# Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

## Preliminary Environmental Information Report

**Volume 1**

## Chapter 25 - Noise & Vibration

April 2021

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## Glossary of Acronyms

| | |
|---|---|
| AAWT | Annual Average Weekday Traffic |
| AIS | Air Insulated Switchgear |
| AONB | Area of Outstanding Natural Beauty |
| BDC | Broadland District Council |
| BNL | Basic Noise Level |
| BPM | Best Practicable Means |
| BS | British Standard |
| BSI | British Standards Institution |
| Cefas | Centre for Environment, Fisheries and Aquaculture Science |
| CIA | Cumulative Impact Assessment |
| CoCP | Code of Construction Practice |
| CRTN | Calculation of Road Traffic Noise |
| DCO | Development Consent Order |
| DECC | Department for Energy and Climate Change |
| DEFRA | Department for the Environment and Rural Affairs |
| DEP | Dudgeon Extension Project |
| DMRB | Design Manual for Roads and Bridges |
| DOW | Dudgeon Offshore Wind Farm |
| EC | European Commission |
| EIA | Environmental Impact Assessment |
| EPA | Environmental Protection Act |
| EPP | Evidence Plan Process |
| EPS | European Protected Species |
| EPUK | Environmental Protection United Kingdom |
| EQS | Environmental Quality Standards |
| ES | Environmental Statement |
| ETG | Expert Topic Group |
| EU | European Union |
| eVDV | Estimated Vibration Dose Value |
| GIS | Gas Insulated Switchgear |
| GIS | Geographical Information System |
| HVAC | High-Voltage Alternating Current |

| | |
|---|---|
| HVDC | High-Voltage Direct Current |
| IPC | Infrastructure Planning Commission |
| IROPI | Imperative Reasons of Overriding Public Interest |
| ISO | International Standards Organisation |
| km | Kilometre |
| LOAEL | Lowest Observed Adverse Effect Level |
| LPA | Local Planning Authority |
| MW | Megawatts |
| NGET | National Grid Electricity Transmission |
| NNDC | North Norfolk District Council |
| NOEL | No Observed Effect Level |
| NorCC | Norwich City Council |
| NP | National Park |
| NPPF | National Planning Policy Framework |
| NPPG | National Planning Practice Guidance |
| NPS | National Policy Statement |
| NPSE | Noise Policy Statement England |
| NSIP | Nationally Significant Infrastructure Project |
| NSR | Noise Sensitive Receptor |
| OAE | Observed Adverse Effect |
| OS | Ordnance Survey |
| OWF | Offshore Wind Farm |
| PEIR | Preliminary Environmental Information Report |
| PID | Public Information Days |
| PPG | Planning Practice Guidance |
| PPV | Peak Particle Velocity |
| PRA | Preliminary Risk Assessment |
| PRoW | Public Rights of Way |
| SEP | Sheringham Shoal Extension Project |
| SLM | Sound Level Meter |
| SNC | South Norfolk Council |
| SNS | Southern North Sea |
| SoS | Secretary of State |

| | |
|---|---|
| SOAEL | Significant Observed Adverse Effect Level |
| TEU | Treaty of the European Union |
| TMP | Traffic Management Plan |
| TRL | Transport Research Laboratory |
| TRRL | Transport and Road Research Laboratory |
| UK | United Kingdom |
| UN | United Nations |
| VDV | Vibration Dose Value |
| WHO | World Health Organisation |
| WTG | Wind Turbine Generator |

## Glossary of Terms

| | |
|---|---|
| The Applicant | Equinor New Energy Limited |
| Array cables | Cables which link the wind turbine generators to the offshore substation platforms. |
| Cable Sealing End Compound | A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation. |
| Cable Sealing End (with circuit breaker) Compound | A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation. |
| Construction Consolidation Sites | Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure. |
| dB(A) | Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A). |
| dB(Z) or (dB Linear) | Decibels measured on a sound level meter incorporating a flat frequency weighting (Z or Linear weighting) across the frequency range. |
| Decibel (dB) | A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in |

| | |
|---|---|
| | noise level of 3dB(A) is the smallest perceptible change. |
| Development Area | The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order). |
| Dudgeon Offshore Wind Farm Extension site | The Dudgeon Offshore Wind Farm Extension offshore wind farm boundary. |
| The Dudgeon Offshore Wind Farm Extension Project (DEP) | The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure. |
| European site | Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017. |
| Evidence Plan Process (EPP) | A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics. |
| Horizontal directional drilling (HDD) zones | The areas within the onshore cable route which would house HDD entry or exit points. |
| Interlink cables | Buried offshore cables which link offshore substation platforms. |
| Jointing bays | Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts. |
| $L_{A10,T}$ | The A weighted noise level exceeded for 10% of the specified measurement period (T). $L_{A10}$ is the index generally adopted to assess traffic noise. |
| $L_{A90,T}$ | The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142:2014+A1:2019 it is used to define the 'background' noise level. |
| $L_{Aeq,T}$ | The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter. |
| $L_{Amax}$ | The maximum A-weighted sound pressure level recorded during a measurement. |

| | |
|---|---|
| Landfall | The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water |
| Mitigation Areas | Areas captured within the onshore development area specifically for mitigating expected or anticipated impacts. |
| National Electricity Grid | The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission |
| Onshore scoping area | An area that encompasses all planned onshore infrastructure and allows sufficient room for receptor identification and environmental surveys. This will be refined following further site selection and consultation. |
| Onshore Substation sites | Parcels of land within onshore substation zones A and B, identified as the most suitable location for development of the onshore substation. Two sites have been identified for further assessment within the PEIR |
| Onshore Substation Zone | Parcels of land within the wider onshore substation search area identified as suitable for development of the onshore substation. Two substation zones (A and B) have been identified as having the greatest potential to accommodate the onshore substation. |
| Study area | Area where potential impacts from the project could occur, as defined for each individual EIA topic. |
| Sheringham Shoal Offshore Wind Farm Extension site | Sheringham Shoal Offshore Wind Farm Extension offshore wind farm boundary. |
| The Sheringham Shoal Offshore Wind Farm Extension Project (SEP) | The Sheringham Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure. |

# 25 NOISE AND VIBRATION

## 25.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the potential impacts of the proposed Dudgeon Extension Offshore Wind Farm Project (DEP) and Sheringham Shoal Extension Offshore Wind Farm Project (SEP) in relation to potential on noise and vibration impacts. The chapter provides an overview of the existing environment for the proposed onshore aspects of DEP and SEP, followed by an assessment of the potential impacts and associated mitigation for the construction, operation, and decommissioning phases of DEP and SEP.
2. This assessment was undertaken with specific reference to the relevant legislation and guidance, of which the primary sources are the National Policy Statements (NPS). Details of these and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Impact Assessment (CIA) are presented in **Section 25.4**.
3. The assessment should be read in conjunction with following linked chapters:
   - **Chapter 22 Onshore Ecology**;
   - **Chapter 23 Archaeology and Cultural Heritage**;
   - **Chapter 26 Traffic and Transport**;
   - **Chapter 29 Socio-Economics**; and
   - **Chapter 30 Health**.
4. Additional information to support the Noise and Vibration assessment includes:
   - **Appendix 25.1 Road Traffic Noise Assessment**;
   - **Appendix 25.2 Construction Noise Assessment**; and
   - **Appendix 25.3 Onshore Substation Zone Operational Noise Assessment**.

## 25.2 Consultation

5. Consultation with regard to noise and vibration has been undertaken in line with the general process described in **Chapter 6 EIA Methodology**. The key elements to date have included scoping and consultation with Broadland District Council (BDC), South Norfolk Council (SNC) and Norwich City Council (NorCC) to discuss the approach for determining the existing noise environment, detailed in **Section 25.5**. The feedback received has been considered in preparing this chapter. **Table 25-1** provides a summary of how the consultation responses received to date have influenced the approach that has been taken.
6. This chapter will be updated following the consultation on the PEIR in order to produce the final assessment that will be submitted with the Development Consent Order (DCO) application. Full details of the consultation process will also be presented in the Consultation Report alongside the DCO application.

*Table 25-1: Consultation responses.*

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| Scoping Opinion | Scoping Opinion Response 19/11/19 | Paragraphs 744 and 745 of the Scoping Report state that there will be no significant sources of vibration associated with the operational substation due to use of vibration isolation pads/mounts to prevent transmission of ground borne vibration according to industry standards.<br><br>The Scoping Report states that there will be negligible levels of ground-borne vibration, but no details of industry standards have been provided and at this stage the exact location of onshore infrastructure and proximity to receptors has not yet been determined. The Inspectorate therefore does not agree this can be scoped out at this stage. | Refer to **Section 25.4.3.7** for discussion on operational phase vibration impacts. |
| Scoping Opinion | Scoping Opinion Response 19/11/19 | Table 3-19 proposes to scope out transboundary impacts from increased noise and vibration, although no justification is provided within the aspect chapter. Nevertheless, given the nature of the Proposed Development the Inspectorate agrees that significant transboundary effects of this type are unlikely and therefore this matter can be scoped out of the ES. | Transboundary impacts scoped out of assessment. |
| Scoping Opinion | Scoping Opinion Response 19/11/19 | The Inspectorate agrees that given the distance between the proposed offshore wind farm arrays and the coast, construction activities in the array area are unlikely to result in significant effects to onshore receptors and that this matter can be scoped out of the ES. | Noise impacts from the offshore wind farm arrays scoped out of the assessment. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| | | With regards to the installation of the export cable, no evidence has been provided to back up the assertion that “noise generated by cable laying vessels is generally low and is unlikely to be significantly elevated above background levels”. In the absence of a defined cable route, it is not possible to determine what receptors could be potentially affected from near-shore. The Inspectorate considers that any likely significant effects should be assessed. | As offshore cable laying vessels will be greater than 1km form the shore, they have not been considered in the assessment. |
| Scoping Opinion | Scoping Opinion Response 19/11/19 | The Inspectorate agrees that given the distance between the proposed offshore wind farm arrays and the coast, operational turbine noise is unlikely to result in significant effects to onshore receptors and that this matter can be scoped out of the ES. | Noise impacts from the offshore wind farm arrays scoped out of the assessment. |
| Scoping Opinion | Scoping Opinion Response 19/11/19 | The ES should provide a description of the noise generation aspects of the Proposed Development for both the construction and operation stage. Any distinctive tonal, impulsive or low frequency characteristics of the noise should be described. | Potential construction noise is presented in **Section 25.6.1.1**<br><br>Operational noise associated with the onshore substation is described in **Section 25.6.2.1** and supplemented by **Appendix 25.3**. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| Scoping Opinion | Scoping Opinion Response 19/11/19 | The Scoping Report acknowledges the potential for piling of foundations for the substation and infrastructure (including National Grid infrastructure, drilling rigs at the landfall, and along the onshore cable route). The ES should identify the locations of any necessary piling and assess the impacts. Where uncertainty exists, the assessment should be undertaken on the basis of the worst case scenario for noise. | Consideration of noise associated with piling is presented in **Section 25.6.1.3**. |
| Scoping Opinion | Scoping Opinion Response 19/11/19 | The ES should provide details of any noise modelling undertaken to inform the assessment, including the relevant input parameters. | Details of noise modelling for the onshore substation options are provided in **Appendix 25.3**. |
| Scoping Opinion | Scoping Opinion Response 19/11/19 | The Scoping Report has not provided a justification for scoping these matters out of the assessment. The Inspectorate considers that significant effects to any recreation/tourism assets along the onshore cable route are unlikely to be significant during the operational phase.<br>However, the exact location of the onshore substation has not yet been determined and Figure 4.4.1 shows a number of tourist attractions within the search area for the substation. As such, the Inspectorate considers it would be premature to scope out the potential for loss of, disturbance to and visual impacts to tourism and recreation assets.<br>However, the Inspectorate agrees that significant effects to these receptors from noise and dust during operation are unlikely and | Operational noise impacts associated with disturbance to recreation and tourism scoped out of the assessment. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| | | that these matters can be scoped out of the assessment. | |
| Broadland District Council (BDC) detailed in the Scoping Response | Email attached to Scoping Response 01/12/20 | On behalf of the District Council I would like to request that the Environmental Statement includes the impacts of the proposals on the following topics:<br>Historic environment (including cultural heritage, listed building and archaeology);<br>Landscape (including important views, trees, historic hedgerows) and have regard to the District Council's Landscape Character Assessment SPD;<br>Biodiversity;<br>Geology & Soils;<br>Noise, Vibration and Air Quality;<br>People and Communities. | Potential noise and vibration impacts considered in **Section 25.6**. |
| Cawston Parish Council (CPC) detailed in the Scoping Response | | A full assessment of the cumulative impact of Dudgeon Sheringham shoal extensions with the three other windfarm cable route schemes which affect North Norfolk including the Cawston area.<br>All assessments of items affecting public health and well-being, including noise and vibration, air quality and traffic impacts, should include the cumulative impacts with the other schemes noted above. | Cumulative noise impacts are assessed in **Section 25.7**. It should be noted that the Applicant has committed to avoid routing DEP and SEP construction traffic through Cawston. |
| Natural England (NE) detailed in the Scoping Response | | Schedule 4 of the Town & Country Planning (Environmental Impact Assessment) Regulations 2017 sets out the necessary information to assess impacts on the natural environment to be included in an Environmental Statement (ES), specifically:<br>Expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) | Potential noise impacts associated with DEP and SEP discussed in **Section 25.6**. |

| Consultee | Date/ Document | Comment | Project Response |
|---|---|---|---|
| | | resulting from the operation of the proposed development. | Potential impacts on onshore ecology are considered in **Chapter 22**. |
| Oulton Parish Council (OPC) detailed in the Scoping Response | | Oulton Parish Council wish to highlight these main concerns… Traffic and transport (project in isolation and cumulative with other projects) Noise from traffic and construction (project in isolation and cumulative with other projects) Night time working (noise and light pollution) | Potential noise impacts associated with construction works are considered in **Section 25.6.1.1**, impacts associated with construction traffic are considered in **Section 25.6.1.2**. |

## 25.3 Scope

### 25.1.1 Study Area

7. The study area for noise and vibration has been defined as the full extent of the onshore PEIR boundary including the landfall location, onshore cable corridor and onshore substation site options as detailed on **Figure 25.1**.

