

Heckington Fen Solar Park

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Chapter 12 – Noise and Vibration

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CHAPTER 12: NOISE AND VIBRATION

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12 NOISE AND VIBRATION

12.1 EXECUTIVE SUMMARY

12.1.1 The assessment has identified potential significant noise effects if trenchless work is required during the construction phase and remains active at night, depending on the final locations where this may be required along the Cable Route Corridor for the grid connection to National Grid Bicker Fen Substation. Additional measures (such as interrupting the drilling at night, use of alternative methods or temporary relocation) and liaison with the closest affected residents will be implemented to minimise the risk of significant effects. Noise and vibration from other construction and decommissioning activities are such that, providing construction working hours are controlled, their effect would be either not significant or negligible. Construction traffic is associated with negligible effects. Operational noise levels can be controlled to suitable noise limits through detailed design and selection of electrical/mechanical plant: the resulting effects would then either be not significant or negligible.

12.2 INTRODUCTION

12.2.1 This chapter considers the potential noise and vibration effects generated by the Proposed Development during construction, operation and decommissioning. Noise and vibration could initially arise from onsite activities during the construction phase of the Energy Park, such as the construction of onsite access tracks, installation of PV panels and the substation and associated infrastructure. Works associated with the proposed connection to the National Grid Bicker Fen Substation are also considered. The movement of construction traffic, both onsite and travelling on public roads, to and from the Proposed Development also represents a potential source of noise and vibration for consideration.

12.2.2 During the operation of the Proposed Development, the main potential source of noise would be associated with electrical and mechanical plant, both the equipment located within the individual PV arrays, energy storage and the substation.

12.3 ASSESSMENT APPROACH

Methodology

Study area and receptors

12.3.1 Residential and educational properties are considered to have a high sensitivity to noise and vibration and have been considered in detail in this chapter. There are a limited number of commercial receptors in proximity to the Energy Park but these are considered to have a low sensitivity to noise and are therefore not considered in further detail in this chapter. Public rights of way have not been considered to be noise-sensitive receptors in the context of this noise assessment, as they would not be expected to be occupied by any individual for a long enough period of time for a significant noise effect to occur.

12.3.2 Build-A-Future East Heckington based at Elm Grange will accommodate young people with Autistic Spectrum Disorder (ASD) or learning difficulties. It is recognised that sudden noise events of sufficient amplitude and character has the potential to disturb some people with autism. There is no single criteria or noise level that is associated with response to noise in ASD persons with hyper-sensitivity to noise, although some studies¹ suggest that most adverse responses occur for loud noises of 55 dB LAeq and above (within

¹ An Observational Study of Classroom Acoustical Design and Repetitive Behaviors in Children with Autism. Shireen M. Kanakri, Mardelle Shepley, Louis G. Tassinary, James W. Varni and Haitham M. Fawaz. Environment and Behavior 2017, Vol. 49(8) 847 –873.

classrooms). It is assumed that the design of the school will account for management of the existing baseline environment for ASD pupils sensitive to noise. The potential for specific disturbance from noise produced by the Proposed Development will be considered on a qualitative basis in the assessment of effects.

12.3.3 A study area for the consideration of noise effects was proposed during the scoping process as those noise-sensitive properties that lie within 250m of the Energy Park, 1km of the Energy Park substation(s) and energy storage areas and 500m of noisy activities along the Cable Route Corridor.

12.3.4 Following consultation, the assessment of operational and construction noise effects has expanded to consider the closest noise-sensitive receptors to the Energy Park, which are located within approximately 150 m to 1200 m. This includes mainly residential receptors as well as an additional needs school at Elm Grange. Based on professional judgement and experience of similar developments, significant noise and vibration effects are unlikely beyond this distance. **Figure 12.2- Noise assessment locations** (document reference 6.2.12) and **Appendix 12.2- Noise Modelling** (document reference 6.3.12.2) sets out the representative receptors considered around the Energy Park boundary.

12.3.5 Noise-sensitive receptors located within 500m of the Cable Route Corridor between the Energy Park and the National Grid Bicker Fen Substation were also considered (see **Appendix 12.2- Noise Modelling** (document reference 6.3.12.2)).

12.3.6 Finally, dwellings exposed to traffic noise along the construction traffic route, which is described in **Chapter 14 -Transport and Access** (document reference: 6.1.14) of the ES, were also considered in terms of how the traffic noise levels they currently experience may change during the construction period.

Construction and decommissioning

12.3.7 Noise and vibration from onsite construction and decommissioning activities have been assessed with the guidance of BS 5228 Parts 1 and 2². This provides guidance on a range of considerations relating to construction noise and vibration including general control measures, estimating likely levels and example criteria. All construction noise effects can be characterised as temporary, short-term adverse.

12.3.8 Construction noise magnitude criteria are set out in **Table 12.1** based on the guidance values set out in BS 5228-1 (Annex E) and the measured baseline noise levels in the area (in quiet areas), based on sustained construction activities occurring during the weekday day-time or Saturday morning periods, with more stringent criteria considered for works outside of these times. Some properties located closest to the A17 experience higher baseline noise levels (see **Section 12.3**), and therefore the criteria of **Table 12.1** can be relaxed for night-time periods, based on BS 5228 guidance. For construction activities which may be expected to occur for less than four weeks in a year, the magnitude of the corresponding effects would reduce (based on BS 5228 and professional judgement).

12.3.9 As detailed in section 16.6, the majority of construction activities will be carried out during daytime periods. However, trenchless construction works will be required in some instances for the cabling works to cross specific obstacles such as ditches, drains or underground services: if horizontal drilling is used, there is the possibility that the associated drilling may need to be carried out continuously including during specific night-time periods. As indicated below, in **Table 12.1**, the applicable criteria would normally reduce by 20dB for night-time work; however, the duration of the works is also a relevant

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

consideration. **Table 12.1** therefore sets out additional criteria that would apply to trenchless work which would only be undertaken in proximity to any particular location for short periods of less than 1 week.

12.3.10 Some construction activity and associated plant could generate significant vibration: the magnitude of Peak Particle Velocity (PPV) has been estimated for these activities based on reasonable worst-case working locations using BS 5228-2 guidance. The criteria of **Table 12.1** for the assessment of the magnitude of construction vibration are based on the guidance in Section B.2 of BS 5228-2 which provides advice on human response to vibration. BS 5228-2 also advises that any risk of building damage, even for sensitive buildings, would only occur at much stronger vibration levels (above 10 mm/s), therefore the proposed criteria would also provide protection in this regard.

12.3.11 The prediction method of Calculation of Road Traffic Noise (CRTN)³ has been used to calculate the possible noise effects of construction related traffic passing to and from the Site along local surrounding roads. This is assessed with reference to the Design Manual for Roads and Bridges (DMRB)⁴: see criteria in **Table 12.1**. The Energy Park access road surface will be checked and maintained prior to use, and on this basis the DMRB advises that significant effects from traffic using the road are unlikely (although momentary vibration may be perceptible in some cases).

Table 12.1: Classification of Magnitude of Change - Construction Noise and vibration

Effect magnitude	Construction noise* over working day	Night-time activity (< 1 week)**	Construction vibration (PPV)	Construction traffic noise increase
High	> 75 dB LAeq	> 55 dB LAeq	> 10 mm/s	> 5 dB
Medium	> 65 dB LAeq ≤ 75 dB LAeq	> 50 dB LAeq ≤ 55 dB LAeq	> 1 mm/s ≤ 10 mm/s	3 to 5 dB
Low	> 55 dB LAeq ≤ 65 dB LAeq	> 45 dB LAeq ≤ 50 dB LAeq	≥ 0.3 mm/s < 1 mm/s	1 to 3 dB
Negligible	≤ 55 dB LAeq	≤ 45 dB LAeq	< 0.3 mm/s	< 1 dB

* This assumes construction during weekday day-time or Saturday mornings for a sustained period of 1 month or more. For shorter duration work (< 1 month), the effect magnitude would decrease (medium to low, etc). For works during evening, Sundays, Bank Holidays or Saturday afternoons (for 1 month or more), the criteria would be reduced by 10dB, and for night-time works by 20dB.

** For properties within 200m of the A17, the criteria for night-time construction are increased by 5dB because typical ambient noise levels are above 45dB LAeq (see **Section 12.5** below).

Operational noise

12.3.12 As noted in the section below (Limitations to the Assessment), the potential noise from fixed electrical and mechanical plant potentially associated with the Proposed Development was assessed on a worst-case basis, considering representative manufacturer selections and an indicative layout. The propagation of operational noise from this plant was modelled using the standard methodology⁵ set out in International

³ HMSO Department of Transport (1988), Calculation of Road Traffic Noise (CRTN).

