Mallard Pass
Solar Farm

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Environmental Statement Volume 2 Appendix 10.2: Noise and Vibration - Assessment Methodology

November 2022

PINS Ref: EN010127

Document Ref: EN010127/APP/6.2

Revision P0

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Reg 5 (2) (a)

Appendix 10.2 - Noise and Vibration Assessment Methodology

Introduction

1.1.1. This appendix sets out the approach for the assessment of impacts of noise and vibration from the Proposed Development.

1.1.2. The NPPF, NPSE and PPG guidance for noise, which is described in **Appendix 10.1**, distinguishes adverse (but non-significant) effects and significant noise effects. It also introduces the concept of LOEL, LOAEL and SOAEL thresholds, to make this distinction clearer. However, these documents do not provide numerical values for these thresholds and advises that they need to be determined for each development based on specific considerations.

1.1.3. For each of the potential impacts considered, criteria for the magnitude of impact were determined in line with this general framework, by considering additional guidance documents (also reference in **Appendix 10.1)**. The guidance referenced is set out below as well as the specific sources considered, the noise baseline and character of the area and a review of potential receptors.

Study Area

1.1.4. Assessment of noise and vibration operational and construction effects have focused on noise-sensitive receptors within 500 m of the Solar PV Site, and 800 m from the Onsite Substation, based on professional judgment and experience (which is provided in **Appendix 1.1**) of similar developments which suggests that significant effects are unlikely beyond this distance, as agreed as part of the scoping process (**Appendix 10.3**).

1.1.5. A selection of residential receptor locations, was determined by the practitioners as representative of dwellings in the study area for the noise study (rather than an exhaustive list of all dwellings) by

considering those closest to these potential sources and grouping together dwellings at similar distances from these sources. Assessment of every residential property in the Study Area would have un-necessarily complicated the assessment. The resulting properties are shown in **Figure 10.1**.

1.1.6. A detailed list of these representative receptors and their minimum separation distance from the Solar PV Site is set out in **Table 9** of **Appendix 10.5**. These receptors are also suitable for the assessment of noise from the Onsite Substation given the respective distances from Works Area 2. Public Rights of Way (PRoWs) located within this Study Area were also considered.

1.1.7. A location marked as Park Farm and located within the Order limits was initially considered but it was subsequently confirmed by the relevant landowner that it was not residential and therefore not noise-sensitive.

1.1.8. All dwellings which are exposed to traffic noise along the construction traffic route, which is described in **Chapter 9: Access and Highways**, were also considered in terms of how the traffic noise levels they currently experience may change during the construction period.

Sources of Information

1.1.9. Sources of information used to inform the baseline and assessment methodology include:

a. Ordnance Survey mapping of the area

b. Plant manufacturer data (see **Appendix 10.5**); and

c. Baseline noise survey results (**Appendix 10.4**).

Assessment Criteria and Assessment of Significance

1.1.10. This section sets out the approach to the assessment of the potential impacts of the Proposed Development on noise-sensitive receptors.

Receptor Sensitivity/Importance/Value

1.1.11. All residential receptors considered for the noise and vibration assessment are of high sensitivity. This is because of the acknowledged sensitivity of these receptors as referenced in the guidance in **Appendix 10.1**. Potential receptors of low or negligible sensitivity to noise (such as commercial and industrial receptors) are not considered in the Chapter, as more sensitive receptors are located in closer proximity to the sources considered in this assessment. No school or healthcare receptors are in closer proximity to sources than the residential receptors identified.

1.1.12. PRoWs may include transient users for recreational purposes, whereas most guidance reviewed in **Appendix 10.1** applies to more noise-sensitive uses such as residential, education or healthcare uses. Based on professional judgment, on a precautionary basis these receptors were determined to have a medium sensitivity to noise (see below).

Magnitude of Impact

<u>Construction Noise and Vibration</u>

1.1.13. The classification of construction noise magnitude is set out in **Table 1** based on the guidance values set out in Annex E of BS 5228-1 [Ref 1]. This guidance advises that the measured baseline noise levels in the area are taken into account: the results of **Annex B in Appendix 10.4** show that existing ambient levels are below 65 dB L_{Aeq} and below 45 dB L_{Aeq} at night, which is consistent with the rural character of the area. On this basis, and following the method in section E.3.2 of BS 5228-1,

relatively stringent criteria given in the standard were used as the basis for the criteria of **Table 1**.