### 25.1.2 Realistic Worst-Case Scenario

#### 25.1.2.1 General Approach

8. The final design of DEP an SEP will be confirmed through detailed engineering design studies that will be undertaken post-consent. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst-case scenario for each individual impact, so that it can be safely assumed that all lesser options will have less impact. Further details are provided in **Chapter 6 EIA Methodology**.
9. The realistic worst-case scenarios for the noise and vibration assessment are summarised in **Table 25-2**. These are based on the construction and operation parameters described in **Chapter 5 Project Description**, which provides further details regarding specific activities and their durations.

10. In addition to the design parameters set out in **Table 25-2**, consideration is also given to how DEP and SEP will be built out as described in **Section 25.1.2.2** to **Section 25.1.2.4** below. This accounts for the fact that whilst DEP and SEP will be the subject of a single DCO application, it is possible that either one or both of DEP and SEP could be developed, and if both are developed, that construction may be undertaken either concurrently or sequentially.

*Table 25-2: Realistic Worst Case Scenarios.*

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| **Construction** | | | | |
| Impacts relating to the landfall | Temporary HDD works<br>• HDD temporary works compound area = 5,750m$^2$<br>• Transition joint bay size = 10 x 15m.<br>• Total construction space required = 30,000m$^2$<br>• One active HDD rig | Temporary HDD works<br>• HDD temporary works compound area = 5,750m$^2$<br>• Transition joint bay size = 15 x 15m.<br>• Total construction space required = 30,000m$^2$<br>• One active HDD rigs | Temporary HDD works<br>• HDD temporary works compound area = 5,750m$^2$ for each project (overlapping)<br>• Transition joint bay size = 10 x 15m for each project<br>• Total construction space required for each project = 30,000m$^2$ (overlapping)<br>• One active HDD rig | The HDD works should not require any prolonged periods of restrictions or closures to the beach for public access, although it is possible that some work activities will be required to be performed on the beach that may require short periods of restricted access. |
| Impacts relating to the onshore cable corridor | Temporary access<br>• Various from public highway (6m wide) to single tracks (3m wide).<br>• Access haul road dimensions = 60km long by 6m wide. | Temporary access<br>• Various from public highway (6m wide) to single tracks (3m wide).<br>• Access haul road dimensions = 60km long by 6m wide. | Temporary access<br>• Various from public highway (6m wide) to single tracks (3m wide).<br>• Access haul road dimensions = 60km long by 6m wide. | The onshore cable duct will be installed in sections of up to 1km at a time, with a typical construction presence of up to four weeks along each 1km section. |

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| | Duration<br>• 24 months in total | Duration<br>• 24 months in total | Duration<br>• 24 months in total | |
| | Material volumes<br>• Width of top soil storage = 6m<br>• Quantity of material excavated for cable trench = 180,000m$^3$ of which 36,000m$^3$ to be disposed of | Material volumes<br>• Width of top soil storage = 6m<br>• Quantity of material excavated for cable trench = 360,000m$^3$ of which 72,000m$^3$ to be disposed of | Material volumes<br>• Width of top soil storage = 6m<br>• Quantity of material excavated for cable trench = 360,000m$^3$ of which 72,000m$^3$ to be disposed of | |
| | Construction corridor<br>• Total width = 45m<br>• Jointing bays = 120 (approximately every 500m) buried below ground<br>• Jointing bay dimensions = 12m long by 4m wide by 2m deep within the working corridor | Construction corridor<br>• Total width = 60m<br>• Approximately 120 jointing bays (one every 500m) buried below ground<br>• Jointing bay dimensions = 12m long by 4m wide by 2m deep within the working corridor.<br>• Two trenches, each 1m wide by 1.75m deep. | Construction corridor<br>• Total width = 60m<br>• Approximately 240 jointing bays (one every 500m) buried below ground along each cable trench<br>• Jointing bay dimensions of 12m long by 4m wide by 2m deep within the working corridor. | |

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| | • One trench, 1m wide by 1.75m deep.<br>• Minimum cable burial depth at 1.2m | • Minimum cable burial depth at 1.2m | • Two trenches, each 1m wide by 1.75m deep.<br>• Minimum cable burial depth at 1.2m | |
| | <u>Construction compounds</u><br>• Up to 2 main compounds of 60,000m$^2$ each<br>• 8 secondary compounds of 2,500m$^2$ each<br>• HDD compounds = 1,500m$^2$ - 4,500m$^2$ | <u>Construction compounds</u><br>• Up to 2 main compounds of 60,000m$^2$ each<br>• 8 secondary compounds of 2,500m$^2$ each<br>• HDD compounds = 1,500m$^2$ - 4,500m$^2$ | <u>Construction compounds</u><br>• Up to 2 main compounds for each project of 60,000m$^2$ each<br>• 8 secondary compounds for each project of 2,500m$^2$ each<br>• HDD compounds = 1,500m$^2$ - 4,500m$^2$ | |
| Impacts relating to the onshore substation | <u>Substation footprint</u><br>• Permanent area = 3.25ha.<br>• Temporary construction area = 1ha<br>• Total construction area = 4.25ha | <u>Substation footprint</u><br>• Permanent area = 6.0ha<br>• Additional construction area = 1ha<br>• Total construction area = 7.0ha. | <u>Substation footprint</u><br>• Permanent area = 6.25ha<br>• Additional construction area = 1ha<br>• Total construction area = 7.25ha. | |
| | <u>Duration</u><br>• 36 months in total | <u>Duration</u><br>• 36 months in total | <u>Duration</u><br>• 36 months in total for each project | |
| Construction traffic | Peak construction traffic provided for DEP and SEP concurrently as a worst-case; as detailed in **Chapter 26 Traffic and Transport** and presented in **Appendix 25.1** | | | |

| Impact | Parameter DEP or SEP in isolation | DEP and SEP concurrently | DEP and SEP sequentially | Notes and Rationale |
|---|---|---|---|---|
| **Operation** | | | | |
| Impacts relating to the onshore cable route | Link boxes<br>• Below ground = 120 (up to 2m x 2m x 1.5m) plus an above ground marker post at each location<br>• Above ground = 120 (up to 1.5m x 1m x 1.5m) | Link boxes<br>• Below ground = 120 (up to 2m x 2m x 1.5m) plus an above ground marker post at each location<br>• Above ground = 120 (up to 1.5m x 1m x 1.5m) | Link boxes<br>• Below ground = 120 for each project (up to 2m x 2m x 1.5m) plus an above ground marker post at each location<br>• Above ground = 120 for each project (up to 1.5m x 1m x 1.5m) | Link boxes are expected to be below ground. Alternatively link boxes may be above ground in cabinets. |
| Impacts relating to the onshore substation | Operational phase equipment layout provided for DEP and SEP together (concurrent) as a worst-case based on 6.25 footprint; noise levels associated with each item of equipment are presented in **Appendix 25.3** | | | |
| **Decommissioning** | | | | |
| No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable route and onshore substation. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore project equipment, including the cable, will be removed, reused or recycled where possible and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the purposes of a worst case scenario, the impacts will be no greater than those identified for the construction phase. | | | | |

#### 25.1.2.2 Construction Scenarios

11. The following principles set out the framework for how DEP and SEP may be constructed:
    - DEP and SEP may be constructed at the same time, or at different times;
    - If built at the same time both Projects could be constructed in four years;
    - If built at different times, either Project could be built first;
    - If built at different times the first project would require a four-year period of construction, the second project a three-year period of construction;
    - If built at different times, the duration of the gap between end of onshore construction of the first project, and the start of onshore construction of the second project may vary from 0 to 1 years;
    - Assuming maximum construction periods, and taking the above into account, the maximum period over which the construction of both projects could take place is 7 years; and
    - The earliest construction start date is 2025 and the latest is 2028.
12. In order to determine which construction scenario presents the realistic worst case for each receptor and impact, the assessment considers both maximum duration effects and maximum peak effects, in addition to each project being developed in isolation, drawing out any differences between each of DEP and SEP.
13. The three construction scenarios considered by **the Chapter 25 Noise and Vibration** are therefore:
    - Build DEP or build SEP in isolation;
    - Build DEP and SEP concurrently – reflecting the maximum peak effects; and
    - Build one project followed by the other with a gap of up to one year between the onshore builds (sequential) – reflecting the maximum duration of effects.
14. Any differences between DEP and SEP, or differences that could result from the manner in which the first and the second projects are built (concurrent or sequential and the length of any gap) are identified and discussed where relevant in the impact assessment section of this chapter (**Section 25.6**). For each potential impact only the worst case construction scenario for DEP and SEP is presented, i.e. either concurrent or sequential. The justification for what constitutes the worst case is provided, where necessary, in **Section 25.6**.

#### 25.1.2.3 Operation Scenarios

15. Operation scenarios are described in detail in **Chapter 5 Project Description**. The relevant scenarios for the onshore operation are:
    - Either DEP or SEP operating in isolation; and
    - DEP and SEP operating at the same time, with a gap of up to one year between each project commencing operation.

16. For PEIR the operation assessment has focussed on DEP and SEP operating at the same as this represents worst case. An additional assessment of the single project scenario will be included within the ES as part of the full application.

17. The operational lifetime of each project is expected to be 35 years.

#### 25.1.2.4 Decommissioning Scenarios

18. Decommissioning scenarios are described in in **Chapter 5 Project Description**. Decommissioning arrangements will be agreed through the submission of a Decommissioning Plan prior to construction, however for the purpose of this assessment it is assumed that decommissioning of DEP and SEP could be conducted separately, or at the same time.

### 25.1.3 Summary of Mitigation Embedded in the Design

19. This section outlines the embedded mitigation relevant to the noise and vibration assessment, which has been incorporated into the design of DEP and SEP (**Table 25-4**). Where other mitigation measures are proposed, these are detailed in the impact assessment (**Section 25.6**).

*Table 25-3: Embedded Mitigation Measures*

| Parameter | Mitigation Measures Embedded into the Design of DEP and SEP |
|---|---|
| **Construction** | |
| Operational substation location | Site selection has identified two onshore substation site options in proximity to the existing Norwich Main substation identifying land at least 345m from the nearest residential properties. |
| HDD at landfall location | Long HDD (up to 1.25km) avoiding trenching works within the intertidal and offshore cable laying vessels would be no closer than 1km from the shore. |

## 25.4 Impact Assessment Methodology

### 25.1.4 Policy, Legislation and Guidance

#### 25.1.4.1 National Policy Statements

20. The assessment of potential impacts upon noise and vibration has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to DEP and SEP are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DECC 2011c).

21. The specific assessment requirements for noise and vibration, as detailed in the NPS, are summarised in **Table 25-4** together with an indication of the section of the PEIR chapter where each is addressed.