⁴ Highways England (2019): Design Manual for Roads and Bridges (DMRB) – LA111 – Noise and Vibration, Nov 2019.

⁵ International Standards Organisation (ISO), ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'

Organisation for Standardisation (ISO) 9613-2. This allowed evaluating the potential noise generated at different distances from the Site.

12.3.13 The resulting effect of operational noise is assessed on the basis of the BS 4142 Standard⁶, as recommended in planning guidance in England when considering commercial or plant noise. The standard provides an objective method for rating the potential effect of noise from fixed plant installations based on the background noise levels that prevail on a site (see **Appendix 12.1- Noise Survey** (document reference 6.3.12.1)) for more details on this standard). The potential character of the noise from the electrical plant items, in particular inverters and transformers, is taken into account by incorporating a penalty in line with BS 4142 guidance.

12.3.14 A contextual analysis is fundamental in BS 4142, and this requires consideration of factors such as the nature of the area and, particularly at night-time, the absolute level of the noise. An external free-field noise rating level lower threshold of 35 dB L_{Ar} is proposed, which would apply even at receptor locations in cases where the background levels are low (below 30 dB L_{A90}). This would provide satisfactory external amenity during the daytime and suitable internal noise levels at night with windows open for ventilation, even taking into account the potential character of the noise, and. This was agreed in consultation with North Kesteven District Council (NKDC) (see **Table 12.3**). A similar noise limit was also applied for at least one other solar farm development⁷. The resulting assessment criteria are set out in **Table 12.2**.

Table 12.2: Classification of Magnitude of Change – operational noise

Effect magnitude	Operational noise
High	Rating level L_{Ar} above 35 dB and 10 dB or more above background, depending on the context
Medium	Rating level L_{Ar} above 35 dB and 5 dB or more above background, depending on the context
Low	Rating level L_{Ar} between 5 dB above or below background, depending on the context; or rating level does not exceed 35 dB.
Negligible	Rating level L_{Ar} 5 dB or more below background, depending on the context

Assessment of Significance

12.3.15 As all receptors considered for the noise and vibration assessment are of high sensitivity, medium or high magnitudes of change correspond to moderate and major effects respectively which are considered to be significant within the meaning of the EIA Regulations and mitigation will be considered.

12.3.16 In this chapter, negligible or low magnitudes of change correspond to minor or negligible effects respectively are not considered significant, but enhancement measures will be considered to minimise the effects, where possible.

⁶ BSI (2019), BS 4142 2014-A1 2019: Methods for rating and assessing industrial and commercial sound.

⁷ The Planning Inspectorate, Appeal decision, Land north of Halloughton, Southwell, Nottinghamshire. Appeal reference APP/B3030/W/21/3279533, decision dated 18/02/2022.

Legislative and Policy Framework

12.3.17 The Environmental Protection Act 1990⁸ defines the powers for local authorities to investigate and control statutory nuisance from noise. Local authorities also have powers under the Control of Pollution Act⁹ (CoPA) 1974 to control noise and vibration from construction activities. Specifically, Section 60 of the CoPA provides the Local Authority with the power to impose at any time operating conditions on the development site. Section 61 allows the developer to negotiate a set of operating procedures with the Local Authority prior to commencement of site works. Notwithstanding these powers, the aim of the planning system is to minimise and control where required construction and operational noise levels from commercial developments.

12.3.18 The Overarching National Policy Statement (NPS) for Energy (EN-1)¹⁰ and 2021 Draft NPS EN-1¹¹ both recognise that noise and vibration from energy development can have effects on the quality of human life as well as on wildlife in some cases. These documents outline general principles for the control and management of these effects and relevant factors and standards to consider but do not provide specific guidance.

12.3.19 The 2021 Draft NPS for Renewable Energy Infrastructure (EN-3)¹² specifically considers solar photovoltaic generation and includes construction (including traffic and transport noise and vibration) as a specific factor to consider. The accompanying text does not however identify specific effects related to noise (aside from the volume of traffic potentially associated with construction activities).

12.3.20 The NPS for Electricity Networks Infrastructure (EN-5)¹³ sets out specific considerations which apply to electricity network infrastructure. Noise can be generated by high-voltage transmission lines under certain conditions due to corona discharge. NPS EN-5 also notes the potential for substation equipment such as transformers and other voltage regulation equipment to produce noise.

12.3.21 The Noise Policy Statement for England (NPSE)¹⁴ and National Planning Policy Framework (NPPF)¹⁵ both include general planning guidance on noise and introduce the principles of adverse noise effects (which should be mitigated and reduced to a minimum) and significant adverse noise effects (which should be avoided). The NPPF also notes that tranquil areas which have remained relatively undisturbed by noise, and which are prized for their recreational and amenity value should be identified and protected.

12.3.22 The online Planning Practice Guidance¹⁶ (PPG) provides more detailed information on the relevance of noise to the planning process and on defining effect thresholds, although these are not precisely defined and need to be considered on a case-by-case basis. The guidance was however used as the basis for determining the magnitude of effect thresholds in the Methodology section above.

⁸ HMSO (1990): Environmental Protection Act, Part III.

⁹ HMSO (1974): Control of Pollution Act, Part III.

¹⁰ Department of Energy & Climate Change (2011). Overarching National Policy Statement for Energy (EN-1).

¹¹ Department for Business, Energy & Industrial Strategy (2021). Draft Overarching National Policy Statement for Energy (EN-1).

¹² Department for Business, Energy & Industrial Strategy (2021). Draft National Policy Statement for Renewable Energy Infrastructure (EN-3).

¹³ Department of Energy & Climate Change (2011). National Policy Statement for Electricity Networks Infrastructure (EN-5).

¹⁴ Department for Environment, Food and Rural Affairs (2010), Noise Policy Statement for England (NPSE).

¹⁵ Ministry of Housing, Communities and Local Government (MHCLG), now the Department for Levelling Up, Housing and Communities (2021), National Planning Policy Framework (NPPF).

¹⁶ Department for Communities and Local Government, now the Department for Levelling Up, Housing and Communities (2014, updated 2019) - Planning Practice Guidance. [Online] Accessed via <https://www.gov.uk/guidance/noise--2> [accessed May 2022]

12.3.23 Professional Practice Guidance on Planning and Noise (ProPG)¹⁷ provides practitioners guidance on a recommended approach to the management of noise in the context of the planning system. Although the guidance is focussed on new residential development, it encourages good acoustic design processes and highlights the importance of considering noise as an early part of development design.

12.3.24 Several local policies highlight the need for considering sources of pollution (including noise and vibration) from local developments and minimise or avoid significant effects in this regard. Specifically, Policy LP26 (Design and Amenity) of the Central Lincolnshire Local Plan¹⁸ and Policies 2 (Development management) and 30 (Pollution) of the South-East Lincolnshire Local Plan¹⁹ were identified.

12.3.25 Other local policies specifically consider low-carbon/renewable energy generation sources and the need for these developments to consider effects on residential amenity (which includes noise): this comprises Policy LP19 (Renewable Energy Proposals) of the Central Lincolnshire Local Plan and Policy 31 (Climate Change and Renewable and Low Carbon Energy) of the South-East Lincolnshire Local Plan.

Scoping Criteria

12.3.26 Following the scoping exercise and subsequent discussion with North Kesteven District Council (NKDC), Boston Borough Council (BBC) and Lincolnshire County Council (LCC), as set out in **Tables 12.3 and 12.4** below, the following potential effects have been assessed:

- Noise and vibration associated with construction and decommissioning activities, including construction traffic, associated with the Energy Park and the cable connection route; and
- Operational noise effects from plant associated with the Proposed Development within the Energy Park.

12.3.27 Operational traffic would be very limited: see **Chapter 14- Transport and Access** (document reference 6.1.14) which describes an anticipated traffic level of up to five vehicles per day (non-HGVs). This would have no appreciable effect on noise and as a result, the associated effects have been scoped out as agreed with the Planning Inspectorate (PINS).

12.3.28 The equipment proposed as part of the Proposed Development would generate minimal levels of vibration during operation: these would rapidly dissipate and be such that levels would be imperceptible at neighbouring properties, based on experience of similar plant. Therefore, operational vibration was also scoped out as agreed with PINS (**Table 12.3**).

Limitations to the Assessment

12.3.29 There were no significant restrictions associated with the COVID-19 pandemic in place during the noise survey (end of February 2022, see **section 12.5**). It was therefore expected that the pandemic would have had either no substantial influence on human activity and road traffic levels and therefore background noise, or that levels would only be marginally lower than normal therefore resulting in a more conservative assessment.

¹⁷ Professional Practice Guidance on Planning and Noise (ProPG), Association of Noise Consultants, Institute of Acoustics and the Chartered Institute of Environmental Health (2017).

¹⁸ Central Lincolnshire Local Plan 2017-2036, adopted April 2017.

