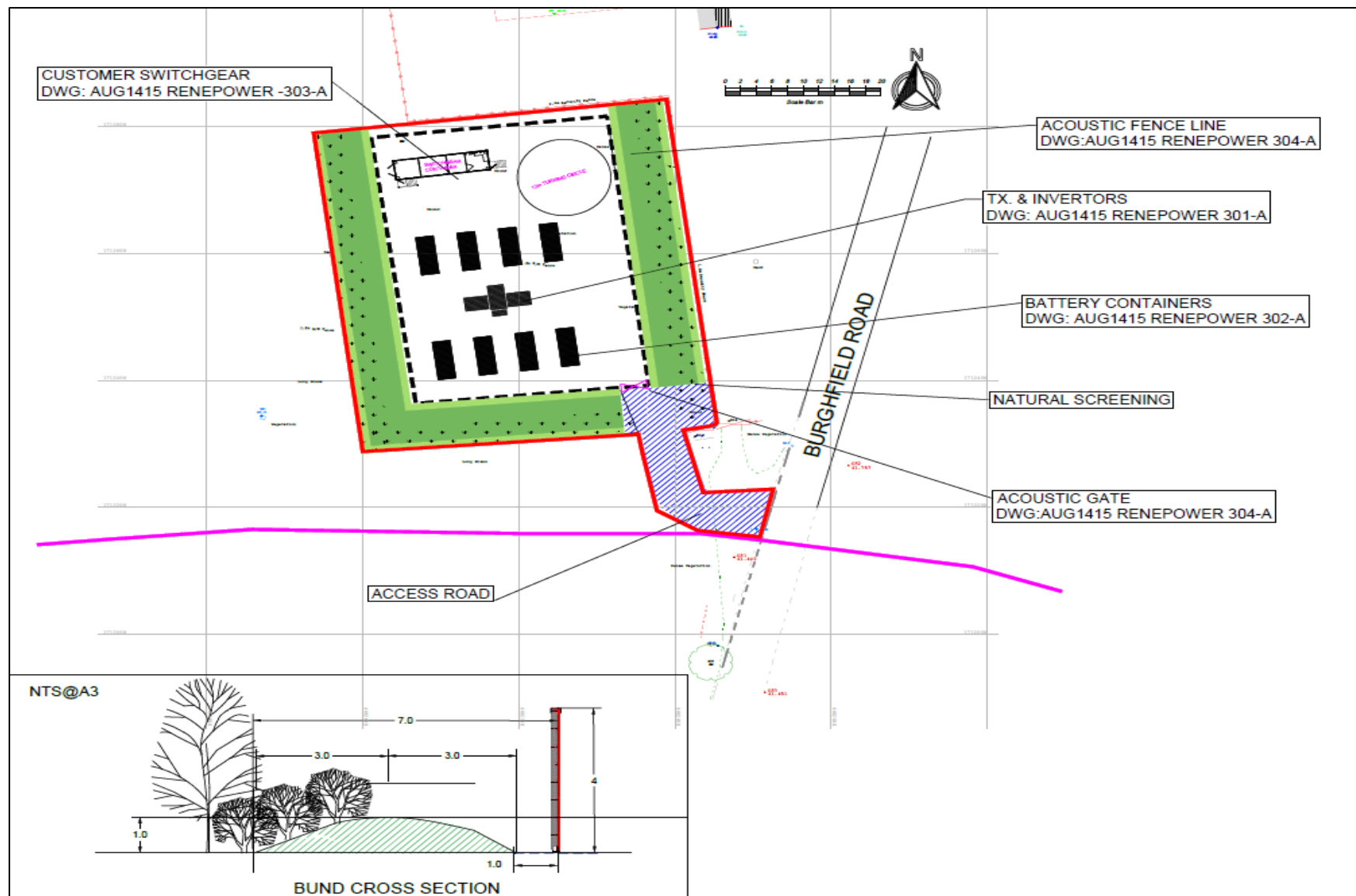




FIGURE 3 – MONITORING LOCATIONS

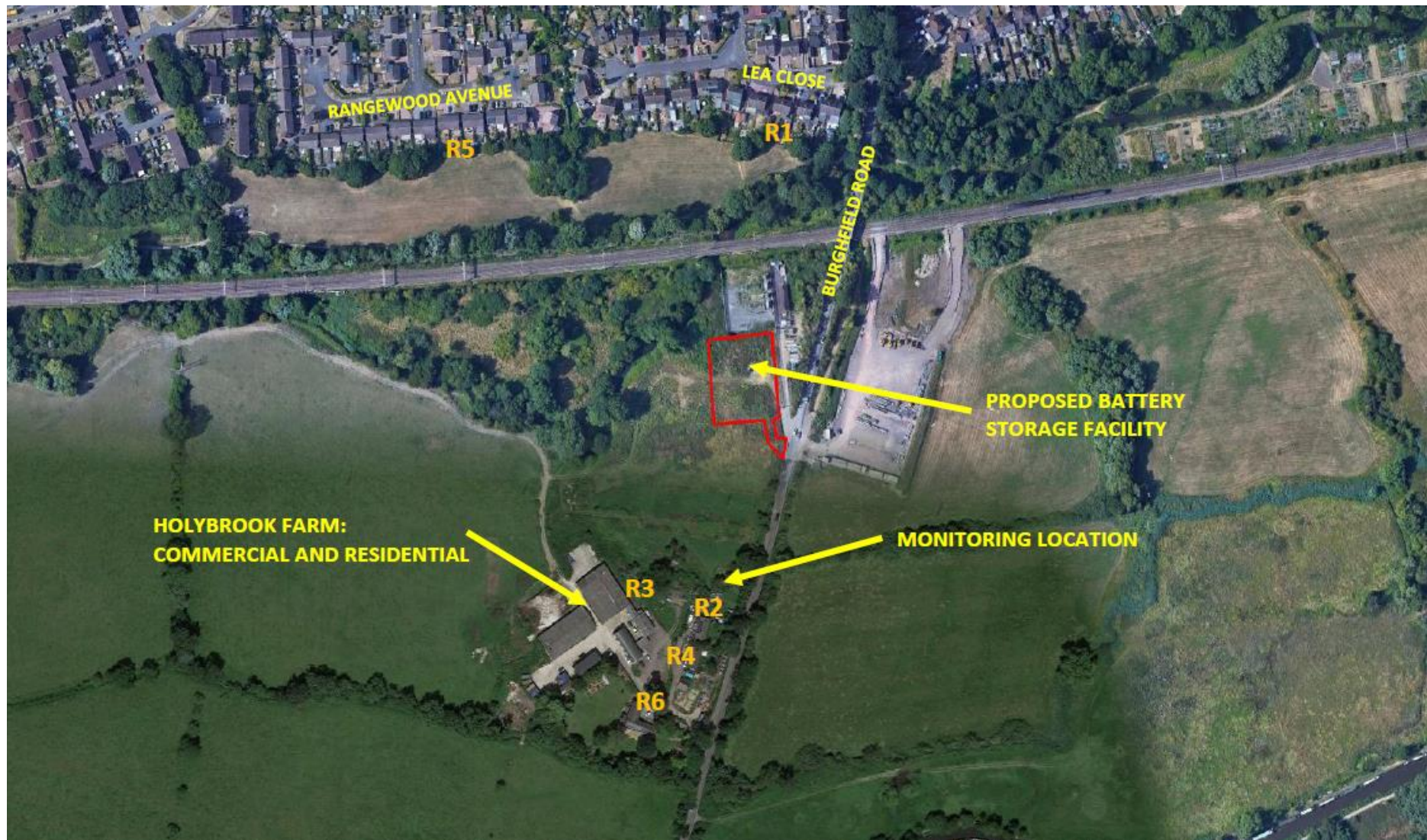