*Table 25-4: NPS Assessment Requirements.*

| NPS Requirement | NPS Reference | Section Reference |
|---|---|---|
| **En-1 NPS for Energy (EN-1)** | | |
| • Where noise impacts are likely to arise, the applicant should include:<br>• A description of the noise generating aspects of the development proposal leading to noise impacts including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise;<br>• Identification of noise sensitive premises and noise sensitive areas that may be affected;<br>• The characteristics of the existing noise environment;<br>• A prediction of how the noise environment will change with the proposed development;<br>• In the shorter term such as during the construction period;<br>• In the longer term during the operating life of the infrastructure;<br>• At particular times of the day, evening and night as appropriate;<br>• An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and<br>• Measures to be employed in mitigating noise.<br>• The nature and extent of the noise assessment should be proportionate to the likely noise impact. | EN-1, paragraph 5.11.4 | Refer to **Section 25.4.3** for the assessment methodology for assessing potential noise and vibration impacts, **Section 25.5** for details on the existing noise environment including the identification of NSRs and **Section 25.6** where any changes in noise levels as a result of DEP and SEP Projects are assessed, and any potential impacts and potential mitigation measures are identified. |

| NPS Requirement | NPS Reference | Section Reference |
|---|---|---|
| The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered. | EN-1, paragraph 5.11.5 | Refer to **Section 25.6.1.2** where any changes in noise levels as a result of DEP and SEP from ancillary works, for example vehicle movements, are assessed and any potential impacts and potential mitigation measures are identified. |
| Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on assessment of particular noise sources may be contained in the technology-specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there are assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies. | EN-1, paragraph 5.11.6 | Any changes in noise levels as a result of DEP and SEP are assessed in **Section 25.6**, and any potential impacts and potential mitigation measures are identified. Noise assessment described within EN-3 and EN-5 relates to the offshore environment.<br>The current relevant British Standards (BS) have been used within this assessment detailed within **Section 25.4**. |

| NPS Requirement | NPS Reference | Section Reference |
|---|---|---|
| The applicant should consult EA and Natural England (NE), or the Countryside Council for Wales (CCW), as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account. | EN-1, paragraph 5.11.7 | Noise impacts on terrestrial protected species is considered within **Chapter 22 Onshore Ecology**. |
| While standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory for dry weather conditions, they are not appropriate for assessing noise during rain. This is when overhead line noise mostly occurs, and when the background noise itself will vary according to the intensity of the rain. Therefore, an alternative noise assessment method to deal with rain-induced noise is needed, such as the one developed by National Grid as described in report TR (T) 94,199319. This follows recommendations broadly outlined in ISO 1996 (BS 7445:1991) and in that respect, is consistent with BS 4142:1997. The IPC [now the Planning Inspectorate and the Secretary of State] is likely to be able to regard it as acceptable for the applicant to use this or another methodology that appropriately addresses these particular issues. | EN-5, paragraph 2.9.8 and paragraph 2.9.9 | DEP and SEP does not include any requirement for additional overhead lines. As such, further operational assessment of rain-induced noise is not considered necessary. . |

### 25.1.4.2 Other

#### *25.1.4.2.1 National Planning Policy Framework*

22. The National Planning Policy Framework (NPPF) (as revised in 2019) forms the basis of the Government's planning policies for England and how these should be applied. Paragraph 170 of the NPPF states planning policies and decisions should contribute to and enhance the natural and local environment by:

- "……preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution……"

23. Furthermore, Paragraph 180 states:

- "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
  - mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
  - identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
  - limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

*25.1.4.2.2 Noise Policy Statement for England, 2010*

24. The NPSE document was published by Defra in 2010 and paragraph 1.7 states three policy aims:

- "Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
  - Avoid significant adverse impacts on health and quality of life;
  - Mitigate and minimise adverse impacts on health and quality of life; and
  - Where possible, contribute to the improvement of health and quality of life."

25. The first two points require that significant adverse impacts should not occur and that, where a noise level falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect (OAE):

- "…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur." (Paragraph 2.24, NPSE, March 2010).

26. Section 2.20 of the NPSE introduces key phrases including 'significant adverse' and 'adverse' and two established concepts from toxicology that are being applied to noise impacts:

- "NOEL – No Observed Effect Level; this is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise"; and

- "LOAEL – Lowest Observed Adverse Effect Level; this is the level above which adverse effects on health and quality of life can be detected".

27. Paragraph 2.21 of the NPSE extends the concepts described above and leads to a significant observed adverse effect level (SOAEL), which is defined as the level above which significant effects on health and quality of life occur.

28. The NPSE states:

- "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". (Paragraph 2.22, NPSE, March 2010).

29. Furthermore, paragraph 2.22 of the NPSE acknowledges that:

- "Further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise".

30. However not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

*25.1.4.2.3 National Planning Practice Guidance for Noise (NPPG) 2019*

31. The National Planning Practice Guidance for Noise (NPPG Noise, July 2019), issued under the NPPF, states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or making decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

### 25.1.4.3 Local Planning Policy

*25.1.4.3.1 North Norfolk Local Development Framework Core Strategy (September 2008)*

32. Policy EN7 Renewable energy states:

"Proposals for renewable energy technology, associated infrastructure and integration of renewable technology on existing or proposed structures will be permitted where individually, or cumulatively, there are no significant adverse effects on…

… residential amenity (noise)"

33. Policy EN13 Pollution and Hazard Prevention and Minimisation states:

"All development proposals should minimise, and where possible reduce, all emissions and other forms of pollution, including light and noise pollution…

… Proposals will only be permitted where, individually or cumulatively, there are no unacceptable impacts on;

The natural environment and generally amenity…"

*25.1.4.3.2 Broadland District Council Development Management Development Plan Document (2015)*

34. Policy EN4 - Pollution states:

"Development proposals will be expected to include an assessment of the extent of potential pollution. Where pollution may be an issue, adequate mitigation measures will be required. Development will only be permitted where there will be no significant adverse impact upon amenity, human health or the natural environment."

#### 25.1.4.4 Guidance Documents

35. BS 4142:2014+A1:2019 – Method for Rating and Assessing Industrial and Commercial Sound

    Describes a method for rating and assessing sound of an industrial and/or commercial nature. This method uses a Rating level to assess the likely effects from sound of an industrial or commercial nature on people using amenity space outside a dwelling or premises used for residential purposes upon which the sound is incident.

36. BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise

    Part 1 provides recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. The legislative background to noise and vibration control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and Local Planning Authorities. This BS provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.

37. BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration

    Part 2 gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels. The Standard includes tables of vibration levels measured during piling operations throughout the UK. It provides guidance concerning methods of mitigating vibration from construction, particularly with regard to percussive piling.

38. BS 6472-1:2008 – Guide to Evaluation of Human Exposure to Vibration in Buildings

    Provides general guidance on human exposure to building vibration in the range of 1Hz to 80Hz and includes curves of equal annoyance for humans. It also outlines the measurement methodology to be employed. It introduces the concept of Vibration Dose Value (VDV) and estimated Vibration Dose Value (eVDV) for the basis of assessment of the severity of impulsive and intermittent vibration levels, such as those caused by a series of trains passing a given location.

39. BS 7445: Parts 1 and 2 – Description and Measurement of Environmental Noise

    Provides details of the instrumentation and measurement techniques to be used when assessing environmental noise and defines the basic noise quantity as the continuous A-weighted sound pressure level ($L_{Aeq}$). Part 2 of BS 7445 replicates International Standards Organisation (ISO) 1996-2.

40. BS 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

Provides a methodology to calculate the noise levels entering a building through facades and facade elements and provides details of appropriate measures for sound insulation between dwellings. It includes recommended internal noise levels which are provided for a variety of situations, and are based on World Health Organisation (WHO) recommendations.

41. Calculation of Road Traffic Noise (CRTN) 1988

    Provides a method for assessing noise from road traffic in the UK and a method of calculating noise levels from the Annual Average Weekday Traffic (AAWT) flows and from measured noise levels. Since publication in 1988 this document has been the nationally accepted standard in predicting noise levels from road traffic. The calculation methods provided include correction factors to take account of variables affecting the creation and propagation of road traffic noise, accounting for the percentage of heavy goods vehicles (HGV), different road surfacing, inclination, screening by barriers and relative height of source and receiver.

42. Design Manual for Roads and Bridges (DMRB), LA 111 Noise and Vibration, Revision 2

    LA111 (formerly HD 231/11, IAN 185/15) provides guidance on the environmental assessment of noise impacts from road schemes. The DMRB contains advice and information on transport-related noise and vibration, which has relevance with regard to the construction and operational traffic impacts affecting sensitive receptors adjacent to road networks. It also provides guideline significance criteria for assessing traffic related noise impacts.

43. ISO 3744:2010 Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane

    Specifies a method for measuring the sound pressure levels on a measurement surface enveloping a noise source, under essentially free field conditions near one or more reflecting planes, in order to calculate the sound power level produced by the noise source.

44. ISO 717-1:2020 Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation

    Defines single-number quantities for airborne sound insulation in buildings and of building elements such as walls, floors, doors, and windows.

45. ISO 9613-2:1996 Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation

    Specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a noise source.

46. WHO (1999) Guidelines for Community Noise

    These guidelines present health-based noise limits intended to protect the population from exposure to excess noise. They present guideline limit values at which the likelihood of particular effects, such as sleep disturbance or annoyance, may increase. The guideline values are 50 or 55dB $L_{Aeq}$ during the day, related to annoyance, and 45dB $L_{Aeq}$ or 60dB $L_{Amax}$ at night, related to sleep disturbance.

The Guidance states:

"The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB $L_{Aeq}$ for continuous noise and 45dB $L_{Amax}$ for single sound events. Lower noise levels may be disturbing depending on the nature of the source."

The WHO guidance also highlights that:

"Night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45dB $L_{Aeq}$, so that people may sleep with bedroom windows open. This value was obtained by assuming that the noise reduction from outside to inside with the window open is 15dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35dB $L_{Aeq}$. To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB $L_{Aeq}$ on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB $L_{Aeq}$. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development."

47. WHO (2009) Night Noise Guidelines for Europe

An extension to the WHO Guidelines for Community Noise (1999). Based on evidential review it concludes that:

"Below the level of 30dB $L_{night,outside}$, no effects on sleep are observed except for a slight increase in the frequency of body movements during sleep due to night noise. There is no sufficient evidence that the biological effects observed at the level below 40 dB $L_{night,outside}$ are harmful to health. However, adverse health effects are observed at the level above 40dB $L_{night,outside}$.

Therefore, 40dB $L_{night,outside}$ is equivalent to the lowest observed adverse effect level (LOAEL) for night noise."

In addition to the above, the following is also stated,

"Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002148/EC), an $L_{night,outside}$ of 40dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55dB is recommended as an interim target for those countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach."

48. WHO (2018) Environmental Noise Guidelines for the European Region

The guidance states:

"The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. They provide robust public health advice underpinned by evidence, which is essential to drive policy action that will protect communities from the adverse effects of noise."

49. Further detail is provided in **Chapter 3 Policy and Legislative Context**.

### 25.1.5 Data and Information Sources

#### 25.1.5.1 Site specific surveys

50. In order to provide site specific and up to date information on which to base the impact assessment, a site characterisation survey is proposed to be conducted. As a result of the COVID-19 pandemic it has not been possible to undertake baseline noise measurements in suitable conditions. As agreed during consultation, the noise survey measurements collected as part of the Hornsea Three Offshore Windfarm application have been used.

#### 25.1.5.2 Other available sources

51. Other sources that have been used to inform the assessment are listed in **Table 25-5**.

*Table 25-5: Other available data and information sources.*

| Data set | Spatial coverage | Year | Notes |
|---|---|---|---|
| Google Maps Aerial Photography | Onshore Noise and Vibration Study Area | 2019 | |
| Environment Agency Lidar Topographical Data | Onshore Noise and Vibration Study Area | 2019 | |
| Local Authority Local Plans | Onshore Noise and Vibration Study Area | 2008 & 2015 | |
| Ordnance Survey Maps | Onshore Noise and Vibration Study Area | 2020 | |
| Project Specific Construction Phasing Plans | Onshore Noise and Vibration Study Area | 2021 | Provided by the Applicant. |
| Information from other projects within the area | Onshore Noise and Vibration Study Area | 2020 | Provided by the Applicant. |
| Baseline Noise Survey Data | Onshore Substation Study Area | 2017 | Data taken from Hornsea Project Three Environmental Statement, Volume 6, Annex 8.1 |

### 25.1.6 Impact Assessment Methodology

52. **Chapter 6 EIA Methodology** provides a summary of the general impact assessment methodology applied to DEP and SEP. The following sections confirm the methodology used to assess the potential impacts on noise and vibration.

#### 25.1.6.1 Definitions

53. For each effect, the assessment identifies receptors sensitive to that effect and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors. The definitions of sensitivity and magnitude for the purpose of the noise and vibration assessment are provided in **Table 25-6** and **Table 25-7**.