¹⁹ South-East Lincolnshire Local Plan 2011-2036, adopted March 2019.

12.3.30 The Proposed Development will include different items of mainly electrical plant, some of which have associated cooling equipment. As the final plant specification and equipment layout is not known, an assessment of potential noise emissions based on an indicative plant layout and specification has been undertaken on a precautionary basis.

12.3.31 The assessment is based on a worst-case assumption that a centralised inverter approach is likely to be used (as opposed to string inverters underneath the panels) as this is considered likely to result in the highest potential noise levels at neighbouring properties based on experience of similar developments.

12.3.32 Noise modelling is also undertaken on a conservative basis which does not account for the screening from the PV panels themselves. In addition, although some of the plant may be located in outdoor enclosures or containers, their sound reduction has been neglected for the purpose of this robust assessment in the absence of detailed information on their acoustic performance.

12.3.33 For the potential works which would be required for construction and decommissioning, in the absence of further details at this stage, reasonable worst-case working locations were considered. This assumed works being undertaken at the closest point in each work area. Typical noise emissions of construction plant items were referenced from BS 5228-1 (see **Appendix 12.2- Noise Modelling** (document reference: 6.3.12.2)). These were used to predict the average sound pressure level for the daily construction working period over different phases of the construction for different receptors.

12.3.34 The potential impacts of the proposed connection to the National Grid Bicker Fen Substation have been considered based on the proposed Cable Route Corridor. For trenchless work in particular, potential drilling locations were considered on a worst-case basis within the corridor based on obstacles likely to require this type of work.

12.4 CONSULTATION

12.4.1 **Table 12.3** presents a summary of consultation prior to issue of the Preliminary Environmental Assessment Report (PEIR) in June 2022. This outlines matters raised within the Scoping Opinion and how these have been addressed through the ES in relation to noise and vibration.

Table 12.3: Summary of Scoping Opinion Responses and other consultation undertaken prior to the PEIR

Consultee	Details of Consultee response	How is matter addressed	Location of response
PINS Scoping Opinion	ID 3.6.1: PINS was not satisfied that sufficient information was available to scope out impacts of noise and vibration construction and decommissioning of the Proposed Development.	This assessment was scoped into the assessment.	The associated impacts are assessed in section 12.6 below.
	ID 3.6.2: PINS was not satisfied that sufficient information was available to scope out impacts of traffic movements during construction and decommissioning	This assessment was scoped into the assessment.	The associated impacts are assessed in section 12.6 below.
	ID 3.6.3: PINS requested that vibration from construction activities such as piling is	This assessment was scoped into the assessment.	The associated impacts are assessed in

Consultee	Details of Consultee response	How is matter addressed	Location of response
	considered based on likely separation distances from sensitive receptors.		section 12.6 below.
	ID 3.6.4: PINS requested that site-specific predictions and assessments of construction or decommissioning noise and vibration are presented.	This is included into the assessment.	The associated predictions are referenced in section 12.6 below.
	ID 3.6.5: PINS agreed that vehicle trip generation during operation is unlikely to be significant and agreed that this can be scoped out, however the anticipated trip generation during operation should be confirmed.	This was scoped out as agreed.	Chapter 14- Transport and Access (document reference 6.1.14) presents expected trip generation during operation of one or two vehicles per day.
	ID 3.6.6: Vibration impacts from plant during the operational phase can be scoped out but the detailed description of the Proposed Development should demonstrate that operational plant and equipment is of a type and to be used in locations unlikely to generate significant vibration for sensitive receptors.	This was scoped out as agreed.	Chapter 4- Proposed Development (document reference 6.1.4) sets out the type and location of plant which are all static and do not include the type of operation likely to generate perceptible levels of vibration at neighbouring receptors.
	ID 3.6.7: It was proposed to mainly rely on baseline data collected in 2011 but it should be demonstrated that this baseline data is representative. The baseline noise information should be agreed with relevant statutory consultees.	Additional baseline noise measurements were undertaken in consultation with local authorities (see below in this table).	See section 12.5 for a description of the baseline noise environment.
	ID 3.6.8: Mitigation measures to be included in the CEMP and CTMP should be agreed with the local Environmental Health Officer (EHO) where possible	Potential approach to mitigation was discussed in consultation with local authorities (see	See section 12.6 for discussion of mitigation measures.

Consultee	Details of Consultee response	How is matter addressed	Location of response
	ID 3.6.9: noise potentially generated by tracking panels should be assessed.	below in this table). This was assessed in the PEIR but this technology is not proposed anymore.	Not applicable.
North Kesteven District Council (NKDC) – scoping response	With regards to baseline noise levels and the need for more measurements, consultation should be undertaken with Lincolnshire County Council regarding traffic growth. The cumulative impact of ongoing works in connection with the Triton Knoll and Viking Link schemes should be considered.	A new survey was undertaken, see below in this table. Cumulative impacts were considered including that of associated traffic.	Chapter 14- Transport and Access (document reference 6.1.14) considered cumulative construction traffic and associated effects are considered in section 12.8 below.
	NKDC agreed with the proposed study area (including a distance of 250m from the potential solar development area) but queried whether a 500m buffer would be more suitable. A plan showing the receptor locations should be provided.	Following consultation, the assessment of operational and construction noise effects has expanded to consider the closest noise-sensitive receptors to the Site, which are located within approximately 150m to 1200m from the proposed Energy Park areas.	Figure 12.2- Noise assessment locations around the Energy Park (document reference 6.2.12) shows the assessment locations considered.
	The impact of piling noise from construction of the support for the solar panels should be assessed.	This was scoped in the assessment.	The associated impacts are assessed in section 12.6 below.
	Noise from tracking panels should be considered, including associated equipment and propagation effects. Operational noise from the substation,	Tracking panels are not proposed any more. Noise from other electrical plant	The associated impacts are assessed in section 12.6 below.

Consultee	Details of Consultee response	How is matter addressed	Location of response
	inverters and other noise-emitting plant should also be considered.	has been assessed.	
Lincolnshire County Council (LCC)	Most construction activities are unlikely to generate significant effects provided that appropriate working methods and hours are adopted. However, work arising from directional drilling along the Grid Connection Route could become significant. These should be assessed as well as operational noise from the substation and energy storage area.	These potential impacts were considered in the assessment.	The associated impacts are assessed in section 12.6 below.
	LCC disagreed with sole reference to 2011 survey and recommends new monitoring is undertaken to consider both the propose Solar Park and Grid Connection route.	A new survey was undertaken to supplement the historical data.	See section 12.5 for a description of the baseline noise environment.
Boston Borough Council - post-scoping consultation	Boston Borough Council (BCC) EHO recommended direct consultation with NKDC as they did not expect significant impacts in their area.	Consultation was undertaken with NKDC, see below.	Not applicable.
NKDC - post-scoping consultation	A proposed supplementary survey was described by letter (23 February 2022) and the NKDC EHO agreed (25 February 2022) that the proposed survey methodology and locations were satisfactory.	The survey was undertaken as proposed at the end of February 2022.	See section 12.5 for a description of the survey and results.
	Further correspondence (05 May 2022) describing an aspect of the assessment of operational noise, where rated noise levels would be considered low below a certain absolute noise level of 35 dB, even in cases of low background below 30 dB. The EHO responded (06 May 2022) this was understood and had no adverse comments.	This was taken into account in the assessment of operational noise.	See operational noise assessment method (Table 12.2).
Lincolnshire County Council (LCC)	The proposed supplementary noise survey was described by letter (23 February 2022) and no specific comments received in response.	Not applicable.	Not applicable.

