



Pearmtree Hill Solar Farm

Environmental Statement

Volume 2

Chapter 12: Noise and Vibration

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Planning Act 2008
Infrastructure Planning
(Applications: Prescribed Forms
and Procedure) Regulations 2009 –
Regulation 5(2)(a)

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12 Noise and Vibration

12.1 Introduction

12.1.1 This chapter presents an assessment of likely significant noise and vibration effects arising from the construction, operation (including maintenance) and decommissioning of the Proposed Development. A full description of the Proposed Development is provided within **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]**.

12.1.2 This chapter is supported by the following figures presented in **ES Volume 3 [EN010157/APP/6.3]**:

- **Figure 12.1: Study Area for Noise – Construction and Decommissioning**
- **Figure 12.2: Study Area for Noise – Operation (Including Maintenance)**
- **Figure 12.3: Baseline Noise Monitoring Locations**
- **Figure 12.4: Construction Works Extents**
- **Figure 12.5: Operational Noise Contours – Unmitigated, Daytime, Ground Floor**
- **Figure 12.6: Operational Noise Contour – Unmitigated, Night-time, First Floor**
- **Figure 12.7: Operational Noise Contour – Mitigated, Daytime, Ground Floor**
- **Figure 12.8: Operational Noise Contour – Mitigated, Night-time, First Floor**

12.1.3 This chapter is supported by the following appendices presented in **ES Volume 4 [EN010157/APP/6.4]**:

- **Appendix 12.1: Full List of Sensitive Receptors**
- **Appendix 12.2: Baseline Noise Conditions**
- **Appendix 12.3: Construction Noise Assessment Details**
- **Appendix 12.4: Operational Noise Assessment Details**

12.1.4 This chapter should be read in conjunction with the following assessment chapters:

- **ES Volume 2, Chapter 7: Biodiversity [EN010157/APP/6.2];**

- **ES Volume 2, Chapter 14: Transport and Access [EN010157/APP/6.2]; and**
- **ES Volume 2, Chapter 15: Cumulative Effects [EN010157/APP/6.2].**

12.2 Legislative framework, planning policy and guidance

12.2.1 This assessment has been undertaken in accordance with the following legislation, and with regard to the following planning policy and guidance.

12.2.2 It should be noted that this chapter does not assess the compliance of the Proposed Development against relevant planning policy. Such an assessment is presented in the **Planning Statement [EN010157/APP/5.5]**.

Legislation

- Environmental Protection Act 1990 – Part III of the Environmental Protection Act 1990 contains the mandatory powers available to local authorities within England and Wales in respect of any noise which either constitutes or is likely to cause a statutory nuisance **[Ref. 12-1]**.
- Control of Pollution Act 1974 – The Control of Pollution Act 1974 and the Environmental Protection Act 1990 give local authorities powers for controlling noise and vibration from construction sites and other similar works **[Ref. 12-2]**.

National planning policy

- Overarching National Policy Statement for Energy (NPS EN-1) (2023) (designated in January 2024) – Discussion on the health effects including noise and other possible impacts, is presented within Section 4.4, with Section 5.12 outlining the planning policy for noise and vibration, including the adoption of relevant standards, the decision-making process and opportunities for mitigation for the assessment of noise **[Ref. 12-3]**.
- National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (2023) (designated in January 2024) – Section 2.10 gives specific consideration to solar development including assessment of construction including traffic noise and vibration impacts **[Ref. 12-4]**.
- National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (2023) (designated in January 2024) – Section 2.9 discusses the assessment of noise and vibration, and Section 2.10 discusses

mitigation for network infrastructure. Paragraphs 2.9.40 to 2.9.42 discusses an assessment of overhead line noise – as no overhead lines are scheduled within the Proposed Development, no assessment of this aspect is assessed **[Ref. 12-5]**.

- National Planning Policy Framework (NPPF) (2024). This sets out the Government's planning policies for England and how these are expected to be applied. It includes statements relating to noise and the requirement to take it into account during the planning process.
- Noise Policy Statement for England (NPSE) (Defra, 2010). NPSE sets out the long term vision of Government noise policy: to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development **[Ref. 12-6]**.

Local planning policy

- East Riding Local Plan 2012 – 2029 (adopted April 2016) **[Ref. 12-8]** has several policies relating to noise and vibration, comprising Policy EC5 'Supporting the energy sector' and Policy ENV6 'Managing environmental hazards'.

Guidance

- Planning Practice Guidance – Noise (2019). The Department for Communities and Local Government 'Planning Practice Guidance' was published in 2014 and updated in 2019. The Planning Practice Guidance on Noise expands upon the NPPF and NPSE and sets out more detailed guidance on noise assessment. Like the NPPF and NPSE, the guidance does not include any specific noise levels but sets out further principles that should underpin an assessment **[Ref. 12-9]**
- BS 7445-1:2003 Guide to Quantities and Procedures **[Ref. 12-10]**
- BS EN 60942:2018 Electroacoustics – Sound Calibrators **[Ref. 12-11]**
- BS EN 61672-1:2013 Electroacoustics – Sound Level Meters **[Ref. 12-12]**
- BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise **[Ref. 12-13]**
- BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration **[Ref. 12-14]**
- BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* **[Ref. 12-15]**

- Association of Noise Consultants *BS 4142:2014+A1:2019 – Technical Note*, 2020 [Ref. 12-16]
- *Calculation of road traffic noise memorandum*, 1988 [Ref. 12-17]
- *Design Manual for Roads and Bridges, LA 111 Noise and vibration*, 2019 [Ref. 12-18]
- Noise Advisory Council *A guide to measurement and prediction of the equivalent continuous sound level L_{eq}* , 1978 [Ref. 12-19]
- Institute of Environmental Management & Assessment (IEMA) *Guidelines for environmental noise impact assessment*, 2014 [Ref. 12-20]
- ISO 9613-2:1996 *Acoustics. Attenuation of sound during propagation outdoors. Part 2: General method of calculation* [Ref. 12-21]
- BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* [Ref. 12-22]
- World Health Organisation (WHO) *Guidelines for community noise* [Ref. 12-23]

12.3 Stakeholder engagement

- 12.3.1 **Table 12-1** provides a summary of the stakeholder engagement activities undertaken by the Applicant in relation to noise and vibration separately from the Environmental Impact Assessment (EIA) scoping, non-statutory consultation, statutory consultation and targeted consultation process in support of the preparation of this assessment, as well as detailing the matters raised, how such matters have been addressed, and where they have been addressed within the DCO Application documentation.
- 12.3.2 **ES Volume 4, Appendix 5.3: Scoping Opinion Response Matrix [EN010157/APP/6.4]** presents the responses received via the Scoping Opinion and the Applicant's response to each matter raised.
- 12.3.3 The **Consultation Report appendices [EN010157/APP/5.2]**, which is submitted in support of the DCO Application, sets out the feedback received during non-statutory, statutory and targeted consultation and how the Applicant has had regard to the matters raised by consultees.

Table 12-1: Summary of stakeholder engagement

Consultee	Date of engagement	Summary of matters raised	How this matter has been addressed	Location where this matter is addressed
East Riding of Yorkshire Council	06 February 2024 (Email correspondence), which outlined the scope of the assessment, following completion of the baseline monitoring exercise.	Response received from East Riding of Yorkshire Council (dated 24 July 2024), stating acceptance of measured baseline levels and assessment approach.	Baseline monitoring locations and programme of monitoring carried out as agreed. Guidance and standards pertinent to the assessment have been outlined, with corresponding assessment criteria as agreed and adhered to.	ES Volume 2, Chapter 12: Noise and Vibration [EN010157/APP/6.2]

12.4 Approach to the assessment

Study area

- 12.4.1 The study area for the construction and decommissioning phase assessments has considered sensitive receptors that are located within 300m of the Order Limits. This has been determined based on the guidance set out in BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise **[Ref. 12-13]**, BS 5228-2 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration **[Ref. 12-14]** and other related guidance documents, including the Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration **[Ref. 12-18]**.
- 12.4.2 For the assessment of the operation (including maintenance) phase noise levels, the study area extends out to the nearest and/or most exposed noise sensitive receptors to the operational noise sources associated with the development, typically up to a maximum distance of 800m. This has been based on professional judgement and is the distance within which the Applicant considers that receptors

could potentially be subject to significant noise effects as a result of the operation (including maintenance) of the Proposed Development.

- 12.4.3 The study areas are shown graphically in **ES Volume 3, Figure 12.1: Study Area for Noise – Construction and Decommissioning [EN010157/APP/6.3]** and **ES Volume 3, Figure 12.2: Study Area for Noise – Operation (including maintenance) [EN010157/APP/6.3]**.