*Table 25-6: Definition of sensitivity for noise and vibration receptors*

| Sensitivity | Definition | Examples |
|---|---|---|
| **High** | Receptor has very limited tolerance of effect | Noise receptors have been categorised as high sensitivity where noise may be detrimental to vulnerable receptors. Such receptors include certain hospital wards (e.g. operating theatres or high dependency units) or care homes at night.<br>Vibration receptors have been categorised as high sensitivity where the receptors are listed buildings or Scheduled Monuments. |
| **Medium** | Receptor has limited tolerance of effect | Noise receptors have been categorised as medium sensitivity where noise may cause disturbance and a level of protection is required but a level of tolerance is expected.<br>Such subgroups include residential accommodation, private gardens, hospital wards, care homes, schools, universities, research facilities, national parks, (during the day); and temporary holiday accommodation at all times.<br>Vibration receptors have been categorised as medium sensitivity where the structural integrity of the structure is limited but the receptor is not a listed building or Scheduled Monument. |
| **Low** | Receptor has some tolerance of effect | Noise receptors have been categorised as low sensitivity where noise may cause short duration effects in a recreational setting although particularly high noise levels may cause a moderate effect.<br>Such subgroups include offices, shops, outdoor amenity areas, long distance footpaths, doctor's surgeries, sports facilities and places of worship. |

| Sensitivity | Definition | Examples |
|---|---|---|
| | | Vibration receptors have been categorised as low sensitivity where the structural integrity of the structure is expected to be high. |
| **Negligible** | Receptor generally tolerance of effect | Noise receptors have been categorised as negligible sensitivity where noise is not expected to be detrimental.<br><br>Such subgroups include warehouses, light industry, car parks, and agricultural land.<br><br>Vibration receptors have been categorised as negligible sensitivity where vibration is not expected to be detrimental. |

*Table 25-7 Definition of magnitude for noise and vibration receptors*

| Magnitude | Definition |
|---|---|
| **High** | Fundamental, permanent / irreversible changes, over the whole receptor, and / or fundamental alteration to key characteristics or features of the receptor's character or distinctiveness. The impact gives rise to serious concern; it should be considered as unacceptable. |
| **Medium** | Considerable, permanent / irreversible changes, over the majority of the receptor, and / or discernible alteration to key characteristics or features of the receptor's character or distinctiveness. The impact gives rise to some concern, but it is likely to be tolerable (depending on its scale and/or duration). |
| **Low** | Discernible, temporary (throughout project duration) change, over a minority of the receptor, and / or limited but discernible alteration to key characteristics or features of the receptor's character or distinctiveness. The impact is undesirable, but of limited concern. |
| **Negligible** | Discernible, temporary (for part of the project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the receptor's character or distinctiveness. The impact is at a threshold of predictive quantification and is not of concern. |
| **No Impact** | No discernible, temporary change, or change for any length of time, over a small area of the receptor, and/no alteration to key characteristics or features of the receptor's character or distinctiveness. |

### 25.1.6.2 Impact Significance

54. In basic terms, the potential significance of an impact is a function of the sensitivity of the receptor and the magnitude of the effect (see **Chapter 6 EIA Methodology** for further details). The determination of significance is guided by the use of an impact significance matrix, as shown in **Table 25-8**. Definitions of each level of significance are provided in **Table 25-9**. For example, in terms of PPG guidance, an Unacceptable Adverse Effect (UAE) is considered to align with a major impact in **Table 25-8** for a medium sensitivity receptor.

55. Potential impacts identified within the assessment as major or moderate are regarded as significant in terms of the EIA regulations. Appropriate mitigation has been identified, where possible, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall impact in order to determine a residual impact upon a given receptor.

*Table 25-8 Impact significance matrix*

| | | Magnitude of effect | | | | |
|---|---|---|---|---|---|---|
| | | **High** | **Medium** | **Low** | **Negligible** | **No Impact** |
| **Sensitivity** | **High** | *Major* | *Major* | *Moderate* | *Minor* | *Negligible* |
| | **Medium** | *Major* | *Moderate* | *Minor* | *Negligible* | *No Impact* |
| | **Low** | *Moderate* | *Minor* | *Negligible* | *Negligible* | *No Impact* |
| | **Negligible** | *Minor* | *Negligible* | *Negligible* | *Negligible* | *No Impact* |

*Table 25-9 Definition of impact significance*

| Significance | Definition |
|---|---|
| **Major** | Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and / or breaches of legislation.<br><br>NPSE/PPG - Unacceptable Adverse Effect (UAE) |
| **Moderate** | Intermediate change in receptor condition, which are likely to be important considerations at a local level.<br><br>NPSE/PPG - Significant Observed Adverse Effect Level (SOAEL) |
| **Minor** | Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process.<br><br>NPSE/PPG – Observed Adverse Effect (OAE) |

| Significance | Definition |
|---|---|
| **Negligible** | No discernible change in receptor condition.<br><br>NPSE/PPG – Lowest Observed Adverse Effect Level (LOAEL) |
| **No impact** | No impact, therefore no change in receptor condition.<br><br>NPSE/PPG – No Observed Effect Level (NOEL) |

#### 25.1.6.3 Construction Phase Noise Assessment Methodology

56. This section outlines the proposed approach for the construction phase assessment.

57. BS 5228:2009+A1:2014 describes several methods for assessing noise impacts during the construction of DEP and SEP.

58. The approach utilised in this assessment is the threshold based 'ABC' method detailed within BS 5228, which specifies a construction noise limit based on the existing ambient noise level and for different periods of the day. The predicted construction noise levels were assessed against noise limits derived from advice within Annex E of BS 5228. **Table 25-10**, reproduced from BS 5228:2009+A1:2014 Table E.1, presents the criteria for selection of a noise limit for a specific receptor location.

*Table 25-10: Construction noise threshold levels based on the ABC method (BS 5228)*

| Assessment category and threshold value period ($L_{Aeq,T}$) | Threshold value, in decibels (dB) | | |
|---|---|---|---|
| | Category A [A)] | Category B [B)] | Category C [C)] |
| Night time (23.00 – 07.00) | 45 | 50 | 55 |
| Evenings and weekends [D)] | 55 | 60 | 65 |
| Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00) | 65 | 70 | 75 |
| [A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. | | | |
| [B)] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. | | | |
| [C)] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. | | | |
| [D)] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays. | | | |

59. The 'ABC method' described in BS 5228 establishes that there is no impact below the three thresholds presented above.

60. BS 5228 states:

"If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect."

61. Noise levels for the construction phase are calculated using the methods and guidance in BS 5228. This Standard provides methods for predicting receptor noise levels from construction works based on the number and type of construction plant and activities operating on site, with corrections to account for:

- The 'on-time' of the plant, as a percentage of the assessment period;
- Distance from source to receptor;
- Acoustic screening by barriers, buildings or topography; and
- Ground type.

62. Construction noise impacts are assessed using the impact magnitude presented in **Table 25-11** for the daytime period, **Table 25-12** for the evening and weekend periods, and

63. **Table** 25-13 for the night time.

*Table 25-11: Construction noise magnitude of effect criteria - daytime*

| Magnitude of effect | Construction noise level (dB) | | | NPSE/PPG category |
|---|---|---|---|---|
| | Category A | Category B | Category C | |
| No Impact | <65 | <70 | <75 | NOEL |
| Negligible | >65.1 - <65.9 | >70.1 - <70.9 | >75.1 - <75.9 | LOAEL |
| Low | >66.0 - <67.9 | >71.0 - <72.9 | >76.0 - <77.9 | OAE |
| Medium | >68.0 - <69.9 | >73.0 - <74.9 | >78.0 - <79.9 | SOAEL |
| High | >70 | >75 | >80 | UAE |

*Table 25-12: Construction noise magnitude of effect criteria - evening and weekends*

| Magnitude of effect | Construction noise level (dB) | | | NPSE/PPG category |
|---|---|---|---|---|
| | Category A | Category B | Category C | |
| No Impact | <55 | <60 | <65 | NOEL |
| Negligible | >55.1 - <55.9 | >60.1 - <60.9 | >65.1 - <65.9 | LOAEL |
| Low | >56.0 - <57.9 | >61.0 - <62.9 | >66.0 - <67.9 | OAE |
| Medium | >58.0 - <59.9 | >63.0 - <64.9 | >68.0 - <69.9 | SOAEL |
| High | >60 | >65 | >70 | UAE |

*Table 25-13 Construction noise magnitude of effect criteria - night time*

| Magnitude of effect | Construction noise level (dB) | | | NPSE/PPG category |
|---|---|---|---|---|
| | Category A | Category B | Category C | |
| No Impact | <45 | <50 | <55 | NOEL |
| Negligible | >45.1 - <45.9 | >50.1 - <50.9 | >55.1 - <55.9 | LOAEL |
| Low | >46.0 - <47.9 | >51.0 - <52.9 | >56.0 - <57.9 | OAE |
| Medium | >48.0 - <49.9 | >53.0 - <54.9 | >58.0 - <59.9 | SOAEL |
| High | >50 | >55 | >60 | UAE |

### 25.1.6.4 Construction Phase Road Traffic Noise Assessment Methodology

64. The road links required for construction traffic are detailed within **Chapter 26 Traffic and Transport** and specifically **Figure 26.1**.

65. Traffic data for the noise assessment were provided as 18hr Annual Average Weekday Traffic (AAWT) (as required by the CRTN methodology) for 2025 Factored Base and 2025 Factored Base + Peak Construction scenarios. The data were provided for the total traffic flow per link, the composition of the flow with percentage HGVs and speed data.

66. An initial study was undertaken to assess whether there would be significant changes in traffic volume and composition on surrounding local roads during the construction of DEP and SEP, displayed in **Appendix 25.1**, identifying road links with a predicted increase in traffic volume of 25% or a decrease of 20%. Traffic flow variations below this level indicate a maximum change in the noise level of less than 1 dB(A) and are considered to be negligible in magnitude, as presented in **Table 25-14**.

67. All road links were assessed following the Basic Noise Level (BNL) calculation procedure within CRTN to predict a relative $L_{A10,18hr}$ dB change for each link. The calculation also incorporates a correction for mean traffic speed and the percentage of heavy vehicles.

68. Construction road traffic noise impacts are determined by assessing the change in BNL. Impact magnitude criteria for construction traffic, as detailed in Table 3.17 of the DMRB, are displayed in **Table 25-14**.

*Table 25-14: Magnitude criteria for relative change due to construction road traffic*

| Increase in BNL of closest public road used for construction traffic (dB) | Impact magnitude | NPSE/PPG Category |
|---|---|---|
| <1.0 | Negligible | LOAEL |
| ≥1.0 to <3.0 | Minor/Low | OAE |
| ≥3.0 to <5.0 | Moderate/Medium | SOAEL |

| Increase in BNL of closest public road used for construction traffic (dB) | Impact magnitude | NPSE/PPG Category |
|---|---|---|
| >5.0 | Major/High | UAE |

#### 25.1.6.5 Construction Phase Vibration Assessment Methodology

69. Ground-borne vibration can result from construction works and may lead to perceptible levels of vibration at nearby receptors, which at higher levels can cause annoyance to residents. In extreme cases, cosmetic or structural building damage can occur, however vibration levels have to be of a significant magnitude for this effect to be manifested and such cases are rare.

70. High vibration levels generally arise from 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction.

71. Annex E of BS 5228-2:2009+A1:2014 contains empirical formulae derived by Hiller and Crabb (2000) from field measurements relating to resultant peak particle velocity (PPV) with several other parameters for vibratory compaction, dynamic compaction, percussive and vibratory piling, the vibration of stone columns and tunnel boring operations. These prediction equations are based on the energy approach. Use of these empirical formulae enables resultant PPV to be predicted and for some activities (vibratory compaction, vibratory piling and vibrated stone columns) they can provide an indicator of the probability of these levels of PPV being exceeded.

72. The empirical equations for predicting construction-related vibration provide estimates in terms of PPV. Therefore, the consequences of predicted levels in terms of human perception and disturbance can be established through direct comparison with the BS 5228-2:2009+A1:2014 guidance vibration levels.

73. Ground-borne vibration assessments may be drawn from the empirical methods detailed in BS 5228-2:2009+1A:2014, in the Transport and Road Research Laboratory (TRRL) 246: Traffic: Traffic induced vibrations in buildings, and within the Transport Research Laboratory (TRL) Report 429 (2000): Ground-borne vibration caused by mechanical construction works.

74. However, these calculation methods rely on detailed information, including the type and number of plant being used, their location and the length of time they are in operation. Given the mobile nature of much of the plant that has the potential to impart sufficient energy into the ground, and the varying ground conditions in the immediate vicinity of the construction works, it was considered that an accurate representation of vibration conditions using these predictive methods was not possible.

75. Consequently, a series of calculations, following the methodologies referred to above, were carried out based on typical construction activities that have the potential to impart sufficient energy into the ground, applying reasonable worst case assumptions in order to determine set-back distances at which critical vibration levels may occur.

76. Humans are very sensitive to vibration, which can result in concern being expressed at energy levels well below the threshold of damage. Guidance on the human response to vibration in buildings is found in BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting.

77. BS 6472 describes how to determine the vibration dose value (VDV) from frequency-weighted vibration measurements. VDV is defined by the following equation:

$$VDV_{b/d,\ day/night} = (\int_0^T a^4(t)dt)^{0.25}$$

78. The VDV is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings. Consideration is given to the time of day and use made of occupied space in buildings, whether residential, office or workshop.

79. BS 6472 states that in homes, adverse comment about building vibrations is likely when the vibration levels to which occupants are exposed are only slightly above thresholds of perception.

80. BS 6472 contains a methodology for assessing the human response to vibration in terms of either the VDV, or in terms of the acceleration or the peak velocity of the vibration, which is also referred to as PPV. The VDV is determined over a 16-hour daytime period or 8-hour night-time period.