12.4.2 In addition, **Table 12.4**, outlines a summary of Section 42 consultation responses since the PEIR.

12.4.3

Table 12.4: Summary of Section 42 Consultation Responses since PEIR

Consultee	Details of Consultee response	How is matter addressed	Location of response
Lincolnshire County Council	<p>Table 12.4 confirms that (without mitigation) some noise-sensitive properties located to the east and south of the proposed energy storage area would experience noise levels higher than the existing typical background noise especially during the quieter night-time period (as a high as +15dB in some cases). The noise modelling carried out as part of the PEIR identifies the location of the energy storage area and assumes a 3m high solid noise barrier would be present around the east, south and west edge. However, paragraph 12.6.15 of the PEIR confirms no such barrier is currently considered within the PEIR.</p> <p>Given the above, at this stage, it is not clear if a 3m high barrier is proposed; if it is, what form this would take (i.e. earth bund or solid fencing) or whether the noise modelling carried out so far does truly represent a possible 'worse case' given a potentially much larger battery storage area is shown on Figure 4.1d which means that elements of this could be closer to the noise sensitive properties currently assessed. This therefore needs to be clarified with the correct site layout plan used as part of the noise modelling and, if a barrier is being proposed and promoted as suitable mitigation to ensure noise levels from the development can be appropriately reduced, then full details of this should be shown and included within the site layout and assessed as part</p>	<p>A screening barrier was considered in the PEIR as a potential mitigation option for noise but this is not required or assumed anymore. This is because the location of the substation and energy storage area has changed to further increase the separation distance between these sources of noise and the majority of noise-sensitive receptors. The worst-case impacts have therefore reduced as a consequence.</p>	<p>See Appendix 12.2- Noise Modelling (document reference 6.3.12.2) – noise modelling for details of the modelling assumptions and results.</p>

Consultee	Details of Consultee response	How is matter addressed	Location of response
	<p>of the final ES. This will be necessary to ensure the benefits that are predicted are realistic and deliverable. The potential impacts of any such barrier would also need to be taken into consideration in assessing other impacts/topics of the ES, for example, such as the LVIA.</p> <p>Figure 3.2 (Working Indicative Site Layout) and Figure 4.1d (Proposed Battery Storage and New Infrastructure) identify significantly different sized areas for the battery storage area. This needs to be clarified to ensure consistency. [...] It is notable that the location/size of the energy storage area used in the noise modelling appears to reflect that shown on Figure 3.2 and not that on Figure 4.1d which is much larger.</p>	<p>Figure 3.2 referred to a previous iteration of the design. In any case, the PEIR modelling was based on a representative quantity of the plant equipment installed towards the south of the area indicated for energy storage, which represented a worst-case. The updated modelling in the revised energy storage area located more centrally is consistent with the required storage capacity and area use indicated in Figure 4.1d- Proposed Energy Storage and New Infrastructure (document reference 6.2.4)</p>	<p>See Appendix 12.2- Noise Modelling (document reference 6.3.12.2) for details of the modelling assumptions and results.</p>
<p>North Kesteven District Council</p>	<p>Table 12.1 states noise levels on the basis that 'this assumes construction during weekday day-time or Saturday mornings for a sustained period of 1 month or more. For sustained works during evening, Sundays, Bank Holidays or Saturday afternoons, the criteria would be reduced by 10dB, and for night-time works by 20dB'. The ES should clarify why and how the 1 week/1 month works</p>	<p>The criteria of the PEIR Table 12.1 were based on professional judgement in addition to the guidance in BS 5228 (Annex E). The latter advises that the duration and character of the impact should be considered to determine if there is a significant effect. A</p>	<p>The criteria of Table 12.1 have been refined and clarified following consultation.</p>

Consultee	Details of Consultee response	How is matter addressed	Location of response
	<p> durations have been specified. Furthermore, it should also explain and give examples of what 'sustained' works relates to in relation to the duration of works and likely noise levels.</p> <p> Tables 12.1 and 12.2 provide different dB levels for construction and operational noise significance; the 'high' effect magnitude for construction assumes +5db above background, whereas for operational noise it assumes +10db above background. The ES will need to set out why different thresholds have been adopted.</p> <p> The ES should explain how the 1 month period has been derived in relation to the overall conclusion of negligible effect [PEIR 12.5.5].</p>	<p> period of one month is referenced several times as a threshold for significance. The thresholds for temporary rehousing or noise insulation reference a minimum duration of 10 days in any 15 days of working.</p> <p> Construction traffic noise increase thresholds are based on the DMRB guidance for short-term traffic changes whereas the operational noise criteria reference BS 4142.</p>	
	<p> Are there any specific considerations in relation to ASD or hypersensitivity to noise stemming from the proximity of Elm Grange school to the proposed works and which need to be factored into the noise assessment? Has contact been made with Elm Grange School to establish whether any pupils are likely to display heightened sensitivity to noise and whether/how this has been accounted for through any corrections or adjustments the construction and operational noise impacts?</p>	<p> The school has been contacted by the Applicant and no concerns were raised regarding potential noise effects of the Proposed Development on the pupils. Nevertheless, the present chapter considers potential impacts in the event that pupils with hypersensitivity to noise are present during either the construction or operation phase.</p>	<p> The associated impacts are assessed in section 12.6 below.</p>
	<p> The locations of proposed HDD drilling should be specified in the ES along with details of whether any mitigation is possible to reduce the anticipated major</p>	<p> Specific locations where drilling may be required along the Cable Route Corridor have been considered on a worst-case basis for</p>	<p> See Figure 4.6- Indicative drill (or similar technology) location (document reference 6.2.4) which shows</p>

Consultee	Details of Consultee response	How is matter addressed	Location of response
	temporary adverse effect which is 'significant'.	the purpose of this assessment.	indicative drill locations – as assessed in this chapter as a worst case assumption for drilling works.
	For operational noise it is assumed that the noise assessment has adopted the indicative layout with a single BESS facility as shown on that plan, along with the disposition of the 132kv and 400kv substations	This was the case for the PEIR but the current assessment reflects the evolution of the design.	See Appendix 12.2- Noise Modelling (document reference 6.3.12.2) for details of the modelling and Figure 4.1d- Proposed Energy Storage Compound (document reference 6.2.4) for an indicative layout of the substation and energy storage area.
	<p>The ES should explain how the +4dB tonal penalty has been adopted.</p> <p>Table 12.4 contains derived background, predicted rated noise levels (dB) and BS 4142 assessment at key receptors. Of note are that Ashley House and Catlins Farm are expected to experience +8db above background daytime and +13db/+15db night-time noise levels. 12.5.19 notes that there is a potential for a medium to high magnitude of change due to operational noise on some highly sensitive receptors under worst-case assumptions and in the absence of any mitigation. This corresponds to moderate to major adverse noise effects which would therefore be significant.</p>	<p>According to BS 4142 a +4 dB penalty represents a tonal character in the noise being “clearly perceptible”, which is likely to be a worst-case given the nature of the sources and distance from noise-sensitive receptors.</p> <p>As discussed above, the location of the substation and energy storage area has changed to further increase the separation distance between these sources of noise and the majority of noise-sensitive receptors. The worst-case impacts have therefore reduced as a consequence.</p>	<p>See Appendix 12.2- Noise Modelling (document reference 6.3.12.2) for details of the modelling and assumptions.</p>

Consultee	Details of Consultee response	How is matter addressed	Location of response
	<p>[PEIR 12.3.8]: The location of the proposed areas of trenchless night-time construction should be identified.</p> <p>Please can estimates be provided as to what the 'shortest practical timescale' is, along with identifying the locations of the probable HDD/trenchless works.</p>	<p>Potential areas of HDD work have been identified in the present assessment based on the proposed Cable Route Corridor.</p> <p>The reference to shortest practical timescale was made in the context of minimising the impacts as part of the construction management.</p>	<p>The grid connection route and potential HDD locations are set out in Figure 4.6- Indicative drill (or similar technology) location (document reference 6.2.4)</p> <p>The associated impacts including work duration estimates are considered in section 12.6 below.</p>
	<p>It should be confirmed through the ES whether a 3m high solid noise barrier is essential to mitigate noise impacts. The above reference suggests that a 3m high solid noise barrier as an integral part of the design has been considered but subsequently discounted? If this is the case there should be a detailed rationale provided. In the consideration of 'alternatives' the ES should also describe how the suggestion of the 'placement of the potentially noisiest sources (such as central inverters, if used) to maximise distance to noise-sensitive receptors' has been considered within the site layout and configuration. [...] The potential impacts of any such barrier would also need to be taken into consideration in assessing other impacts/topics of the ES, for example, such as the LVIA.</p>	<p>As discussed above, this mitigation measure is not considered further. The location of the substation and energy storage area has changed to further increase the separation distance between these sources of noise and the majority of noise-sensitive receptors.</p>	<p>Not applicable.</p>
	<p>Although noise estimates do not include the screening effects of the panels around</p>	<p>The noise modelling did not assume any reduction from the</p>	<p>See Appendix 12.2- Noise Modelling</p>

Consultee	Details of Consultee response	How is matter addressed	Location of response
	<p>the BESS (the noise attenuating effects of which should be detailed in the ES) the Hoare Lea report doesn't then advise what the 'other noise reduction measures' are and if this includes the role of the panels for sound reduction, and what % or amount of mitigation is provided by the panels.</p>	<p>screening effects of the solar panels themselves, although they will in practice provide some screening in many cases. The reductions assumed in the PEIR were based on further mitigation measures at source which are not required and therefore assumed in the present ES.</p>	<p>(document reference 6.3.12.2) for details of the modelling and assumptions.</p>
	<p>It is notable that the location/size of the energy storage area used in the noise modelling appears to reflect that shown on Figure 3.2 and not that on Figure 4.1d which is much larger. On that basis it is not clear whether the noise modelling carried out so far represents a possible 'worse case' given a potentially much larger battery storage area is shown on Figure 4.1d which means that elements of this could be closer to the noise sensitive properties currently assessed.</p>	<p>See discussion above in relation to similar comments made by LCC.</p>	<p>See Appendix 12.2- Noise Modelling (document reference 6.3.12.2) for details of the modelling and assumptions.</p>
<p>Boston Borough Council</p>	<p>Cumulative effects of the cabling works of several other local schemes proposed at Temple Oaks, Folkingham and Bicker Solar Farm should be taken into account as these schemes also propose cabling works to connect to National Grid at Bicker. The potential for cumulative impacts on residential amenity, the environment and heritage assets should be taken into account, along with any proposed mitigation in relation to traffic movements, dust and noise impacts, especially during construction phases.</p>	<p>Chapter 14- Transport and Access (document reference 6.1.14) considers cumulative construction traffic.</p>	<p>The associated effects are considered in section 12.8 below.</p>

Consultee	Details of Consultee response	How is matter addressed	Location of response
British Horse Society	<p>The position of the inverters should ensure they are installed away from the highway or permissive routes. Sudden noise and continuous levels of noise can be a hazard for equestrians as horses are flight animals, therefore the further away these elements can be located, the better it will be for safety.</p>	<p>Noise from inverters likely to be required across the site is continuous rather than impulsive in nature and, although potentially audible on public rights of way, would have relatively low levels (<55 dB LAeq) and so unlikely to cause significant disturbance. Nevertheless, a separation distance of 10m from any plant to public rights of way has been included in the design.</p> <p>Louder noise may occur for limited periods during the construction phase and it is recommended that clear information is provided for transient users of public rights of way (including horse riders) during this period.</p>	<p>See section 12.7 for recommended enhancement measures.</p>

12.5 BASELINE CONDITIONS

Site Description and Context

12.5.1 The baseline noise environment in the vicinity of the Energy Park site was observed to be generally rural in nature, with a range of natural noise sources (bird noise, wind in trees, etc.). Noise from agricultural activities will also represent a contribution at times given the nature of the area, although this may be for limited periods particularly during evening and night-time periods.

12.5.2 Traffic noise, in particular from the A17, also represents a notable influence in the area, which can be dominant for properties located in proximity to the A17, and more distant or minimal for others. As the water in the drains located in the area is generally not running, no audible water noise was noted during the surveys.

12.5.3 This description also applies to the wider assessment area between the Energy Park and the National Grid Bicker Fen Substation, with a decreasing influence of noise from the A17 with increasing distance. Noise from the Bicker Fen Wind Farm can also be audible in some conditions for locations in relative proximity to it.

Baseline Survey Information

12.5.4 The methodology for determining baseline background noise levels in the vicinity of the Proposed Development was discussed at scoping stage, as well as after scoping directly with North Kesteven District Council (NKDC), Boston Borough Council (BBC) and Lincolnshire County Council (LCC). It was agreed to undertake a new noise survey at representative locations around the Energy Park to supplement historical background noise data measured in the area.

12.5.5 This new survey was undertaken at the end of February 2022, at a range of locations agreed in consultation. **Appendix 12.1- Noise Survey** (document reference 6.3.12.1) sets out the results of the new survey as well as summarising the relevant historical data previously measured in the area, both those undertaken in March 2011 for the Heckington Fen Wind Park and in June 2014 to support the assessment of the Triton Knoll Wind Farm onshore Electrical System works. All measurement locations are represented in **Figure 12.1- Noise Survey Locations** (document reference 6.2.12).

12.5.6 The 2022 survey demonstrated that in the day-time, background levels of 33 to 40 dB L_{A90} could be typically experienced at properties neighbouring the Site, with higher noise levels of 44 to 50 dB L_{A90} for locations closer to the A17. During evening periods, levels measured at quieter locations north of the Site tended to decrease to around 31 dB L_{A90} as activity levels decreased, and below 30 dB L_{A90} at night-time. This is considered typical of rural properties, for the majority of periods not affected by agricultural activities. Historical data measured in 2011 at locations north of the Site showed levels sometimes below 30 dB even during quiet day-time periods.

12.5.7 For locations closer to the A17, background levels of around 45 and 37 dB L_{A90} were found to be typical for evening and night-time periods respectively in the 2022 survey. However, historical data measured in 2011 in the rear amenity area at number 2 Council Houses in East Heckington suggests that marginally lower levels were experienced there: typically 40 dB L_{A90} for evening periods and on average around 35 dB L_{A90} for the night-time periods. Ambient levels were typically above 50 dB L_{Aeq} during day-time periods and above 45 dB L_{Aeq} during night-time periods. These comparisons suggest that traffic noise levels on the A17 may have increased since 2011, but consultation feedback suggests this could be due to temporary construction activity in the area, and so it was considered prudent to refer to the historical data as this would provide a more robust assessment for the operational life of the Proposed Development.

12.5.8 For properties set back around 500-600m from the A17, such as Derwent Cottage, the 2022 measurements suggest that background noise levels are marginally (2-3 dB) quieter than for measurements made closer to the A17. However, historical measured data suggests typical levels of around 35 dB for evening periods and below 30 dB for night-time. The College/Caitlins Farm properties are located approximately 1 km from the A17 and therefore experience similar levels as other rural survey locations (particularly based on the 2011 survey).

12.5.9 The typical background noise levels used for the purpose of the BS 4142 analysis based on the above analysis are therefore summarised below in **Table 12.5**.

Table 12.5: Derived typical background noise levels (LA90, dB) based on the review of baseline noise data

Type	Example properties	Quiet (evening) day-time periods	Night-time
Close to the A17 (within 200m)	Elm Grange Farm, Council Houses, The Rakes, etc.	40	35
Within 200-600m of the A17	Derwent Cottage	35	28
Away from the A17 (1 km or more)	Glebe Farm, College Farm	30	23

12.5.10 Finally, for properties south of the A17, along the cable route corridor between the Energy Park and the National Grid Bicker Fen Substation, typical ambient levels during the day-time and night-time vary between 45-50 dB LAeq during the day-time and around 40 dB LAeq at night-time.

Implications of Climate Change

12.5.11 As noted in **Chapter 13- Climate Change** (document reference 6.1.13), increased temperatures and changes in rainfall are projected. As the assessment of noise effects has been considered against a baseline environment in the absence of rainfall, this would not affect the outcome of the assessment. Increased temperatures would affect the need for plant to operate ancillary cooling equipment: however, the assessment has been undertaken on the basis of all plant (including cooling) operating at full duty, even during the night-time and therefore this accounts for future temperature increases.

12.6 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction noise

12.6.1 Full details of the exact construction method, plant and duration are not available at this stage of the Proposed Development. Potential noise levels are therefore assessed on a worst-case basis, considering potential emission noise levels from typical activities based on the type and scale of development. It is however assumed that construction works and associated vehicle movements would be restricted to day-time periods (08:00-18:00) on weekdays and Saturday mornings (08:00-13:00), with most construction activities (see exceptions below) not ongoing at other times.

12.6.2 Potential levels of noise associated with different construction activities, for different distances, are evaluated in **Appendix 12.2- Noise Modelling** (document reference 6.3.12.2). The areas where the solar panel array would be constructed are at least approximately 150m or more from the sensitive receptors identified around the Energy Park. Therefore, most construction activities in these areas, including setting up

temporary site compounds, earthworks and installation of solar panels including percussive piling of support structures, would be associated with noise levels of no more than 55 to 64 dB L_{Aeq} (over the working day).

12.6.3 For the grid connection trench work, at distances of 80 to 400m or more from noise-sensitive receptors (at the closest point), levels of 59 to 45 dB L_{Aeq} are predicted when the activity is at the closest point, and works would move rapidly away. According to the criteria of **Table 12.1**, this would generally represent a low magnitude of change at most, which would correspond to a **temporary minor effect** which is **not significant**.

12.6.4 For more distant properties, located 400m or more from the main construction works, the effects would be negligible. This includes the works associated with the National Grid Bicker Fen Substation extension which are more than 500m from the nearest noise-sensitive locations.

12.6.5 Construction of the Energy Park's main access track from the A17 would occur at closer distances to some properties, approximately 50m from Rectory Cottages, which would correspond to noise levels of up to 65 dB L_{Aeq} , but this would likely only be ongoing for a period of 1-2 months. In addition, properties such as Rectory Cottages experience elevated baseline noise levels from the A17 which will reduce the effects of the construction works in practice. Overall, this is considered to be associated with a **negligible** effect which is **not significant**.

12.6.6 The Energy Park track located closest to Elm Grange Farm and Build-A-Future East Heckington would be used temporarily during an early phase of the construction and could therefore require some upgrading work: although this would be undertaken in relative proximity to sensitive receptors at Build-A-Future East Heckington, these works would last a very short period; furthermore, Build-A-Future East Heckington is also exposed to substantial existing noise from the A17 (with day-time ambient levels typically above 50 dB L_{Aeq}). It is considered that, overall, the magnitude of change would be low at most, representing a **temporary minor effect** which is **not significant**.

12.6.7 Other activities potentially affecting Build-A-Future East Heckington would include construction of the nearest temporary site compound (predicted levels of 51 to 58 dB L_{Aeq}) and piling works for the solar array mounts (predicted levels of 50 to 56 dB L_{Aeq} when piling works occur within 600m of the school). This is only marginally above existing baseline noise levels and which would correspond to negligible impacts based on the criteria of **Table 12.1**. The impact of these activities, even accounting for the increased sensitivity of the receptor (with the potential for some ASD pupils to have increased noise sensitivity), is considered to represent on balance a **temporary minor effect** which is **not significant**. Due to the impulsive character of the piling noise, which is likely to be audible at times when works are ongoing within around 600m from the school, it is however recommended that the school is informed of the start of these works so that the risk of distress for noise-sensitive pupils is minimised.

12.6.8 Specific construction activities associated with cable laying works, both within the Energy Park and the grid connection route, will require trenchless techniques such as horizontal directional drilling (HDD) when crossing certain obstacles – for example the South Forty Foot Drain, the A17 and Internal Drainage Board maintained ditches. An assumption that certain obstacles will be drilled has been assumed to provide a worst case noise assessment. Although other techniques such as micro-bore / pipe jacking could be used, data for an HDD rig has been assumed to represent a worst-case scenario. Potential locations where HDD may be required have been identified both within the Energy Park and within the Cable Route Corridor between the Site and the National Grid Bicker Fen Substation: see **Figure 4.2- Indicative drill (or similar technology) location** (document reference 6.2.4).

12.6.9 Once an HDD bore has been started, it is sometimes not possible to stop until it is completed, depending on several factors include ground conditions and drilling technique, hence the potential need for some night-time working. This means that work could be required outside of the assumed day-time construction hours (i.e. evening, Saturday afternoon, Sundays, Bank Holidays or at night) as a worst-case, the drilling work may need to continue through the night, such that a continuous operation can be completed. Works duration will depend on several factors such as the exact trenchless technique used, ground conditions etc. However, the duration of the actual drilling activity (including potential night-time work) is likely to be less than one week. Despite the short associated duration of the works, this may be associated with potentially significant effects.

12.6.10 **Appendix 12.2- Noise Modelling** (document reference: 6.3.12.2) sets out predicted noise levels from a HDD drilling rig at different distances (on a worst-case basis). The potential closest separation distance of HDD works from the nearest noise-sensitive locations would vary between approximately 80m (for Royalty Farm) to 300m and more for other properties. This would correspond to levels of 55 to 68 dB LAeq over a working period as a worst-case. For work undertaken during normal day-time hours, this would correspond to **negligible or low** magnitude of change when the relative short duration of the works (in any particular location) is taken into account. It could however represent a **Medium** magnitude of change for work near Royalty Farm during evening or Saturday afternoon periods.

12.6.11 If HDD/trenchless works have to continue over the night-time period, in the absence of mitigation, this could represent higher magnitudes of change, as set out below in **Table 12.6**. This assessment is based on the predictions of **Appendix 12.2- Noise Modelling** (document reference: 6.3.12.2) and the criteria of **Table 12.1**.

Table 12.6: Classification of Magnitude of Change – HDD Construction activity at night-time.

Magnitude of effect	Properties within 200m of A17	Other properties	Potentially affected properties
High	<200m	<300m	Royalty Farm, White House Barn, properties on Timms Drove (Council House)
Medium	200-300m	300-500m	Beech House, Home Farm, Rakes Farm, Cattleholme Farm, Ashleigh House, College Cottage, Swineshead House, Bridge Farm and Barns, Derwent Cottage, First Cottage, Timms Drove (Woods).
Low	300-500m	500-850m	<i>Not specified.</i>
Negligible	>500m	>850m	

12.6.12 For some of the properties highlighted in **Table 12.6**, **medium to high** magnitudes of effect could represent a **moderate to major temporary adverse effect** which is **significant**. For properties located further away this would represent a **minor or negligible adverse effect** respectively which is **not significant**.

12.6.13 Traffic associated with the construction works may also be associated with potential effects. This is assessed in **Chapter 14- Transport and Access** (document

reference 6.1.14 / APP-069). The assessment explains that typical construction traffic levels associated with the Energy Park would be less than 90 vehicle movements per day, which is expected to include less than 30 HGV movements on the A17. When compared to the baseline traffic levels on the A17 of around 20,000 vehicles per day (including around 3000-4000 HGVs), the construction traffic would represent a negligible influence (<0.1 dB) in terms of noise for properties located along the A17, based on the guidance in CRTN.

12.6.14 Traffic movements associated with the construction of the cable route would also be similarly limited to low values with similar effects.

12.6.15 Potential traffic associated with the National Grid Bicker Fen Substation extension, as a worst-case, would represent a total of 18 two-way movements per day on average during the busiest construction periods, including 12 HGV trips. The associated heavy vehicle traffic would not be routed through the village of Bicker, but mainly use either the A17 or the A52 (which typically carries more than 5000 vehicles and more than 500 HGVs per day): the relative impact of the additional construction traffic on either of these roads would also represent a negligible influence (<0.1 dB). The final part of the route would use existing haul routes from the A17 or A52 avoiding Bicker: for properties located along these routes, noise levels below 55 dB are predicted from HGV movements using the prediction method²⁰ of BS 5228-1: this corresponds to a negligible effect based on the criteria of **Table 12.1**.

12.6.16 In all cases, noise from traffic associated with the construction works therefore represents in either case a **negligible** effect which is **not significant**.

Construction vibration

12.6.17 Some of the construction activities, such as piling operations, drilling or vibratory rolling techniques, can generate vibration levels in close proximity to their use. Whilst occasional momentary vibration can arise when heavy vehicles pass dwellings at very short separation distances (i.e. 10m or less), this is not sufficient to constitute a risk of significant effects and therefore traffic vibration effects are not considered further in this chapter.

12.6.18 The works associated with construction of the solar arrays could include percussive piling and ground compaction, but as this would be at least 150m from the nearest sensitive receptors, the associated worst-case vibration levels would be **negligible** (<0.3 mm/s).

12.6.19 Similarly, HDD works are commonly considered to be similar to auger boring in terms of vibration generation from rotary boring. BS5228-2 indicates that vibration from such activities falls to below 1 mm/s within a distance of approximately 10m to 15m. It is estimated that for distances of 80m or more, representative of worst-case separation distances for this work, levels would reduce to less than 0.3 mm/s which would therefore also represent negligible effects.

12.6.20 Construction of the main Energy Park access track may involve ground compaction at a distance of 50m from Rectory Cottages, which would be associated with worst-case vibration levels of 0.3 to 0.5 mm/s which would just be perceptible but associated with a low magnitude of change (**Table 12.1**) and therefore represent a **temporary minor adverse effect** which is not significant.

²⁰ The haul route methodology of BS 5228-1 was applied, assuming that HGV generate sound power levels of 108 dB (assuming full power operation which is precautionary), assuming an average of one HGV movement per hour at a dwelling located 5 m from the track centre.

Operation

12.6.21 The additional equipment proposed for the National Grid Bicker Fen Substation extension includes equipment such as circuit breakers and switches which would not produce noise during most operational conditions and will be similar in design to the existing substation switchgear. There will be no additional transformers or other substantial outdoor noise-generating plant installed as part of the Solar Park’s connection at Bicker Fen. Considering that the nearest noise-sensitive properties are more than 500m away and that any noise emitted from the connection bay will be indistinguishable from the normal operational noise from the substation as a whole, no noise assessment of the connection bay is considered necessary.

12.6.22 **Appendix 12.2- Noise Modelling** (document reference 6.3.12.2) details the assumptions made for the noise modelling of operational noise from electrical and mechanical plant associated with the Solar Park, onsite substation and energy storage area, based on manufacturer information. This includes transformers, inverters and associated cooling equipment. Noise modelling was undertaken on this basis, neglecting screening effects from the solar panels and energy storage containers to provide a worst-case assessment.

12.6.23 Although the plant associated with solar energy generation will mainly operate during the daytime, in which background levels tended to be more elevated, daylight periods may extend to early morning periods (05:00 to 07:00) and evening periods during the summer months. Furthermore, the energy storage equipment could operate at any time depending on associated requirements. Therefore, as a worst-case, the plant noise from the Proposed Development has been considered against evening and night-time. These quieter periods will also tend to experience lower temperatures, and therefore plant components providing cooling are likely to operate at reduced duty during these periods. The plant has nevertheless been assumed to operate at full duty which is also likely to be precautionary.

12.6.24 One of the main potential sources of operational noise are the inverters associated with the energy storage, which may be due in part to the conservative assumptions made as the basis of the modelling. As noise from these units and the other inverters and transformers likely to be included as part of the Onsite Substation is likely to include a tonal character which may be “clearly perceptible” (on a worst-case basis), a penalty of +4 dB has been applied to the calculated noise levels in accordance with BS 4142 (see **Appendix 12.1- Noise Survey** (document reference 6.3.12.1)).

12.6.25 The resulting rated noise levels are then compared with background noise levels for the noise-sensitive receptors considered (**Table 12.5**) and the associated magnitude of change is assessed using the criteria of **Table 12.2**. This is set out in detail in **Appendix 12.2- Noise Modelling** (document reference: 6.3.12.2), but a summary for key receptors around the Energy Park is set out below in **Table 12.7**.

Table 12.7: Derived background, predicted rated noise levels (dB, from Solar Park, onsite substation and energy storage area) and BS 4142 assessment at key receptors

Property	Typical background (L _{A90})	Predicted plant noise level (L _{Aeq})	Predicted rated plant noise (L _{Ar})	Difference with background	Magnitude of Change prior to mitigation
Day-time					
Elm Grange Farm	40	30	34	-6	Negligible

Property	Typical background (L _{A90})	Predicted plant noise level (L _{Aeq})	Predicted rated plant noise (L _{Ar})	Difference with background	Magnitude of Change prior to mitigation
Derwent Cottage	35	31	35	0	Low
Ashleigh House	40	34	38	-2	Low
Caitlins Farm	30	27	31	1	Low
Glebe Farm	30	29	33	3	Low
Mill Green Farm	30	28	32	2	Low
Maryland Bank	30	25	29	-1	Low
Night-time					
Elm Grange Farm	35	30	34	-1	Low
Derwent Cottage	28	31	35	7	Low
Ashleigh House	35	34	38	3	Low
Caitlins Farm	23	27	31	8	Low
Glebe Farm	23	29	33	10	Low
Mill Green Farm	23	28	32	9	Low
Maryland Bank	23	25	29	6	Low

12.6.26 The assessment undertaken demonstrates that, in all cases, the worst-case predicted rated noise levels are lower or similar to existing typical background noise levels during quiet periods of the day. According to BS 4142 (see **Table 12.2**) and taking into account the context of the Proposed Development in the area, this a negligible to low magnitude of impact.

12.6.27 When considering night-time periods, the predicted levels are either similar to the typical derived background noise levels (**Table 12.5**) or, if higher than existing background noise levels, do not exceed an absolute level of 35 dB L_{Ar}, which is considered low (see **Table 12.2**). This also corresponds to a low magnitude of change. Furthermore, the predictions are based on worst-case assumptions, including that the inverter plant would operate at full load during quieter periods at night, which is particularly unlikely to occur due to lower temperatures (and therefore reduced cooling loads, which could reduce noise levels by 7 to 10 dB based on available manufacturer information). The contextual analysis (necessary for BS 4142 assessment) therefore concludes that a **low** magnitude of change is predicted.

12.6.28 Finally, the predicted levels of operational noise at Build-A-Future East Heckington would be of no more than 34 dB L_{Ar}, which is more than 5 dB below the typical

background noise levels experienced at this location during day-time periods. Therefore, even accounting for the potential sensitivity of some of the pupils with ASD and the character of the noise, this is considered unlikely to generate significant effects.

12.6.29 In conclusion, the potential effects of operational noise, in all cases, are **minor or negligible adverse** which is **not significant**.

Decommissioning

12.6.30 Decommissioning is likely to involve activities of similar or reduced intensity as for the construction phase and therefore result in comparable noise and vibration effects in the most part; however, trenchless work or piling are unlikely to be required for this phase. The corresponding effects would therefore be **temporary minor** and **not significant**.

12.7 MITIGATION AND ENHANCEMENT

Mitigation by Design

12.7.1 The design of the Proposed Development has been developed to generally maximise the distance between the proposed noise-generating equipment and noise-sensitive receptors. In particular, all central solar inverters would be located at least 200m away from these receptors, and more typically 400m or more (see **Outline Design Principles** (document reference 7.1)).

12.7.2 The main source of noise identified and associated with potential significant noise effects in the PEIR was the energy storage area and onsite substation which was located to the south-east of the Energy Park area. Following the consultation process, it is now proposed to locate this area in a more central part of the Energy Park: this has substantially reduced the noise impacts predicted, with no significant operational noise effects identified even in the absence of mitigation (as set out in **Section 12.6**).

12.7.3 The final route for the grid connection to the National Grid Bicker Fen Substation will be designed to maximise the distance from the works (in particular trenchless works) from noise-sensitive properties, taking into account other constraints. Crossing points requiring potential HDD and associated work areas will be identified and located at the furthest possible distance, within the Order Limits, from dwellings. There is flexibility within the Order Limits at certain crossing points – particularly for those more complex crossings - for example, the drilling pit for crossing the South Forty Foot Drain can be located on the north side of the crossing to maximise the distance to the closest property, Royalty Farm.

Additional Mitigation

Construction

12.7.4 Construction works likely to generate substantial levels of noise, aside from potential trenchless works, and HGV deliveries shall be limited to daytime hours of 08:00 to 18:00 during Monday to Friday, and 08:00 to 13:00 on Saturdays, unless otherwise agreed with the local authorities. Other construction activities unlikely to generate high noise levels (e.g. Site access and inductions, light vehicle movements etc.) may continue during other day-time periods.

12.7.5 If percussive piling is used for the support structures/foundations for the solar array, this should be further restricted (when works are undertaken within 400m of residential properties) to no more than two periods of four hours each with at least one hour of no piling between these four hour periods and restricted to the hours of 08:00 to 18:00 Monday to Friday and 08:00 to 12:00 on Saturdays.

12.7.6 This would reduce the potential effects of most construction activities (aside from trenchless works) to have, at worst, a short-term, temporary, **minor** adverse effect at the nearest residential receptors which is **not significant**.

12.7.7 The worst-case noise levels predicted above for HDD work assumed a location for the drilling rig at ground level and not down in a pit and at the closest potential point to the noise-sensitive receptors identified. Furthermore, the assumed noise levels for this activity may not arise in practice based on many factors, including soil condition and type of equipment used. It may also be possible to interrupt drilling at night. Therefore, the suitability of the proposed mitigation measures discussed below (based on a worst-case) will need to be determined at a later stage, in particular once the final locations of the HDD works (if required) and the necessary equipment have been determined.

12.7.8 HDD locations will be chosen to maximise the separation distance with noise-sensitive locations where possible. Drilling locations within the Energy Park (to cross underground utilities) shall not be closer than 300m from properties located along the A17 and at least 500m from other properties. No HDD will be carried out at locations within 100m of a residential property.

12.7.9 Where possible, HDD works that are likely to result in significant noise effects²¹ at nearby residential receptors will be restricted to daytime working hours on weekdays (i.e. 08:00 to 18:00, Monday to Friday or 08:00 to 13:00 on Saturdays) and interrupted at night. The duration of any trenchless works would be minimised within practical and safety constraints. Local residents potentially affected will be kept informed of the likely period during which the work will take place, the times and durations of planned works and the measures that are being taken to avoid unnecessary noise. On completion of the trenchless works at a particular location, local residents will be informed that the works are complete and noise effects due to trenchless works will cease.

12.7.10 If HDD work is required to continue at night, it should be controlled if possible not to exceed a level of 50dB L_{Aeq} at the closest neighbouring residential properties (or 55 dB L_{Aeq} for properties located within 200m of the A17. If it is not possible to control HDD noise within these limits, the following measures will be investigated:

- use of alternative techniques such as micro-bore / pipe jacking;
- use of temporary noise barriers around trenchless compounds in order to provide screening for sources located at low heights (note however that it is likely to be impractical to provide noise barriers that are high enough to screen an entire HDD drilling rig, for example)
- monitoring noise from the works and interrupting the noisiest drilling work at night;
- offering affected residents temporary re-housing for the duration of the trenchless works.

12.7.11 The above measures can be implemented in the CEMP which can be secured by a DCO requirement.

12.7.12 The above mitigation measures are considered achievable in practice, and it is therefore considered that the potential effect of night-time trenchless works would have, at worst, a short-term, temporary, **minor** adverse effect at the nearest residential receptors which is **Not Significant**.

Operation

12.7.13 Selection of the final solar and electrical plant technology approach would be made on the basis of different considerations including noise. The detailed design of the Proposed Development, including final plant locations and selections, can be controlled through a requirement of the DCO that would establish suitable noise limits at the boundary of the Site. This should be determined such that total rated noise levels L_{Ar} , including the applicable character correction, do not exceed suitable plant noise limits: **Table 12.8**. These limits are defined in terms of rated noise levels, including relevant character penalties (if applicable), as assessed in line with BS 4142. The final plant selection and design to achieve the proposed noise limits can be secured through a DCO requirement.

²¹ Within 300m of properties close to the A17, and within 500m of other properties.

Table 12.8: Proposed plant noise limits (rated noise levels, dB).

Type	Example properties	Quiet (evening) day-time periods	Night-time
Close to the A17 (within 200m)	Elm Grange Farm, Council Houses, The Rakes, etc.	45	39
Within 200-600 m of the A17	Derwent Cottage	39	35
Away from the A17 (1km or more)	Glebe Farm, College Farm	35	35

12.7.14 The results set out in **Section 12.6 (Table 12.7)** and detailed in **Appendix 12.2- Noise Modelling** (document reference 6.3.12.2) have shown that the limits of **Table 12.8** are achievable even on the basis of worst-case assumptions and in the absence of additional mitigation such as screening or plant enclosures.

12.7.15 If the final design includes a reduced number of Energy Storage or central inverter equipment, or if string inverters are used (partially or fully across the site), as allowed by the Design Principles and Works Plans, this would be likely to result in reduced noise levels to those predicted and the conclusions of the above assessment would remain applicable.

12.7.16 The final design of electrical equipment will follow the following process:

- placement of the potentially noisiest sources (such as central inverters, if used and onsite substation) to maximise where possible distance to noise-sensitive receptors, subject to other constraints;
- selection of suitable units based on manufacturer noise data;
- model total noise levels from all electrical plant and compare against the applicable noise limits (**Table 12.8**).

12.7.17 On this basis, residual effects of operational noise, in all cases, remain **minor or negligible** adverse which is **not significant**.

Enhancements

12.7.18 Good practice management measures to minimise construction noise and vibration will also be referenced in the CEMP (which can be secured by a DCO requirement) and implemented by the contractor:

- provision of monthly reporting of information to local residents (including public rights of way users) to advise of potential noisy works;
- setting up and publicising a contact point with the contractor to log, monitor and address any complaints associated with noise during the construction period;
- the Energy Park access road surface will be checked and maintained prior to use;
- mobile plant and stationary plant items to be routed or located to maximise separation distance from noise-sensitive receptors (where possible), accounting for site-specific constraints;
- select quieter plant units where possible;
- all plant when not in use is to be switched off;
- operate only well-maintained construction plant selected for the specific activity; and

- provide site specific induction inclusive of good neighbourly behaviour and follow the Considerate Construction Scheme requirements.

12.7.19 The above would represent best practice. Further guidance in this regard in BS 5228-1 will also be referenced.

12.7.20 It is also recommended to specifically engage with Build-A-Future East Heckington and inform them of anticipated works periods, in particular the upgrade and temporary use of the track west of Elm Grange and piling works within 600m.

12.7.21 All proposed mitigation measures are summarised in **Table 12.9**.

Table 12.9: Mitigation summary

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured	
		By Design	DCO requirement
1	Site design maximising distances from main sources of noise (from construction and operation) to noise-sensitive receptors where possible.	X	
2	Detailed design and selection of electrical/mechanical plant to achieve suitable noise limits.		X
3	Restriction of construction and piling working hours, good practice measures to minimise construction noise and vibration (as part of CEMP).		X
4	Minimise extent and effects of trenchless work particularly for night-time work; liaise with closest affected residents; interrupt drilling at night or investigate alternative techniques, screening and/or temporary re-housing.		X

12.8 CUMULATIVE AND IN-COMBINATION EFFECTS

12.8.1 The above assessment has demonstrated that beyond a distance of approximately 1km, construction works (within the Energy Park) and operational noise effects from the Proposed Development become negligible.

12.8.2 As can be seen within **Table 2.8** in **Chapter 2- EIA Methodology and Public Consultation** (document reference 6.1.2) of this ES there are 15 cumulative sites that have been requested to be included within the cumulative assessment. Of these, four are within 5km of the Energy Park, with the Solar Farm development of Vicarage Drove (B/21/0443) being located closest to the Proposed Development as is briefly encompassed by the Order Limits and located in close proximity to the National Grid Bicker Fen Substation.

12.8.3 This scheme at Vicarage Drove was approved in February 2022, with a planning condition that works on the site must commence within 4 years. It is, therefore, likely that this scheme would be operational by the time the extension to National Grid Bicker Fen

Substation for the Heckington Fen proposal was being built. However, even if Vicarage Drove and the extension to the Bicker Fen Substation were being built at the same time, there would be no significant cumulative operational noise issue given the separation distances involved. **Chapter 14 -Transport and Access** (document reference 6.1.14) considers that cumulative traffic impacts considerations are also unlikely to be significant and this would also be the case for noise.

12.8.4 The other schemes are located too far away from the Proposed Development to result in a cumulative noise impact from either the construction, operation or decommissioning phase, given the localised nature of the impacts identified.

12.9 SUMMARY

Introduction

12.9.1 This chapter has considered the potential effects of noise and vibration associated with the Proposed Development, both associated with the different construction and decommissioning activities and traffic, as well as the operational phase.

Baseline Conditions

12.9.2 The baseline conditions were determined from a combination of new survey work and reference to historical data captured at noise-sensitive receptors neighbouring the Energy Park.

Likely Significant Effects

12.9.3 The assessment has identified potential significant noise effects if trenchless work is required and remains active at night, depending on the final locations where this may be required along the grid connection route.

12.9.4 Noise and vibration from other construction activities may be audible or perceptible at times but the worst-case levels are such that, providing construction working hours are controlled in a standard manner, their effect would be either not significant or negligible. Construction traffic is associated with negligible effects.

12.9.5 Likely levels of operational noise from electrical or mechanical plant, in relation to the baseline noise environment and context of the area (during quieter periods of the evening and night), on the basis of worst-case assumptions, are such that no significant effects are expected.

Mitigation and Enhancement

12.9.6 Construction working hours would be controlled for most noise-generating activities, and good practice measures would further reduce noise levels in practice.

12.9.7 The potential effects of HDD trenchless construction if required for night-time work would be minimised and managed through the selection of the final drilling locations and liaison with the closest affected residents. Where these works are required in relative proximity to sensitive receptors, such that significant effects remain likely, the drilling will be interrupted at night where possible, or alternatively different trenchless techniques, screening, or offer of temporary re-housing (for the duration of these works) would be investigated. Residual effects would likely be minor at most following implementation of these measures.

12.9.8 Operational noise would be controlled to a set of proposed noise limits at the nearest noise-sensitive receptors through detailed design and selection of

electrical/mechanical equipment, attenuation and/or screening measures. The residual effects would then be either not significant or negligible.

Cumulative and In-combination Effects

12.9.9 No Cumulative or In-combination Effects of noise or vibration were identified.

Conclusion

12.9.10 It is therefore concluded that the effects of the Proposed Development can be suitably controlled such that significant adverse effects are eliminated where reasonably practicable.

12.9.11 **Table 12.10** provides a summary of effects, mitigation and residual effects.

Table 12.10: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Construction								
Residential/ educational receptors	Construction activities noise – except trenchless work	Temporary direct	High	Negligible to low	Local	Negligible to Minor adverse	CEMP including restriction of working hours, good practice measures.	Negligible to Minor (not significant)
Residential/ educational receptors	Construction traffic noise	Temporary direct	High	Negligible	Regional	Negligible	CTMP including restriction on movement hours.	Negligible (not significant)
Residential/ educational receptors	Construction trenchless work Noise	Temporary direct	High	Medium to High	Local	Moderate to Major adverse	Minimise extent and effects of trenchless work particularly for night-time HDD; liaise with closest affected residents; interrupt drilling at night or investigate alternative techniques, screening and/or temporary re-housing. Implemented in CEMP.	Minor (not significant)
Residential/ educational receptors	Construction Vibration	Temporary direct	High	Negligible to Low	Local	Negligible to Minor adverse	CEMP including restriction of working hours,	Negligible to Minor

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Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
							good practice measures	(not significant)
Operation								
Residential/ educational receptors	Operational Noise	Permanent direct	High	Negligible to Low	Local	Negligible to Minor adverse	Detailed design and selection of electrical/mechanical plant to achieve suitable noise limits. Set out in DCO requirement.	Negligible to Minor adverse (not significant)
Decommissioning								
Residential/ educational receptors	Decommissioning activities noise and vibration	Temporary direct	High	Negligible to low	Local	Negligible to Minor adverse	DEMP including restriction of working hours, good practice measures.	Negligible to Minor adverse. (not significant)
Cumulative and In-combination								
None								