Scope of the assessment

- 12.4.4 The scope of this assessment has been established throughout the EIA process and design of the Proposed Development. Further information can be found in **ES Volume 1, Chapter 5: Approach to the EIA [EN010157/APP/6.1]**.
- 12.4.5 This section provides an update to the scope of the assessment from that presented in the EIA Scoping Report which is located in **ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4]** and re-iterates/updates the evidence base for scoping matters in or out following further iterative assessment.

Receptors/matters scoped into the assessment

- 12.4.6 **Table 12-2** presents the receptors/matters that are scoped into the assessment reported within this ES, together with appropriate justification.

Table 12-2: Receptors/matters scoped into the assessment

Receptor/matter	Phase	Justification
Noise	Construction and decommissioning	<p>Construction and decommissioning activities are likely to involve large earthmoving/lifting plant items with the potential for significant noise effects to occur.</p> <p>This matter is scoped into the assessment, as detailed within ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4] and confirmed within ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4].</p>
Road traffic noise	Construction and decommissioning	<p>During construction and decommissioning, there is potential for increase in HGV/vehicle movements that may cause significant effects.</p>

Receptor/matter	Phase	Justification
		This matter is scoped into the assessment, as detailed within ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4] and confirmed within ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4] .
Vibration	Construction and decommissioning	<p>Activities may involve large earthmoving plant items and compaction with the potential for significant effects to occur.</p> <p>This matter is scoped into the assessment, as detailed within ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4] and confirmed within ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4].</p>
Noise	Operation (including maintenance)	<p>Operational plant items are likely to have an impact on the existing noise environment and affect local amenity.</p> <p>This matter is scoped into the assessment, as detailed within ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4] and confirmed within ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4].</p>

12.4.7 Sensitive receptors which have been scoped into the assessment are summarised in **Table 12-3**. The sensitive receptors considered to represent single dwellings or a number of dwellings adjacent to or within proximity of one another. Where a sensitive receptor represents a number of dwellings in close proximity, it can be reasonably assumed that impacts will be consistent with that likely to be experienced at adjacent dwellings.

12.4.8 A detailed list of sensitive receptors included in the assessment is presented in **ES Volume 4, Appendix 12.1: Full List of Sensitive Receptors [EN010157/APP/6.4]**.

Table 12-3: Receptors scoped into the assessment

Ref.	Name	Phase	Justification
R9	White Cross Roundabout	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area B

Ref.	Name	Phase	Justification
R10	Riston Grange	Operation (including maintenance)	Proximity to Land Area B
R11	Long Riston	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area B
R12	Carr House Farm, Long Riston	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area B
R13	Routh	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area D
R14	Meaux Decoy Farm, Routh	Construction, operation (including maintenance) and decommissioning	Proximity to Land Areas D and E
R16	Meaux (North)	Construction, operation (including maintenance) and decommissioning	Proximity to Land Areas C, D and F
R17	Meaux (South)	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area F
R18	Meaux (East)	Construction, operation (including maintenance) and decommissioning	Proximity to Land Areas C, D and F
R19	Crown Farm, Meaux	Construction, operation (including maintenance) and decommissioning	Proximity to Land Areas D, E and F
R20	Arnold Carr Farm, Arnold	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area C
R21	Weel	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area E
R22	Springdale Farm, Carr Lane, Weel	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area E and 132kV cable route
R23	Wawne (Northwest)	Operation (including maintenance)	Proximity to Land Area F
R24	Wawne (North)	Construction, operation (including maintenance) and decommissioning	Proximity to Land Area F
R25	High Farm Holiday Park / Heron Lakes	Operation (including maintenance)	Proximity to Land Area B

Ref.	Name	Phase	Justification
R29	Woodmansey	Construction and decommissioning	Proximity to 132kV cable route
R30	Cottingham	Construction and decommissioning	Proximity to 132kV cable route
R31	Arnold	Construction and decommissioning	Proximity to 132kV cable route
R32	Beverley	Construction and decommissioning	Proximity to 132kV cable route

Receptors/matters scoped out of the assessment

12.4.9 **Table 12-4** presents the receptors/matters that are scoped out of the assessment that are therefore not considered as part of this ES, together with appropriate justification.

Table 12-4: Receptors/matters scoped out of the assessment

Receptor/matter	Phase	Justification
Vibration	Operation (including maintenance)	<p>This matter is scoped out of the assessment, as detailed within ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4] and confirmed within ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4].</p> <p>However, ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4] did note that the ES should describe the potential sources of vibration arising from the operation of relevant components, including the substations, as well as any measures to control emissions and confirmation of how these are secured through the Draft DCO or other legal mechanism. The Applicant can confirm that operational elements including fixed plant items/structures would not emit discernible levels of vibration and are located at a sufficient distance away from sensitive receptors.</p>
Road traffic noise	Operation (including maintenance)	Once the Proposed Development is operational, the effect on the local road system is expected to be minimal for

Receptor/matter	Phase	Justification
		<p>maintenance purposes and occasional equipment replacement.</p> <p>This matter is scoped out of the assessment, as detailed within ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4] and confirmed within ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4].</p>
Tophill Low Site of Special Scientific Interest (SSSI)	Construction, operation (including maintenance) and decommissioning	<p>This receptor was proposed to be scoped into the assessment for construction and decommissioning (scoped out for operation (including maintenance), as detailed within ES Volume 4, Appendix 5.1: Scoping Report [EN010157/APP/6.4] and confirmed within ES Volume 4, Appendix 5.2: Scoping Opinion [EN010157/APP/6.4]. The justification given was that Tophill Low SSSI is located 365m north of Land Area A and is designated for wintering wildfowl; potential noise impacts as a result of construction and decommissioning activities therefore require further investigation.</p> <p>Land Area A has subsequently been removed from the Order Limits, as noted in ES Volume 1, Chapter 4: Alternatives and Design Iteration [EN010157/APP/6.1]. Tophill Low SSSI is now located in excess of 5km from the Order Limits. The impact of noise from construction, operation (including maintenance) and decommissioning activities associated with the Proposed Development on Tophill Low SSSI is therefore likely to be negligible.</p> <p>This receptor is therefore scoped out of the assessment.</p>

12.4.10 Since the removal of Area A from the Order Limits, as detailed in **ES Volume 1, Chapter 4: Alternatives and Design Iteration [EN010157/APP/6.1]**, it is noted that a number of sensitive receptors previously considered for assessment in the

Preliminary Environmental Information Report are consequently in excess of 800m from any noise-producing elements expected during the operation (including maintenance) phase of the Proposed Development and a minimum of 300m from the Order Limits when considering the construction and decommissioning phases of the Proposed Development. Therefore, these sensitive receptors fall outside of the respective study areas for the operation (including maintenance) phase and the construction and decommissioning phases.

12.4.11 The sensitive receptors scoped out of the assessment are summarised in **Table 12-5**:

Table 12-5: Receptors scoped out of the assessment

Ref.	Name/description	Phase	Justification
R1	Wilfholme	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R2	Brandesburton	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R3	Low Baswick Farm	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R4	Leven (West)	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R5	Leven (South)	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R6	Glebe Farm, Leven	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R7	Linley Hill Road, Leven	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R8	Catwick	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R10	Riston Grange	Construction and decommissioning	This receptor no longer falls within the study area for assessment.
R15	Tickton (South)	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.

Ref.	Name/description	Phase	Justification
R23	Wawne (Northwest)	Construction and decommissioning	This receptor no longer falls within the study area for assessment.
R25	High Farm Holiday Park / Heron Lakes	Construction and decommissioning	This receptor no longer falls within the study area for assessment.
R26	Thearne	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R27	Tickton (North)	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R28	Tophill Low SSSI	Construction, operation (including maintenance) and decommissioning	This receptor no longer falls within the study area for assessment.
R29	Woodmansey	Operation (including maintenance)	This receptor does not fall within the study area for assessment.
R30	Cottingham	Operation (including maintenance)	This receptor does not fall within the study area for assessment.
R31	Arnold	Operation (including maintenance)	This receptor does not fall within the study area for assessment.
R32	Beverley	Operation (including maintenance)	This receptor does not fall within the study area for assessment.

Establishing baseline conditions

12.4.12 The following section presents a summary of the prevailing baseline conditions. Further details are presented in **ES Volume 4, Appendix 12.2: Baseline Noise Conditions [EN010157/APP/6.4]**.