81. The response of a building to ground-borne vibration is affected by the type of foundation, ground conditions, the building construction and the condition of the building. For construction vibration, the vibration level and effects detailed in **Table 25-15** were adopted based on BS 5228. Limits for transient vibration, above which cosmetic damage could occur, are given numerically in terms of PPV.

*Table 25-15: Transient vibration guide values for cosmetic damage*

| Line | Type of building | Peak component particle velocity in frequency range of predominant pulse | |
|---|---|---|---|
| | | 4 Hz to 15 Hz | 15 Hz and above |
| 1 | Reinforced or framed structures<br>Industrial and heavy commercial buildings | 50 mm.s$^{-1}$ at 4 Hz and above | |
| 2 | Un-reinforced or light framed structures | 15 mm.s$^{-1}$ at 4 Hz increasing to | 20 mm.s$^{-1}$ at 15 Hz increasing to |
| | Residential or light commercial type buildings | 20 mm.s$^{-1}$ at 15 Hz | 50 mm.s$^{-1}$ at 40 Hz and above |

82. **Table 25-16** lists the minimum set-back distances at which vibration levels of reportable significance for other typical construction activities may occur; set back distances were derived using the calculation methods provided in BS 5228.

*Table 25-16: Predicted distances at which vibration levels may occur*

| Activity | Set-back distance at which vibration level (PPV) occurs | | | |
|---|---|---|---|---|
| | 0.3 $mm.s^{-1}$ | 1.0 $mm.s^{-1}$ | 10 $mm.s^{-1}$ | 15 $mm.s^{-1}$ |
| Vibratory compaction (start-up) | 166m | 65m | 9m | 6m |
| Vibratory compaction (steady state) | 102m | 44m | 8m | 6m |
| Percussive piling | 48m | 19m | 3m | 2m |

83. **Table 25-17** reproduced from research (Rockhill et al, 2014) details minimum safe separation distance for piling activities from sensitive receptors to reduce the likelihood of cosmetic damage occurrence.

*Table 25-17: Receptor proximity for indicated piling methods*

| Building type (limits on vibrations from Eurocode 3) Architectural merit | Piling method | | |
|---|---|---|---|
| | Press-in | 25 kJ drop hammer | 170 kW 27 Hz vibrohammer |
| Residential | 2.6 m | 29.6 m | 27.7 m |
| Light commercial | 0.5 m | 11.8 m | 13.8 m |
| Heavy industrial | 0.14 m | 5.9 m | 5.5 m |
| Buried services | 0.06 m | 3.9 m | 3.7 m |
| Building type (limits on vibrations from Eurocode 3) | 0.03 m | 2.9 m | 2.2 m |

84. For construction vibration from sources other than blasting, the vibration level and effects presented in **Table 25-18** were adopted based on Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.

*Table 25-18: Construction vibration - magnitude of effect*

| Vibration limit PPV (mm/s) | Interpreted significance to humans | Magnitude of effect | NPSE/PPG Category |
|---|---|---|---|
| <0.14 | Vibration unlikely to be perceptible | No Impact | NOEL |
| 0.14 to 0.3 | Vibration might just be perceptible in the most sensitive situations for | Negligible | LOAEL |

| Vibration limit PPV (mm/s) | Interpreted significance to humans | Magnitude of effect | NPSE/PPG Category |
|---|---|---|---|
| | most vibration frequencies associated with construction | | |
| 0.3 to 1.0 | Vibration might just be perceptible in residential environments | Low | OAE |
| 1.0 to <10.0 | It is likely that vibration at this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents | Medium | SOAEL |
| >10.0 | Vibration is likely to be intolerable for any more than a brief exposure to this level | High | UAE |

#### 25.1.6.6 Operational Phase Noise Assessment Methodology

85. Where there are sound sources such as fixed plant associated with a proposed development, the most appropriate assessment guidance is BS 4142. The guidance describes a method of determining the level of noise of an industrial noise source and the existing background noise level.

86. BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident, and combines procedures for assessing the impact in relation to:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

87. This standard is applicable to the determination of the following levels at outdoor locations:

> “a) rating levels for sources of sound of an industrial and/or commercial nature; and
>
> b) ambient, background and residual sound levels, for the purposes of:
>
> 1) investigating complaints;

2) assessing sound from existing, proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and

3) assessing sound at proposed new dwellings or premises used for residential purposes."

88. The standard incorporates a requirement for the assessment of uncertainty in environmental noise measurements and introduces the concepts of 'significant adverse impact' rather than likelihood of complaints. BS 4142 requires the consideration of the characteristics of the sound under investigation, time of day and frequency of occurrence.

89. The standard applies to industrial/commercial and background noise levels outside residential buildings and for assessing whether existing and new industrial/commercial noise sources are likely to give rise to significant adverse impacts on the occupants living in the vicinity.

90. Assessment is undertaken by subtracting the measured background noise level from the rating level; the greater this difference, the greater the magnitude of the impact.

91. BS 4142 refers to the following:

"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; and

The lower the rating level 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".

92. When assessing the noise from a source, which is classified as the Rated Noise Level, it is necessary to have regard to the acoustic features that may be present in the noise. Section 9.1 of BS 4142 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

93. An operational assessment in accordance with BS 4142 has been undertaken for the Projects.

94. For clarity, an explanation of each penalty correction type (taken from BS 4142:2014+A1:2019, page 13 and 14) is provided here:

Tonality - For sound ranging from not tonal to prominently tonal a correction of between 0 dB and +6 dB for tonality can be applied. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity - A correction of up to +9 dB can be applied for sound that is impulsive. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Intermittency - When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

Other sound characteristics - Where the specific sound feature characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

95. An operational assessment in accordance with BS 4142 has been undertaken for the onshore substation as it is the only noise source associated with the operational phase. Due to the separation distance, existing ambient soundscape and a detailed screening of the onshore substation plant and equipment, no penalty corrections for intermittency, tonality or impulsivity are required. These acoustic features are added based on perceptibility at the receptor location and are discussed further in **Appendix 25.3**.

96. The determination of the specific sound level free from sounds influencing the ambient sound at the assessment location is obtained by measurement or a combination of measurement and calculation. This is to be measured in terms of the $L_{Aeq, T}$, where 'T' is a reference period of:

- 1 hour during daytime hours (07:00 to 23:00 hours); and
- 15 minutes during night-time hours (23:00 to 07:00 hours).

97. The assessment of noise from proposed fixed substation plant associated with the DEP and SEP was considered at the nearest receptors.

98. To predict the noise from the operational aspects of DEP and SEP, SoundPLAN noise modelling software was utilised. The model incorporated proposed buildings based on elevation drawings, proposed fixed plant and where identified, additional noise sources (such as temporary generating plant) associated with DEP and SEP. The model also included nearby residential dwellings and other buildings in the onshore Study Area, intervening ground cover and topographical information.

99. Noise levels for the operational phase were predicted at Noise Sensitive Receptor (NSR) locations detailed in **Table 25-20**. The calculation algorithm described in ISO 9613 was used in the operational noise propagation modelling exercise.

100. The magnitude of impact based on a predicted level of operational noise sources above the prevailing background sound environment, in accordance with BS 4142, are summarised in **Table 25-19**. Section 11 of BS 4142 states that:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

101. The WHO NNG for Europe was published to complement the WHO Guidelines for Community Noise and introduced additional research on the effects of night-time noise exposure.

102. In summary, the NNG found that below the level of 30 dBA $L_{night,outside}$ there are no observed effects on sleep. Furthermore, there is no evidence that biological effects observed at levels below 40 dBA Lnight outside are harmful to health. At levels above 55 dBA $L_{night,outside}$, the NNG detailed that adverse health effects occur frequently and there is limited evidence that the cardio-vascular system is coming under stress.

103. Therefore, based on the NNG, the following effect levels for assessing against the NPSE categories are also relevant as detailed in **Table 25-19**:

- <30 dBA $L_{night,outside}$ - NOEL;
- <40 dBA $L_{night,outside}$ - LOAEL; and
- >55 dBA $L_{night,outside}$ - SOAEL.

*Table 25-19: Operational noise magnitude of effect criteria for industrial/commercial noise sources*

| Rating level ($L_{Ar,Tr}$ dB) | Magnitude of effect | NPSE/PPG category using BS 4142 criteria | WHO NNG threshold | NPSE/PPG category using WHO NNG threshold |
|---|---|---|---|---|
| ≤ Measured $L_{A90}$ | No Impact | NOEL | <30 dBA $L_{night,outside}$ | NOEL |
| = Measured $L_{A90}$ dB to + 2.9 dB | Negligible | LOAEL | <40 dBA $L_{night,outside}$ | LOAEL |
| Measured $L_{A90}$ + 3 dB to 4.9 dB | Low | OAE | | |
| Measured $L_{A90}$ + 5 dB to 9.9 dB | Medium | SOAEL | >55 dBA $L_{night,outside}$ | SOAEL |
| ≥ Measured $L_{A90}$ + 10 dB | High | UAE | | |

### 25.1.6.7 Operational Phase Vibration Assessment

104. Full details of the appropriate guidance as it pertains to the assessment of vibration effects are set out in **Section 25.1.6.5**.

105. The operational substation equipment is not anticipated to generate noticeable levels of vibration.

106. Any vibration effects that could be generated are considered negligible as industry standard requires the use of vibration isolation pads/mounts to prevent transmission of ground borne vibration. The proposed onshore project substation will be designed to achieve negligible levels of ground-borne vibration.

> "*Damping of noise radiating surfaces can reduce resonance and the reductions can be quite dramatic. However, the "damper" has to be carefully selected and designed for the specific situation*" (Environment Agency, 2004).

107. Therefore, it is considered there will be no significant sources of vibration associated with the operation of the onshore substation, and an operational phase vibration assessment has not been undertaken.

### 25.1.7 Cumulative Impact Assessment Methodology

108. The cumulative impact assessment (CIA) considers other plans, projects and activities that may impact cumulatively with DEP and SEP. As part of this process, the assessment considers which of the residual impacts assessed for DEP and/or SEP on their own have the potential to contribute to a cumulative impact, the data and information available to inform the cumulative assessment and the resulting confidence in any assessment that is undertaken. **Chapter 6 EIA Methodology** provides further details of the general framework and approach to the CIA.

109. For noise and vibration, these activities include on-site construction noise, noise associated with construction road traffic and operational phase noise associated with the onshore substation.

### 25.1.8 Assumptions and Limitations

110. Due to reduced transportation during COVID-19 restrictions and the related effect on the current baseline noise levels at all noise sensitive receptors a dedicated noise survey was not undertaken to inform this PEIR. However, this will be undertaken in 2021 once 'normal' conditions are resumed. In lieu of a dedicated baseline noise survey the baseline survey data presented for Hornsea Project Three have been used where applicable.

111. For the assessment of construction noise associated with the onshore cable corridor, noise predictions were undertaken assuming all construction plant is simultaneously operating at the PEIR boundary for each activity.

112. Similarly, the assessment of noise associated with construction of the onshore substation was undertaken assuming all construction plant is simultaneously operating at the substation site option boundaries.

113. This approach is considered to display the worst case scenario for noise levels within the work areas and assumes all plant is operating at the nearest location to NSRs.

114. Construction road traffic data were provided considering peak flow for DEP and SEP concurrently on the basis that this would represent the worst case traffic intensity across all the build out scenarios. For completeness, a further assessment of construction traffic data noise impacts will be provided for DEP or SEP in isolation and DEP and SEP sequentially and will be reported within the ES to support the DCO application.

115. Data associated with operation of the onshore substation were provided considering DEP and SEP concurrently on the basis that this would represent the worst case noise for the operation scenarios. For completeness, a further assessment an assessment of operational substation noise for DEP or SEP in isolation will be reported within the ES to support the DCO application.

## 25.5 Existing Environment

### 25.1.9 Baseline Noise Environment

116. An understanding of the baseline noise environment is generally required to determine the significance of potential impacts during both construction and operational phases.

117. Consultation was undertaken with BDC to agree the baseline survey approach in light of the COVID-19 pandemic and the following sections outline this approach.

#### 25.1.9.1 Onshore Substation Site Options

118. It was agreed that the effects from reduced transportation sources and the countrywide lockdown due to government COVID-19 restrictions would have an effect on the current baseline noise levels at all receptors within the vicinity of the onshore substation study area and therefore any new noise survey should be postponed until 'normal' conditions are resumed.

119. In lieu of a dedicated baseline noise survey it was agreed that, given the proximity of the two projects, that the baseline survey data presented within Hornsea Project Three DCO application would be suitable for the purposes of determining the background noise level ($L_{A90}$) for the operational phase assessment of DEP and SEP at this PEI stage.

120. It is proposed that a new dedicated baseline noise survey will be undertaken during 2021 to support the DEP and SEP noise impact assessment that will be reported within the ES as part of the DCO application.

121. Onshore substation NSRs are presented in **Table 25-20**. The corresponding baseline survey locations are presented in **Table 25-21** and displayed in **Figure 25.1**.