Table 1: Classification of Magnitude of Impact - Construction Noise and vibration

Magnitude of Impact	Construction noise* over working day	Construction vibration (PPV)	Construction traffic noise increase
High	> 75dB L_{Aeq}	> 10mm/s	> 5dB
Medium	> 65dB L_{Aeq} ≤ 75dB L_{Aeq}	> 1mm/s ≤10mm/s	3 to 5dB
Low	> 55dB L_{Aeq} ≤ 65dB L_{Aeq}	≥ 0.3mm/s <1mm/s	1 to 3dB
Negligible	≤ 55dB L_{Aeq}	<0.3mm/s	< 1dB

** This assumes construction during weekday day-time or Saturday mornings for a sustained period of 1 month or more. For works during evenings, Sundays, Bank Holidays or Saturday afternoons, the construction noise column (only) would be reduced by 10dB, and for night-time works by 20dB.*

1.1.14. The construction noise criteria derived(*) assume that construction activities occur during the weekday day-time or Saturday morning periods, with more stringent criteria considered for works outside of these times as noted below **Table 1**. This is again based on the detailed guidance of Annex E of BS 5228.

1.1.15. BS 5228 also advises that the duration and character of the impact (in addition to the noise level) must also be considered to determine if there is a significant effect. Annex E of BS 5228-1 references several times a period of one month as a threshold for significant effect. The thresholds for temporary rehousing or noise insulation works, for residents affected by noise levels reference a minimum duration of 10 days in any 15 days of working. Therefore, in the assessment of Chapter 10, when the

duration of the exposure at a certain noise level was expected to occur for less than four weeks in a year, the assessment considers on a case-by-case basis how magnitude of the corresponding impacts may reduce. For example, a high magnitude of impact may reduce to a low magnitude for sufficiently brief exposure.

1.1.16. Some construction activities and associated plant could generate significant vibration: the magnitude of Peak Particle Velocity (PPV) was estimated for these activities based on the assumed worked locations using guidance from Annex E of BS 5228-2. The criteria of **Table 1** for the assessment of the magnitude of construction vibration are based on the guidance in Section B.2 of BS 5228-2 which provides advice on human response to vibration. BS 5228-2 also advises that any risk of building damage, even for sensitive buildings, would only occur stronger vibration levels above 10 mm/s, therefore the proposed criteria would also provide protection in this regard. No allowance was made for works outside of standard weekday hours as this was not relevant to the assessment.

1.1.17. The prediction method of 'Calculation of Road Traffic Noise' [Ref 2] has been used to calculate the possible noise impacts of construction related traffic passing to and from the Order limits along local surrounding roads. This is assessed with reference to the criteria for short-term changes in road traffic noise in Table 3.54a of the Design Manual for Roads and Bridges (DMRB) [Ref 3]: this is reproduced in **Table 1**. The Order limits access road surface will be checked and maintained prior to use, and on this basis the DMRB advises (paragraph 1.4) that significant vibration impacts from traffic using the road is unlikely (although momentary vibration may be perceptible in some cases). The DMRB also references 5228-2 which does not consider vibration from vehicle movements as a notable source.

Operational Noise (Residential Receptors)

1.1.18. The propagation of operational noise from this plant was modelled using the standard methodology set out in International Organisation for Standardisation (ISO) standard 9613-2 [Ref 4]. The standard provides a suitable and recognised method for evaluating the propagation of noise from the source of operational noise which were identified to noise-sensitive receptors. **Appendix 10.5** sets out the assumed noise emission levels for the sources which were assumed as the basis for this analysis, on a robust basis.

1.1.19. The resulting impact of operational noise on residential receptors was assessed on the basis of the BS 4142 Standard [Ref 5] which provides an objective method for rating the potential impact of noise from fixed plant installations based on the background noise levels that prevail on a site. The potential character of the noise from the electrical plant items, in particular inverters and transformers, is taken into account by incorporating a penalty in line with BS 4142 guidance (see **Appendix 10.1** for more information).