Data sources to inform the EIA baseline characterisation

12.4.13 The following data sources have been used to characterise the existing baseline conditions:

- Aerial photography and Ordnance Survey mapping
- Addressbase Plus

Site visits/surveys

- 12.4.14 A series of baseline noise surveys were undertaken between 13 November 2023 and 12 January 2024 at 15 noise monitoring locations representative of the nearest noise sensitive receptors, as agreed with East Riding of Yorkshire Council (refer to **Table 12-1** above). The surveys were completed at each monitoring location for a period of one week and avoiding school holiday periods. Full details of the survey procedure are included in **ES Volume 4, Appendix 12.2: Baseline Noise Conditions**.
- 12.4.15 The results of the baseline surveys, presented in **Table 12-9**, have been used to inform the operation (including maintenance) phase assessment of the Proposed Development. In addition, the baseline survey data and site visits aided in the derivation of assessment criteria for the construction and decommissioning phases, in that it demonstrated a predominantly rural area with ambient levels rarely exceeding 65 dB(A).
- 12.4.16 Due to the removal of Area A from the Order Limits, noise monitoring locations one and two (MP1, MP2) are not utilised within the assessment; as such, they have been excluded from the data summary in **Table 12-9** and in **ES Volume 3, Figure 12.3: Baseline Noise Monitoring Locations [EN010157/APP/6.3]**.

Approach to design flexibility

- 12.4.17 The design parameters, as outlined in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]** and **Design Parameters Document [EN010157/APP/5.8]**, set out the reasonable 'worst-case' parameters for the Proposed Development.
- 12.4.18 **ES Volume 1, Chapter 5: Approach to the EIA [EN010157/APP/6.1]** sets out those elements of the Proposed Development for which optionality is present within the design.

Assessment assumptions

- 12.4.19 The assessment is based on the design parameters, as outlined in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]** and **Design Parameters Document [EN010157/APP/5.8]**.

Construction (on-site activities)

- 12.4.20 The following construction works have been assessed in conjunction with the descriptions provided in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]**:

- Preparatory works:
 - Activity 1: Installation of temporary culverts in watercourses
 - Activity 2: Stripping of topsoil, trenching, storage and capping
 - Activity 3: Site establishment; mobilisation areas, running tracks, compounds and fencing
 - Activity 4: Construction of access tracks and laydown areas
 - Activity 5: Delivery of plant and materials to site
- Infrastructure:
 - Activity 6: Installation of solar PV modules, support structures and mounting
 - Activity 7: Installation of inverters, transformers, BESS and switch gear
 - Activity 8: Construction of on-site substations
 - Activity 9: Installation of storage containers
 - Activity 10: Installation of construction drainage with pumping
- Cable installation:
 - Activity 11: Set-up of temporary compounds
 - Activity 12: Stripping of topsoil
 - Activity 13: Trenching and installation of cabling
 - Activity 14: Horizontal Directional Drilling

12.4.21 More detail on the works involved is set out in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]**.

12.4.22 **ES Volume 3, Figure 12.4: Construction Works Extents [EN010157/APP/6.3]** presents the location and extent of each construction activity considered. Detailed construction methodologies and plant lists are included in **ES Volume 4, Appendix 12.3: Construction Noise Assessment Details [EN010157/APP/6.4]**, which have been used to inform this assessment.

12.4.23 The assessment assumes all plant items are in operation simultaneously during that task, at a position which is the shortest distance from source to receiver. This provides a worst-case scenario of likely construction impact.

12.4.24 The typical emissions of construction plant items and activities associated with **paragraph 12.4.20** have been considered. Where necessary, plant levels derived from BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise [Ref. 12-13], as detailed in **ES Volume 4, Appendix 12.3: Construction Noise Assessment Details**

[EN010157/APP/6.4]. Plant levels and their relevant on-times have been used to predict the average emission level for each construction task.

12.4.25 Working hours on-site would be from 07:00 until 19:00 Monday to Friday and 07:00 until 12:00 on Saturday, with no working to take place on Sundays or Bank Holidays unless necessary and agreed with East Riding of Yorkshire Council; this is stated in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]** and detailed in and secured by the **Outline Construction Environmental Management Plan (Outline CEMP) [EN010157/APP/7.2]**.

12.4.26 The construction noise impacts within the Order Limits have been assessed for fields where solar PV development is proposed, as detailed in **ES Volume 3, Figure 3.1: Indicative Operational Layout Plan [EN010157/APP/6.3]** and as shown on the **Works Plans [EN010157/APP/2.2]**. The assessment has accounted for the construction tasks occurring concurrently across the working area. This is likely to be an overestimation of impacts, assuming all plant items are operating at the closest distance of approach to sensitive receptors. In reality, the movement of vehicles and plant would be transient across the area.

Construction (road traffic)

12.4.27 The assessment of construction traffic noise utilises the information set out in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]** alongside the traffic routing and future baseline traffic flows derived in **ES Volume 2, Chapter 14: Transport and Access [EN010157/APP/6.2]**. Annual average weekday traffic flows have been used to predict the change in noise level through different phases of the construction works.

Operation (including maintenance)

12.4.28 Details of noise emitting equipment associated with the operation (including maintenance) phase have been considered and are outlined in **ES Volume 4, Appendix 12.4: Operational Noise Assessment Details [EN010157/APP/6.4]**. It should be noted that the final equipment may be subject to change prior to installation. The impact of operational noise has been assessed using currently available equipment.

12.4.29 The actuator involved with the tracker design is noted to be of negligible impact as a noise source and has not been considered in the assessment.

12.4.30 Two operational periods have been assessed:

- Daytime (07:00 – 23:00) – all equipment operating; and

- Night-time (23:00 – 07:00) – all equipment operating at reduced capacity due to lower ambient temperatures and, subsequently, less load on the cooling mechanisms for plant.

Decommissioning

12.4.31 The likely noise impacts during the decommissioning phase are considered to be no greater than those in the construction phase, as it is envisaged that similar plant and works would be used.

Assessment methodology and criteria

Construction noise

12.4.32 Prediction and assessment of construction noise is based on the methodology contained within BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise [Ref. 12-13]. The noise predictions determine whether the construction activities have the potential to result in significant adverse effects on the surrounding sensitive receptors. The prediction method considers the noise emission level of the proposed plant items, separation distance between the source and receptor, topographical features and intervening ground conditions.

Construction vibration

12.4.33 Certain construction works can produce ground-borne vibration, which has the potential to give rise to impacts at sensitive receptors including buildings and buried structures. The main source of vibration associated with the construction is expected to be attributable to compaction works.

12.4.34 In the absence of specific working methods and plant specifications, the assessment of construction induced vibration has been informed by the empirical prediction formulae set out in Annex E of BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Vibration [Ref. 12-14], which covers a range of vibration inducing construction activities.

Construction traffic

12.4.35 The impact of traffic flow fluctuations on the public highway during construction has been calculated to establish whether they have the potential to give rise to significant effects, in accordance with DMRB LA 111 Noise and Vibration [Ref. 12-18]. The assessment determines the noise level change likely to occur on

road links in the vicinity of the Site (see **ES Volume 4, Appendix 14.2: Traffic Flow Diagrams [EN010157/APP/6.4]**).

12.4.36 Basic noise level predictions have been carried out which consider notional receptors located at 10m from the edge of the carriageway and 1.5m above ground level using the algorithms set out in the *Calculation of Road Traffic Noise* publication [Ref. 12-17]. Where traffic flows are less than 1000 vehicles within an 18-hour day, an alternative formula is adopted as detailed in the Noise Advisory Council's document 'A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level L_{eq} ' [Ref. 12-19].

12.4.37 Following the information set out in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1]** and with reference to the indicative phasing provided in **ES Volume 2, Chapter 14: Transport and Access [EN010157/APP/6.2]**, 2026 construction year flows (Quarter Three) have been adopted for assessment purposes. The construction traffic flows have been separated into six phases:

- Phase 1: Land Area B
- Phase 2: Land Areas B and C
- Phase 3: Land Areas C and D and commencement of the grid connection works
- Phase 4: Land Areas D and E and continuation of the grid connection works
- Phase 5: Land Areas E and F and continuation of the grid connection works
- Phase 6: Land Area F and completion of the grid connection works.

12.4.38 For the purposes of this assessment, only Phase 2 through Phase 5 have been assessed to present a worst-case scenario e.g., Phase 2 would consider the cumulative impact from vehicles serving both Land Areas B and C concurrently, as opposed to Land Area B in isolation.

12.4.39 The calculated noise change throughout each phase of construction incorporates the following:

- 2026 Construction Year Baseline vs 2026 Baseline + Construction.

12.4.40 The road links considered in the assessment are widespread across the local area and have been determined by the assessment methodology presented in **ES Volume 2, Chapter 14: Transport and Access [EN010157/APP/6.2]**. The full list of road links that have been considered and their locations are presented in **ES Volume 4, Appendix 14.2: Traffic Flow Diagrams [EN010157/APP/6.4]**.

12.4.41 It is worthy of note that proposed construction traffic along Carr Lane (Land Area B) would be directed into Fields B4 and B8 without passing those nearest properties along Carr Lane. This road link has been assessed as a haul road in conjunction with the assessment of on-site construction activities.

Operational noise

12.4.42 The predicted noise emissions generated during operation (including maintenance) of the Proposed Development have been determined at the surrounding noise sensitive receptors using the computational noise modelling software SoundPLAN (v9.0). The modelling software calculates industrial noise in accordance with the methodology set out in ISO 9613-2: 1996 [Ref. 12-21].

12.4.43 The following noise-producing plant has been considered for the operation (including maintenance) phase:

- Four BESS per hybrid pack (84 hybrid packs, 336 BESS total)
- Four DC-DC converters per hybrid pack (84 hybrid packs, 336 converters total)
- One inverter (including transformer) per hybrid pack (84 hybrid packs, 84 inverters total)
- Two 180 Mega Volt Amp substations.

12.4.44 Details of operational stage noise sources associated with the Proposed Development are included in **ES Volume 4, Appendix 12.4: Operational Noise Assessment Details [EN010157/APP/6.4]**.

12.4.45 The significance criteria for the operation (including maintenance) phase assessment are derived from BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [Ref. 12-15].

Decommissioning noise, vibration and traffic

12.4.46 In the absence of specific data, it is assumed that the processes detailed in the construction phase above would also apply for the decommissioning phase. This is to present a worst-case scenario, as some activities taking place during construction phase would not be repeated for the decommissioning phase, and so it is considered that the potential impacts from decommissioning would be no greater than those assessed for the construction phase.

Sensitivity of the receptor

12.4.47 Receptor sensitivity has been categorised for a range of receptor types, which has been informed by guidance contained in the following documents:

- DMRB LA 111 Noise and Vibration **[Ref. 12-18]**
- IEMA document 'Guidelines for Environmental Noise Impact Assessment' **[Ref. 12-20]**

Table 12-6: Receptor sensitivity for noise and vibration

Receptor sensitivity	Type of receptor
High	Residential properties, educational establishments, hospitals, places of Worship, hotels, children's nurseries, nursing homes
Medium	Commercial premises including offices, halls, public municipal areas, bars and restaurants
Low	Industrial premises
Negligible	All other areas such as those used primarily for agricultural purposes

Magnitude of impact (change)

12.4.48 The magnitude of the impact within this assessment has been described using the following scale:

- High;
- Medium;
- Low; and
- Negligible.

12.4.49 Although the lowest measure of magnitude of impact is defined as 'negligible', it should be noted that noise levels may still be audible/perceptible during construction, operation (including maintenance) and decommissioning phases, but does not cause any change in behaviour, attitude or other physiological response.

12.4.50 Criteria for determining the magnitude of impact, presented in **Table 12-7**, have been informed by a variety of guidance documents as listed in **Section 12.2**, depending on the phase of the Proposed Development.

Table 12-7: Magnitude of impact criteria

Impact	Primary standard used	Magnitude of impact			
		Negligible	Low	Medium	High
Construction & decommissioning daytime noise [1] [2]	BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Noise [Ref. 12-13]	Less than 55 dB LAeq, T	Between 55 & 65 dB LAeq, T	Between 66 & 75 dB LAeq, T	Greater than 75 dB LAeq, T
Construction road traffic noise [3]	DMRB LA 111 Noise and Vibration [Ref. 12-18]	Less than 1 dB increase in road traffic noise	1.0 to 2.9 dB increase in road traffic noise	3.0 to 4.9 dB increase in road traffic noise	Greater than or equal to 5 dB increase
Construction Vibration	BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Vibration [Ref. 12-14]	Less than 0.3mm/s PPV	0.3 to less than 1.0mm/s PPV	1.0 to 9.9mm/s PPV	Greater than or equal to 10mm/s PPV
Operational noise (daytime period) [4][5]	BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [Ref. 12-15]	Rating Level Less than dB LA90, T – 5	Rating Level up to and equal to + 5dB above L90, T or 40 dB LAr	Rating Level up to and equal to + 9dB above L90, T or 49 dB LAr	Rating Level equal to or greater than 10 dB above L90, T or 50 dB LAr
Operational noise (night-time period) [4][5]		Rating Level Less than dB LA90, T – 5	Rating Level up to and equal to + 5dB above L90, T or 35 dB LAr	Rating Level up to and equal to + 9dB above L90, T or 44 dB LAr	Rating Level equal to or greater than 10 dB above L90, T or 45 dB LAr
Notes: [1] Daytime construction phase noise levels are based on a time period ‘T’ which equates to the duration of a working day on site.					

Impact	Primary standard used	Magnitude of impact			
		Negligible	Low	Medium	High
<p>[2] The construction noise impact criteria will apply if the works occur for a duration exceeding 10 or more days or nights in any 15 consecutive days or nights; or a total number of days exceeding 40 in any 6 consecutive months.</p> <p>[3] Construction traffic noise levels are based on dB LA10, 18h – significant observed adverse effect occurs where construction traffic noise levels exceed the threshold level as determined in BS 5228-1</p> <p>[4] Operation (including maintenance) phase noise criteria are based on Rating Levels as defined in BS 4142 and refer to a nominal 1-hour duration for the daytime period and 15-minute duration for the night-time and dawn periods.</p> <p>[5] Magnitude of impact is subject to whichever is highest.</p>					

12.4.51 Regarding the magnitude criteria for the operation (including maintenance) phase, BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [Ref. 12-15] advises that where rating levels and background levels are low, which is typically the case in rural areas, the assessment of operational noise should take the absolute noise level into context. The Association of Noise Consultants Guide to BS 4142 [Ref. 12-16] provides some clarity to this by stating:

“BS 4142 does not define ‘low’ in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB LA90, and low rating levels as being less than about 35 dB LA_{r, Tr}”

12.4.52 It goes on to suggest that:

“...similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate”.

12.4.53 In this case, it is considered that a minimum rating level of 40 dB LA_{r, T} during the daytime, and 35 dB LA_{r, T} for the low magnitude impact criteria, would align with guidance in Planning Practice Guidance [Ref. 12-9], which defines noise below the lowest observed adverse effect level (LOAEL) as follows:

“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”.

12.4.54 Furthermore, BS 8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’ [Ref. 12-22] and the World Health Organisation (WHO) ‘Guidelines for Community Noise’ (1999) [Ref. 12-23] provide guidance levels for internal noise within dwellings of 30 dB LA_{eq, T} for good sleeping conditions at night. However, as residents are likely to be inside their properties at night, BS 8233: 2014 [Ref. 12-22] states that building envelope attenuation reduces external noise by approximately 15 dB for a partially open window. Consequently, an external high-magnitude criterion of 45 dB LA_{r, T}, indicating a significant observed adverse effect level (SOAEL), has been adopted for the night-time.

12.4.55 Based on the adaptation of absolute limits, WHO 1999 [Ref. 12-23] provides its guidance on permissible levels, above which adverse effects are likely to occur. Therefore, the criteria for LOAEL and SOAEL adopted within this assessment are considered as a design limit, above which the onset of LOAEL and SOAEL would occur.

Significance of effect

12.4.56 The overall significance of an effect is determined by combining the sensitivity of the receptor (as presented in **Table 12-6**) and magnitude (as presented in **Table 12-7**). The assessment of significance relies on best practice and the relevant published standards and guidance documents as defined in **Section 12.2**.

12.4.57 The significance of an effect is reported as either 'significant' or 'not significant'. Where an effect is assessed as 'negligible' or 'minor', this is considered to achieve the LOAEL within the Noise Policy Statement for England [**Ref. 12-7**] and is considered **not significant**. Where the effect is classed as 'moderate' or 'major', this is considered to achieve the SOAEL and is classed as **significant**.

Table 12-8: Determining significance of effects for noise and vibration

Magnitude of impact	Sensitivity of receptor			
	High	Medium	Low	Negligible
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

12.5 Environmental baseline

12.5.1 The following section presents a summary of the baseline conditions for the receptors scoped into the assessment, as presented within **Table 12-3**. Full details of the baseline conditions are presented in **ES Volume 4, Appendix 12.2: Baseline Noise Conditions [EN010157/APP/6.4]**.

Existing baseline

12.5.2 **Table 12-9** presents a summary of the results of the baseline noise survey, which have been used for the operation (including maintenance) phase noise impact assessment. The table also provides the representative background sound levels adopting statistical analysis adopted within BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [**Ref. 12-15**]. Graphs used for the statistical analysis have been provided in **ES Volume 4, Appendix 12.3: Construction Noise Assessment Details [EN010157/APP/6.4]**.

12.5.3 Representative background sound levels ($L_{A90, T}$) incorporate the time periods derived from BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [**Ref. 12-15**]; specifically, 1 hour for daytime ($\text{dB } L_{A90, 1h}$) and 15 minutes for night-time ($\text{dB } L_{A90, 15min}$).

Table 12-9: Baseline Noise Measurements Summary

Ref.	Period	Average measured noise levels, dB		Representative background sound level, dB LA90, T
		LAeq, T	LA90, T	
MP3	Daytime	51	45	41
	Night-time	44	31	23
MP4	Daytime	54	46	43
	Night-time	49	31	24
MP5	Daytime	49	38	34
	Night-time	45	30	22
MP6	Daytime	41	34	30
	Night-time	39	25	19
MP7	Daytime	59	33	27
	Night-time	53	23	18
MP8	Daytime	59	42	36
	Night-time	52	31	28
MP9	Daytime	44	36	33
	Night-time	36	27	22
MP10	Daytime	44	29	21
	Night-time	37	22	17
MP11	Daytime	43	33	26
	Night-time	40	27	25
MP12	Daytime	58	30	22
	Night-time	47	27	28
MP13	Daytime	46	31	28
	Night-time	36	22	19
MP14	Daytime	48	34	30
	Night-time	46	31	24
MP15	Daytime	48	36	31
	Night-time	48	35	34

Future baseline in the absence of the Proposed Development

- 12.5.4 On the basis that the Site is located within a rural setting, typically comprising agricultural land use, there is not expected to be significant changes to the future baseline conditions.
- 12.5.5 Where the Proposed Development is located close to transport infrastructure, such as roads and rail lines, there is potential for growth in the traffic flows in the future baseline scenario. In the absence of significant alterations to the wider road or rail network, the variation in traffic flows would be expected to be incremental and therefore unlikely to give rise to perceptible changes in the acoustic environment.

12.6 Mitigation embedded into the design

12.6.1 This assessment has been based on the principle that measures have been ‘embedded’ into the design of the Proposed Development to remove potential significant effects as far as practicable, for example by the considered placement of infrastructure. The **Design Approach Document [EN010157/APP/5.7]** identifies the project design principles and design mitigation that has been embedded into the design of the Proposed Development. The embedded mitigation relevant to this assessment is detailed in **Table 12-10** below.

Table 12-10: Embedded mitigation relevant to noise and vibration

Embedded mitigation measure relevant to noise and vibration	Function	Securing mechanism
The two on-site substations will not be located within 250m of any existing residential properties or environmental designated sites.	To minimise noise impact on noise sensitive receptors during operation.	Works Plans [EN010157/APP/2.2]
The Proposed Development design will incorporate a minimum offset distance of 50m from residential properties from solar PV modules and other infrastructure.	To minimise noise impact on noise sensitive receptors during operation.	Works Plans [EN010157/APP/2.2]
Inverters will be located a minimum of 200m from existing sensitive residential receptors unless it can be demonstrated to the satisfaction of East Riding of Yorkshire Council that the location of inverters within 200m of existing residential receptors, would not give rise to materially new or materially different noise effects compared to those reported within ES Volume 2, Chapter 12: Noise and Vibration [EN010157/APP/6.2] .	To minimise noise impact on noise sensitive receptors during operation.	Design Parameters Document [EN010157/APP/5.8]
A minimum 200m offset to construction compounds from residential dwellings.	To minimise noise impact on noise sensitive receptors during construction.	Works Plans [EN010157/APP/2.2]
The Proposed Development design will incorporate a minimum offset distance of 10m from any existing woodland, trees (from the edge of the canopy) and hedgerows, where reasonably practicable.	To minimise noise impact on ecological receptors present in the woodland, trees or hedgerows.	Outline LEMP [EN010157/APP/7.5]

12.7 Assessment of likely effects (without additional mitigation)

Construction noise

- 12.7.1 **ES Volume 4, Appendix 12.3: Construction Noise Assessment Details [EN010157/APP/6.4]**, details the predicted noise levels and magnitude of impact during the construction phase associated with the Proposed Development.
- 12.7.2 The highest noise levels from construction activity (in the absence of additional mitigation) are predicted to be during the construction of access tracks and laydown areas. This activity is shown to result in predicted noise levels of up to 80 dB(A) at six sensitive receptors; noise levels of this magnitude would result in a high impact in the short term. Predicted noise levels from this are due to the short distance between works location and sensitive receptors; in practice, predicted noise levels are likely to occur for a short period of time, due to the transient nature of the activity.
- 12.7.3 Further construction activities that are likely to result in predicted noise levels in excess of 75 dB $L_{Aeq,T}$ are:
- Infrastructure:
 - Installation of construction drainage with pumping
 - Cable installation:
 - Stripping of topsoil
 - Trenching and installation of cabling
- 12.7.4 Noise levels of this magnitude would result in a high impact in the short term at three receptors considered. Similar to the construction of the access tracks, predicted noise levels associated with the drainage, stripping of topsoil and cable trenching would only occur for a limited amount of time, during periods where the activity occurs at nearest distance to the receptor.
- 12.7.5 The following activities are likely to result in predicted noise levels in excess of 65 dB $L_{Aeq,T}$:
- Preparatory works:
 - Stripping of topsoil, trenching, storage and capping
 - Site establishment; mobilisation areas, running tracks, compounds and fencing
 - Infrastructure:
 - Installation of solar PV modules, support structures and mounting

- Cable installation:
 - Horizontal Directional Drilling - crossing methodology

12.7.6 Predicted noise levels from these activities would result in a medium impact in the short term.

12.7.7 The following activities are predicted to result in noise levels below 65 dB $L_{Aeq,T}$:

- Preparatory works:
 - Installation of temporary culverts under watercourses
 - Delivery of plant and materials to site
- Infrastructure:
 - Installation of inverters, transformers, BESS and switchgear
 - Construction of on-site transformers
 - Installation of storage containers
- Cable installation:
 - Set-up of temporary compounds
- Haul roads.

12.7.8 Noise levels from these activities are considered to result in a low impact in the short term.

Construction vibration

12.7.9 Potential sources of vibration associated with the construction works are likely to arise from compaction of access tracks and tunnelling works associated with the Horizontal Directional Drilling.

12.7.10 In the absence of specific working methods and plant specifications, the assessment of construction induced vibration has been informed by the empirical prediction formulae set out in Annex E of BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Vibration [Ref. 12-14], which covers a range of vibration-inducing construction activities.

12.7.11 To provide an indication of potential ground vibration levels due to compaction, a representative Bomag 'BW203' drum roller has been adopted for assessment. This is due to the fact that sufficient data are available to serve the aforementioned prediction formulae regarding the amplitude of vibration, drum width and number of drums.

12.7.12 **Table 12-11** summarises the potential vibration levels at a range of setback distances:

Table 12-11: Prediction of vibration levels at varying distances, mm/s (PPV)

Operating scenario	Peak particle velocity at setback distance (m)				
	10	20	30	40	50
Steady state operation	5.3	2.2	1.2	0.8	0.6
Start up and run down	5.6	2.6	1.6	1.1	0.8

12.7.13 Given the limited separation distances to the sensitive receptors (less than 20m in some instances), it is considered that vibration from compaction activities during the widening of the access tracks may give rise to disturbance (between 1.0 and 9.9 mm/s Peak Particle Velocity).

12.7.14 Where sensitive receptors are located further than 50m from the compaction activity, it is noted that vibration levels are predicted to fall below 1.0 mm/s Peak Particle Velocity.

Construction traffic

12.7.15 **Table 12-12** summaries the potential impact of construction phase traffic noise from the Proposed Development in the absence of additional mitigation.

Table 12-12: Construction traffic road noise level change – short term

Road name/link	Short term noise level change, dB L _{A10,18h}			
	Phase 2	Phase 3	Phase 4	Phase 5
A1035	0.3	0.0	0.0	1.6
Meaux Lane	0.8	0.3	0.5	2.0
Beverley Road	0.5	0.0	0.0	1.6
A165	0.6	0.0	0.1	1.6
Black Tup Lane	3.5	2.1	0.0	0.0

12.7.16 The assessment of construction related road traffic noise indicates that, during Phase 2 and Phase 3 of the construction programme, noise levels are expected to increase along Black Tup Lane by 3.5 dB and by 2.1 dB, respectively. It is acknowledged that the level of change along this road link is the result of low baseline traffic flows. Based on the application of absolute noise levels as a result of construction traffic movements, the affected receptors along Black Tup Lane are likely to result in levels below 65 dB L_{Aeq, T}; levels of this magnitude are not considered a significant adverse effect in line with the recommendations of DMRB LA 111 Noise and Vibration [Ref. 12-18] and those threshold levels as derived in 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise [Ref. 12-13].

12.7.17 Noise predictions indicate that the effect of construction traffic elsewhere would increase noise levels by up to of 2.0 dB, with the greatest change occurring on Meaux Lane during Phase 5.

12.7.18 **ES Volume 2, Chapter 14: Transport and Access [EN010157/APP/6.2]** notes that the traffic flow data used in the above assessment represent the likely busiest days of construction for each land area (i.e., when construction and staff-related trips will be at their highest). On this basis, it is considered that a worst-case scenario is presented.

Operational noise

12.7.19 A summary of predicted noise levels from the operation of proposed plant items, incorporating the scenarios outlined in **Section 12.4** associated with the Proposed Development are provided in **Table 12-12**, along with assessment against the representative background sound level ($L_{A90, T}$) and adopted LOAEL absolute design targets. Predictions include the input plant source levels and operating characteristics as identified in **ES Volume 4, Appendix 12.4: Operational Noise Assessment Details [EN010157/APP/6.4]**.

12.7.20 Based on previous experience of similar projects, it is acknowledged that some plant items such as inverters and transformers may exhibit tonal elements in proximity to the unit. However, analysis of the predicted levels at each receptor, in accordance with the objective method prescribed in BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [**Ref. 12-15**], demonstrate that these tonal elements would not be sufficiently prominent to warrant a character correction.

12.7.21 Notwithstanding, it is reasonable to expect that the Proposed Development would introduce new noise sources to an otherwise rural environment that are readily distinguishable. In accordance with BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [**Ref. 12-15**], a +3 dB rating correction has been added to the specific noise predictions (i.e., predictions in the absence of rating corrections), to those receptors where predicted noise levels exceed the residual sound level for the corresponding assessment period.

12.7.22 Rating levels, accounting for the combined noise emissions of all plant items itemised in **Section 12.4** and in the absence of additional mitigation, are provided in **Table 12-12** overleaf. It is noted that the sensitivity of individual properties varies between medium and high for the following sensitive receptors:

- R11 – Long Riston
- R13 – Routh
- R16 – Meaux (North)
- R17 – Meaux (South)

12.7.23 **Table 12-12** differentiates these sensitive receptors further to summarise the potential noise effects for properties of medium and high sensitivity, separately.

Table 12-12: Predicted operational rating levels and assessment, prior to additional mitigation

Ref.	Receptor sensitivity	Rating level, dB L _{AR, Tr}		Exceedance above representative background sound level, dB		Exceedance above lower absolute threshold, dB		Predicted magnitude of impact	
		Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R9	High	31	31	-10	8	-9	-4	Negligible	Low
R10	High	34	33	-8	10	-7	-2	Negligible	Low
R11	High	34	33	-10	8	-6	-2	Negligible	Low
	Medium	31	31	-13	6	-9	-4	Negligible	Low
R12	High	42	41	6	15	2	6	Medium	Medium
R13	High	35	37	-2	9	-6	2	Low	Medium
	Medium	31	30	-6	2	-10	-5	Low	Low
R14	High	45	44	9	9	5	9	Medium	Medium
R16	High	40	42	11	24	0	7	Low	Medium
	Medium	41	44	12	26	1	9	Medium	Medium
R17	High	38	41	10	16	-2	6	Low	Medium
	Medium	39	42	11	17	-1	7	Low	Medium
R18	High	39	39	12	22	-1	4	Low	Medium
R19	High	35	38	5	10	-5	3	Low	Medium
R20	High	42	41	12	22	2	6	Medium	Medium
R21	High	41	41	5	6	1	6	Medium	Medium
R22	High	34	37	4	10	-6	2	Low	Medium
R23	High	32	35	2	7	-8	0	Low	Low
R24	High	33	35	3	7	-8	0	Low	Low
R25	High	33	32	-9	9	-8	-3	Negligible	Low

12.7.24 The predicted Rating Level from the operation (including maintenance) phase of the Proposed Development is shown to exceed the representative background sound level by a margin greater than 5 dB(A) and also exceeds the absolute noise level threshold set out in **Table 12-7** (40 dB L_{Ar,1h} for daytime, 35 dB L_{Ar,15min} for night-time) at the following receptors:

- R12 – Carr House Farm, Long Riston
- R13 – Routh
- R14 – Meaux Decoy Farm, Routh
- R16 – Meaux (North)
- R17 – Meaux (South)
- R18 – Meaux (East)
- R19 – Crown Farm, Meaux
- R20 – Arnold Carr Farm, Arnold
- R21 – Weel
- R22 – Springdale Farm, Carr Lane, Weel

12.7.25 For all other locations, the predicted Rating Level falls below these thresholds.

12.7.26 Noise contours for the daytime (07:00-23:00) and night-time period (23:00-07:00), for the scenario prior to additional mitigation, are presented graphically in **ES Volume 3, Figure 12.5: Operational Noise Contours – Unmitigated, Daytime, Ground Floor [EN010157/APP/6.3]** and **ES Volume 3, Figure 12.6: Operational Noise Contours – Unmitigated, Night-time, First Floor [EN010157/APP/6.3]**, respectively.

Decommissioning noise, vibration and traffic

12.7.27 The likely impacts during the decommissioning phase would be no greater than that during the construction phase, as it is envisaged that similar plant and works would be used.

12.8 Additional mitigation

Construction noise and traffic

Best practicable means

12.8.1 Through the implementation of the **Outline CEMP [EN010157/APP/7.2]**, and **Outline Construction Traffic Management Plan (Outline CTMP) [EN010157/APP/7.7]**, Best Practicable Means as defined by the Control of

Pollution Act 1974 will be implemented, which will serve to minimise the noise and vibration impacts at receptors in the vicinity of the construction works.

12.8.2 Measures that may be employed where reasonably practicable to mitigate the noise level impact from the construction and decommissioning phases are outlined below:

- Ensure that each item of equipment complies with the noise limits quoted in The Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001 **[Ref. 12-24]**;
- Plant and equipment that generates low levels of noise and vibration shall be adopted;
- Where practicable, temporary enclosures will be used to screen all static or semi-static plant from noise sensitive receptor locations;
- All engine compartments or acoustic enclosures are closed whilst engines are running;
- Use of hand-held equipment to carry out the works where practicable in lieu of mechanical means;
- Minimising drop heights of materials (i.e. lorry with lifting boom or dumper carefully depositing materials);
- Regular briefings for operators of moving plant to emphasise the importance of noise mitigation, specifically avoiding movement over irregular surfaces (which tends to create more noise/vibration emissions);
- At all times, workers' shouting or raised voices to be kept to a minimum;
- All plant, equipment and noise control measures applied to plant and equipment to be maintained in good and efficient working order and operated such that noise emissions are minimised as far as reasonably practicable.
- Any plant, equipment or items fitted with noise control equipment found to be defective will not be operated until repaired;
- Machines in intermittent use to be shut down or throttled down to a minimum during periods between works;
- As far as is reasonably practicable, the location and orientation of semi-static equipment to be chosen to minimise the noise impact on sensitive receptors;
- A quiet working ethic will be employed to ensure that all members of the workforce have consideration for the nearby residents;

- Shouting and use of radios when entering to and from Site, and when working on Site, will be controlled;
- Operatives will be briefed not to sound car horns to gain access to the Main and Satellite Construction Compounds. To assist, security will arrange for the Site to be unlocked up to one hour prior to the start of the core working hours;
- The delivery routes set out in the **Outline CTMP [EN010157/APP/7.7]** will be communicated to and adhered to by all suppliers;
- Control and limit noise from reversing alarms, using the following hierarchy:
 - Design the Main and Satellite Construction Compound layouts to limit and avoid the need for the reversing of vehicles and ensure that drivers are familiar with the worksite layout; and
 - Utilise banksmen to avoid the use of reversing alarms.
- Where banksmen are necessary, use reversing alarms incorporating one or more of the features listed in hierarchical order below or any other comparable system:
 - Highly directional sounders;
 - Use of broadband signals;
 - Self-adjusting output sounders;
 - Flashing warning lights; and
 - Set reversing alarms to the minimum output noise level required for health and safety compliance.
- Toolbox talks will be carried out by the principal contractor to ensure that all members of the workforce are aware of their possible noise impact and of the sensitivities of the vicinity. These will also ensure that Best Practicable Means of control are delivered on the Site.
- A programme of community liaison will be carried out, including notification of works and details of the complaints process.