*Table 25-20: Onshore substation noise sensitive receptors included in assessment*

| NSR identifier | Coordinates | | Classification | Sensitivity |
|---|---|---|---|---|
| | X | Y | | |
| SSR1 | 620863 | 302329 | Residential | Medium |
| SSR2 | 621180 | 301320 | Residential | Medium |
| SSR3 | 621610 | 301271 | Residential | Medium |
| SSR4 | 620339 | 301806 | Residential | Medium |
| SSR5 | 622499 | 302482 | Residential | Medium |
| SSR6 | 622529 | 302038 | Residential | Medium |
| SSR7 | 621575 | 302924 | Residential | Medium |
| SSR8 | 621319 | 303086 | Residential | Medium |
| SSR9 | 620982 | 301753 | Residential | Medium |

| NSR identifier | Coordinates | | Classification | Sensitivity |
|---|---|---|---|---|
| | X | Y | | |
| SSR10 | 620997 | 301476 | Residential | Medium |

*Table 25-21: Onshore substation baseline noise survey locations*

| Measurement location | Coordinates | | Corresponding NSR |
|---|---|---|---|
| | X | Y | |
| Location 1 | 621283 | 301230 | SSR1, SSR2, SSR4, SSR9, SSR10 |
| Location 2 | 621751 | 301375 | SSR3, SSR7, SSR8 |
| Location 3 | 622199 | 302211 | SSR5, SSR6 |

122. A summary of the measured results is provided in **Table 25-22**.

*Table 25-22 Measured baseline sound levels, onshore substation zone*

| Measurement location | Period | $L_{Aeq,T}$ (dB) | $L_{AFmax}$ (dB) | $L_{A10}$ (dB) | $L_{A10}$ (dB) |
|---|---|---|---|---|---|
| Location 1 | Daytime (07:00 - 23:00) | 43 | 84 | 46 | 33 |
| | Night-time (23:00 - 07:00) | 40 | 85 | 43 | 28 |
| Location 2 | Daytime (07:00 - 23:00) | 53 | 87 | 47 | 36 |
| | Night-time (23:00 - 07:00) | 48 | 99 | 44 | 29 |
| Location 3 | Daytime (07:00 - 23:00) | 61 | 90 | 63 | 50 |
| | Night-time (23:00 - 07:00) | 55 | 91 | 59 | 29 |

#### 25.1.9.2 Onshore Cable Corridor and Landfall Location

123. It was agreed that no baseline noise measurements would be necessary along the cable route to inform the construction phase noise assessment. It was agreed that a conservative approach would be to use the lowest threshold (for the BS5228:2009+A1:2014 'ABC method') at all identified NSRs for the assessment of construction noise.

### 25.1.10 Baseline Road Traffic Noise

124. The road links required for DEP and SEP construction traffic are presented in **Appendix 25.1**. Road links likely to experience an increase in traffic flows greater than 25% were assessed further by undertaking calculations of BNL.

### 25.1.11 Climate Change and Natural Trends

125. Noise is managed and driven by EU, UK and local legislation and policies. The UK's noise strategy and standards are enacted through management actions at a local authority level. There is a policy trend towards the achievement and maintenance of the noise environment across the UK, which is reflected in current legislation, policy and guidance. Predicted noise levels due to a change in land use, new developments and associated vehicles are assessed as part of the development planning and consent process.

126. Potential impacts to the prevailing soundscape should be minimised, avoided, or mitigated to suitable levels (in accordance with current legislation, policy and guidance), avoiding an adverse impact, where possible. In addition to planning controls there is a clear trend for noise from vehicle, commercial and industrial sources to be driven down in compliance with stricter legislation and guidance. Consequently, in relation to the DEP and SEP and its immediate receiving environment it is reasonable to predict a general steady baseline soundscape would be maintained.

## 25.6 Potential Impacts

### 25.1.12 Potential Impacts during Construction

#### 25.1.12.1 Impact 1: On-site Construction Noise at Landfall Location

##### *25.1.12.1.1 Magnitude of effect - all scenarios*

127. For all construction scenarios it is proposed that there will be one active HDD rig operating at the landfall location.

128. For the DEP and SEP sequentially scenario, the magnitude of effect associated with construction works at the landfall location is considered to be the same as for DEP or SEP in isolation and DEP and SEP concurrently scenarios but for a longer duration.

129. Assumptions regarding construction plant for each activity, and the expected construction noise levels at the nearest NSRs, are provided in **Appendix 25.2**.

130. The predicted noise level at the nearest NSR during landfall construction activities is 49.5 dB $L_{Aeq,T}$. This level represents a magnitude of effect of no impact during the daytime and evenings and weekends reference periods, in accordance with the criteria outlined in **Section 25.1.6.3**.

131. During the night-time reference period, the predicted noise level (49.5 dB $L_{Aeq,T}$) would represent an effect of medium magnitude.

##### *25.1.12.1.2 Impact Significance*

132. NSRs surrounding the landfall location are assumed to be of medium sensitivity; therefore, indicating no impact during daytime and evenings and weekends reference periods for all construction scenarios.

133. During the night-time reference period, a moderate adverse impact is predicted without mitigation.

*25.1.12.1.3 Mitigation*

134. Should night-time working be required at the landfall, additional mitigation measures would be required.

135. Prior to construction, a Construction Noise Management Plan (CNMP) will be prepared, outlining Best Practical Means (BPM) for noise mitigation to be adhered including, but not limited to:

- Ensuring plant and machinery is turned off when not in use;
- Using modern, quiet equipment and ensuring such equipment is properly maintained and regularly inspected;
- Informing local residents about the construction works, including the timing and duration of any particularly noisy elements; and
- Implement a grievance mechanism (e.g. complaint procedure) for local residents to report nuisance and other issues, including 24-hour contact details for a site representative.

136. To further mitigate noise associated with the landfall location, temporary screening around the work area or construction compound so that no part of the noise source is visible at the NSR. It is generally considered that screening can provided approximately 5 - 10 dB of attenuation but the effectiveness is dependent on the distance to the noise source, and the height and length of the screening.

*25.1.12.1.4 Residual Impacts*

137. After implementation of the specific noise control measures, and on the basis that a 5 -10 dB noise reduction is readily achievable with screening, the magnitude of the effect would be reduced to no impact representing a residual impact of **no impact** significance at NSRs near the landfall location.

### 25.1.12.2 Impact 2: On-site Construction Noise Along Onshore Cable Corridor

*25.1.12.2.1 Magnitude of effect – all scenarios*

138. Potential construction noise along the onshore cable corridor is assumed to be equal for each of the construction scenarios; as there would be the same number of active workfronts at any one time.

139. To assess the potential impacts from construction noise, 34 NSR locations were identified along the cable corridor. NSR locations were chosen to represent the worst case for each group of residential dwellings along the onshore cable corridor; closest to the proposed works with minimal existing screening.

140. Construction noise impacts along the onshore cable corridor will be temporary in nature and linked to the following activities:

- Installation of temporary access tracks;
- Establishing temporary work areas;
- Installation, ducting and pulling of cables along the onshore cable corridor; and

- Trenchless crossing works (HDD) along the onshore cable corridor.

141. It is understood that all construction works are proposed to be undertaken during the daytime reference period, with the exception of trenchless crossing works that are continuous activities and require the flexibility to potentially continue 24hrs a day for brief periods.

142. Construction noise at NSRs along the cable corridor has been calculated assuming all construction plant is simultaneously operating at the PEIR boundary for each activity, with the exception of trenchless crossing works, which are limited to specific locations. This approach is considered to represent the worst case scenario for potential construction noise generated areas along the cable corridor and assumes all plant is operating at the nearest location to NSRs. It should be noted that the PEIR boundary represents an approximately 200m wide study corridor. This will be significantly reduced down to an application boundary of 45m wide (single project) and 60m (two projects). This reduction from 200m down to 60m will incorporate feedback from stakeholders and from the PEIR assessment findings. With the aim to further reduce potential impacts identified here.

143. Trenchless crossing works assume all plant associated with that activity to be in simultaneous operation at each proposed crossing location.

144. Assumptions regarding plant for each construction activity are provided in **Appendix 25.2** in addition to the predicted construction noise level at each NSR.

145. **Table 25-23** presents the predicted number of NSRs per magnitude of effect level for each construction activity.

*Table 25-23: Magnitude of effect predicted for construction noise at identified NSRs along the cable corridor for each construction activity type (numbers denote the number of NSRs predicted to experience each magnitude type)*

| No impact | Negligible | Low | Medium | High |
|---|---|---|---|---|
| **Installation of temporary access tracks – daytime** | | | | |
| 8 | 1 | 1 | 0 | 24 |
| **Establishing temporary work areas – daytime** | | | | |
| 10 | 0 | 1 | 3 | 20 |
| **Cable duct and installation - daytime** | | | | |
| 8 | 1 | 1 | 0 | 24 |
| **Cable pull – daytime** | | | | |
| 9 | 0 | 1 | 0 | 24 |
| **Trenchless crossing works (HDD) - daytime** | | | | |
| 33 | 0 | 1 | 0 | 0 |
| **Trenchless crossing works (HDD) - evening and weekends** | | | | |
| 28 | 2 | 1 | 2 | 1 |

| Trenchless crossing works (HDD) - night-time | | | | |
|---|---|---|---|---|
| 29 | 1 | 0 | 4 | 10 |

*25.1.12.2.2 Impact Significance*

146. It is seen from **Table 25-23** that without mitigation a magnitude of effect of medium or high is predicted for all construction activities (except daytime trenchless crossing works) at the majority of NSRs. For those NSRs with increased separation from the construction works the magnitude of effect is no greater than low. As all NSRs along the onshore cable corridor are of medium sensitivity, and for those potentially experiencing a medium or high magnitude of construction noise this would represent impacts of moderate and major adverse significance and a requirement for mitigation.

*25.1.12.2.3 Mitigation Measures*

147. The assessment of construction noise along the onshore cable corridor is based on the distance from the PEIR boundary, i.e. potential distance from the works. However, as stated earlier, the current onshore cable corridor boundary is typically 200m but will be refined down to a 60m corridor for the application boundary. Following this reduction of the corridor width the distance of separation between construction activities and NSRs will increase at many locations, resulting in lower noise levels at some but not all NSRs.

148. Prior to construction a CNMP will be prepared detailing site specific noise control measures for construction activities will be identified and implemented to reduce potential construction noise.

149. Where significant impacts remain, the following enhanced mitigation measures will be considered and included in the CNMP, where applicable:

- Temporary screening around the work area or construction compound;
- Use of silencers and/or enclosures around noisy equipment; and
- Choosing alternative, lower impact equipment or methods where practicable.

*25.1.12.2.4 Residual Impacts*

150. After implementation of the specific noise control measures agreed through the CNMP, the magnitude of the effect would be reduced to no impact to NSRs in proximity to the onshore cable works, representing a residual impact of **minor adverse** significance.

### 25.1.12.3 Impact 3: On-site Construction Noise at the Onshore Substation Site Options

*25.1.12.3.1 Magnitude of effect – all scenarios*

151. Potential construction noise at the onshore substation options are assumed to be the same for all of the construction scenarios: DEP or SEP alone, DEP and SEP Together (both sequentially and concurrently).

152. Noise predictions were undertaken assuming all construction plant is simultaneously operating at each of the substation site options. This approach is considered to display the worst case scenario for noise levels associated with construction of the onshore substation and assumes all plant is operating at the nearest location to each NSR.

153. Assumptions regarding construction plant for each activity are provided in **Appendix 25.2** in addition to the predicted noise level at each NSR.

154. All NSRs considered in the assessment are in excess of 345m from the two substation site options and from **Appendix 25.2** it can be seen that a predicted magnitude of effect of no impact is predicted at all NSRs during the daytime construction period.

155. During the evenings and weekends and night-time construction periods, it is seen that a magnitude of effect of no impact is predicted from concrete pouring works at either substation site options.

*25.1.12.3.2 Impact Significance*

156. All NSRs in proximity to the onshore substation options are considered to be of medium sensitivity; therefore, the assessment indicates **no impact** at all NSRs and no requirement for additional mitigation measures.

### 25.1.12.4 Impact 4: Noise from Off-Site Construction Traffic (concurrent scenario only)

*25.1.12.4.1 Magnitude of effect*

157. Road links required for DEP and SEP construction traffic are presented in **Figure 26.1** of **Chapter 26 Traffic and Transport**. These road links were assessed further by undertaking of BNL calculations, which are provided in full in **Appendix 25.1**.

158. Traffic flow data were provided encapsulating the combined traffic for DEP and SEP built at the same time as this represents the worst case traffic numbers. An assessment of both DEP and SEP in isolation will also be provided as part of the noise impact assessment supporting the full DCO application

159. The assessment considers the peak construction traffic against the 2025 baseline. This is considered the worst case year for assessment purposes as it represents the earliest year for the start of construction works. Later years would have higher baseline traffic flows and therefore the introduction of DEP and SEP construction traffic would represent a lesser impact magnitude.

160. The construction road traffic noise assessment predicts changes in $L_{A10,hr}$ results representing a no impact magnitude of effect for 16 of the identified road links, a magnitude of effect of negligible at 137 of the road links, a magnitude of effect of low at 17 of the road links, a magnitude of effect of medium at six of the road links, and a magnitude of effect of high at six of the identified road links. These are detailed in full in **Appendix 25.1**.

*25.1.12.4.2 Impact Significance*

161. All NSRs along the identified road links are considered to be of medium sensitivity.

162. Therefore, the assessment indicates that the impact significance from peak construction traffic will be no impact at 16 road links, negligible across 137 road links, minor adverse along 17 of the links. On this basis there is no requirement for additional mitigation measures along these 170 road links.

163. The assessment indicates an impact of moderate adverse significance along six of the identified road links and major adverse across six of the identified road links. Due to the low traffic flow along the effected links (<1000 total vehicles 18hr AAWT) predicted impacts may be exaggerated.

#### *25.1.12.4.3 Mitigation Measures*

164. A Construction Traffic Management Plan (CTMP) would be developed to reduce peak construction traffic flows causing significant traffic and transport impacts along the identified links, this will also serve to reduce the associated construction traffic noise and the relative noise change. Traffic management measures are provided in **Chapter 26 Traffic and Transport - Section 26.6**.

#### *25.1.12.4.4 Residual Impact*

165. Following the implementation of an agreed traffic measures within the CTMP, the impact magnitude would be expected to reduce to low during the peak construction traffic scenario for these nine road links, representing a residual adverse impact of **minor adverse** significance.

### 25.1.12.5 Impact 5: Construction Vibration

#### *25.1.12.5.1 Onshore cable corridor*

166. The operation of HDD rigs and ancillary equipment would produce the greatest vibration impacts along the onshore cable corridor and is therefore taken forward as the worst case for vibration assessment.

167. Vibration levels decay very rapidly with distance from a source (BS 5228-2:2009+A1:2014). A representative example of HDD given within BS 5228-2:2009+A1:2014 is for boring through silts overlying sandstone with a PPV of 8 mm/s at 4.5m from the source, decreasing to a PPV of 2.7mm/s at 7m from the source and 1.8mm/s at 12m from the source.

168. Given the distance of separation between trenchless crossing locations and the NSRs (at least 47m) PPV levels would be below the criteria outlined in **Table 25-18** at all NSRs along the onshore cable corridor. Vibration effects from onshore cable corridor construction activities would be of no greater than negligible magnitude; representing an impact of no greater than minor adverse significance at medium sensitivity receptors. No further mitigation measures are proposed.

#### *25.1.12.5.2 Onshore substation*

169. The operation of piling rigs is considered to produce the greatest vibration impacts at the onshore substation and is therefore taken forward as the worst case for vibration assessment.

170. Based on the separation distances per piling method, provided in **Table 25-16**, vibration effects from piling works would be of no greater than negligible magnitude at worst; indicating negligible adverse impact significance at medium sensitivity receptors. No further mitigation measures are proposed.

#### *25.1.12.5.3 Construction road traffic*

171. Paragraph 3.32 of HD213/11 (2011) states that:

*"PPV's in the structure of buildings close to heavily trafficked roads rarely exceed 2 mm/s and typically are below 1 mm/s. Normal use of a building such as closing doors, walking on suspended wooden floors and operating domestic appliances can generate similar levels of vibration to those from traffic".*

172. Therefore, vibration impact assessment on road links has not been undertaken and are not considered further within this assessment.

## 25.1.13 Potential Impacts during Operation

### 25.1.13.1 Impact 6: Operation of the Onshore Substation (concurrent scenario only)

173. This operational noise assessment only considers the potential impacts for DEP and SEP operating concurrently, which represents the worst case operational noise scenario. A further assessment will be included with the ES as part of the full DCO application that will include consideration of the single project operational scenario.

174. There are two substation site options identified to the south of the existing Norwich Main substation. Only one of these site options would be taken forward in the final application.

175. The assessments were undertaken using the unmitigated worst case scenario for the potential components that could be in operation at the onshore substation; based on the fixed plant details provided in **Appendix 25.3**.

176. Operations at the onshore substation are proposed to be 24 hours a day. A detailed SoundPLAN noise model was created to assess noise levels as a result of the proposed onshore substation plant at Site 1 and Site 2.

177. Full details regarding assumptions and operational noise sources included in the assessments and the predicted noise levels at each NSR are provided in **Appendix 25.3**.

#### *25.1.13.1.1 Magnitude of effect – Onshore Substation Site 1*

178. Using the BS 4142 criteria, the predicted unmitigated noise levels indicate no impact magnitude of effect at all NSRs during the daytime as the predicted rating level, $L_{Ar,T}$, is below the background sound level, $L_{A90}$.

179. During the night-time reference period, magnitude of effect of no impact is predicted at SSR4, SSR7 and SSR8; and negligible magnitude of effect is predicted at SSR1, SSR5 and SSR10 using the BS 4142 criteria.

180. At SSR2 and SSR9, a low magnitude of effect is predicted during the night-time in accordance with the BS 4142 criteria.

181. A medium magnitude of effect is predicted at SSR3 and SSR6 in accordance with the BS 4142 criteria during the night-time reference period.

#### *25.1.13.1.2 Impact Significance – Substation Site Option 1*

182. All NSRs are considered to be of medium sensitivity; therefore, during the daytime reference period the significance of impact will be no impact, and no additional mitigation is required.

183. During the night-time reference period the assessment indicates an impact of negligible significance at SSR1,SSR4, SSR5, SSR7, SSR8 and SSR10, and minor adverse significance at SSR2 and SSR9.

184. At SSR2 and SSR9, an impact of moderate adverse significance is predicted based on the BS4142 criteria, which would warrant additional mitigation measures.

185. For context whilst moderate adverse impacts are identified at SSR2 and SSR9 against the criteria set out in BS4142, when assessing the absolute noise level (i.e. not in relation to the existing background sound level) at these NSRs using WHO NNG criteria, the magnitude of effect is predicted to be low, representing an impact of **minor** adverse significance.

#### *25.1.13.1.3 Mitigation Measures - Onshore Substation Site 1*

186. Detailed analysis of the predicted noise levels at NSRs in proximity to Substation Site Option 1 indicate that noise associated with Super Grid Transformer (SGT) and Shunt Reactor (SHR) components are the dominant contributors of noise from the onshore substation.

187. Mitigation measures would focus on introducing noise attenuation at these items of substation equipment. To reduce the magnitude of effect noise attenuation would be introduced at the SGT to reduce source noise levels from 90 dB $L_{WA}$ to 80 dB $L_{WA}$ and at SHRs to reduce noise levels from 89 dB $L_{WA}$ to 80 dB $L_{WA}$. Noise enclosures are readily available that would achieve this level of attenuation.

#### *25.1.13.1.4 Residual Impact - Onshore Substation Site 1*

188. The predicted noise levels after implementation of the mitigation measures (noise enclosures for selected substation equipment) are provided in **Appendix 25.3**.

189. The incorporation of noise enclosures at both the SGTs and SHRs to reduce source noise to no greater than 80 dB $L_{WA}$ would reduce the magnitude of effect at all substation NSRs to no greater than negligible in accordance with the BS 4142 criteria during the night-time reference period, representing a residual impact of **negligible** significance at all NSRs.

#### *25.1.13.1.5 Magnitude of effect - Onshore Substation Site 2*

190. Using the BS 4142 criteria, the predicted unmitigated noise levels indicate, at worst, negligible impact magnitude of effect at all NSRs during the daytime.

191. During the night-time reference period, a negligible magnitude of effect is predicted at SSR3, SSR4, SSR5 and SSR6 using the BS 4142 criteria.

192. At SSR2, SSR8 and SSR10, a low magnitude of effect is predicted during the night-time in accordance with the BS 4142 criteria.

193. A medium magnitude of effect is predicted at SSR1, SSR7 and SSR9 in accordance with the BS 4142 criteria during the night-time reference period.

#### *25.1.13.1.6 Impact Significance - Onshore Substation Site 2*

194. All NSRs are considered to be of medium sensitivity; therefore, the significance of impact will be negligible adverse, at worst, during the daytime reference period.

195. The assessment indicates negligible adverse impact significance at SSR3, SSR4, SSR5 and SSR6.

196. At SSR2, SSR8 and SSR10 minor adverse impact significance is predicted.

197. The assessment indicates moderate adverse impact significance at SSR1, SSR7 and SSR9 and a requirement for additional mitigation measures. However, when assessing the absolute noise level at theses NSRs, a low impact magnitude of effect is indicated in accordance with the WHO NNG criteria; therefore, resulting in minor adverse impact significance and no additional mitigation measures required.

#### *25.1.13.1.7 Mitigation Measures - Onshore Substation Site 2*

198. Detailed analysis of the predicted noise levels at NSRs indicate that noise associated with the SGT, SHRs and the 220kV 400kV filter reactor Air Core Reactors (ACRs) are the dominant contributors of noise from the onshore substation zone.

199. Mitigation measures include attenuating the SGT and SHRs to achieve a source noise levels of 80 dB $L_{WA}$ and attenuating the 220kV 400kV filter reactor ACRs to reduce the source noise level from 87 dB $L_{WA}$ to 82 dB $L_{WA}$.

#### *25.1.13.1.8 Residual Impact - Onshore Substation Site 2*

200. The predicted noise levels after implementation of the mitigation measures are provided in **Appendix 25.3**.

201. The residual impact shows a low magnitude of effect, at worst, in accordance with the BS 4142 criteria at all NSRs during the night-time reference period; therefore, indicating **minor** adverse impact at all NSRs and is considered to be not significance in EIA terminology.

### 25.1.14 Potential Impacts during Decommissioning

202. No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. It is likely the cables would be pulled through the ducts and recycled, with the transition pits and ducts capped and sealed then left in situ.

203. A full EIA will be carried out ahead of any decommissioning works. The programme for onshore decommissioning is expected to be similar in duration to the construction phase of 36 months. The detailed activities and methodology for decommissioning will be determined later within the DEP and SEP lifetime, in line with relevant policies at that time, but would be expected to include:

- Dismantling and removal of electrical equipment;
- Removal of cabling from site;
- Removal of any building services equipment;
- Demolition of the buildings and removal of fences; and
- Landscaping and reinstatement of the sites.

204. Whilst details regarding the decommissioning are currently unknown, it is anticipated that the impacts would be similar to those during construction.

205. The decommissioning methodology cannot be finalised until immediately prior to decommissioning but would be in line with relevant policy at that time.

## 25.7 Cumulative Impacts

### 25.1.15 Identification of Potential Cumulative Impacts

206. The first step in the cumulative assessment is the identification of which residual impacts assessed for DEP and/or SEP on their own have the potential for a cumulative impact with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 25-24** below, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale. Only potential impacts assessed in **Section 25.6** as negligible or above are included in the CIA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

*Table 25-24 Potential Cumulative Impacts (impact screening)*

| Impact | Potential for Cumulative Impact | Rationale |
|---|---|---|
| **Construction** | | |
| Impact 1: On-site construction noise at landfall location | Yes | Potential for night-time construction noise impacts associated with the landfall location to act cumulatively with construction noise associated with other nearby projects where there is a temporal overlap. The likelihood of a temporal overlap with other nearby projects may increase for sequential scenario where construction works at the landfall location will take place over a longer period of time. Impact significance of no impact is predicted during the daytime and evenings and weekends periods at landfall location NSRs; therefore, it is considered that there is no potential pathway for cumulative construction noise impacts. |

| Impact | Potential for Cumulative Impact | Rationale |
|---|---|---|
| Impact 2: On-site construction noise along onshore cable corridor | Yes | Potential for construction noise impacts associated with the onshore cable corridor to act cumulatively with construction noise associated with other nearby projects where there is a temporal overlap. The likelihood of a temporal overlap with other nearby projects may increase for sequential scenario where construction works at along the onshore cable corridor will take place over a longer period of time. |
| Impact 3: On-site construction noise at the onshore substation | No | Impact significance of no impact predicted at all NSRs surrounding the onshore substation site options; therefore, it is considered that there is no potential pathway for cumulative construction noise impacts. |
| Impact 4: Noise from off-site construction traffic | Yes | Potential for construction road traffic noise impacts associated with the Projects to act cumulatively with construction traffic on the local road network associated with other nearby projects where there is a temporal overlap. The likelihood of a temporal overlap with other nearby projects may increase for sequential scenario where construction works will take place over a longer period of time. |

| Impact | Potential for Cumulative Impact | Rationale |
|---|---|---|
| Impact 5: Construction vibration | Yes | Potential for cumulative construction vibration impacts with other nearby potential sources of vibration at locations where trenchless crossing works are being undertaken. Due to separation distance between the onshore substation site options and NSRs (<345m) vibration impacts were not considered in the CIA. |
| **Operation** | | |
| Impact 6: Operation of the onshore substation | Yes | Potential for operational phase noise impacts associated with the onshore substation site options to act cumulatively with other nearby industrial / commercial premises. The likelihood for cumulative effects associated with the onshore substation site options may be greater for concurrent and sequential scenarios when both Projects are operating due to the larger number of potential noise sources. |
| **Decommissioning** | | |
| The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage. | | |

### 25.1.16 Other Plans, Projects and Activities

207. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative impacts for inclusion in the CIA (described as 'project screening'). This information is set out in **Table 25-25** below, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to DEP & SEP, status of available data and rationale for including or excluding from the assessment.