FIGURE 4 – VARIATION OF AMBIENT NOISE LEVELS

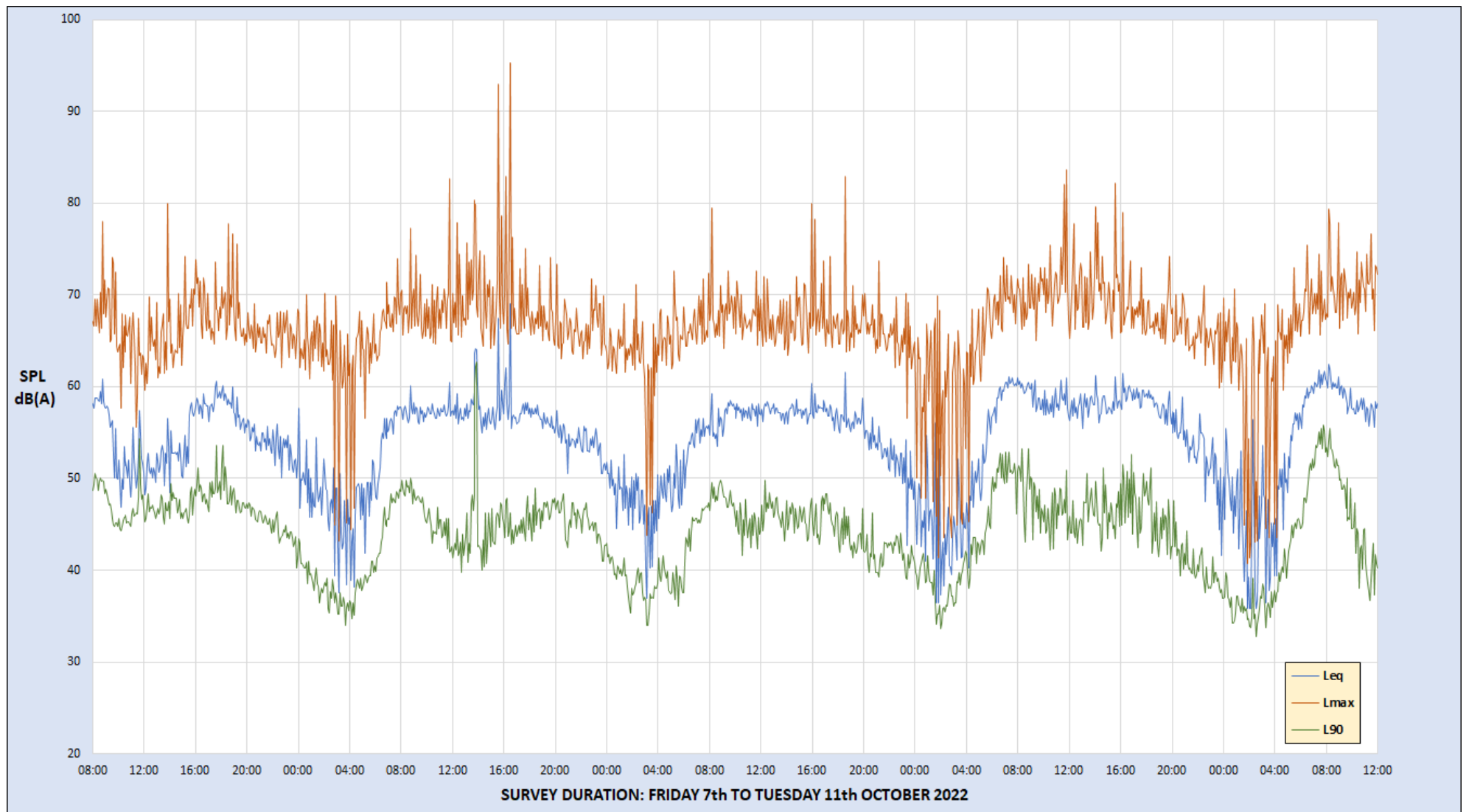


FIGURE 5 – ATTENUATED DAYTIME NOISE MAP



FIGURE 6 – ATTENUATED NIGHT-TIME NOISE MAP