1.1.20. An external free-field noise rating level criterion of $L_{Ar,Tr}$ 35 dB is proposed at receptor locations in cases where the background levels are low (below 30 dB L_{A90}), as proposed in consultation with SKDC and RCC Environmental Health Department (see **Appendix 10.3**). This would provide satisfactory external amenity during the daytime and suitable internal noise levels at night with windows open for ventilation[1],

[1] BS 8233 [Ref 6] advises that even an open window will provide at least 10 dB of reduction, so external noise levels of 35 dB would translate to internal noise levels below 25 dB. The standard also advises (at 7.7.2) that for steady noise sources, average internal noise levels of 35dB would provide suitable resting conditions for daytime periods and levels of 30 dB for sleeping at night in bedrooms. The standard also advises

even taking into account the potential character of the noise. This criterion was applied for at least one other solar farm development[2].

1.1.21. The resulting assessment criteria are set out in **Table 2**.

Table 2: Classification of Magnitude of Impact - operational noise (residential receptors)

Magnitude of Impact	Operational noise (residential receptors)
High	Rating level L_{Ar} above 35dB and 10dB or more above background, depending on the context
Medium	Rating level L_{Ar} above 35dB and 5dB or more above background, depending on the context
Low	Rating level L_{Ar} between 5dB above or below background, depending on the context; or rating level below 35 dB
Negligible	Rating level L_{Ar} 5dB or more below background, depending on the context

1.1.22. The "context" in **Table 2** refers to a fundamental requirement of BS 4142: this requires consideration not only of the difference between rated levels of background but also of several contextual factors. These include consideration of:

- the absolute level of the noise, particularly at night. This was done through the consideration of a lower cut-off of 35 dB.
- the character and level of the sound compared to the baseline noise environment: in this case, the potential character of noise (and how

that for external private amenity spaces, such as gardens, levels of less than 50 to 55 dB are recommended.

[2] The Planning Inspectorate, Appeal decision, Land north of Halloughton, Southwell, Nottinghamshire. Appeal reference APP/B3030/W/21/3279533, decision dated 18/02/2022.

it may differ from the baseline) is accounted for in the assessment by addition of a character correction;

- The sensitivity of the receptor and whether these include mitigation measures which provide protection from the noise source: in this case, it was assumed that residential receptors did not have specific localised mitigation for the proposed noise sources.

PRoW receptors

1.1.23. For the construction phase, the assessment of magnitude of impact will be based on the criteria of **Table 1** but account for the reduced sensitivity of the PRoW receptors (see below).

1.1.24. For operational noise, based on the guidance of BS 8233 [Ref 6] which is referenced in Appendix 10.1, it is considered reasonable in the present assessment, on a precautionary basis, to consider a level of 55 dB $L_{Aeq,1h}$ as a threshold of significant noise effects for PRoW receptors for the operational phase of the Proposed Development.

Significance of Effect

1.1.25. The assessment of effect significance was determined in line with Chapter 2 (Overview of the EIA process), on the basis of professional judgement and referencing the guidance discussed above.

1.1.26. All residential receptors are of high sensitivity, as they are clearly referenced in the guidance based on which the magnitude thresholds defined above were determined. PRoWs are generally not referenced in guidance documents (as outline in **Appendix 10.1**). They are considered to have a medium sensitivity due to the transient nature of the use of these paths, which reduces the risk of significant effects.

1.1.27. The relationship applied between magnitude of impact and sensitivity to determine the level of significance is provided in **Table 3** (which is consistent with **Table 2.1 in Chapter 2**). In considering how the impact

magnitude translates into effect significance, the principles of the NPSE/PPG referenced above were applied together with the derivation of the magnitude of impact thresholds. For example, the medium impact thresholds for construction noise are based on levels which the BS 5228-1 guidance advises as corresponding to significant effects for residential receptors.

Table 3: Significance of Effects

Magnitude of Impact	Residential receptors	PRoW Receptors
High	**Major**	**Moderate**
Medium	**Moderate**	Minor
Low	Minor	Minor
Negligible	Negligible	Negligible

1.1.28. Moderate and major effects are considered to be significant within the meaning of the EIA Regulations and mitigation (in addition to any embedded measures) will be considered. Minor or negligible effects respectively are not considered significant, but enhancement measures will be considered to minimise these effects, where possible.

References

Ref 1 BSI (2014). BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise and Part 2: Vibration.

Ref 2 HMSO Department of Transport (1988). Calculation of Road Traffic Noise (CRTN).

Ref 3 Highways England (2020). Design Manual for Roads and Bridges (DMRB) LA111 Noise and vibration. Revision 2.

Ref 4 International Organization for Standardization (ISO) (1996). ISO 9613 Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation.

Ref 5 BSI (2019). BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

Ref 6 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings