Fosse Green Energy

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EN010154

6.1 Environmental Statement

Chapter 11: Noise and Vibration

VOLUME

6

Planning Act 2008 (as amended)

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

18 July 2025

Planning Act 2008

The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulation 2009 (as amended)

Fosse Green Energy

Development Consent Order 202[ ]

6.1 Environmental Statement

Chapter 11: Noise and Vibration

Regulation Reference	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	EN010154
Application Document Reference	EN010154/APP/6.1
Author	Fosse Green Energy Limited

Version	Date	Issue Purpose
Rev 1	18 July 2025	DCO Submission

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11. Noise and Vibration

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) describes the baseline conditions and findings of an assessment of the likely significant effects from noise and vibration as a result of the Proposed Development. For more details about the Proposed Development, refer to **Chapter 3: The Proposed Development [EN010154/APP/6.1]**.

11.1.2 This chapter identifies and proposes measures to address the potential impacts and likely significant effects of the Proposed Development on noise and vibration, during the construction, operation (including maintenance), and decommissioning phases of the Proposed Development.

11.1.3 This chapter is supported by the following figures:

a. **Figure 11-1: Receptor and Noise Monitoring Positions [EN010154/APP/6.2];**

b. **Figure 11-2: Noise Contours – Operational Phase Centralised BESS [EN010154/APP/6.2]**; and

c. **Figure 11-3: Noise Contours – Operational Phase Distributed Configured BESS [EN010154/APP/6.2]**.

11.1.4 It is also supported by the following appendices:

a. **Appendix 11-A: Noise and Vibration Policy and Legislation [EN010154/APP/6.3];**

b. **Appendix 11-B: Acoustic Terminology [EN010154/APP/6.3];**

c. **Appendix 11-C: Baseline Noise Surveys [EN010154/APP/6.3];** and

d. **Appendix 11-D: Construction and Operational Noise Modelling [EN010154/APP/6.3].**

11.1.5 This chapter assesses noise and vibration effects on human receptors and does not include the assessment of noise and vibration on ecological or heritage receptors. Where relevant, the impacts of noise and vibration on heritage receptors are assessed in **Chapter 7: Cultural Heritage** of this ES **[EN010154/APP/6.1]**, impacts of noise and vibration on ecological receptors are assessed in **Chapter 8: Ecology and Nature Conservation [EN010154/APP/6.1]** and noise and vibration impacts on landscape and visual receptors are assessed in **Chapter 10: Landscape and Visual Amenity** of this ES **[EN010154/APP/6.1].**

11.2 Legislation and Planning Policy

11.2.1 Legislation, planning policy, and guidance relating to the assessment of noise and vibration effects pertinent to the Proposed Development comprises the

documents listed below. More detail regarding these policies can be found in **Appendix 11-A: Noise and Vibration Policy and Legislation [EN010154/APP/6.3].**

Legislation

a. Control of Pollution Act 1974 (Ref. 11-1); and

b. Environmental Protection Act 1990 (Ref. 11-2).

National Planning Policy

a. The Overarching National Policy Statement for Energy Infrastructure (NPS EN-1) (2023) (Ref. 11-3);

b. The National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (2023) (Ref. 11-4);

c. National Planning Policy Framework (NPPF) (2023) (Ref. 11-5); and

d. Noise Policy Statement for England (NPSE) (Ref. 11-6).

Local Policy

a. Central Lincolnshire Local Plan (2023) (Ref. 11-7);

Guidance

a. Planning Practice Guidance Noise (PPGN) (Ref. 11-8).

b. British Standard (BS) 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise (Ref. 11-9).

c. BS 5228-2:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration (Ref. 11-10)

d. BS 7445-1:2003 – Description and environment of environmental noise – Part 1: Guide to quantities and procedures (Ref. 11-11).

e. BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound (Ref. 11-12).

f. BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings (Ref. 11-13).

g. World Health Organization Guidelines for Community Noise (Ref. 11-14).

h. Calculation of Road Traffic Noise (Ref. 11-15).

i. Institute of Environmental Management and Assessment Guidelines for Environmental Noise Impact Assessment (IEMA Guidelines) (Ref. 11-16).

11.3 Consultation

11.3.1 A scoping exercise was undertaken in June 2023 to establish the content, approach and method of the EIA. A request for an EIA Scoping Opinion was issued to the Secretary of State through the Planning Inspectorate in June

2023. Comments received in the EIA Scoping Opinion (**Appendix 1-B [EN010154/APP/6.3]**), and Applicant responses in relation to the noise and vibration assessment are summarised in **Table 11-1**.

Table 11-1: Scoping Opinion Responses (Noise and Vibration)

Consultee	Summary of comment	How matter has been addressed	Location of response
Planning inspectorate	Based on the nature and characteristics of the Proposed Development the Inspectorate agrees that construction road traffic vibration can be scoped out of the assessment.	This point has been noted, and a preliminary assessment of construction traffic vibration is scoped out of the EIA.	N/A
Planning inspectorate	The ES should demonstrate that operational plant and equipment is of a type and to be used in locations unlikely to result in significant vibration impacts on sensitive receptors.	The Proposed Development includes solar PV panels, transformers, inverters energy storage infrastructure, electrical connection infrastructure, and potentially includes tracker panel motors and mechanisms. None of these components are a source of perceptible ground-borne vibration and would not require specific measures to control vibration emissions. As such, operational plant will not generate significant vibration effects upon sensitive receptors.	**Chapter 3: The Proposed Development** of this ES **[EN010154/APP/6.1]**.
Planning inspectorate	The ES project description should contain information on potential sources of operational noise and their location in order to inform the assessment of potential significant effects on sensitive receptors.	Details of potential sources of operational noise and their locations are provided in **Chapter 11: Noise and Vibration, Section 11.5** of this ES. Proposed infrastructure in the Cable Corridor is limited to underground cables. Cables generate very low levels of noise and would be underground, so any noise emissions are highly unlikely to be	**Figure 3-2a Indicative Fixed South Facing Layout [EN010154/APP/6.2]** **Figure 3-5: Indicative Centralised BESS Layout [EN010154/APP/6.2]** **Appendix 11-D: Construction and Operational Noise**

Consultee	Summary of comment	How matter has been addressed	Location of response
		perceptible above ground. As such, operational noise in the Cable Corridor is scoped out and the operational noise assessment covers solar farm infrastructure only.	**Modelling [EN010154/APP/6.3]**
Planning inspectorate	The Inspectorate does not agree to scope out an assessment of decommissioning noise.	Noise associated with the decommissioning phase has been explicitly considered within this ES chapter.	**Chapter 11: Noise and Vibration, Section 11.7** of this ES chapter.
Planning inspectorate	The Inspectorate considers that noise and vibration may also have the potential to lead to adverse effects on landscape and visual receptors (for example in terms of tranquillity), and as such the effects of noise and vibration on these receptors should also be assessed.	This ES chapter considers potential noise and vibration effects on human receptors. **Chapter 10: Landscape and Visual Amenity** of this ES **[EN010154/APP/6.1]** considers effects on landscape and visual receptors.	**Chapter 10: Landscape and Visual Amenity [EN010154/APP/6.1]** of this ES.
Planning inspectorate	The ES should explain how the study area and sensitive receptors were selected, including provision of appropriate figures. Effort should be made to agree the study area with relevant consultation bodies. As flexibility is sought to accommodate future developments in technology, the ES should identify the extent of likely operational noise levels and be able to demonstrate that effects have been	This ES chapter provides an explanation on how the study area and sensitive receptors were selected and include appropriate figures. Consultation has been undertaken with local authorities on the study area, noise monitoring locations and sensitive receptors. This ES chapter identifies the extent of likely operational noise levels to demonstrate that effects are based on a worst-case basis. The assessment provides flexibility to accommodate future technology through a	**Chapter 11: Noise and Vibration, Section 11.3, 11.4, 11.7 and 11.8** of this ES chapter. **Figure 11-2: Noise Contours – Operational Phase Centralised BESS** **Figure 11-3: Noise Contours – Operational Phase Distributed BESS**

Consultee	Summary of comment	How matter has been addressed	Location of response
	determined on a worst-case basis.	commitment at the detailed design phase to confirm the noise levels at sensitive receptors will be no higher than the levels in **Table 11-21.**	
Navenby Parish Council	Concerns about noise from tilt motors to orient solar panels	Tilt motors emit very low levels of noise (approximately 10 dB at 30m) and are unlikely to be audible at any nearby properties. As such, they are not considered in the noise assessment presented in this ES chapter.	**Chapter 11: Noise and Vibration, Section 11.4**, Paragraph 11.4.56 of this ES chapter. **Appendix 11-D: Construction and Operational Noise Modelling [EN010154/APP/6.3]** of this ES.
Aubourn with Haddington Parish Council Lincolnshire	Would like to see mitigation statements of how high frequency sounds will be measured and reduced around the solar farm.	This ES chapter contains an assessment of operational noise from inverters, transformers and energy storage infrastructure in line with national policy and British standards guidance. Solar farms tend to generate broadband noise, which contains a reasonably even distribution of noise across low to high frequencies. High frequency noise does not tend to be an issue around solar farms as high frequency sound experiences a substantially higher level of atmospheric attenuation than low frequencies. As low frequency substation noise can be a concern, measures are adopted to address potential low frequency noise issues.	**Framework Operational Environmental Management Plan ([EN010154/APP/7.8]**
Environment Agency	The ES should consider vibration from construction e.g.,	Construction vibration effects are assessed in this ES chapter.	**Chapter 11: Noise and Vibration, Section 11.7**,

Consultee	Summary of comment	How matter has been addressed	Location of response
	for frame which may consist of driven piles, screw anchors, or the installation of concrete blocks.		Paragraph 11.7.17 to 11.7.55 of this ES chapter.
Environment Agency	The applicant must consider vibration from building works e.g., piling for network connection etc	Construction vibration effects are assessed in this ES chapter.	**Chapter 11: Noise and Vibration, Section 11.7**, Paragraph 11.7.17 to 11.7.55 of this ES chapter.
North Kesteven District Council	Account for the future cumulative development of the North Hykeham Relief Road. Baseline noise sources may also include operational noise from RAF Waddington as well as road traffic noise.	Any noise associated with RAF Waddington is included as a baseline noise source through noise monitoring. The North Hykeham Relief Road is included in the cumulative assessment.	**Chapter 11: Noise and Vibration, Section 11.5 and 11.10** of this ES chapter.
North Kesteven District Council	Operational noise assessment will need to account for potential permanent (as opposed to temporary/reversible) effects if the DCO incorporates provision of a new National Grid substation.	The cumulative assessments accounts for potential noise effects due to the proposed new National Grid substation.	**Chapter 11: Noise and Vibration, Section 11.10** of this ES chapter.
North Kesteven District Council	Cumulative construction noise impacts may need to be considered alongside construction and operational noise stemming from Springwell West/associated grid infrastructure	Construction and operational noise from Springwell West is included in the cumulative assessment	**Chapter 11: Noise and Vibration, Section 11.10** of this ES chapter.
Coleby Parish Council	Noise may affect local communities and the effects of this will need evaluation and mitigation in any final project development proposals	This ES chapter contains an assessment of impacts on human receptors as a result of construction noise and operational noise from inverters and battery storage units in line with	**Chapter 11: Noise and Vibration, Section 11.7** of this ES chapter.

Consultee	Summary of comment	How matter has been addressed	Location of response
		national policy and British standards guidance. The results of the assessment have been used to determine the requirement for mitigation.	

11.3.2 Further consultation in response to formal pre-application engagement was undertaken through the Preliminary Environmental Information (PEI) Report, issued in October 2024. **Table 11-2** outlines the statutory consultation responses relating to the noise and vibration assessment and how these have been addressed through this ES. The **Potential Main Issues for Examination [EN010154/APP/7.11]**, **Consultation Report [EN010154/APP/5.1]** and **Consultation Report Appendices [EN010154/APP/5.2]** provide further detailed responses, as relevant, to the feedback received during statutory consultation.

Table 11-2: Statutory Consultation Responses (Noise and Vibration)

Consultee	Summary of comment	How matter has been addressed	Location of response
Anglian Water	Consideration to be given to vibration affecting underground services	A commitment has been made within the **Framework CEMP [EN010154/APP/7.7]** to undertake a risk assessment of potential damage to underground services due to construction induced vibration as a result of driven piling or Horizontal Directional Drilling (HDD).	**Framework Construction Environmental Management Plan ([EN010154/APP/7.7])**
North Kesteven District Council (NKDC)	Consultation welcomed with Environmental Health Officers following PEIR Consultation and prior to ES being prepared to understand how it is intended to reduce significant noise impacts.	Meeting with NKDC undertaken to discuss significant effects and how they would be addressed in this ES.	**Chapter 11: Noise and Vibration, Table 11-3** of this ES chapter.
Lincolnshire County Council	Swinberby Quarry, Whisby Quarry and Norton Bottoms Quarry should be considered under the	The quarries are existing operations and have been consented subject to	**Chapter 11: Noise and Vibration, Section 11.5 and 11.7** of this ES chapter.

	cumulative assessment. They are large operations that encompass many hectares and undertake industrial activities. Consideration should be given to this Cumulative Effect, particularly noise impacts.	their own noise controls. As such, operations are part of the existing baseline and any contributions to the existing sound environment at sensitive receptors would be accounted for through noise monitoring.

11.3.1 Further engagement has also been undertaken with North Kesteven District Council (NKDC). A technical note was provided to NKDC on 14 September 2023 detailing the following:

a. noise and vibration study area;

b. noise and vibration sensitive receptors; and

c. noise monitoring locations.

11.3.2 An email response was received dated 13 September 2023 from NKDC confirming that the approach set out in the technical note was acceptable.

11.3.3 An online meeting was undertaken in response to a statutory consultation request.

11.3.4 A summary of this further engagement is presented in **Table 11-3**.

Table 11-3: Further Engagement (Noise and Vibration)

Consultee	Date / Method	Summary of Consultation
NKDC	14/09/23: E-mail	Noise and vibration study area covering 300m for construction noise and 500m for operational noise. Noise and vibration sensitive receptors covered in **Table 11-5**. Noise monitoring locations covered in **Table 11-6**.
NKDC	27/02/25: MS Teams meeting	Updated approach to BESS noise modelling covered in **Appendix 11-D: Construction and Operational Noise Modelling**. Mitigation measures covered in **Chapter 11: Noise and Vibration, Sections 11.6 and 11.8** of this ES chapter. Residual significant effects covered in **Chapter 11: Noise and Vibration, Section 11.9** of this ES chapter.

11.4 Assessment Methodology

11.4.1 This section sets out the scope and methodology for the preliminary assessment of the noise and vibration impacts of the Proposed Development.

Study Area

11.4.2 The Study Area was defined to include noise and vibration sensitive receptors likely to be at risk from possible direct and indirect impacts that might arise from the Proposed Development, termed the Zone of Influence (ZoI).

11.4.3 The potential ZoI for construction and decommissioning noise effects from the Principal Site includes receptors within 300m of the Principal Site, based on the results of preliminary modelling, and based on guidance in BS 5228-1 (Ref. 11-9) which states construction noise predictions are generally reliable up to 300m.

11.4.4 The Study Area for construction and decommissioning noise effects along the Cable Corridor includes receptors within 300m, as per guidance in BS 5228-1 (Ref. 11-9). There will be no noise or vibration from the Cable Corridor during operation, except for occasional minor and temporary maintenance work, and therefore these impacts have been scoped out of the assessment and do not require a ZoI.

11.4.5 The potential ZoI for operational noise effects from the Principal Site includes receptors within 500m. The ZoI distance of 500m is based on the results of preliminary modelling, professional judgement, and AECOM's previous experience of co-located solar and BESS projects of this scale. It is considered that receptors further than 500m from the Principal Site will experience considerably lower levels of noise and vibration emissions as these will attenuate over distance, resulting in negligible noise and vibration effects from the Proposed Development. Therefore, the wider 500m operational Study Area has been used for both the construction, decommissioning and operational noise and vibration assessment of the Principal Site. This is a precautionary basis for the assessment effects from construction and decommissioning activities. Additionally, a Study Area of 50m either side of construction traffic routes (see **Chapter 13: Traffic and Transport [EN010154/APP/6.1])** has been defined based on guidance in the Design Manual for Roads and Bridges LA111 (DMRB) (Ref. 11-17).

11.4.6 The construction, decommissioning and operational Study Areas were agreed in consultation with NKDC, as per **Table 11-3** and illustrated in **Figure 11-1: Receptor and Noise Monitoring Positions [EN010154/APP/6.2]**.

Sources of Information

11.4.7 The following sources of information have been used to inform the baseline and assessment presented within this ES chapter:

a. **Chapter 3: The Proposed Development [EN010154/APP/6.1]**, **Figure 3-2A: Indicative Fixed South Facing Site Layout Plan**

[EN010154/APP/6.2], and **Figure 3-2B: Indicative Single Axis Tracker Site Layout Plan [EN010154/APP/6.2]** for the noise model;

b. Aerial imagery and OS mapping of the DCO Site and surrounding area to define sensitive receptors and monitoring locations;

c. Plant noise source data were referenced from BS 5228-1 and from specification sheets provided by the Applicant and previous co-located solar and BESS project noise assessments;

d. **Chapter 3: The Proposed Development [EN010154/APP/6.1]** for information on the construction, operation and maintenance, and decommissioning phases of the Proposed Development; and

e. **Chapter 13: Traffic and Transport [EN010154/APP/6.1]** for information on construction traffic.

Scope of the Assessment

11.4.8 The following potential impacts have been agreed to be considered as part of the EIA for the Proposed Development for which an assessment is provided in **Section 11.7** of this ES chapter:

a. During the construction phase:
   i. Construction noise;
   ii. Construction vibration; and
   iii. Construction traffic noise.

b. During operation (and maintenance):
   i. Solar farm and Battery Energy Storage System (BESS) infrastructure noise.

c. During decommissioning activities:
   i. Decommissioning noise;
   ii. Decommissioning vibration; and
   iii. Decommissioning traffic noise.

11.4.9 Through the EIA Scoping process, the Planning Inspectorate agreed that the following potential impacts do not need to be considered in detail as part of the EIA for the Proposed Development:

a. During the construction phase:
   i. Construction traffic vibration.

b. During operation (and maintenance):
   i. Operational traffic noise; and
   ii. Operational vibration.

c. During decommissioning activities:
   i. Decommissioning traffic vibration.

11.4.10 The potential mechanisms of impact identified above are therefore not considered further within this ES chapter.

Impact Assessment Methodology

Sensitive Receptors

11.4.11 Potential sensitive receptors (i.e. buildings whose occupants may be disturbed by adverse noise and vibration levels, and structures that are sensitive to vibration) have been taken into consideration when assessing the effects associated with noise and vibration levels from the construction, operational and decommissioning phases of the Proposed Development.

11.4.12 The type of noise-sensitive receptors that may experience significant effects due to the construction, operation, and decommissioning of the Proposed Development are identified in **Table 11-4** as either residential or non-residential.

11.4.13 The approach to the assessment of non-residential receptors differs from that adopted for residential receptors. Government policy for noise in the NPSE is based on relationships between noise and health/quality of life, and noise insulation of a typical dwelling and is not considered applicable to non-residential receptors.

11.4.14 Non-sensitive locations include those where no human or other noise-sensitive activity takes place, or where such activity would not be affected by noise from the Proposed Development, such as barns, outbuildings, or industrial facilities.

Table 11-4: Receptor Types

Receptor Group	Receptors in Group
Residential	Individual dwellings and private open spaces (e.g. gardens)
Non-residential	Non-residential community facilities such as schools, hospitals, places of worship, and noise sensitive commercial properties

11.4.15 The effects of noise and vibration generated during the construction, decommissioning, and operational phases of the Proposed Development are considered at nearby sensitive receptors. Several receptors that may potentially be affected have been considered in this assessment. When considering groups of properties as a single receptor, noise and vibration is assessed at the nearest receptor to the DCO Site (i.e. the receptor that will experience the highest levels of noise and vibration). Although noise and vibration may be perceivable at other receptors in each identified receptor group, effects will not be significant if they are suitably controlled at the identified sensitive receptors.

11.4.16 Noise-sensitive receptors have been identified through a desktop study of aerial imagery and mapping and are presented in **Figure 11-1: Receptor and Noise Monitoring Positions [EN010154/APP/6.2]** and are summarised in

Table 11-5. The selection of receptors presented was agreed with the Local Planning Authorities through the EIA Scoping process and therefore includes some receptors that sit outside of the defined Study Area.

Table 11-5: Sensitive Receptors

Receptor ID	Name	Approximate Coordinates	Receptor Type	Distance (where relevant)	
				Solar PV Areas and BESS Compound	Cable Corridor
R1	Grocock's Farm, Aubourn	53.137760°, -0.609023°	Residential	210m	70m
R2	Marlborough Farm, Aubourn	53.140671°, -0.607029°	Residential	600m	-
R3	Larkers Farm, Fen Lane	53.133067°, -0.623558°	Residential	160m	-
R4	Grange Farm, Linga Lane	53.129517°, -0.621214°	Residential	570m	-
R5	North Field Farm, Aubourn Road	53.138730°, -0.630897°	Residential	100m	-
R6	Fen Lane Properties	53.135387°, -0.631533°	Residential	140m	-
R7	Northeast Bassingham Properties	53.132631°, -0.633605°	Residential	365m	-
R8	West Bassingham Properties/ Saint Michael and All Angels Church	53.127890°, -0.643638°	Residential/ Place of Worship	170m	-
R9	River Farm, Thurlby Road	53.134280°, -0.647263°	Residential	130m	-
R10	Church Farm, Thurlby Road	53.134169°, -0.656515°	Residential	100m	-
R11	River Farm, Norton Disney	53.128498°, -0.656466°	Residential	120m	-
R12	Norton Disney Properties	53.121832°, -0.671720°	Residential	320m	-
R13	Tonges Farm, Swinderby Road	53.129815°, -0.668917°	Residential	100m	-
R14	Thurlby Road Properties	53.142306°, -0.669787°	Residential	670m	-

Receptor ID	Name	Approximate Coordinates	Receptor Type	Distance (where relevant)	
				Solar PV Areas and BESS Compound	Cable Corridor
R15	South Witham St Hughs Properties	53.145620°, -0.662324°	Residential	190m	-
R16	Thurlby Receptors	53.143034°, -0.645155°	Residential	400m	-
R17	Bassingham Road Properties	53.139776°, -0.645592°	Residential	210m	-
R18	Witham Farm, Aubourn Road	53.136541°, -0.639289°	Residential	400m	-
R19	East Witham St Hughs Properties	53.151055°, -0.654135°	Residential	100m	-
R20	Northam Witham St Hughs Properties	53.153993°, -0.654110°	Residential	120m	-
R21	Sheepwalks Farm, Witham St Hughs	53.157544°, -0.656726°	Residential	250m	-
R22	Halfway Farm, Ramper Cottage, Newark Road	53.155845°, -0.673569°	Residential	280m	-
R23	High Walks Farm, Stone Lane	53.158374°, -0.647140°	Residential	100m	-
R24	Corner Farm, Haddington	53.156450°, -0.636903°	Residential	310m	-
R25	Haddington Properties	53.156269°, -0.631972°	Residential	490m	-
R26	Grange Cottage, Bassingham Road	53.149064°, -0.631083°	Residential	50m	-
R27	Sky Lane Properties	53.166608°, -0.638620°	Residential	110m	-
R28	Crossways Farm, Old Haddington Lane	53.168083°, -0.641319°	Residential	170m	-
R29	South Thorpe on the Hill Properties	53.176145°, -0.642586°	Residential	110m	-
R30	West Thorpe on the Hill Properties	53.179869°, -0.647644°	Residential	430m	-

Receptor ID	Name	Approximate Coordinates	Receptor Type	Distance (where relevant)	
				Solar PV Areas and BESS Compound	Cable Corridor
R31	Thorpe Park Lodges, Middle Lane	53.179718°, -0.634767°	Residential	420m	-
R32	Station Road Properties, Thorpe on the Hill	53.184561°, -0.649474°	Residential	650m	-
R33	Eagle Lane Properties, Thorpe on the Hill	53.183272°, -0.653727°	Residential	430m	-
R34	Cathedral View Holiday Park	53.166640°, -0.652524°	Residential	60m	-
R35	Housham Grange, Newark Road	53.166333°, -0.659083°	Residential	15m	-
R36	Housham Wood Farm, Newark Road	53.169788°, -0.663586°	Residential	120m	-
R37	Scotland Farm/ Gamekeepers Cottage, Eagle Lane	53.181063°, -0.666265°	Residential	220m	-
R38	Morton Lane Properties	53.175712°, -0.681271°	Residential	160m	-
R39	Morton Hall Prison	53.168047°, -0.685986°	Residential	160m	-
R40	Park Crescent Properties	53.164268°, -0.685068°	Residential	240m	-
R41	Morton Manor, The Avenue	53.165376°, -0.679002°	Residential	90m	-
R42	Morton Properties	53.163378°, -0.677812°	Residential	340m	-
R43	1-12 Bassingham Road	53.151092°, -0.628395°	Residential	230m	-
R44	The Dovecote Pub and Restaurant	53.157255°, -0.670243°	Residential	90m	-
R45	Rose Orchard Restaurant	53.169665°, -0.641244°	Residential	190m	-

Receptor ID	Name	Approximate Coordinates	Receptor Type	Distance (where relevant)	
				Solar PV Areas and BESS Compound	Cable Corridor
R46	Lowfield Farm	53.134114, -0.622001	Residential	170m	-
R47	Lincoln Road Properties	53.124184, -0.530096	Residential	-	15m
R48	Far End Properties	53.122726, -0.533511	Residential	-	90m
R49	Boothby Heath Farm	53.122478, -0.499437	Residential	-	140m
R50	19 Park Crescent	53.165526, -0.683522	Residential	60m	-
R51	New Development at Witham St Hughs south of A46	53.157931, -0.665325	Residential	90m	-

Public Rights of Way and Permissive Paths

11.4.17 Noise is assessed based on the effect on health and quality of life. It is acknowledged that short-term exposure to noise can cause disturbance to PRoW and Permissive Path users and result in adverse noise effects. Planning Practice Guidance Noise (Ref. 11-8) identifies an adverse noise effect as *"Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life."* This is considered to describe the level of noise effect that may be perceived by PRoW and Permissive Path users.

11.4.18 However, given the linear nature of PRoWs and Permissive Paths, the range of noise impacts along them that forms the ambient noise environment, and the transient usage of a PRoW or Permissive Path, a material change in the experience of using the PRoW or Permissive Path as a whole as a result of noise emissions from the Proposed Development, which could affect PRoW and Permissive Path users' health or quality of life, is not anticipated. As such, an assessment of noise effects on PRoW and Permissive Path users as a result of the Proposed Development has been scoped out, in line with the list of proposed receptors to be included in the noise assessment presented in the **Appendix 1-A: EIA Scoping Report [EN010154/APP/6.3]** and as agreed with the NKDC's Environmental Health Officer.

11.4.19 The NPSE (Ref. 11-6) provides a means for noise effects to be identified. It allows for adverse effects on health and quality of life to occur where all reasonable steps have been taken to reduce these effects whilst taking into account sustainable development.

11.4.20 In accordance with the NPSE, all reasonable steps to minimise the effects of noise on PRoW and Permissive Path users will be taken during the construction, operational and decommissioning phases of the Proposed Development. These measures are set out in the **Framework Construction Environmental Management Plan (CEMP)** (**[EN010154/APP/7.7]**), **Framework Decommissioning Environmental Management Plan (DEMP)** (**[EN010154/APP/7.9]**), and **Framework Operational Environmental Management Plan (OEMP)** (**[EN010154/APP/7.8]**) submitted alongside the DCO application. The production of detailed versions of these documents prior to the commencement of the relevant stage of the Proposed Development is secured through requirements in Schedule 2 of the draft **DCO [EN010154/APP/3.1]**.

Baseline Noise Monitoring Methodology

11.4.21 Baseline noise monitoring has been carried out to establish the existing noise climate in the area. The monitoring procedures followed guidance from BS 7445-1:2003 'Description and environment of environmental noise – Part 1: Guide to quantities and procedures' (Ref. 11-11) and BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (Ref. 11-12). All noise measurements included $L_{Aeq,T}$ and $L_{A90,T}$ sound level indicators.

11.4.22 Noise monitoring was carried out at nineteen locations for a period of one week in the period from 1 September to 29 September 2023. These locations provide suitably representative baseline noise data for sensitive receptors affected by the operational Principal Site. Noise monitoring was carried out in public areas that were considered to provide representative noise conditions to nearby sensitive receptors.

11.4.23 Monitoring locations and the Study Area are shown in **Figure 11-1: Receptor and Noise Monitoring Positions [EN010154/APP/6.2]**. The monitoring locations have been allocated as representative of the local noise environment at each of the noise-sensitive receptors (**Table 11-6**) within the Principal Site Study Area and agreed with NKDC (see **Table 11-3)**.

11.4.24 A weather station was installed along with noise monitors so weather conditions could be logged during noise monitoring. This allows periods of adverse weather conditions (i.e. wind speeds exceeding 5 m/s and precipitation) to be identified and noise data for these periods to be removed.

11.4.25 As the Cable Corridor cabling is buried underground, there are no operational noise risks associated with it. Consequently, noise-sensitive receptors along the Cable Corridor have not been monitored as construction noise and vibration criteria are not dependent on measured baseline noise data (see **Section 11.5**).

Table 11-6: Noise Monitoring Locations

Location	Approximate Coordinates	Representative of Receptors
ML1	53.1417328, -0.6187112	R1, R2, R5
ML2	53.1653260, -0.6788865	R39, R40, R41, R42, R50

Location	Approximate Coordinates	Representative of Receptors
ML3	53.1678124, -0.6532607	R34, R35
ML4	53.1774512, -0.6690730	R36, R37, R38
ML5	53.1779803, -0.6451380	R29, R30
ML6	53.1542148, -0.6522123	R19, R20, R21
ML7	53.1554657, -0.6357167	R23, R24, R25
ML8	53.1444724, -0.6615736	R14, R15
ML9	53.1263084, -0.6691780	R11, R12, R13
ML10	53.1332978, -0.6530170	R9, R10
ML11	53.1329980, -0.6338144	R7, R18
ML12	53.1291593, -0.6432601	R8
ML13	53.1666593, -0.6390226	R27, R28, R45
ML14	53.1424162, -0.6443360	R16, R17
ML15	53.1796555, -0.6339880	R31
ML16	53.1571798, -0.6694733	R22, R44, R51
ML17	53.1501388, -0.6277502	R26, R43
ML18	53.1342486, -0.6213518	R3, R4, R6, R46
ML19	53.1827489, -0.6522784	R32, R33

Defining an Effect

11.4.26 The assessment presented in this ES chapter follows NPSE guidance, which does not follow the standard EIA methodology set out in **Chapter 5: EIA Methodology [EN010154/APP/6.1]**.

11.4.27 The NPSE sets definitions for 'significant adverse effects' and 'adverse effects' using the concepts:

a. Lowest Observed Adverse Effect Level (LOAEL) – the level above which, as an average response, adverse effects on health and quality of life can be detected; and

b. Significant Observed Adverse Effect Level (SOAEL) – the average response level above which, as an average response, significant adverse effects on health and quality of life occur.

11.4.28 The NPSE states that:

> *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".*

11.4.29 Noise levels exceeding the SOAEL should be avoided as far as reasonably practicable. For noise levels exceeding the LOAEL, the NPSE (Ref. 11-6) states that:

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

11.4.30 All noise effects are local, only affecting nearby sensitive receptors, and are direct in nature; however, defining a likely effect and whether it is significant or not depends on the nature of a noise source. Likely effects have been defined based on guidance set out in the NPSE and PPGN.

11.4.31 A new source of noise is assessed by the absolute noise level it generates at sensitive receptors. Where an exceedance of the defined SOAEL for each noise source occurs, it is an indication of a likely significant effect. However, for the assessment of construction traffic noise where an existing noise source (road traffic noise) is changed, the assessment of the effect level due to the change in noise refers to guidance within the IEMA Guidelines (Ref. 11-16) and consideration of the absolute noise level based on guidance set out in the NPSE and PPGN.

11.4.32 Government policy for noise is based on community exposure response relationships between noise and health/quality of life, and the noise insulation of a typical dwelling. Consequently, an assessment based on LOAELs and SOAELs cannot be applied to non-residential sensitive receptors. As such, the approach to the assessment of non-residential receptors differs from that adopted for residential receptors. Non-residential receptors are considered on a case-by-case basis by considering the applicable design criteria for good internal noise levels.

Assessment Scenario

11.4.33 There are three options being considered for the Proposed Development regarding how the design of noise generating plant at the Solar Stations will proceed (as further described in **Chapter 3: The Proposed Development** of this ES **[EN010154/APP/6.1]**):

a. Option 1: Includes containers that will house transformers, switchgear and central inverters together.

b. Option 2: Includes containers that will house transformers and switchgear. Inverters would be provided separately as string inverters. These are smaller than central inverters and generate lower levels of noise; however, a substantially larger number of inverters are required in a string arrangement.

c. Option 3: Transformers, switchgear and inverters (as central or string-type) each provided separately and not housed in containers.

11.4.34 For the construction assessment scenario, Option 1 is considered to represent a reasonable worst-case due to the likely requirement that this option will require more substantial foundations than alternative options. The

requirement for more substantial foundations will mean either additional noise may be generated by larger plant or the construction time for robust foundations may be longer. These high generating noise activities in distributed locations will generate a higher level of noise than the string inverter option, which will not require the use of heavy plant during construction.

11.4.35 Although plant within containers will require cooling fans to regulate the temperature within the units, noise emissions from internal plant will be attenuated by the unit, which acts as a noise barrier. The level of attenuation is dependent on the surface density of the unit material, and an assumed 5mm steel construction can attenuate noise by a weighted sound reduction index of 39 dB, which is sufficient acoustic performance to noticeably attenuate noise levels. Consequently, Option 3 is considered to represent the worst-case scenario for operational noise.

11.4.36 Option 3 will include either string or central inverters. The string inverters would not generate high levels of noise; however, there would be multiple units spread throughout Principal Site. Although there would be a far smaller number of central inverters, they generate higher levels of noise than string inverters. Consequently, the Option 3 assessment considers central inverters as the worst-case scenario.

11.4.37 At this stage of the Proposed Development some flexibility is required as to whether to pursue a distributed BESS arrangement where BESS units are located alongside Solar Stations, or a centralised BESS arrangement where BESS and inverter units are located at a single BESS compound. As such, two operational noise scenarios have been modelled for Option 3 and assessed to cover noise effects from either the distributed BESS arrangement or centralised BESS arrangement.

Construction and Decommissioning Phase

Overview of Works

11.4.38 As discussed in paragraph 11.4.34, Option 1 is considered to represent a reasonable worst case assessment scenario for the construction noise and vibration assessment. For the purposes of assessing noise and vibration, the construction programme has been summarised into three scenarios that represent high Noise Generating Activities (NGA). These activities are most likely to generate likely significant effects and are as follows:

a. NGA1 – Construction of the BESS (covering both distributed and centralised layouts), Solar Stations, and ground mounted solar PV panel arrays;

b. NGA2 – Cable installation (general works) at the Cable Corridor and the Interconnecting Cable Corridor; and

c. NGA3 – Cable installation (Horizontal Directional Drilling (HDD) activities) at the Cable Corridor and the Interconnecting Cable Corridor.

11.4.39 It should be noted that, if the string inverter option was progressed, additional piling would be required for each string inverter as they could not be attached

to moving panels. As such, NGA1 noise would last marginally longer for the string inverter option than the central inverter option. However, the construction noise assessment is based on worst-case noise levels that would be unchanged as they already account for piling for solar PV structures. As such, NGA1 noise predictions adequately account for both central and string inverter options.

11.4.40 Detailed information on construction of the Proposed Development can be found in **Chapter 3: The Proposed Development** of this ES **[EN010154/APP/6.1]**.

11.4.41 Based upon the most rapid feasible construction programme, construction of the Grid Connection Cables is anticipated to require 12 months, whereas construction of the solar farm (Principal Site and Interconnecting Cable Corridors) will require an estimated 24 months.

11.4.42 The core working hours are defined as:

a. Monday to Friday: 07:00 to 19:00 – all activities. Any percussive piling works within 400m of residential properties will only occur for two periods of four hours (between 08:00 to 18:00) with at least one hour break between the two periods;

b. Saturday: 09:00 to 13:00 – all activities, except percussive piling within 400m of residential properties;

c. Saturday: 13:00 to 18:00 – all activities, except for HGV deliveries, works likely to generate substantial levels of noise (defines as activities generating more than 45 dB LAeq at neighbouring dwellings), and percussive piling (unless agreed with the relevant local authority); and

d. Sundays, Bank Holidays and outside of the construction hours noted above (including nights): no activities except for Horizontal Directional Drilling (HDD) drilling which could be required subject to the restrictions stated in the Framework CEMP (**[EN010154/APP/7.7]**, future detailed CEMP(s), and any other restrictions agreed with the relevant planning authorities pursuant to the consent process under section 61 of the Control of Pollution Act 1974 (Ref. 11-1).

11.4.43 The core working hours set out above will be shortened if working would necessitate artificial lighting and therefore the working day may be shorter in the winter months (with the exception of activities such as HDD which may require continuous working).

11.4.44 Emergency working and continuous work may require work to extend beyond the core working hours quoted above.

11.4.45 Cabling and groundworks will be prioritised during the drier summer months where possible.

Prediction Methodology

11.4.46 Noise levels experienced by sensitive receptors during construction and decommissioning works depend upon several variables, the most significant of which are:

a. The noise generated by plant or equipment used on site, generally expressed as sound power levels (Lw) or the vibration generated by the plant;

b. The periods of use of the plant on site, known as its 'on-time';

c. The distance between the noise/vibration source and the receptor;

d. The noise attenuation due to ground absorption, air absorption and barrier effects;

e. In some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and

f. The time of day or night the works are undertaken.

Construction and Decommissioning Noise Criteria

11.4.47 The construction noise criteria were based on the Association of Noise Consultants Construction Noise Guide (ANC Guide) (Ref. 11-19). The ANC Guide was issued in 2021 and, although it is primarily aimed at providing a consistent approach to Section 61 applications, it also represents the most modern interpretation of example assessment methods in Annex E of BS5228-1 and the latest industry standard.

11.4.48 The ANC Guide defines the LOAEL and the SOAEL for construction noise, as presented in **Table 11-7**. The Unacceptable Adverse Effect Level (UAEL), as defined in **Appendix 11-1: Noise and Vibration Policy and Legislation** of this ES **[EN010154/APP/6.3]**, for construction noise is based on the trigger level for temporary rehousing[1] as set out in section E.4 of BS 5228-1 (Ref. 11-9).

Table 11-7: Thresholds of Potential Effects of Construction Noise at Residential Buildings

Time Period	Threshold Value (LAeq,T dB)		
	LOAEL	SOAEL	UAEL
Day (07:00–19:00) Saturday (07:00–13:00)	65	75	85
Evening (19.00–23.00) Weekends (13.00–23.00 Saturdays and 07.00–23.00 Sundays)	55	65	75
Night (23.00–07.00)	45	55	65

[1] Where construction noise levels are such that noise insulation will not provide sufficient attenuation to prevent disturbance or interference with activities or sleep, then the occupants can be temporarily re-housed away from the construction site.

Time Period	Threshold Value (LAeq,T dB)		
	LOAEL	SOAEL	UAEL

Note: The values apply to a location one metre from a residential building façade containing a window, ignoring the effect of the acoustic reflection from that façade.

As per standard practice where ambient noise levels exceed the relevant LOAEL value defined in this table, the LOAEL is set at the ambient sound level and the SOAEL set 5 dB higher.

Construction and Decommissioning Vibration

11.4.49 BS 5228-2 (Ref. 11-10) provides guidance on the perception of vibration within occupied buildings. This provides a simple method of determining acoustic annoyance alongside evaluation of cosmetic damage associated with construction and decommissioning induced vibration. **Table 11-8** details Peak Particle Velocity (PPV) levels (a standard measure of vibration effects) and their potential effect on humans.

Table 11-8: Criteria for Construction and Decommissioning Vibration (Human Response)

Effect Level	PPV Vibration Level	BS 5228-2 Description of Impact
LOAEL	0.3mm/s	Vibration might be just perceptible in residential environments.
SOAEL	1.0mm/s	It is likely that vibration of this level in residential environments will cause complaint, but it can be tolerated if prior warning and explanation has been given to residents.

11.4.50 The recommended PPV vibration limits for transient vibration, above which cosmetic damage could occur for different types of buildings are provided in BS 5228-2 (Ref. 11-10) and presented in **Table 11-9**. For these limits, 'minor damage' is possible at vibration magnitudes that are greater than twice those given in **Table 11-9**, and 'major damage' can occur at values greater than four times the tabulated values. Consequently, the significance of effect has been provided based on the sensitivity of a building to vibration induced cosmetic damage. Cosmetic damage would precede the onset of any structural damage.

Table 11-9: Criteria for Construction and Decommissioning Vibration (Cosmetic Building Damage)

Type of building	Peak component particle velocity in frequency range of predominant pulse, at which cosmetic damage could occur	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures, Industrial and heavy commercial buildings	50mm/s at 4Hz and above	50mm/s at 4Hz and above
Industrial and heavy commercial buildings		

Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

Note 1: Guide values might need to be reduced by up to 50% due to dynamic loading from continuous vibration.

Note 2: A potential negligible effect (not significant) is indicated at vibration levels up to the threshold values.

Note 3: A potential minor adverse effect (not significant) is indicated at vibration levels up to a magnitude of twice the threshold values.

Note 4: A potential moderate adverse effect (significant) is indicated at vibration levels up to a magnitude of four times the threshold values.

Note 5: A potential major adverse effect (significant) is indicated at vibration levels equal to or greater than a magnitude of four times the threshold values.

Determining a Construction and Decommissioning Noise and Vibration Effect

11.4.51 Although a significant effect due to construction and decommissioning activities may be determined through an assessment based on exceedances of the defined SOAELs for construction noise, consideration of the significance of the effect for temporary construction activities exceeding the LOAEL is undertaken through qualitative consideration of the following:

a. Duration of activities;

b. Frequency of events;

c. Number of receptors; and

d. Sensitivity of receptors.

Construction and Decommissioning Traffic Noise

11.4.52 During the peak construction period, there will be a peak of up to 50 heavy goods vehicle (HGV) and 25 light goods vehicle (LGV) deliveries per day, as set out in **Chapter 13: Traffic and Transport** of this ES **[EN010154/APP/6.1]**. Traffic during decommissioning is expected to be similar to (or lesser than during) the construction phase. Construction and decommissioning traffic noise have been assessed for a representative worst-case day during the peak construction year, which is forecast to be 2032. Calculated construction traffic noise levels along the main access routes set out in **Appendix 11-D: Construction and Operational Noise Modelling** of this ES **[EN010154/APP/6.3]** have been compared to measured ambient noise levels so a potential change in noise can be derived.

11.4.53 Road traffic noise levels have been calculated with reference to methodology within the Calculation of Road Traffic Noise (CRTN) (Ref. 11-15), which contains an equation for the calculation of the Basic Noise Level (BNL) from a road relative to the 18-hour Average Annual Weekday Traffic (AAWT) flow from 06:00 to 24:00. The temporary changes in road traffic noise levels along the local road network due to construction traffic have been assessed based

on short-term changes in noise from Table 7-14 of the IEMA Guidelines (Ref. 11-16). Assessment criteria are presented in **Table 11-10.**

Table 11-10: Construction Traffic Noise Assessment Criteria

Effect Level	Magnitude criteria
Negligible	≥ 0 dB and < 1 dB
Minor	≥ 1 dB and < 3 dB
Moderate	≥ 3 dB and < 5 dB
Major	≥ 5 dB

Operational Noise

11.4.54 The main sources of operational noise that are considered in the assessment are:

a. The Onsite Substation;

b. BESS; and

c. Inverters / switchgears / transformers.

11.4.55 As discussed in paragraph 11.4.35, the central inverter Option 3 is considered to represent a reasonable worst case assessment scenario for the operational noise and assessment. Both distributed and centralised BESS layouts have been assessed.

11.4.56 The DCO application allows for the selection of either fixed south facing or single axis tracker arrangement panels. If a single axis tracker arrangement is taken forward, a tracker system would be used on the solar PV modules to maximise their efficiency by keeping them oriented towards the sun. Noise emissions from tracker motors are very low and unlikely to be perceptible at sensitive receptors. Consequently, tracker motors have not been included in the operational noise assessment. Details on noise emissions from tracker motors can be found in **Appendix 11-D: Construction and Operational Noise Modelling** of this ES **[EN010154/APP/6.3]**.

11.4.57 Noise predictions of the operational Proposed Development have been undertaken using CadnaA®, which implements the calculation procedures of ISO 9613 'Acoustics – Attenuation of Sound During Propagation Outdoors' (Ref. 11-20), to predict the propagation of noise away from the Proposed Development in all directions and to quantify resultant noise levels at the identified noise sensitive receptor locations.

11.4.58 Operational noise has been assessed following BS 4142 guidance (Ref. 11-12), whereby the rating level of noise emissions from activities is compared against the background level of the pre-development noise climate. Source data for operational noise emissions is presented in **Appendix 11-D: Construction and Operational Noise Modelling** of this ES **[EN010154/APP/6.3]**. The relevant parameters in this instance are as follows:

a. Background sound level – $L_{A90,T}$ – defined in the Standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels;

b. Specific sound level – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr; and

c. Rating level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise.

11.4.59 BS 4142 recognises that certain acoustic features of a sound source can increase the impact over that expected based purely on the sound level. The standard identifies the following features to be considered:

a. Tonality – a penalty of 2 dB is applied for a tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible;

b. Impulsivity – a penalty of 3 dB is applied for impulsivity which is just perceptible at the receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible. An impulse is defined as the sudden onset of a sound;

c. Intermittency – a penalty of 3 dB can be applied if the intermittency of the specific sound is readily identifiable against the residual acoustic environment at the receptor i.e. it has identifiable on/off conditions; and

d. Other sound characteristics – a penalty of 3 dB can be applied where the specific sound features characteristics that are neither tonal nor impulsive but are readily distinctive against the residual acoustic environment.

11.4.60 BS 4142 states the following regarding the assessment of impacts, comparing the rating level of the new noise source with the existing background level:

"Typically, the greater this difference, the greater the magnitude of the impact.

A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

11.4.61 BS 4142 advises that, where rating levels and background levels are low, which is the case in rural areas surrounding the Principal Site, the assessment of operational noise should take into context the absolute noise level. The ANC Guide to BS 4142 (Ref. 11-12) provides context 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 L_{A90}, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$".

11.4.62 The ANC Guide suggests 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".

11.4.63 A minimum rating level of 35 dB $L_{Ar,Tr}$ for the LOAEL would align with guidance in PPGN, which defines noise below the 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".

11.4.64 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (Ref. 11-13) and the World Health Organization (WHO) 'Guidelines for Community Noise' (Ref. 11-14) provide guidance levels for internal noise within dwellings of 30 dB $L_{Aeq,T}$ for good sleeping conditions at night. In accordance with examples in Annex A of BS 4142, it is assumed that building envelope attenuation would be reduced to approximately 10 dB by a partially open window. Consequently, an external SOAEL of 40 dB $L_{Ar,Tr}$ has been adopted for the night-time.

11.4.65 The assessment criteria for noise from fixed plant installations is summarised in **Table 11-11**.

Table 11-11: Operational Noise Assessment Criteria

Effect Level	Rating Level (External) at Receptor, $L_{Ar,Tr}$	
	Daytime (07:00–19:00) and Evening (19:00–23:00)	Night-time (23:00–07:00)
LOAEL	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 35 dB $L_{Ar,Tr}$	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 30 dB $L_{Ar,Tr}$
SOAEL	Greater than 10 dB above the background noise level – minimum of 45 dB $L_{Ar,Tr}$	Greater than 10 dB above the background noise level – minimum of 40 dB $L_{Ar,Tr}$

Non-Residential Receptors

11.4.66 One non-residential noise sensitive receptor is identified within the Study Area at R8 (Saint Michael and All Angels Church). Design criterion from BS 8233: 2014 for place of worship, counselling, meditation or relaxation is considered applicable. This design criterion is a range of 30-35 dB LAeq,T. Assuming that the church may have doors or windows open at some points during the year, the maximum external noise level (assuming 30 dB attenuation for building envelope with closed windows) before the design criterion would be exceeded would be 65 dB $L_{Aeq,T}$.

Assessment Assumptions and Limitations

Baseline Assumptions and Limitations

11.4.67 The measured ambient sound levels (taken during September 2023, see **Table 11-12**) have been considered as representative of the future baseline scenarios. No major developments (e.g., highway or railway schemes, industrial facilities) are currently known to be proposed in the Study Area that are likely to notably alter the local baseline noise environment. Future developments proposed within the Study Area are considered as relevant as part of the cumulative assessment presented in **Section 11.10** of this ES chapter.

11.4.68 Any measurement of existing ambient or background sound levels will be subject to a degree of uncertainty. Environmental sound levels vary between days, weeks, and throughout the year due to variations in source levels and conditions, meteorological effects on sound propagation and other factors. Hence, any measurement survey can only provide a sample of the ambient levels. Every effort has been made such that measurements were undertaken in such a way as to provide a representative sample of conditions, such as avoiding periods of adverse weather conditions, and school holiday periods (which are often considered to result in atypical sound levels). However, a small degree of uncertainty will always remain in the values taken from such a measurement survey. A precautionary approach is adopted when analysing such data to provide a robust assessment.

11.4.69 The PEIR stated that sound monitoring would be undertaken to define ambient background sound conditions at receptors R47 to R49 to supplement the assessment of cable laying construction noise (NGA2). However, as the locations are rural and sound data would only affect the assessment if they were greater than the LOAEL, it was established that a representative sound level for these receptors could be applied through a review of daytime ambient sound conditions presented in **Table 11-12**. As such, representative daytime ambient sound conditions of 45 dB $L_{Aeq,12h}$ have been applied at receptors R47 to R49.

Noise Model Assumptions

11.4.70 A series of assumptions were made for the generation of the construction and operational noise models as follows:

a. Digital noise modelling of the operational Proposed Development has been based on the maximum worst-case parameters set out in the drawings, plans, and construction and operation details as set out in the **Proposed Development Parameters [EN010154/APP/7.4]** and **Chapter 3: The Proposed Development** of this ES **[EN010154/APP/6.1]**;

b. Sound level data for operational noise-producing plant (i.e., inverters and transformers) have been based on industry sound pressure level measurement data (see **Appendix 11-D: Construction and Operational Noise Modelling)** of this ES **[EN010154/APP/6.3]**;

c. BESS units are modelled operating at 80%, which is considered worst-case for Lincolnshire weather conditions. Units will have cooling ends on one of the short sides of the BESS units. To retain flexibility in the design and model a worst-case scenario, each BESS in both the centralised and distributed BESS options has been modelled with cooling fans on each short end of each BESS units.

d. Surrounding ground conditions are rural farmland and have been modelled as soft (G=0.8);

e. Air temperature was set at 10 degrees Celsius and humidity 80%, which are typical annual average weather conditions in Lincolnshire based on historical weather data;

f. One order of reflection was modelled; and

g. Land topography has been incorporated into the noise modelling.

Construction Noise Assumptions and Limitations

11.4.71 The assessment of construction noise (and vibration) has considered construction activities that have the potential to result in significant effects on identified receptors, based on information presented in **Chapter 3: The Proposed Development** of this ES **[EN010154/APP/6.1]**, previous experience of co-located solar and BESS construction sites, and professional judgement. These assessments are based on a reasonable representative worst-case scenario. Construction noise predictions have been undertaken using the computer modelling software CadnaA® (v2025) (Ref. 11-18), based on an example schedule of plant items that are typically used in such developments for the purposes of carrying out a quantitative assessment at this stage. Construction plant is summarised in **Appendix 11-D: Construction and Operational Noise Modelling** of this ES **[EN010154/APP/6.3]**.

11.4.72 Construction noise predictions in CadnaA® have been undertaken using BS 5228-1 (Ref. 11-9) methodologies. Construction sound sources are taken to be representative of the plant and/or activities that will be used during the construction of the Proposed Development. Noise predictions were carried out to represent a conservative scenario where construction plant is active nearest to the identified receptors and does not take into account quieter periods when limited activities take place or at further distances. Consequently, noise predictions may overestimate construction noise levels and are therefore considered to be a reasonable likely worst-case.

11.4.73 The solar PV mounting structures will be installed on galvanised steel piles that are driven or screwed into the ground. Piling is unlikely to be required for the construction of foundations for the Solar Stations, although this is dependent upon local ground conditions and other types of foundation such as concrete blocks or plinths, ground screws, or reinforced concrete piles may be used. To present a worst case for the assessment it is assumed that driven piling will be used.

11.4.74 Decommissioning noise modelling has not been undertaken due to the similarities in process between construction activities and decommissioning

activities. However, commentary is provided on the likely level of decommissioning noise on the basis that decommissioning and construction phase plant would be the same but without the need for piling and drilling for trenchless crossings.

Operational Assumptions and Limitations

11.4.75 The assessment of operational noise accounts for the illustrative design layout of the Proposed Development covering two different BESS options:

a. a centralised BESS where all BESS units will be located within a compound next to the Onsite Substation; and

b. a distributed BESS where BESS units will be spread in clusters around the solar PV area.

11.4.76 Noise source data for inverters has been referenced from manufacturer's data for an E-Storage MV Skid and BESS units are based on manufacturer's data for an E-Storage SolBank 3. These units are considered to represent a reasonable worst-case assessment.

11.4.77 Operational noise has been predicted with all plant being in maximum operation at all times of day. Cooling fans on inverters and battery units will operate dependent on ambient temperatures and would not be in a full mode of operation during cooler temperatures. Consequently, noise predictions represent a reasonable worst-case and are likely to overestimate actual impacts.

11.4.78 Sound level data for transformers in reduced modes of operation is not available from manufacturers and therefore not available for the purposes of this assessment (because specific equipment has not been selected at this stage). Noise predictions for transformers are based on inverters and cooling fans operating at full load so are likely to represent an overestimate of actual conditions.

11.4.79 The Proposed Development has options for either Fixed South Facing (FSF) or Single Axis Tracker (SAT) PV panels. The FSF PV panels do not generate any noise; however, motors from SAT motors generate noise. Noise emissions from tracker motors are low and would not materially influence off-site operational noise levels. As such, they have not been included in the operational noise models. Further information regarding this approach is provided in **Appendix 11-D: Construction and Operational Noise Modelling [EN010154/APP/6.3].**

11.4.80 There may be a requirement for component replacement works in the solar PV areas during the operational phase of the development if any infrastructure needs replacing. These works would be phased and would therefore be considerably less intensive than construction activities. As such, construction phase predictions are considered representative of any potential component replacement works that may occur in the future.

11.5 Baseline Conditions

Existing Baseline

11.5.2 The land use within the DCO Site is primarily agricultural. Other surrounding land uses in proximity to the DCO Site Boundary are arable farming, woodland, residential and quarries. There are individual and clusters of residential properties located adjacent to the DCO Site Boundary.

11.5.3 The dominant sources of sound in the area are road traffic on:

a. A46;
b. Haddington Lane;
c. Fosse Lane;
d. Butts Lane;
e. Bassingham Road; and
f. Moor Lane.

11.5.4 Additionally, the former RAF Swinderby site to the west of the DCO Site is now used by Cemex as a quarry.

11.5.5 Results of baseline noise monitoring are presented in **Table 11-12**. More detailed results are presented in **Appendix 11-C: Baseline Noise Surveys** of this ES **[EN010154/APP/6.3]**.

Table 11-12: Baseline Noise Monitoring Results

Location Reference	Sound Level Indicator	Day (07:00–19:00) dB	Evening (19:00–23:00) dB	Night (23:00–07:00) dB
ML1	$L_{Aeq,1h}$ dB	45	39	41
	$L_{A90,1h}$ dB	34	28	27
ML2	$L_{Aeq,1h}$ dB	51	43	39
	$L_{A90,1h}$ dB	36	34	30
ML3	$L_{Aeq,1h}$ dB	61	56	52
	$L_{A90,1h}$ dB	50	50	45
ML4	$L_{Aeq,1h}$ dB	47	42	36
	$L_{A90,1h}$ dB	37	33	30
ML5	$L_{Aeq,1h}$ dB	50	45	42
	$L_{A90,1h}$ dB	42	40	33
ML6	$L_{Aeq,1h}$ dB	45	43	37

Location Reference	Sound Level Indicator	Day (07:00–19:00) dB	Evening (19:00–23:00) dB	Night (23:00–07:00) dB
	$L_{A90,1h}$ dB	38	32	29
ML7	$L_{Aeq,1h}$ dB	46	44	43
	$L_{A90,1h}$ dB	40	35	34
ML8	$L_{Aeq,1h}$ dB	50	44	40
	$L_{A90,1h}$ dB	36	31	30
ML9	$L_{Aeq,1h}$ dB	48	40	38
	$L_{A90,1h}$ dB	35	31	28
ML10	$L_{Aeq,1h}$ dB	48	45	40
	$L_{A90,1h}$ dB	38	32	29
ML11	$L_{Aeq,1h}$ dB	47	41	39
	$L_{A90,1h}$ dB	34	28	24
ML12	$L_{Aeq,1h}$ dB	46	42	37
	$L_{A90,1h}$ dB	38	32	32
ML13	$L_{Aeq,1h}$ dB	59	53	50
	$L_{A90,1h}$ dB	53	48	42
ML14	$L_{Aeq,1h}$ dB	55	48	43
	$L_{A90,1h}$ dB	42	34	29
ML15	$L_{Aeq,1h}$ dB	50	47	42
	$L_{A90,1h}$ dB	44	41	35
ML16	$L_{Aeq,1h}$ dB	87	84	79
	$L_{A90,1h}$ dB	80	69	58
ML17	$L_{Aeq,1h}$ dB	58	54	49
	$L_{A90,1h}$ dB	41	36	33
ML18	$L_{Aeq,1h}$ dB	54	38	38
	$L_{A90,1h}$ dB	35	31	28
ML19	$L_{Aeq,1h}$ dB	48	44	40

Location Reference	Sound Level Indicator	Day (07:00–19:00) dB	Evening (19:00–23:00) dB	Night (23:00–07:00) dB
	$L_{A90,1h}$ dB	41	37	33

11.5.6 The noise monitoring location at ML16 was approximately 5m from the nearside kerb of the A46. As such, measured noise levels are not representative of receptors in the area. Distance corrections have been applied to measured noise data at ML16 to provide representative noise data. Corrected noise data and distances from receptors to the A46 are presented in **Table 11-13**.

Table 11-13: Corrected ML16 Noise Data

Receptor	Approximate Distance to A46 (m)	Sound Level Indicator	Corrected Noise Data		
			Day (07:00–19:00) dB	Evening (19:00–23:00) dB	Night (23:00–07:00) dB
R22	45	$L_{Aeq,1h}$ dB	77	74	69
		$L_{A90,1h}$ dB	70	59	48
R44	40	$L_{Aeq,1h}$ dB	78	75	70
		$L_{A90,1h}$ dB	71	60	49
R51	50	$L_{Aeq,1h}$ dB	77	74	69
		$L_{A90,1h}$ dB	70	59	48

Future Baseline

11.5.7 The future baseline scenarios are set out in **Chapter 5: EIA Methodology** of this ES **[EN010154/APP/6.1]**. Cumulative developments covered in **Section 11.10** of this ES chapter would mostly influence areas in their close proximity and would not influence noise levels in the wider area around the Proposed Development as operational traffic associated with cumulative developments is minimal.

11.5.8 Although the wider area around the Proposed Development would not be influenced by cumulative developments, it is expected that natural growth in traffic may increase future baseline noise levels. However, it is unlikely that there would be a material increase in noise as it would require an increase in traffic of 25% (assuming traffic composition remains consistent) to result in an increase in noise of 1dB.

11.5.9 In the absence of the Proposed Development, it is considered likely that the future baseline noise environment may be higher than represented by the September 2023 measurements of the ambient sound levels. However, any

perceptible changes to baseline noise are likely to be localised to the immediate area of a new development. As baseline sound data is used to derive noise assessment criteria, lower levels of baseline sound result in more conservative assessment criteria. Consequently, use of measured baseline data is considered conservatively representative of future baseline conditions.

11.5.10 The assessment of construction traffic noise effects accounts for the future peak construction year, which includes natural traffic growth. However, the operational noise assessment assumes that the measured baseline data is representative (i.e. no higher) than future baseline conditions, which represents a reasonable worst-case scenario.

11.6 Embedded Mitigation Measures

11.6.1 Where practicable, mitigation measures have been incorporated into the Proposed Development design and/or how it shall be constructed. Through iterative assessment, potential impacts have been predicted and opportunities to mitigate them identified with the aim of preventing or reducing impacts as much as possible. This approach provides the opportunity to prevent or reduce potential adverse impacts from the outset. This embedded mitigation/mitigation by design approach has been taken into account when evaluating the significance of the potential impacts.

Construction and Decommissioning

11.6.2 Measures to control noise are defined in Annex B of BS 5228-1 (Ref. 11-9) and measures to control vibration are defined in Section 8 of BS 5228-2 (Ref. 11-10). These embedded measures represent Best Practicable Means (BPM) (as defined in Section 72 of the Control of Pollution Act, (Ref. 11-1)) and are secured within the **Framework CEMP** (**[EN010154/APP/7.7]**) and **Framework DEMP** (**[EN010154/APP/7.9]**, which are secured by the DCO requirements.

11.6.3 Best Practicable Means that would be implemented during construction and decommissioning works and secured through the CEMP and DEMP are presented below:

a. Ensuring that all appropriate processes, procedures and measures are in place to minimise noise before works begin and throughout the construction programme.

b. All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) which should form a prerequisite of their appointment.

c. Ensuring that, where reasonably practicable, noise and vibration are controlled at source (e.g., the selection of inherently quiet plant and low vibration equipment), review of the construction programme and methodology to consider quieter methods, consideration of the location of equipment on-site and control of working hours.

d. Use of modern plant, complying with applicable UK noise emission requirements.

e. Hydraulic techniques for breaking concrete or rocks to be used in preference to percussive techniques, where reasonably practicable.

f. When piling, use of lower noise piling where reasonably practicable.

g. Off-site pre-fabrication where reasonably practicable.

h. Regular and effective maintenance by trained personnel will be undertaken to keep plant and equipment working to manufacturer's specifications.

i. All construction plant and equipment to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use.

j. Loading and unloading of vehicles, dismantling of site equipment or moving equipment or materials around the DCO Site to be conducted in such a manner as to minimise noise generation, as far as reasonably practicable.

k. All vehicles used on-site shall incorporate broadband reversing warning devices as opposed to the typical tonal reversing alarms to minimise noise disturbance, where reasonably practicable.

l. Appropriate routing of construction traffic on public roads and along access tracks to avoid sensitive areas where practicable (see **Chapter 3: The Proposed Development** of this ES (**[EN010154/APP/6.1]**), **Chapter 13: Traffic and Transport** of this ES (**[EN010154/APP/6.1]**) and the **Framework Construction Traffic Management Plan (CTMP)** (**[EN010154/APP/7.18]**)).

m. Unnecessary revving of engines will be avoided, and equipment will be switched off when not in use.

n. Drop heights of materials will be minimised.

o. Plant and vehicles will be sequentially started up rather than all together.

p. Plant will always be used in accordance with manufacturers' instructions. Care will be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading will also be carried out away from such areas.

q. Any percussive piling works within 400m of residential properties will only occur for two periods of four hours (between 08:00 to 18:00) with at least one hour break between the two periods.

11.6.4 A construction noise monitoring scheme shall be developed as per the requirements of the **Framework CEMP** (**[EN010154/APP/7.7]**) submitted alongside the DCO application following appointment of a principal contractor and prior to commencement of construction works. Monitoring during the decommissioning phase will be undertaken in accordance with the **Framework DEMP [EN010154/APP/7.9]** submitted with the DCO application.

11.6.5 The effect of noise and vibration on nearby sensitive receptors can be minimised through a good communication strategy. Prior to construction works being undertaken, liaison will be undertaken with occupiers of sensitive receptors that may be adversely affected by construction noise and vibration.

11.6.6 Noise complaints will be monitored and reported to the Applicant for immediate investigation and action. A display board will be installed on-site, and a website will be set up. These will include contact details for the Community Liaison Officer or alternative with whom nuisance or complaints can be lodged. A logbook of complaints will be prepared and managed by the Site Manager.

11.6.7 The communication strategy and noise complaint system will be secured through the DCO as part of the **Framework CEMP [EN010154/APP/7.7]** and **Framework DEMP [EN010154/APP/7.9]** submitted alongside the DCO.

11.6.8 Where high noise generating works are required to be undertaken outside of core daytime working hours, they will comply with the restrictions stated in the **Framework CEMP [EN010154/APP/7.7]**, and consents will be sought from the relevant local authority under Section 61 of the Control of Pollution Act 1974 (Ref. 11-1) for the proposed construction works, excluding non-intrusive surveys, as relevant. The Section 61 application will set out the specific method of working, calculations of noise levels at nearby receptors, the actual working hours required, noise monitoring locations, details of communication measures and the mitigation measures implemented to minimise noise and vibration impacts.

11.6.9 As requirements for HDD activities will not be finalised until a principal contractor is appointed, a hierarchy of mitigation measures is contained in the **Framework CEMP** (**[EN010154/APP/7.7]**) to ensure that significant noise effects do not occur due to potential night-time works:

a. Where practicable, avoid HDD works within 200m (the distance at which significant effects are predicted at night) of residential receptors (although this will depend on the results of the ground investigation survey);

b. Where HDD activities may occur within 200m of sensitive receptors, the option for open cut cable laying will be explored as an alternative to HDD. (This is not viable if HDD is a commitment in specific locations due to stakeholder requests or other environmental issues);

c. Where HDD activities may occur within 200m of sensitive receptors, the timing of the HDD activities will be delayed until after 10am to avoid more sensitive time periods;

d. The potential for the use of quieter equipment than listed in **Appendix 11-D: Construction and Operational Noise Modelling** of this ES (**[EN010154/APP/6.3]** will be explored by the principal contractor; and

e. Depending on the location, plant and timing of works, temporary acoustic fencing will be installed around the HDD site boundary to screen receptors from noise emission if HDD works are required within 200m of a sensitive receptor. This mitigation could provide 10 dB of attenuation when the noise screen completely hides the sources from the receptor.

11.6.10 Consideration has been given to traffic routing, timing, and access points to the Proposed Development to minimise noise impacts at existing receptors as detailed in **Chapter 13: Traffic and Transport** of this ES (**[EN010154/APP/6.1]**. Management of Heavy Goods Vehicles (HGV) on the highway network will be managed through the **Framework CTMP** (**[EN010154/APP/7.18]**), which will be secured through the DCO. Appropriate routing of construction and decommissioning traffic on public roads and along access tracks will be pursuant to the CTMP.

Operation (and maintenance)

11.6.11 Embedded mitigation measures that will be applied for the operational phase of the Proposed Development are summarised as follows:

a. Plant selection (noise emissions will be one of the criteria evaluated when procuring equipment for use on the site); and

b. Design, location and orientation of Solar Stations, BESS and the Onsite Substation to minimise noise at receptors.

11.6.12 Plant that will be used in the Proposed Development has not yet been finalised. Consequently, a conservative approach has been taken when defining sound data for noise sources and it may be possible that quieter plant can be incorporated into the final design. Quieter plant would be the most effective way of controlling noise emissions.

11.6.13 The Proposed Development layout has been optimised to locate inverters and BESS, in both the centralised and distributed layouts, as far as practically possible from sensitive receptors where the highest levels of noise were predicted. The illustrative site layout (**Figure 3-2A: Indicative Fixed South Facing Site Layout Plan [EN010154/APP/6.2],** and **Figure 3-2B: Indicative Single Axis Tracker Site Layout Plan [EN010154/APP/6.2]**) has been designed to locate Solar Stations at least 200m from residential properties.

11.6.14 Although the indicative Proposed Development layout has been optimised to minimise noise levels at sensitive receptors, there is a requirement to retain some flexibility on where infrastructure will be located on-site. Consequently, if there is a decision in the future to move noise generating infrastructure closer to sensitive receptors than shown in **Figure 11-1: Receptor and Noise Monitoring Positions** of this ES **[EN010154/APP/6.2]**), the Applicant commits that noise at sensitive receptors will be no higher than the levels presented in **Table 11-21**. The measures to achieve this are discussed in **Section 11.8** and secured in the **Framework OEMP [EN010154/APP/7.8]** in accordance with the relevant Requirement in Schedule 2 of the DCO. Modelling will be undertaken at the detailed design phase to confirm the noise levels at sensitive receptors will be no higher than the levels presented in **Table 11-21**.

11.6.15 Low frequency noise can be very difficult to predict with a high level of certainty and similarly hard to identify and resolve if present. This is because it can be generated by the unexpected interactions between system components and can be amplified by the geometry of the site and receptor buildings. The issue

of low frequency noise will be considered during the detailed design post consent for the Onsite Substation and eliminated through design or appropriately mitigated through isolation and/ or attenuation measures, where appropriate. This requirement is secured through a requirement in the **draft DCO [EN010154/APP/3.1]**.

11.7 Assessment of Effects

11.7.1 The assessment takes into account the embedded mitigation measures as detailed in **Section 11.6** above. The potential effects of the Proposed Development are assessed using the methodology as detailed in **Section 11.4** of this ES chapter.

Construction

Construction Noise Effects

NGA1

11.7.2 Noise predictions have been undertaken for NGA1, which will be undertaken during core daytime working hours. It is likely that construction activities will be carried out in phases, however confirmation on phasing is not finalised at this time. Noise predictions have therefore assumed that all phases are being constructed at the same time which simulates a worst-case scenario to ensure a robust assessment. The results of construction noise predictions are summarised in **Table 11-14**. The construction noise LOAEL and SOAEL are defined for each receptor in **Table 11-14.** Where the representative measured daytime ambient noise level exceeds the LOAEL (65 dB) the LOAEL and SOAEL are defined as per the methodology outlined in **Table 11-7.**

Table 11-14: Construction Noise Predictions for NGA1

Receptor Reference	Representative Measured Daytime Ambient Noise Level $L_{Aeq,12h}$ dB	LOAEL / SOAEL dB	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
Below LOAEL			
R1	45	65 / 75	64
R2	45	65 / 75	60
R4	54	65 / 75	61
R7	47	65 / 75	61
R12	48	65 / 75	62
R14	50	65 / 75	60
R15	50	65 / 75	64
R16	55	65 / 75	64
R17	55	65 / 75	64
R18	47	65 / 75	63

Receptor Reference	Representative Measured Daytime Ambient Noise Level $L_{Aeq,12h}$ dB	LOAEL / SOAEL dB	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
R22	77	77 / 82	64
R24	46	65 / 75	63
R25	46	65 / 75	60
R30	50	65 / 75	60
R31	50	65 / 75	58
R32	48	65 / 75	58
R33	48	65 / 75	62
R37	47	65 / 75	63
R40	51	65 / 75	64
R44	78	78 / 83	69
R51	77	77 / 82	69
Above or equal to LOAEL and below SOAEL			
R3	54	65 / 75	65
R5	45	65 / 75	67
R6	54	65 / 75	65
R8	46	65 / 75	65
R9	48	65 / 75	67
R10	48	65 / 75	69
R11	48	65 / 75	69
R13	48	65 / 75	70
R19	45	65 / 75	68
R20	45	65 / 75	69
R21	45	65 / 75	67
R23	46	65 / 75	68
R26	58	65 / 75	72
R27	59	65 / 75	67
R28	59	65 / 75	68
R29	50	65 / 75	65
R34	61	65 / 75	72

Receptor Reference	Representative Measured Daytime Ambient Noise Level $L_{Aeq,12h}$ dB	LOAEL / SOAEL dB	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
R36	47	65 / 75	70
R38	47	65 / 75	65
R39	51	65 / 75	67
R41	51	65 / 75	69
R42	51	65 / 75	70
R43	58	65 / 75	68
R45	59	65 / 75	67
R46	54	65 / 75	67
R50	51	65 / 75	67
Above or equal to SOAEL			
R35	61	65 / 75	76

11.7.3 For NGA1, there is potential for exceedances of the SOAEL to occur at receptor R35 (Housham Grange, Newark Road). This is a **significant** effect prior to additional mitigation.

11.7.4 There are several receptors that are predicted to experience noise levels exceeding the LOAEL but below the SOAEL. At this stage of the process, the duration of exposure to noise is not known as works will be mobile covering the extents of the DCO Site and transient in nature. However, occupants of nearby receptors can be more tolerant of high noise events if they are regularly communicated with and kept informed of timings and duration of high noise generating events. Paragraph 6.3 of BS5228-1 states that:

"Local residents might be willing to accept higher levels of noise if they know that such levels will only last for a short time."

11.7.5 The communication strategy, which will be secured through the DCO as part of the **Framework CEMP [EN010154/APP/7.7]** submitted alongside the DCO, will ensure that occupants of affected properties will be notified of the timings and duration of works. Consequently, the assessment of construction noise assessment at all receptors except R35 identifies noise effect as **not significant.**

11.7.6 There is a place of worship at R8 where construction noise levels of up to 65 dB $L_{Aeq,T}$ are predicted. It is not anticipated that desirable internal noise levels (see paragraph 11.4.66) would be exceeded; however, as construction noise predictions are on the threshold of significance, consultation will be undertaken with the church to make sure that the timings of piling for Solar PV

Mounting Structures avoid any periods when the church may be particularly sensitive to noise, as secured through the DCO as part of the **Framework CEMP [EN010154/APP/7.7]**.

NGA2

11.7.7 Receptors and worst-case distances to potential locations of cable laying activities are identified in **Table 11-15**. Details on how noise predictions have been derived are detailed in **Appendix 11-D: Construction and Operational Noise Modelling** of this ES **[EN010154/APP/6.3]**. Representative ambient noise data for receptors R47 to R49 has been defined at 45 dB $L_{Aeq,12h}$ based on a review of daytime ambient sound conditions in rural locations presented in **Table 11-12**.

Table 11-15: Cable Laying Construction Noise Effects – NGA2

Receptor Reference	Representative Measured Daytime Ambient Noise Level $L_{Aeq,12h}$ dB	LOAEL / SOAEL dB	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
Below LOAEL			
R48	45	65 / 75	62
R49	45	65 / 75	63
Above or equal to LOAEL and below SOAEL			
R1	45	65 / 75	67
R47	45	65 / 75	68
Above or equal to SOAEL			
No exceedances of SOAEL have been predicted			

11.7.8 For NGA2, noise predictions at sensitive receptors indicate that the SOAEL will not be exceeded; however, the LOAEL is predicted to be exceeded at R1 and R47.

11.7.9 For continuous construction noise activities exceeding the LOAEL for a month or longer, a significant effect could be identified. Cable laying activity will be relatively short in duration and individual receptors would be exposed to noise for a period of less than a month. As such, NGA2 construction noise effects are **not significant**.

NGA3

11.7.10 For NGA3, HDD activities may last for up to three days and involve activities at a drill site and a reception pit. At this stage of the Proposed Development, five locations that require trenchless cable installation methods have been identified for the interconnecting cables between solar PV areas, as illustrated in **Figure 3-12: Indicative Cable Corridor Trenched and Trenchless Crossing Locations [EN010154/APP/6.2]**. For the purposes of the noise assessment, HDD has been identified as worst-case trenchless cable

installation method due to the potential requirement for night-time working. Potential HDD locations are listed in **Table 11-16**.

Table 11-16: Potential HDD Locations and Distance to Nearest Receptor

HDD ID	Description	Distance to Nearest Receptor
HDD1	Under the A46 in the east end of the northern section	160m
HDD2	Under the A46 at the west end of the northern section	235m
HDD3	Under the river Witham	290m
HDD4	Under the river Brant	460m
HDD5	Under a line of trees	900m

11.7.11 It is noted that HDD operations will only occur during the construction phase (cable installation) and will not occur during decommissioning (as cables are either left in situ or pulled back through the ducting from discrete locations without the need for HDD). As the drilling activities at the entry pit will generate the highest level of noise, calculations of noise have been based on a reasonable worst-case assumption that all potential HDD sites are entry pits.

11.7.12 The most onerous noise criteria of 55 dB $L_{Aeq,T}$ for continuous HDD works is during the night-time period. Calculations of HDD noise (**Appendix 11-D: Construction and Operational Noise Modelling** of this ES **[EN010154/APP/6.3]**) indicate that significant effects (an exceedance of SOAEL) may occur at night at sensitive receptors within 200m of activities. Consequently, the assessment of HDD noise focuses on receptors within 200m of a potential drill site location.

11.7.13 Receptors within 200m of the Cable Corridor and Interconnecting Cable at likely HDD locations that may be subjected to significant effects have been selected. Results of noise calculations at receptors within 200m of the Cable Corridor and Interconnecting Cable route boundaries are presented in **Table 11-17**.

Table 11-17: HDD Noise Effects – NGA3

HDD ID	Receptor	Approximate Distance (m)	Calculated Noise Level $L_{Aeq,T}$ dB
HDD2	R28	160m	57

11.7.14 HDD activities are not predicted to exceed the SOAEL during the daytime, weekday evening and weekend at any receptors; however, if works extend into the night, the SOAEL may be exceeded. Noise calculations indicate that the SOAEL would be exceeded during night works that occur within 200m of a receptor. Consequently, HDD activities at all identified locations have the potential to result in significant noise effects if they extend into the night-time period.

11.7.15 The hierarchy of mitigation measures for HDD activities listed in paragraph 11.7.15 will ensure that HDD activity noise effects will be reduced as far as reasonably practicable. This hierarchy (as set out in Table 3-5 of the **Framework CEMP** (**[EN010154/APP/7.7]**) includes the use of acoustic fencing which, if required, could provide 10 dB of noise attenuation. Consequently, noise from HDD activities at locations R28 would reduce to below the night-time SOAEL of 55 dB $L_{Aeq,T}$, and noise effects are **not significant**.

11.7.16 For all works that are undertaken outside core work periods, they will comply with the restrictions stated in the **Framework CEMP [EN010154/APP/7.7]** and a Section 61 consent (Control of Pollution Act, Ref. 11-1) would be applied for and will contain details on the methodology, mitigation, communication strategy and monitoring. If Section 61 consent is not applied for, it will be open for the local authority to serve a notice pursuant to Section 60 of that Act specifying actions to control noise if it considers it appropriate to do so, in accordance with the terms of that provision. It is not a pre-requisite for Section 61 consent to be in place at any time for the purposes of construction or operation of the Proposed Development although it is common practice for such applications to be made in advance.

Construction Vibration Effects

NGA1

11.7.17 It is generally accepted that, without a highly detailed understanding of the media, waveform, and frequency distribution, ground-borne vibration prediction methods are "*beset with complexities and uncertainties*" (Ref. 11-21). However, it is unlikely that typical construction and decommissioning working routines would generate levels of vibration at local receptors at a level where cosmetic damage would be expected to be sustained or cause adverse effects for local residents. The level of impact at different receptors will be dependent upon several factors including distance between the works, ground conditions and the specific activities being undertaken. Consequently, vibration effects are defined with reference to information in guidance documents identified in the following paragraph.

11.7.18 Surface plant, such as cranes, compressors and generators, are not recognised as sources of high levels of ground-borne vibration. Reference to Figure C2 of 'Control of Vibration and Noise During Piling' (Ref. 11-22) confirms that PPVs significantly less than 5mm/s are generated by such machinery, even at distances of only 10m. For example, the indication is that a bulldozer would generate a PPV of approximately 0.6mm/s and a 'heavy lorry on [a] poor road surface' would generate a PPV of less than 0.1mm/s at 10m. These values are well below levels at which cosmetic building damage are predicted to occur; the lower levels being 15mm/s for predominantly transient vibrations and 7.5mm/s for continuous vibrations at the base of residential or lighter framed commercial buildings. The aforementioned values are also below the 1.0mm/s SOAEL (see **Table 11-8**) where it is likely that vibration in residential environments will result in complaints but can be tolerated if prior warning and explanation is given to residents.

11.7.19 Driven piling is assumed to be used for construction of PV modules as a worst-case scenario from the vibration perspective. Piling vibration calculations based on regression analysis of driven piling data from Table D.2 of BS 5228-2 (**Ref. 11-10**)11-69. This data relates to large scale driven piles and is referenced as there is no available vibration data for mini-pilers used in the construction of solar PV mounting frames. As such, calculated vibration levels are likely to be overestimated and conservative.

11.7.20 Regression analysis is presented in **Appendix 11-D, Construction and Operational Noise Modelling** of this ES (**[EN010154/APP/6.3]** and identifies that the SOAEL is potentially exceeded at receptors within 60m of driven piling activities. Three receptors are identified at a distance of 60m or closer to the driven piling activities at solar PV areas within the Principal Site: R26, R35, and R50.

11.7.21 The minimum distance between any piling works for the construction of PV modules and the nearest receptor is approximately 15m at R35. A PPV of 3.4mms^{-1} is calculated at this distance. The next closest property located at a distance of 50m is R26, which may experience piling induced vibration of 1.2mms^{-1}. R50 is at a distance of approximately 60m and may experience piling vibration levels of 1.0mms^{-1}.

11.7.22 At this stage of the Proposed Development, the duration of exposure to levels of vibration exceeding the SOAEL is not certain. Consequently, as the SOAEL is exceeded at these receptors when using large scale driven pile data which is the worst case, construction vibration effects are identified as **significant**.

11.7.23 At all other receptors, ground borne vibration is below the SOAEL and would occur for a short duration so is concluded as **not significant**.

NGA2

11.7.24 The highest levels of vibration that would be generated by cable laying activities would be the use of a vibratory roller during reinstatement. Vibratory rollers may generate adverse levels of vibration (i.e., exceeding 0.3mm/s) at receptors within 50m and significant levels of vibration (i.e., exceeding 1.0mm/s) at receptors within 25m.

11.7.25 No receptors within a distance of between 25 and 50m of the Cable Corridor are identified in **Table 11-5**. One receptor within 25m of the Cable Corridor is identified in **Table 11-5** as R47, which may experience vibration up to a PPV of 1.9mms^{-1}.

11.7.26 For a PPV level above 1.0 m/s, BS 5228-2 (Ref. 11-10) states that:

"It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents".

11.7.27 For PPV vibration levels exceeding 1.0mm/s, prior warning will be provided on the timings and duration of vibration generating activities. This will be secured through the **Framework CEMP** (**[EN010154/APP/7.7]**), which will be secured through the DCO. Given the short duration of these activities (i.e., less than a

day) affecting individual receptors, prior warning is considered sufficient to offset significant effects. Accordingly, at this stage, it is anticipated that vibration at nearby sensitive receptors would be **not significant** for cable laying activities.

NGA3

11.7.28 HDD activities would generate similar levels of vibration to bored piling. Bored piling calculations are based on analysis of data from Table D.6 of BS 5228-2, which is presented in **Appendix 11-C: Baseline Noise Surveys** of this ES (**[EN010154/APP/6.3]**).

11.7.29 The nearest receptor (R17) to the potential HDD works is approximately 160m away. The predicted vibration level from bored piling at this distance is lower than the LOAEL of 0.3mm/s as detailed in **Table 11-8**. Therefore, ground borne vibration is **not significant** during HDD activities. As such, vibration at nearby sensitive receptors from HDD activities would be **not significant**.

Construction Traffic Noise Effects

11.7.30 The potential changes in noise from road traffic along links affected by construction traffic as a result of the Proposed Development have been considered by calculating a CRTN BNL at 10m next to roads within the CRTN AAWT range and comparing the change. **Table 11-18** presents the results of the assessment. Refer to **Figure 13-6: Surrounding Highway Network** (**[EN010154/APP/6.2]** for the locations of the road links shown in **Table 11-18**.

Table 11-18: Construction Traffic Noise Assessment

Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
A46 west of Halfway House Roundabout	76.0	76.1	+0.1	Negligible
Halfway House Lane	63.7	64.9	+1.2	Minor
Haddington Lane (between Fosse Lane and Old Haddington Lane)	65.3	66.0	+0.7	Negligible
Old Haddington Lane (between Haddington Lane and A46)	64.6	65.3	+0.7	Negligible
A46 east of Fosse Lane	75.2	75.3	+0.1	Negligible
Haddington Lane (south of Old Haddington Lane)	67.5	68.1	+0.6	Negligible
South Hykeham Road	66.4	67.0	+0.6	Negligible
Haddington Lane (south of Stone Lane)	62.1	62.4	+0.3	Negligible
Moor Lane	63.4	64.7	+1.3	Minor
Bassingham Road (between Moor Lane and Clay Lane)	61.7	62.4	+0.7	Negligible

Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
Unnamed Road (south of Halfway House Roundabout)	69.9	70.2	+0.3	Negligible
Broughton Lane (south of Hill Rise)	62.5	63.0	+0.5	Negligible
Broughton Lane (north of Hill Rise)	65.0	65.2	+0.2	Negligible
B1178 Tower Lane	69.9	70.0	+0.1	Negligible
Heath Lane	63.5	63.9	+0.4	Negligible
A607 Grantham Road (south of Coleby)	67.3	67.5	+0.2	Negligible
Haddington Lane (Between Butts Lane and Dovecote Lane)	62.1	62.4	+0.3	Negligible
Halfway House Roundabout (Halfway House Lane/A46(E)/Unnamed Road/A46(W))	76.7	76.8	+0.1	Negligible
A46 EB On-Slip and Off-Slip (Fosse Lane(N)/Fosse Lane(E)/Haddington Lane)	66.0	66.9	+0.9	Negligible
A46 WB On-Slip and Off-Slip (Haddington Lane(W)/Old Haddington Lane/Haddington Lane)	67.6	68.2	+0.6	Negligible
Haddington Lane(N)/Butts Lane/Haddington Lane(S)/Stone Lane	68.3	68.8	+0.5	Negligible
Bridge Road/Church Road/Bassingham Road	67.3	67.8	+0.5	Negligible
Haddington Lane/Bassingham Road/Moor Lane	65.2	65.8	+0.6	Negligible
Unnamed Road/Moor Lane/Norton Lane	64.5	65.6	+1.1	Minor
North Hykeham Roundabout (A46(N)/ Newark Road/ A46(S)/ Middle Lane)	75.2	75.3	+0.1	Negligible
A607 / White Lane / Church Lane	70.1	70.2	+0.1	Negligible
A15 Sleaford Road / Green Man Road	73.0	73.1	+0.1	Negligible

11.7.31 Changes in road traffic noise due to construction traffic are identified as, at worst, minor and **not significant**.

11.7.32 Changes in road traffic noise have only been calculated from roads with flows of greater than 1,000 Annual Average Weekday Traffic (AAWT). This is because the CRTN (Ref. 11-15) calculations are unreliable for traffic flows below an AAWT of 1,000. Consequently, a qualitative assessment of potential construction traffic noise effects has been undertaken based on average hourly construction traffic flows.

11.7.33 On low-flow roads during the peak 3-month period, there are forecast to be approximately two light vehicle movements and four heavy vehicle movements per hour on Hill Rise, the unnamed Road between A15 Sleaford Road and High Dike and Fen Lane. Construction traffic may cause disturbance, but construction traffic flows are not considered of sufficient magnitude to result in an adverse effect i.e., "*Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response* " (referenced from PPGN noise exposure hierarchy table – reproduced in **Appendix 11-A: Noise and Vibration Policy and Legislation** of this ES (**[EN010154/APP/6.3]**). Consequently, construction traffic noise effects on the identified low flow roads are considered to be, at worst, negligible and **not significant**.

11.7.34 Higher levels of construction traffic are forecast on The Avenue and Clay Lane. Whilst they both still represent low flow roads, 37 light vehicle and 11 heavy vehicle movements per hour are forecast on The Avenue and 51 light vehicles per hour are forecast on Clay Lane. Construction traffic will access The Avenue from the A46. Receptor R42 is the only sensitive receptor located on The Avenue; however, the site access point (C-004 in **Figure 13-4** of this ES (**[EN010154/APP/6.3]**) is located approximately 500m before R42. As such, construction traffic on the Avenue would not affect any sensitive receptors so negligible effects are identified, which are **not significant**.

11.7.35 Construction traffic will join Clay Lane from the north off Bassingham Road adjacent to receptor R9. No other receptors are located on Clay Lane. Because of the very low baseline flows on Clay Lane, there would be a substantial increase in traffic due to construction traffic. However, traffic on Bassingham Road dominates noise levels at R9 and the increase in noise on Bassingham Road (between Moor Lane and Clay Lane) would be less than 1 dB. As such, the increase in traffic noise on Clay Lane would have a negligible effect on R9 when contextualised with baseline traffic noise levels from Bassingham Road. As such, construction traffic noise effects on Clay Lane are **not significant**.

Operation (and Maintenance)

Operational Noise

11.7.36 For the purpose of this assessment, plant are assumed to operate continuously so there will not be any noticeable impulsive or intermittent characteristics from plant noise emissions experienced at the surrounding

receptors. Transformers can have tonal features, although noise emissions from central inverters will be dominated by the cooling fans such that any tonal features of the transformers will not be noticeable. However, overall plant noise emissions will likely be experienced at receptors as a distinctive continuous and steady hum; therefore a 3 dB correction to account for noise that is 'distinctive against the residual acoustic environment' has been applied in determining the rating level as per BS 4142 guidance in paragraph 11.4.59.

11.7.37 Details of the operational noise modelling methodology are provided in **Appendix 11-D: Construction and Operational Noise Modelling** of this ES (**[EN010154/APP/6.3]**).

11.7.38 As the night-time period provides the most onerous assessment criteria and operational noise is assumed to be consistent, the assessment considers night-time noise only.

Operational Noise Effects – Centralised BESS

11.7.39 Operational noise predictions with the centralised BESS layout and the assessment of noise effects are presented in **Table 11-19**. The predicted rating noise level at each receptor is compared to the defined LOAEL and SOAEL levels defined in **Table 11-11** to determine the noise effect. Receptors have been grouped depending on whether they are 'Below LOAEL', 'Above or equal to LOAEL and below SOAEL' or 'Above or equal to SOAEL'. Predicted noise contours for the centralised BESS scenario are presented at **Figure 11-2: Noise Contours – Operational Phase Centralised BESS [EN010154/APP/6.2]**.

Table 11-19: Operational Noise Effects – Centralised BESS

Receptor Reference	Lowest Measured Background Level LA90,1h dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Noise Level LAr,Tr dB
Below LOAEL			
R2	27	30 / 40	29
R4	28	30 / 40	28
R7	24	30 / 40	29
R8	32	32 / 42	24
R9	29	30 / 40	27
R10	29	30 / 40	24
R11	28	30 / 40	22
R12	28	30 / 40	18
R13	28	30 / 40	21
R14	30	30 / 40	14
R15	30	30 / 40	20
R17	29	30 / 40	20

Receptor Reference	Lowest Measured Background Level LA90,1h dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Noise Level LAr,Tr dB
R19	29	30 / 40	28
R20	29	30 / 40	28
R21	29	30 / 40	22
R22	48	48 / 58	18
R23	34	34 / 44	26
R24	34	34 / 44	29
R25	34	34 / 44	21
R27	42	42 / 52	26
R28	42	42 / 52	27
R29	33	33 / 43	21
R30	33	33 / 43	16
R31	35	35 / 45	11
R32	33	33 / 43	13
R33	33	33 / 43	18
R34	45	45 / 55	25
R35	45	45 / 55	27
R36	30	30 / 40	25
R37	30	30 / 40	18
R38	30	30 / 40	21
R39	30	30 / 40	21
R40	30	30 / 40	18
R41	30	30 / 40	24
R42	30	30 / 40	24
R44	49	49 / 59	22
R45	42	42 / 52	26
R50	30	30 / 40	20
R51	48	48 / 58	21
Above or equal to LOAEL and below SOAEL			
R1	27	30 / 40	30
R3	28	30 / 40	31
R5	27	30 / 40	37
R6	28	30 / 40	33

Receptor Reference	Lowest Measured Background Level LA90,1h dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Noise Level LAr,Tr dB
R16	29	30 / 40	33
R18	24	30 / 40	31
R26	33	33 / 43	42
R43	33	33 / 43	37
R46	28	30 / 40	31
Above or equal to SOAEL			
None			

11.7.40 Operational noise with the centralised BESS layout does not result in any exceedances of the SOAEL. As such, operational noise effects are identified as **not significant**.

11.7.41 The LOAEL is exceeded at nine receptor locations (as detailed in **Table 11-19** above) and adverse levels of noise are identified. The NPSE (Ref. 11-6) states that:

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

11.7.42 Reasonable steps to reduce noise are covered in **Section 11.6** and have been applied in noise predictions. Consequently, although adverse levels of noise are identified at some receptors, NPSE requirements are complied with through provision of embedded mitigation and no additional mitigation measures are warranted.

Operational Noise Effects – Distributed BESS

11.7.43 Operational noise predictions with the distributed BESS layout and the assessment of noise effects are presented in **Table 11-20**. The predicted rating noise level at each receptor is compared to the defined LOAEL and SOAEL levels to determine the noise effect. Receptors have been grouped depending on whether they are 'Below LOAEL', 'Above or equal to LOAEL and below SOAEL' or 'Above or equal to SOAEL'. Predicted noise contours for the distributed BESS scenario are presented at **Figure 11-3: Noise Contours – Operational Phase Distributed BESS [EN010154/APP/6.2]**.

Table 11-20: Operational Noise Effects – Distributed BESS

Receptor Reference	Lowest Measured Background Level LA90,1h dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Noise Level LAr,Tr dB
Below LOAEL			

Receptor Reference	Lowest Measured Background Level LA90,1h dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Noise Level LAr,Tr dB
R2	27	30/40	26
R4	28	30/40	28
R7	24	30/40	27
R8	32	32/42	26
R9	29	30/40	28
R14	30	30/40	23
R15	30	30/40	28
R17	29	30/40	26
R18	24	30/40	29
R22	48	48/58	28
R23	34	34/44	33
R24	34	34/44	29
R25	34	34/44	24
R27	42	42/52	37
R28	42	42/52	38
R29	33	33/43	32
R30	33	33/43	27
R31	35	35/45	23
R32	33	33/43	24
R33	33	33/43	28
R34	45	45/55	35
R35	45	45/55	38
R37	30	30/40	29
R40	30	30/40	29
R44	49	49/59	32
R45	42	42/52	36
R51	48	48/58	31
Above or equal to LOAEL and below SOAEL			
R1	27	30/40	30
R3	28	30/40	31
R5	27	30/40	33
R6	28	30/40	31

Receptor Reference	Lowest Measured Background Level LA90,1h dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Noise Level LAr,Tr dB
R10	29	30/40	34
R11	28	30/40	33
R12	28	30/40	30
R13	28	30/40	34
R16	29	30/40	30
R19	29	30/40	32
R20	29	30/40	30
R21	29	30/40	33
R26	33	33/43	37
R36	30	30/40	36
R38	30	30/40	32
R39	30	30/40	31
R41	30	30/40	34
R42	30	30/40	36
R43	33	33/43	32
R46	28	30/40	34
R50	30	30/40	31
Above or equal to SOAEL			
None			

11.7.44 Operational noise with the distributed BESS layout does not result in any exceedances of the SOAEL. As such, operational noise effects are identified as **not significant**.

11.7.45 The LOAEL is exceeded at twenty-one receptor locations (as detailed in **Table 11-19** above) and adverse levels of noise are identified. The NPSE (Ref. 11-6) states that:

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

11.7.46 Reasonable steps to reduce noise are covered in **Section 11.6** and have been applied in noise predictions. Consequently, although adverse levels of noise are identified at some receptors, NPSE requirements are complied with

through provision of embedded mitigation and no additional mitigation measures are warranted.

Equipment Replacement Works

11.7.47 During the proposed 60-year operational life of the Proposed Development, site-wide replacement of the solar PV panels, inverters, batteries and other equipment may be required in line with the design life of these components, as explained in **Chapter 3: The Proposed Development** of this ES (**[EN010154/APP/6.1]**. Site-wide replacement of these components will be similar to those assessed in NGA1; however these activities will be planned to occur in stages, which means that replacement activities will be of much lower intensity compared to the construction phase.

11.7.48 For the purposes of the noise and vibration assessment, these equipment replacement works are assumed (as a worst-case scenario) to be similar to those assessed in NGA1 but without any requirement for high noise generating activities such as piling. As such, noise and vibration levels during maintenance works would be comparable to those during the decommissioning phase, as discussed in paragraphs 11.7.50 to 11.7.52. Consequently, noise and vibration effects during maintenance works would be **not significant**.

11.7.49 Maintenance would be phased and would therefore be considerably less intensive than during construction. It is estimated that approximately 10% of the daily HGV/coach and car/LGV movements would be generated during peak construction of the Principal Site and Cable Corridor. As such, noise effects due to maintenance traffic would be **not significant**.

Decommissioning (2093 to 2095)

Decommissioning Noise Effects

11.7.50 Noise effects during the decommissioning phase of the Proposed Development will be similar or less than noise effects during the construction phase as each phase will utilise similar heavy plant. Decommissioning noise is likely to be of shorter duration and most probably without drilling or excavation noise along the cable routes.

11.7.51 Decommissioning of the PV panels, Onsite Substation, mounting structures, inverters, transformers and BESS would use plant similar to NGA1 with the exception that there would be no requirement for piling. The piling rig provides the highest level of noise for NGA1 plant. Removing it from the list would reduce the total sound power level of plant in Table 1 of **Appendix 11-D: Construction and Operational Noise Modelling** of this ES **[EN010154/APP/6.3]** from a sound power level of 121 dB to 117 dB. Assuming this 4 dB reduction can be applied to the worst-case NGA1 noise predictions in **Table 11-14**, the highest predicted noise level of 76 dB $L_{Aeq,T}$ at R35 would reduce to 72 dB $L_{Aeq,T}$ and below the SOAEL. As such, PV panels, Onsite Substation, mounting structures, inverters, transformers and BESS decommissioning noise effects would be **not significant**.

11.7.52 For the Cable Corridor and Interconnecting Cable route, noise effects would be equivalent to NGA2; however, there would be no requirement for HDD works so NGA3 is not relevant for decommissioning works. No significant noise effects are identified for NGA2. As such, cable decommissioning noise effects would be **not significant**.

11.7.53 Noise during decommissioning works would be controlled and managed through measures secured in the **Framework DEMP** (**[EN010154/APP/7.9]**).

Decommissioning Vibration Effects

11.7.54 Vibration during decommissioning would be generated by surface plant at the solar PV areas and use of vibratory rollers during reinstatement of ground after removal of cables.

11.7.55 As identified in 11.7.18, use of surface plant would not generate levels of vibration exceeding the SOAEL. Significant vibration effects may occur at R47, which may experience vibration up to a PPV of 1.9mms^{-1} due to potential vibration from a vibratory roller. Given the short duration of these activities (i.e., less than a day) affecting individual receptors, prior warning is considered sufficient to offset significant effects. Accordingly, at this stage, it is anticipated that vibration at nearby sensitive receptors would be **not significant** for decommissioning activities.

11.7.56 Vibration during decommissioning works would be controlled and managed through measures secured in the **Framework DEMP** (**[EN010154/APP/7.9]**).

Decommissioning Traffic Noise Effects

11.7.57 Decommissioning traffic flows would likely be lower than those during the traffic forecast during the construction phase. Assuming that similar routes and site access points are adopted, similar conclusions to the construction traffic noise assessment can be applied to the decommissioning traffic noise assessment. As such, decommissioning traffic noise effects would be, at worst, minor and **not significant**.

11.8 Additional Mitigation and Enhancement

Construction Noise and Vibration

11.8.2 Significant construction noise effects due to NGA1 are identified at R35. This is considered to be a precautionary significant effect as construction noise assumptions are conservative and likely to over-estimate noise levels. However, to ensure that no exceedances of the SOAEL would occur, additional mitigation measures in the form of temporary, mobile acoustic screening would be implemented, as set out in the **Framework CEMP** (**[EN010154/APP/7.7]**). Guidance in BS 5228-1 states that:

11.8.3 "…*as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier…*".

11.8.4 Assuming the implementation of this screening and subsequent reduction in noise at R35 by at least 5 dB, NGA1 noise would be reduced below the SOAEL to 71 dB $L_{Aeq,T}$. As such, residual construction noise effects would be **not significant**.

11.8.5 Three properties (R26, R35 and R50) are identified as located at 60m or closer to the Principal Site. These properties may experience temporary exceedances of the SOAEL if driven piling is undertaken at a distance of 60m or closer. This is considered to be a precautionary approach to construction vibration and likely to over-estimate vibration levels. However, if driven piling is to be undertaken, a commitment is included in the **Framework CEMP [EN010154/APP/7.7]** to undertake a construction vibration risk assessment such that significant effects would be avoided. If it is unavoidable that the SOAEL would be exceeded, the risk assessment would focus on limiting the exposure of nearby receptors to levels of vibration exceeding the SOAEL as far as reasonably practicable. Furthermore, the timing of any driven piling within 60m to residential receptors will be delayed until after 10am to avoid more sensitive time periods.

Operational Noise

11.8.6 No significant operational noise effects are identified. As such, no additional mitigation measures are required.

11.8.7 Although there is a requirement for flexibility in the design, the DCO commits to achieving operational noise levels no greater than noise predictions. To accommodate this requirement but retain flexibility in the design, operational noise limits are defined based on the highest predicted operational noise levels from the centralised BESS layout and the distributed BESS layout. Modelling will be undertaken at the detailed design phase to confirm the noise levels at sensitive receptors will be no higher than the levels established. Operational noise limits are defined in **Table 11-21**. The measures to achieve this are discussed in **Section 11.8** and secured in the **Framework OEMP [EN010154/APP/7.8**] and Requirements 13 and 16 of Schedule 2 of the DCO.

Table 11-21: Operational Noise Limits

Receptor Reference	Noise Limit LAr,Tr dB
R1	30
R2	29
R3	31
R4	28
R5	37
R6	33
R7	29
R8	26
R9	28

Receptor Reference	Noise Limit LAr,Tr dB
R10	34
R11	33
R12	30
R13	34
R14	23
R15	28
R16	33
R17	26
R18	31
R19	32
R20	30
R21	33
R22	28
R23	33
R24	29
R25	24
R26	42
R27	37
R28	38
R29	32
R30	27
R31	23
R32	24
R33	28
R34	35
R35	38
R36	36
R37	29
R38	32
R39	31
R40	29
R41	34
R42	36

Receptor Reference	Noise Limit LAr,Tr dB
R43	37
R44	32
R45	36
R46	34
R50	31
R51	31

Decommissioning Noise and Vibration

11.8.8 No significant noise or vibration effects are identified during the decommissioning phase. As such, no additional mitigation measures are required.

11.9 Residual Effects and Conclusions

11.9.1 **Table 11-22** provides a summary of residual effects during the construction, operational and decommissioning phases of the Proposed Development on noise and vibration sensitive receptors following implementation of mitigation.

11.9.2 The assessment of construction phase activities accounts for potential direct effects due to construction noise and vibration emissions, and indirect effects due to construction traffic noise. No likely significant residual effects are identified during the construction phase with the exception of precautionary likely significant construction vibration effects identified at R26, R35, R50 during piling for solar structures. The effect is precautionary as calculations are based on percussive piling rigs from BS 5228-2 as vibration data for mini-piling rigs used for solar PV structures is not available. As such, construction vibration effects are likely to be overestimated.

11.9.3 The operational phase accounts for direct noise effects as a result of proposed solar farm infrastructure and accounts for maintenance activities. The assessment accounts for two different BESS layouts; a centralised BESS and a distributed BESS. Assumptions made when modelling BESS cover a worst-case scenario in terms of the location of cooling fans and operating load. No likely significant residual effects are identified during the operational phase.

11.9.4 The assessment of decommissioning phase activities accounts for potential direct effects due to decommissioning noise and vibration emissions, and indirect effects due to decommissioning traffic noise. No likely significant residual effects are identified during the decommissioning phase.

11.9.5 No significant noise or vibration effects are identified with the exception of precautionary significant vibration effects due to solar PV structure piling; however, it is expected that these significant effects would not occur. As such, the noise and vibration assessment demonstrates compliance with the first aim of the NPSE by avoiding significant effects on health and quality of life.

11.9.6 Mitigation measures covered in **Section 11.6** and **Section 11.8** cover all reasonable measures to mitigate adverse effects on health and quality of life. As such, the noise and vibration assessment demonstrates compliance with the second aim of the NPSE.

11.9.7 Whist the Proposed Development does not result in significant adverse noise effects; all reasonable measures have been applied to reduce the impact on nearby communities as reasonably practicable to an acceptable level as best practice. This has been achieved through appropriate design and locating of noise generating plant. Measures to effectively manage and control noise emissions throughout the lifespan of the Proposed Development are secured in the **Framework Operational Environmental Management Plan (OEMP) [EN010154/APP/7.8]**. As such, the noise and vibration assessment demonstrates compliance with the third aim of the NPSE

Table 11-22: Summary of Residual Effects

Receptor	Sensitivity (value)	Description of impact	Additional mitigation/ enhancement measure	Magnitude of impact after additional mitigation	Residual effect after additional mitigation
R35	Residential	NGA1 construction noise	Acoustic screening	Above or equal to LOAEL and below SOAEL	Not Significant
R3, R5, R6, R8, R9, R10, R11, R13, R19, R20, R21, R23, R26, R27, R28, R29, R34, R36, R38, R39, R41, R42, R43, R45, R46, R50	Residential	NGA1 construction noise	None	Above or equal to LOAEL and below SOAEL	Not Significant
R1, R2, R4, R7, R12, R14, R15, R16, R17, R18, R22, R24, R25, R30, R31, R32, R33, R37, R40, R44, R51	Residential	NGA1 construction noise	None	Below LOAEL	Not Significant
R1, R47	Residential	NGA2 construction noise	None	Above or equal to LOAEL and below SOAEL	Not Significant
R48, R49	Residential	NGA2 construction noise	None	Below LOAEL	Not Significant
R28	Residential	NGA3 construction noise	None	Above or equal to LOAEL and below SOAEL	Not Significant

Receptor	Sensitivity (value)	Description of impact	Additional mitigation/ enhancement measure	Magnitude of impact after additional mitigation	Residual effect after additional mitigation
All other receptors	Residential	NGA3 construction noise	None	Below LOAEL	Not Significant
R26, R35, R50	Residential	NGA1 construction vibration	Construction vibration risk assessment	Above or equal to SOAEL	Significant
R1, R47, R48, R49	Residential	NGA2 construction vibration	None	Below SOAEL	Not Significant
All receptors	Residential	NGA3 construction vibration	None	Below LOAEL	Not Significant
All receptors	Residential	Construction traffic noise	None	Minor/ Negligible	Not Significant
R1, R3, R5, R6, R16, R18, R26, R43, R46	Residential	Operational noise – Centralised BESS	None	Above or equal to LOAEL and below SOAEL	Not Significant
R2, R4, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R19, R20, R21, R22, R23, R24, R25, R27-R42, R44, R45, R50, R51	Residential	Operational noise – Centralised BESS	None	Below LOAEL	Not Significant
R2, R4, R7, R8, R9, R14, R15, R17, R18, R22, R23, R24, R25, R27-R35, R37, R40, R44, R45, R51	Residential	Operational noise – Distributed BESS	None	Above or equal to LOAEL and below SOAEL	Not Significant

Receptor	Sensitivity (value)	Description of impact	Additional mitigation/ enhancement measure	Magnitude of impact after additional mitigation	Residual effect after additional mitigation
R1, R3, R5, R6, R10-R13, R16, R19, R20, R21, R26, R36, R38, R39, R41, R42, R43, R46, R50	Residential	Operational noise – Distributed BESS	None	Below LOAEL	Not Significant
All receptors	Residential	Maintenance Noise and Vibration	None	Below SOAEL	Not Significant
All receptors	Residential	Maintenance Traffic Noise	None	Negligible	Not Significant
All receptors	Residential	Decommissioning Noise	None	Below SOAEL	Not Significant
All receptors	Residential	Decommissioning Vibration	None	Below SOAEL	Not Significant
All receptors	Residential	Decommissioning Traffic Noise	None	Negligible	Not Significant

11.10 Cumulative Assessment

11.10.1 This section presents an assessment of the potential for Cumulative Effects to arise between the Proposed Development and other proposed and committed plans and projects including other developments (referred to as 'Cumulative Schemes') within the surrounding area as relevant.

11.10.2 This assessment has been made with reference to the methodology and guidance set out in **Chapter 5: EIA Methodology** (**[EN010154/APP/6.1]**) and **Chapter 15: Cumulative Effects and Interactions** (**[EN010154/APP/6.1]**) and shortlist of cumulative schemes also identified in **Chapter 15: Cumulative Effects and Interactions** (**[EN010154/APP/6.1]**).

11.10.3 Of the shortlisted developments listed in **Chapter 15: Cumulative Effects and Interactions** (**[EN010154/APP/6.1]**) and shown on **Figure 15-2** (**[EN010154/APP/6.2]**), ten cumulative developments are considered to have the potential for Cumulative Effects when considered in combination with the Proposed Development due to being located within the ZoI for noise and vibration.

11.10.4 This Cumulative Effect assessment identified for each receptor those areas where the predicted effects of the Proposed Development could interact with effects arising from other plans and, or developments on the same receptor based on a spatial and, or temporal basis.

11.10.5 The Cumulative Schemes in **Table 11-23** were given consideration owing to their proximity to the Proposed Development or potential for impacts on the same sensitive receptors as the Proposed Development. The anticipated significance of potential construction and operational phase Cumulative Effects are presented in **Table 11-23**.

11.10.6 As decommissioning is not anticipated to be undertaken until 2093 (60 years after the expected operation date of 2033), there is no certainty about what activities at cumulative developments may be occurring at that time. As such, Cumulative Effects during decommissioning are not considered in this section and, as a worst-case, similar Cumulative Effects would be anticipated during decommissioning as those identified during the construction phase.

Table 11-23: Assessment of Cumulative Effects during Construction and Operation

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Assessment of Cumulative Effects
5	15/1347/OUT Associated applications: 24/0456/RESM / 22/0174/RESM / 21/0276/RESM	Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated service infrastructure (outline with means of access) Associated applications: - Reserved matters application for construction of private access road to Sheepwalks Farm pursuant to outline application 15/1347/OUT-Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated service infrastructure (outline with means of access) - Reserved matters application for the erection of 154 dwellings (Cell 6) with layout, scale, appearance, landscaping and access to be considered pursuant to outline planning application 15/1347/OUT - Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated	123	**Construction:** Construction of the Proposed Development is scheduled to commence in 2031. Construction of the cumulative development (ID5) is already underway so is anticipated to be complete prior to construction of the Proposed Development commencing. As such, cumulative construction noise and vibration effects are anticipated to be **not significant**. **Operation:** Construction and operation noise effects from the Proposed Development have been assessed on this cumulative development, which is identified as R51 in **Table 11-19** of this chapter. Noise and vibration effects during operation of the Proposed Development are anticipated to be **not significant**. As such, there are not anticipated to be any cumulative operation noise and vibration effects, so they are considered to be **not significant**.

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Assessment of Cumulative Effects
		service infrastructure (outline with means of access) (Resubmission of 20/1659/RESM) - Application for approval of reserved matters for 181 dwellings (Cells 2a, 3a and 3b) comprising details of appearance, landscaping, layout and scale pursuant to Outline Planning Permission 15/1347/OUT - Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated service infrastructure (outline with means of access)		
13	18/1560/EIASCO	Development of a 55km potable water pipeline from Lincoln to Grantham with associated infrastructure including partially buried 20 million litre bulk potable water storage tank, 3km connecting pipeline to Anglian Water (AWS) site at Bracebridge Heath (Bracebridge Spur), connecting sections of pipeline to the existing Central Lincs Trunk Main, partially buried 3million litre break tank and the erection of 3 pumping stations (the Grantham Resilience Pipeline Project).	0	**Construction:** The redline boundary of the cumulative development (ID13) overlaps the Cable Corridor of the Proposed Development. Whilst there may be potential for overlapping construction activities, it is considered that this is unlikely due to the short duration required for the Proposed Development cable laying activities and cumulative development (ID13) pipeline laying activities. As such, cumulative construction effects are identified as **not significant**. **Operation:** The cumulative development redline boundary overlaps with the Cable Corridor. Operational infrastructure

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Assessment of Cumulative Effects
				associated with ID13 would be underground and any noise emitted from pipelines would not be perceptible above ground. As such, cumulative operational noise effects are anticipated to be **not significant**.
34	20/1736/RESM	Residential development of 70 affordable dwellings (Cell 2B). Reserved Matters application comprising details of appearance, landscaping, layout and scale pursuant to outline planning permission 15/1347/OUT - Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated service infrastructure (outline with means of access)	257	**Construction:** Construction of the Proposed Development is scheduled to commence in 2031. By this time, it is anticipated that construction of the cumulative development would be complete. As such, there are not anticipated to be any cumulative construction effects, so they are considered to be **not significant**. **Operation:** Both construction and operational noise effects from the Proposed Development have been assessed on this cumulative development, which is identified as R51 in **Table 11-19** of this chapter. Noise and vibration effects on this receptor during the construction and operation of the Proposed Development are anticipated to be **not significant**. As such, there are not anticipated to be any cumulative operation effects, so they are considered to be **not significant**.
49	22/0520/FUL	Installation of a ground based solar PV array (approximately 6KW)	364	**Construction:** The cumulative development (ID49) is small in scale and construction activities are expected to be minimal.

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Assessment of Cumulative Effects
				As such, cumulative construction noise and vibration effects are anticipated to be **not significant**. **Operation:** No operational noise assessment was submitted with the cumulative development application as operational noise emissions would be minimal. As such, cumulative operational effects are anticipated to be **not significant**.
63	EN010149	Springwell Solar Farm is a proposed new solar farm with battery storage and supporting grid connection infrastructure in North Kesteven, Lincs.	0	**Construction:** Springwell Solar Farm will connect to the same substation (cumulative development 105) as the Proposed Development. There is potential for cumulative construction noise effects to occur but there would be no operational noise sources. The overlap of redline boundaries occurs to the east of Navenby at the end of the Cable Corridor. At this location, there are no sensitive receptors within the noise and vibration study area. As such, cumulative construction effects are anticipated to be **not significant**. **Operation:** No operational noise emissions would occur from cable laid in the Cable Corridor. As such, cumulative operational effects are **not significant**.
86	23/0584/EIASCR	Erection of 400MW Battery Storage Development incorporating 324	0	**Construction:**

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Assessment of Cumulative Effects
	23/0390/EIASCO	Containerised Battery Storage Units, 54 transformer/inverter blocks and 8 back up auxiliary transformers, 4 storage containers for spare parts etc, substation comprising 4-6 switchgear units, a control room and a HV compound with 2 Step-up Transformers, associated access tracks, inverter, switchgear substations, boundary treatments and CCTV - Request for Scoping Opinion		The redline boundary of the cumulative development overlaps the Cable Corridor of the Proposed Development. Whilst there may be potential for overlapping construction activities, it is considered that this is unlikely due to the short duration required for the Proposed Development cable laying activities. As such, cumulative construction effects are anticipated to be **not significant**. **Operation:** The overlap between the cumulative development's redline boundary is with the Cable Corridor of the Proposed Development. As no operational noise impacts are predicted in relation to the operation of the Cable Corridor, the Proposed Development would not contribute to operational noise levels at this location. As such, cumulative operational effects are **not significant**.
95	PL/0087/23	For construction of the North Hykeham Relief Road (NHRR) between the A46 Hykeham Roundabout and the A15 Sleaford Road Roundabout at the end of the Lincoln Eastern Bypass, with junctions at South Hykeham Road, Brant Road and Grantham Road. The Proposed Scheme will comprise 8km of dual all-purpose carriageway with a 70mph speed limit (120kph design speed) and associated structures, earthworks,	0	**Construction:** Construction of the Proposed Development is scheduled to commence in 2031. The cumulative development is set to open in 2028 so, even allowing for delays, construction activities are anticipated to be complete prior to commencement of construction of the Proposed Development. As such, there are not anticipated to be any cumulative construction effects, so they are considered **not significant**.

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Assessment of Cumulative Effects
		drainage, street lighting, traffic signals, utility diversions and installations, pipeline diversion, temporary materials processing, landscaping, and highway features		**Operation:** R31 is located within the operational noise study area of the cumulative development. Changes in road traffic noise at R31 are less than 1 dB and would not be perceptible. As such, there would be no perceptible interaction between noise from the Proposed Development and noise from the cumulative development, therefore cumulative operational noise effects are anticipated to be **not significant**.
99	EIA/03/24	For the installation of floating Solar PV arrays plus terrestrial based ancillary infrastructure and equipment, cable route and access	499	The cumulative development is in close proximity to receptors R32, R33 and R37 from **Table 11-19**. No assessment of construction or operational noise has been submitted for this application at the time of writing this ES chapter. However, levels of construction and operational noise from the Proposed Development are below the LOAEL at the identified receptors. As such, the Proposed Development would not contribute to a cumulative significant effect so cumulative construction and operational effects are **not significant**.
103	EN0110016	Leoda Solar - Ground-mounted solar electricity generating station with a targeted gross output of 500 to 600 Megawatts (MW) and associated grid connection infrastructure.	0	Leoda Solar will connect to the same substation (cumulative development 105) as the Proposed Development. There is potential for cumulative construction noise effects to occur but there would be no operational noise sources. The overlap of redline boundaries occurs to the east of Navenby at the end of the Cable Corridor. At this location, there are no

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Assessment of Cumulative Effects
				sensitive receptors within the noise and vibration study area. As such, there are not anticipated to be any cumulative construction or operational effects, so they are considered **not significant**.
105	24/1080/EIASCR	Erection of new 400kv Air Insulated Switchgear (AIS) substation and associated development	0	The cumulative development is located at the end of the Cable Corridor to the east of Navenby. There is potential for cumulative construction noise effects to occur but there would be no operational noise sources. At this location, there are no sensitive receptors within the noise and vibration study area. As such, there are not anticipated to be any cumulative construction or operational effects, so they are considered **not significant**.
108	25/0533/FUL	"Brant Energy Storage Scheme 1GW Battery Energy Storage System located west of Coleby and east of Broughton Lane"	0	The cumulative development is located at the Cable Corridor to the west of Coleby and east of Broughton Lane. There is potential for cumulative construction noise effects to occur but there would be no operational noise sources. Along this stretch of the Cable Corridor, there are no sensitive receptors within the noise and vibration study area. As such, there are not anticipated to be any cumulative construction or operational effects, so they are considered **not significant**.

11.11 References

Ref. 11-1 Her Majesty's Stationery Office (1974); Control of Pollution Act.

Ref. 11-2 Her Majesty's Stationery Office (1995); Environmental Protection Act.

Ref. 11-3 Department of Energy and Climate Change. (2023) Overarching National Policy Statement for Energy (EN-1).

Ref. 11-4 Department of Energy and Climate Change (2023) National Policy Statement for Renewable Energy Infrastructure (EN-3).

Ref. 11-5 Ministry of Housing, Communities & Local Government (2023) National Planning Policy Framework.

Ref. 11-6 Department for Environment Food and Rural Affairs (2010); Noise Policy Statement for England.

Ref. 11-7 Central Lincolnshire County Council (2023); Central Lincolnshire Local Plan Adopted 2023.

Ref. 11-8 Ministry of Housing, Communities & Local Government (2019); Planning Practice Guidance - Noise.

Ref. 11-9 British Standards Institute (2009 with 2014 amendments) BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites Part 1: Noise, BSi, London.

Ref. 11-10 British Standards Institute (2009 with 2014 amendments) BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites Part 2: Vibration, BSi, London.

Ref. 11-11 British Standards Institute (2003); BS 7445 – Description and environment of environmental noise – Part 1: Guide to quantities and procedures, BSi, London.

Ref. 11-12 British Standards Institute (2014 with 2019 amendments); BS 4142 – Methods for rating and assessing industrial and commercial sound, BSi, London.

Ref. 11-13 British Standards Institute (2014); BS 8233 – Guidance on sound insulation and noise reduction for buildings, BSi, London.

Ref. 11-14 World Health Organization (1999); Guidelines for Community Noise.

Ref. 11-15 Department of Transport/Welsh Office (1988), Calculation of Road Traffic Noise. Her Majesty's Stationery Office, London.

Ref. 11-16 Institute of Environmental Management and Assessment (2014); Guidelines for Environmental Noise Impact Assessment.

Ref. 11-17 Highways England, (2020); Design Manual for Road and Bridges Sustainability & Environment Appraisal LA 111 Noise and Vibration, BSi, London.

Ref. 11-18 CadnaA®, registered trademark of Datakustik GmbH (Munich, Germany).

Ref. 11-19 ANC Acoustics & Noise Consultants BS4142:2014+A1:2019 Technical Note, Version 1.0 March 2020

Ref. 11-20 International Standards Organization (Part 1: 1993, Part 2: 1996) ISO 9613 – Acoustics – Attenuation of sound during propagation outdoors, ISO.

Ref. 11-21 Hiller, D. M., and G. I. Crabb, (2000); Groundborne Vibration Caused by Mechanised Construction Works. TRL Report 429.

Ref. 11-22 Selby, A.R. (1997). “Control of vibration and noise during piling.” Brochure publication, British Steel, UK