Setback distances

12.8.3 As stated above in the list of Best Practicable Means measures, the location and orientation of semi-static equipment can be chosen to minimise the noise impact on sensitive receptors. Where it has been identified there is potential for the construction works to give rise to potential noise impacts at sensitive receptors, setback distances to the proposed works will be included in the Construction Environmental Management Plan, in order to reduce any potential noise impacts (as detailed in and secured by the **Outline CEMP [EN010157/APP/7.2]**).

Temporary noise barriers

- 12.8.4 As stated above in the list of Best Practicable Means measures: where there is potential for the construction works to give rise to medium or high impact magnitudes at sensitive receptors, temporary noise barriers may be installed close to noise-producing plant to minimise construction induced noise levels (where feasible).
- 12.8.5 BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – noise [Ref. 12-13] advises that the approximate acoustic attenuation provided by a barrier will be 5 dB when the top of the plant is just visible to the receiver over the noise barrier and 10 dB when the barrier completely hides the noise sources from the receiver. Given the height of certain noise sensitive receptors that have the potential to be affected by the proposed construction works (existing and proposed), it may be challenging to break line of sight between the works and the surrounding receptors in all instances.
- 12.8.6 Temporary noise barriers could comprise a well-constructed site hoarding or a proprietary temporary barrier system that can be rapidly installed and modified on-site to screen specific construction activities. In all instances, the hoarding/barrier should be free from gaps, holes, slits or cracks, with no gaps between the barrier and the ground.

Construction vibration

- 12.8.7 At this stage, it is expected that vibration will be controlled through the consideration and selection of appropriate techniques (e.g., use of vibratory compaction plant which generate lower levels of vibration). This may dictate the use of smaller plant items which compact material in thinner layers.
- 12.8.8 The detailed construction stage vibration assessment should be undertaken once the appointed contractor's working methods and plant items are known. This should account for both existing receptors and any new, future receptors. From this, specific mitigation measures can be identified. It is considered that reasonable mitigation measures can be implemented to limit potential disturbance.
- 12.8.9 The vibration control measures, determined through the vibration assessment, will be set out in the Construction Environmental Management Plan and are secured by the **Outline CEMP [EN010157/APP/7.2]**.

Operational noise

12.8.10 The predicted exceedances at the sensitive receptors are understood to be primarily due to fan noise emanating from the BESS within each Land Area.

12.8.11 When choosing attenuation measures or implementing an effective noise reduction program, there are two possible approaches for treatment:

- At source – modify the source to radiate at a lower sound power level; and
- In the path – deflect or block the acoustic path of noise.

Mitigation at source

12.8.12 In the case of fan noise being a major component of the acoustic emissions from the Proposed Development, the use of silencers and acoustic louvres have been shown to be effective as a noise control measure. Additionally, seeking a reduction in fan speed whilst maintaining the required airflow for cooling requirements would serve to reduce noise emissions.

12.8.13 Specifically, the following attenuation is proposed:

- 8 dB reduction from chillers associated with BESS; and
- 4 dB reduction from inlet vents associated with DC-DC converters.

12.8.14 Re-orientation of equipment to direct sound away from sensitive receptors is also beneficial with regard to predicted noise impacts.

12.8.15 As part of the proposed mitigation strategy, BESS have been re-orientated so that the chillers face into the respective hybrid packs as a typical layout. This is with the exception of 18 out of the 84 hybrid packs that have the chiller associated with each BESS facing outwards. Due to the specific placement and positioning of these hybrid packs in question, keeping the BESS in this orientation ensures that the associated chillers face away from the most affected properties in the vicinity.

Mitigation through transmission

12.8.16 The mitigated scenario incorporates an acoustic barrier 3m in height and of a 3m offset from each hybrid pack that falls within a 500m radius of those properties previously shown to fall under a “medium” magnitude of impact in the unmitigated scenario (see **Section 12.7**).

12.8.17 Barriers should be constructed using a suitably dense material of more than 20kg/m², with no holes or gaps around or underneath.

Decommissioning noise, vibration and traffic

12.8.18 Additional mitigation measures for the decommissioning phase are detailed in and secured by the **Outline Decommissioning Environmental Management Plan (Outline DEMP) [EN010157/APP/7.4]**. These will serve to minimise the noise and vibration impacts at receptors in the vicinity of the decommissioning works. A Decommissioning Traffic Management Plan will be developed prior to decommissioning and will reflect the circumstances prevailing during the period in which decommissioning is to be carried out, as secured by the **Outline DEMP [EN010157/APP/7.4]**.

12.9 Assessment of residual effects (with additional mitigation)

Construction noise and traffic

- 12.9.1 By adopting the additional mitigation measures outlined in **Section 12.8**, it is considered that noise levels from construction activity on site and the local road network would not exceed 65 dB $L_{Aeq,T}$ at all of the sensitive receptors considered.
- 12.9.2 Based on the application of suitable mitigation measures, the magnitude of impact during the construction phase at **high** sensitivity receptors is considered **low**, resulting in a temporary **minor adverse** effect, which is considered **not significant**.

Construction vibration

- 12.9.3 Following the application of additional mitigation measures, the magnitude of impact during the construction phase at **high** sensitivity receptors is considered **low**, resulting in a temporary **minor adverse** effect, which is considered **not significant**.

Operational noise

- 12.9.4 Following the process shown in **Table 12-12**, the Rating Level due to the combined noise emissions of all plant items itemised in **Section 12.4**, incorporating the additional mitigation measures specified in **Section 12.8**, are provided in **Table 12-13** overleaf.

Table 12-13: Predicted operational rating levels and assessment, following additional mitigation

Ref.	Receptor sensitivity	Rating level, dB L _{AR, Tr}		Exceedance above representative background sound level, dB		Exceedance above lower absolute threshold, dB		Predicted magnitude of impact	
		Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R9	High	31	31	-10	8	-9	-4	Negligible	Low
R10	High	33	33	-8	10	-7	-2	Negligible	Low
R11	High	34	33	-10	8	-6	-2	Negligible	Low
	Medium	31	31	-13	6	-9	-4	Negligible	Low
R12	High	30	33	-6	7	-10	-2	Negligible	Low
R13	High	33	33	-3	5	-7	-2	Low	Low
	Medium	31	30	-5	2	-9	-5	Low	Low
R14	High	35	35	-1	0	-5	0	Low	Low
R16	High	32	35	3	17	-8	0	Low	Low
	Medium	41	44	12	26	1	9	Medium	Medium
R17	High	29	32	1	7	-11	-3	Low	Low
	Medium	39	42	11	17	-1	7	Low	Medium
R18	High	29	32	2	15	-11	-3	Low	Low
R19	High	30	33	0	5	-10	-2	Low	Low
R20	High	32	35	2	16	-8	0	Low	Low
R21	High	36	35	0	0	-4	0	Low	Low
R22	High	27	30	-3	3	-13	-5	Low	Low
R23	High	30	33	0	5	-10	-2	Low	Low
R24	High	30	33	0	5	-10	-2	Low	Low
R25	High	28	28	-13	5	-12	-7	Negligible	Low

- 12.9.5 Following the application of additional mitigation measures, the highest magnitude of impact during the operation (including maintenance) phase at **medium** sensitivity receptors is considered **medium**, resulting in a permanent **minor adverse** effect, which is considered **not significant**.
- 12.9.6 Following the application of additional mitigation measures, the highest magnitude of impact during the operation (including maintenance) phase at **high** sensitivity receptors is considered **low**, resulting in a permanent **minor adverse** effect, which is considered **not significant**.
- 12.9.7 Noise contours of the specific noise for the daytime (07:00-23:00) and night-time period (23:00-07:00), for the mitigated scenario, are presented graphically in **ES Volume 3, Figure 12.7: Operational Noise Contours – Mitigated, Daytime, Ground Floor [EN010157/APP/6.3]** and **ES Volume 3, Figure 12.8: Operational Noise Contours – Mitigated, Night-time, First Floor [EN010157/APP/6.3]**, respectively.

Decommissioning noise, vibration and traffic

- 12.9.8 As the residual impacts during the decommissioning phase are unlikely to be any greater than those during the construction phase, no significant effects are predicted.

12.10 Opportunities for enhancement

- 12.10.1 Opportunities for environmental enhancement in relation to noise and vibration have not been considered within this assessment.

12.11 Monitoring requirements

- 12.11.1 If required, any general noise monitoring measures will be detailed in the Operational Environmental Management Plan, as detailed in and secured by the **Outline OEMP [EN010157/APP/7.3]**.
- 12.11.2 The **Outline CEMP [EN010157/APP/7.2]**, **Outline OEMP [EN010157/APP/7.3]** and **Outline DEMP [EN010157/APP/7.4]** secure procedures for setting up and publicising a contact point for the Proposed Development to log, monitor and address any complaints associated with noise during the construction, operation and decommissioning phases. Should any noise-related complaints be received during either construction, operation or decommissioning, the Applicant would consider undertaking targeted monitoring.

12.12 Difficulties and uncertainties

12.12.1 Construction plant lists based on prior experience from similar sites have been generated for the various activities using the best available information at the time of writing. It is expected that these would be refined nearer the time of construction, and suitably controlled within the Construction Environmental Management Plan, which would be substantially in accordance with the **Outline CEMP [EN010157/APP/7.2]**.

12.13 Summary

12.13.1 A summary of this assessment is presented in **Table 12-14**. The sensitivity of each receptor is identified alongside any relevant embedded mitigation and the potential effects that could arise on those receptors. Any proposed additional mitigation measures are stated, and the magnitude of impact (change) and residual effects then assessed. Finally, any monitoring requirements are stated, where applicable.

Table 12-14: Assessment summary

Receptor/matter	Phase	Sensitivity of the receptor	Embedded mitigation	Potential effects (without additional mitigation)	Additional mitigation	Magnitude of impact	Residual effect (with additional mitigation)	Monitoring requirement
Key: + = positive, - = negative, D = direct, I = indirect, ST = short term, MT = medium term, LT = long term, P = permanent, T = temporary								
Noise	Construction	High	Construction compounds to be located a minimum of 250m from potential receptors.	Major adverse (ST) (T)	Best Practicable Means measures and Outline CEMP [EN010157/APP/7.2]	Minor	Minor adverse (-) (D) (ST) (T) Not significant	Targeted noise monitoring at sensitive receptors
Increase in traffic flow	Construction	High	--	Moderate adverse (-) (D) (ST) (T) on Black Tup Lane	Best Practicable Means measures, Outline CEMP [EN010157/APP/7.2] and Outline CTMP [EN010157/APP/7.7]	Minor	Minor adverse (-) (D) (ST) (T) Not significant	N/A
Vibration	Construction	High	--	Moderate adverse (-) (D) (ST) (T) on sensitive receptors within 20m of vibratory activities	Best Practicable Means measures and Outline CEMP [EN010157/APP/7.2]	Minor	Minor adverse (-) (D) (ST) (T) Not significant	Targeted noise monitoring at sensitive receptors
Noise	Operation (including maintenance)	High	Substations greater than 250m from residential properties or any environmental designated site. Minimum offset distance of 50m to residential properties from solar PV modules and other infrastructure.	Moderate adverse (-) (D) (LT) (P)	Optimised selection of plant and equipment, use of acoustic barriers, inclusion of acoustic silencers and/or louvres	Minor	Minor adverse (-) (D) (LT) (P) Not significant	Verification plant noise measurements of installed equipment
Noise	Decommissioning	High	Construction compounds to be located a minimum of 250m from potential receptors.	Major adverse (ST) (T)	Best Practicable Means measures and Outline DEMP [EN010157/APP/7.4]	Minor	Minor adverse (-) (D) (ST) (T) Not significant	Targeted noise monitoring at sensitive receptors
Increase in traffic flow	Decommissioning	High	--	Moderate adverse (-) (D) (ST) (T) on Black Tup Lane	Best Practicable Means measures and Outline DEMP [EN010157/APP/7.4]	Minor	Minor adverse (-) (D) (ST) (T) Not significant	N/A

Receptor/matter	Phase	Sensitivity of the receptor	Embedded mitigation	Potential effects (without additional mitigation)	Additional mitigation	Magnitude of impact	Residual effect (with additional mitigation)	Monitoring requirement
Decommissioning vibration	Decommissioning	High	--	Moderate adverse (-) (D) (ST) (T) on sensitive receptors within 20m of vibratory activities	Best Practicable Means measures and Outline DEMP [EN010157/APP/7.4]	Minor	Minor adverse (-) (D) (ST) (T) Not significant	Targeted noise monitoring at sensitive receptors

12.14 References

- **Ref. 12-1:** Environmental Protection Act 1990. Available online: <https://www.legislation.gov.uk/ukpga/1990/43/contents>
- **Ref. 12-2:** Control of Pollution Act 1974. Available online: <https://www.legislation.gov.uk/ukpga/1974/40>
- **Ref. 12-3:** Department for Energy Security and Net Zero (2023) (designated in January 2024). Overarching National Policy Statement for Energy (EN-1). Available online: <https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1>
- **Ref. 12-4:** Department for Energy Security and Net Zero (2023) (designated in January 2024). National Policy Statement for Renewable Energy Infrastructure (EN-3). Available online: <https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3>
- **Ref. 12-5:** Department for Energy Security and Net Zero (2023) (designated in January 2024). National Policy Statement for Electricity Networks Infrastructure (EN-5). Available online: <https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5>
- **Ref. 12-6:** Ministry of Housing, Communities and Local Government (2024) National Planning Policy Framework. Available online: <https://assets.publishing.service.gov.uk/media/675abd214cbda57cadc3476e/NPPF-December-2024.pdf>
- **Ref. 12-7:** Noise Policy Statement for England (Defra, 2010). Available online: <https://www.gov.uk/government/publications/noise-policy-statement-for-england>
- **Ref. 12-8:** East Riding of Yorkshire Council (2016). East Riding Local Plan 2012 – 2029. Available online: <https://www.eastriding.gov.uk/planning-permission-and-building-control/planning-policy-and-the-local-plan/east-riding-local-plan/>
- **Ref. 12-9:** Planning Practice Guidance – Noise (2019). Available online: <https://www.gov.uk/government/collections/planning-practice-guidance>
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1: Guide to quantities and procedures). London: British Standard Institution.

- **Ref. 12-11:** British Standards Institution (2018) British Standard EN 60942:2018, Electroacoustics – Sound calibrators. London: British Standard Institution.
- **Ref. 12-12:** British Standards Institution (2013) British Standard EN 61672-1:2013, Electroacoustics - Sound level meters (Part 1: Specifications). London: British Standard Institution.
- **Ref. 12-13:** British Standards Institution (2014) British Standard 5228:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites (Part 1: Noise). London: British Standard Institution.
- **Ref. 12-14:** British Standards Institution (2014) British Standard 5228:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites (Part 2: Vibration). London: British Standard Institution.
- **Ref. 12-15:** British Standards Institution (2019) British Standard 4142:2014+A1:2019, Methods for rating and assessing industrial and commercial sound. London: British Standard Institution.
- **Ref. 12-16:** Adcock, C., Adnitt, R., Brownstone, M., Lewis, T., Raymond, A., Shortt, P. and Tickner, C., (2020) BS 4142:2014+A1:2019 – Technical Note. Northallerton: Association of Noise Consultants.
- **Ref. 12-17:** Department of Transport (1988) Calculation of Road Traffic Noise. Surrey: Her Majesty's Stationary Office.
- **Ref. 12-18:** Highways England (2019) Design Manual for Roads and Bridges, LA 111 Noise and Vibration. Available online: <https://www.standardsforhighways.co.uk/dmrb/search/cc8cfcf7-c235-4052-8d32-d5398796b364> (Accessed: February 2024).
- **Ref. 12-19:** Noise Advisory Council (1978) A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level L_{eq} . Available online: <https://www.omegawestdocuments.com/media/documents/43/43.15%20-%20Noise%20Advisory%20Council%20document%20entitled%20A%20guide%20to%20measurement%20and%20prediction%20of%20the%20equivalent%20continuous%20sound%20level%20Leq.pdf>

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- **Ref. 12-21:** International Organization for Standardization (1996) ISO 9613-2:1996(E): Acoustics. Attenuation of sound during propagation outdoors - Part 2: General method of calculation. Geneva, Switzerland: International Organization for Standardization.
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- **Ref. 12-24:** Secretary of State (2001) The Noise Emission in the Environment by Equipment for use Outdoors Regulations. Available online: <https://www.legislation.gov.uk/ukxi/2001/1701>

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