208. The project screening has been informed by the development of a CIA Project List which forms an exhaustive list of plans, projects and activities in a very large study area relevant to DEP and SEP. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

*Table 25-25: Summary of projects considered for the CIA in relation to Noise and Vibration (project screening)*

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Hornsea Project Three Offshore Windfarm | DCO consented | 2021-2025 (single phase) 2021-2031 (two phase) | 0km, direct intersection of the two cable corridors<br><br>1.4km from onshore substation Site 1 and 0.95km from onshore substation Site 2 | Y | Construction impacts at the landfall (Impact 1), onshore cable corridor (Impact 2) considered in the CIA.<br><br>Also potential for operational phase impacts at NSRs surrounding the onshore substation zone (Impact 6) and therefore considered in the CIA. |
| Norfolk Vanguard Offshore Windfarm | DCO consented[1] | 2022-2027 | 0km, direct intersection of the two cable corridors | Y | Construction impacts along onshore cable corridor (Impact 2) considered in the CIA. |

[1] Following completion of this CIA, the ruling of a Judicial Review brought against the Secretary of State for Business Energy and Industrial Strategy's (BEIS) decision to award a DCO for NV has been handed down. The decision to grant the order has been submitted to the Secretary of State for redetermination. BEIS will be considering its options, namely appeal or redetermination. Until such time as this process reached a conclusion it has been decided to maintain the NV/ NB cumulative assessment for stakeholder review.

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | 30km between onshore substation Site 1 and Site 2 | | Due to the separation distance between the onshore substation option locations, operational phase impacts (Impact 6) were not considered in the CIA. |
| Norfolk Boreas Offshore Windfarm | DCO examination | 2023-2028 | 0km, direct intersection of the two cable corridors<br><br>30km between onshore substation Site 1 and Site 2 | Y | Construction impacts along onshore cable corridor (Impact 2) considered in the CIA.<br><br>Due to the separation distance between the onshore substation option locations, operational phase impacts (Impact 6) were not considered in the CIA. |
| East Anglia TWO Offshore Windfarm | DCO examination | Unknown | 45km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | for cumulative noise impacts and is therefore not considered in the CIA. |
| Expansion of London Luton Airport | Pre-application DCO | 2023-2036 | 135km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Sunnica Energy Farm | Pre-application DCO | 2022-2025 | 59km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| East Anglia THREE Offshore Windfarm | DCO Consented | 2020-2025 | 52km | N | Given the distance between the project and the PEIR boundary, there would be no |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| East Anglia ONE North Offshore Windfarm | DCO examination | Unknown | 44km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Sizewell C Project | DCO examination | 2022-2034 | 43km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Medworth Energy from Waste | Pre-application DCO | 2022-2025 | 66km | N | Given the distance between the project and the PEIR boundary, |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Combined Heat and Power Facility | | | | | there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| A428 Black Cat to Caxton Gibbet Road Improvement scheme | Pre-examination DCO | 2021-2025 | 100km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Great Yarmouth Third River Crossing | DCO Consented | Unknown | 31km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Lake Lothing Third Crossing | DCO Consented | Unknown | 33km | N | Given the distance between the project and |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Norwich Northern Distributor Road | DCO Consented | Construction completed | 1.5km | N | As construction of the scheme has been completed, there is no mechanism for cumulative noise impacts and is therefore not considered in the CIA. |
| Bradwell B new nuclear power station | Pre-application DCO | Unknown | 94km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| A47 North Tuddenham to Easton | Pre-examination DCO | 2021-2024 | 0km - intersects onshore cable corridor | N | Even though the scheme intersects the proposed onshore cable corridor, there are no nearby NSRs in the immediate area with predicted construction impacts of negligible or higher. Therefore, it is considered that there is no pathway for cumulative noise impacts. |
| Oikos Marine & South Side Development | Pre-application DCO | Unknown | 125km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Progress Power Station | DCO Consented | Unknown | 27km | N | Given the distance between the project and the PEIR boundary, there would be no |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| East Anglia ONE Offshore Windfarm | DCO Consented | Construction completed | 56km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Galloper Offshore Wind Farm | DCO Consented | Construction completed | 45km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Woodside Link Houghton Regis Bedfordshire | DCO Consented | Construction completed | >130km | N | Given the distance between the project and the PEIR boundary, |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Nautilus Interconnector | Pre-application DCO | 2024-2028 | 45km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| TIGRE Project 1 (TP1) | Pre-application DCO | Unknown | N/A | N | As the project is at the pre-application stage, there is insufficient information within the public domain to enable an assessment on the potential cumulative noise impacts. This project was therefore not taken forward into the CIA. |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| M1 Junction 10a Grade Separation - Luton | DCO Consented | Unknown | 130km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Bramford to Twinstead Overhead Line | Pre-application DCO | late 2020s | 56km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Rookery South Energy from Waste Generating Station | DCO Consented - undergoing construction | 2020-2022 | 130km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | not considered in the CIA. |
| Palm Paper 3 CCGT Power station Kings Lynn | DCO Consented | Unknown | 48km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| Millbrook Power | DCO Consented | 2020-2022 | 130km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| A14 Cambridge to Huntingdon Improvement Scheme | Construction | 2016-2020 | 80km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | impacts and is therefore not considered in the CIA. |
| Kings Lynn B Connection Project | DCO Consented | Not available | 48km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| A47/A11 Thickthorn Junction | Pre-application DCO | 2020-2022 | 2.2km | N | Construction of the proposed scheme is scheduled to finished before DEP and SEP construction. Therefore, it is considered that there is no potential pathway for cumulative noise impacts. |
| A47 Blofield to North Burlingham | Pre-application DCO | 2020-2021 | 15.9km | N | Construction of the proposed scheme is scheduled to finished before DEP and SEP construction. Therefore, |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | it is considered that there is no potential pathway for cumulative noise impacts. |
| A47 Wansford to Sutton | Pre-application DCO | 2021-2022 | 100km | | Construction of the proposed scheme is scheduled to finished before DEP and SEP construction. Therefore, it is considered that there is no potential pathway for cumulative noise impacts. |
| Y/7/2018/7001 Construction of permeable surfaced footpath and access road for pedestrians and emergency and maintenance vehicles. | Approved | Unknown | >1km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| C/5/2017/5007 Change of use from B8: Warehousing to a | Approved | Unknown | >1.5km | N | Given the distance between the project and the PEIR boundary, there would be no |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Sui Generis use for waste processing and the production of refuse derived fuel (RDF) | | | | | mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| FUL/2020/0003 Extraction of mineral without compliance with condition no. 12 (restoration scheme for overburden/quarry waste storage) of planning permission C/7/1996/7022 to alter the restoration scheme in areas of overburden/quarry waste storage. | Approved | Unknown | >2km from PIER boundary | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| 20181024 | Registered | Unknown | 0.2km | N | There is insufficient information within the public domain to enable |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Nationally Significant Infrastructure Proposal - underground cable route associated with offshore wind farm. | | | | | assessment of potential cumulative noise impacts; therefore, this proposed project was not taken forward in the CIA. |
| 20181400 Demolition of 4 Existing Units and Development of 10 Residential Units (Reserved Matters Application Following Outline Approval 20151644) | Final decision | Unknown | <0.05km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is considered that there is no pathway for cumulative noise impacts. |
| 20201012 Screening Opinion (Environmental Impact Assessment) | Final Decision - EIA Not Required 04-06-2020 | Unknown | 0km - within PIER boundary | N | There is insufficient information within the public domain to enable assessment of potential cumulative noise impacts; therefore, this proposed project was |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Regulations 2017 - Proposed Development of a Ground Mounted Solar Farm & Associated Infrastructure | | | | | not taken forward in the CIA.<br><br>Additionally, there is only one common NSR between the projects with predicted impact of **negligible** or higher. As this NSR approximately 700m from the boundary of the proposed solar farm the potential for cumulative impacts during the construction phases is unlikely. |
| 20191148 Prior Notification - agricultural building | No prior approval required | Unknown | 0.38km | N | There is insufficient information within the public domain to enable assessment of potential cumulative noise impacts; therefore, this proposed project was not taken forward in the CIA.<br><br>Additionally, there is only one common NSR |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | between the projects with predicted impact of **negligible** or higher. As this NSR approximately 500m from the boundary of the proposed agricultural building the potential for cumulative impacts during the construction phases is unlikely. |
| 20181336 Infiltration Lagoon to serve Food Enterprise Park | Approved | Unknown | 0.5km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is considered that there is no pathway for cumulative noise impacts. |
| 20181294 Milling Tower Building & 6 No Storage Hopper Silos for Food | Approved | Unknown | 0.46km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, the it is considered that there is |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| Processing & Production | | | | | no pathway for cumulative noise impacts. |
| 20180077 Change of Use From Potato Store to Agricultural Chemical Storage | Approved | Unknown | >1.5km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| 2019/0740 Erection of agricultural building and shed | Approved with conditions | Unknown | >1km | N | Given the distance between the project and the PEIR boundary, there would be no mechanism for potential for cumulative noise impacts and is therefore not considered in the CIA. |
| 2017/2270 Agricultural building | Prior approval not required | Unknown | 0km - within PIER boundary | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | considered that there is no pathway for cumulative noise impacts. |
| PF/19/1584 Demolition of garage and outbuilding; erection of detached garage, single storey side extension, alterations to some windows openings and overcladding of external brickwork | Approved | Unknown | 0.42km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is considered that there is no pathway for cumulative noise impacts. |
| IS2/19/0413 Proposal to demolish garages replacing with construction of wheelchair adaptable bungalow (affordable unit) | Advice Given | Unknown | 0.3km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is considered that there is no pathway for cumulative noise impacts. |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| IS2/18/1802 Proposed erection of detached double garage and erection of a detached outbuilding to provide two self-contained holiday lets | Advice Given | Unknown | 0.3km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is considered that there is no pathway for cumulative noise impacts. |
| IS2/17/1671 Demolition of former school and erection of four dwelling houses | Advice Given | Unknown | 0.53km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is considered that there is no pathway for cumulative noise impacts. |
| IB/18/0570 Affordable housing development | Advice Given | Unknown | 0.35km | N | No nearby NSRs in the immediate area with predicted construction impacts of **negligible** or higher; therefore, it is considered that there is no pathway for |

| Project | Status | Construction Period | Closest Distance from the Projects (km) | Included in the CIA (Y/N) | Rationale |
|---|---|---|---|---|---|
| | | | | | cumulative noise impacts. |
| NP/17/1405 Prior notification to erect replacement agricultural storage building | Permission not required | Unknown | 0.13km | N | No nearby NSRs in the immediate area with predicted construction impacts of negligible or higher; therefore, the it is considered that there is no pathway for cumulative noise impacts. |

209. In summary, the following projects will be assessed for potential direct cumulative impacts:

- Hornsea Project Three Offshore Windfarm;
- Norfolk Vanguard Offshore Windfarm; and
- Norfolk Boreas Offshore Windfarm.

### 25.1.17 Assessment of Cumulative Impacts

210. Having established the residual impacts from DEP and/or SEP with the potential for a cumulative impact, along with the other relevant plans, projects and activities, the following sections provide an assessment of the level of impact that may arise.

#### 25.1.17.1 Cumulative Impact 1: Construction Noise at Landfall Location

211. There is the potential for cumulative construction noise impacts should night-time works be required by both DEP/SEP and Hornsea Project Three Offshore Windfarm occur at the same time.

212. The current construction programme for DEP and SEP indicates that HDD works at the landfall location would be undertaken in year two (2026) for DEP or SEP in isolation and DEP and SEP concurrent scenarios and in years two (2026) and five (2029) for the DEP and SEP sequentially scenario, depending on the gap between projects.

213. Hornsea Project Three is reported to complete construction in 2025 (single phase build out) or 2031 (two phase build out). Landfall works for Hornsea Project Three are reported to take place in Year 2 (2023), Year 4 (2025) and potentially Year 6 (2027).

214. Although it is considered unlikely that construction works would be undertaken simultaneously for DEP/SEP and Hornsea Project Three during the night-time for both projects, there is potential for these works to overlap. Should this overlap occur, the results of the noise assessments for each project could increase by up to +3dB; assuming (for the purposes of the assessment) the equivalent equipment is used at both sites.

215. It is assumed that suitable mitigation measures will be implemented to reduce impacts associated with the Hornsea Project Three landfall construction noise to not significant in EIA terms. Therefore, after implementation of the proposed mitigation measures for the DEP and SEP (described in **Section 25.6.1**) the potential for significant cumulative construction noise impacts at the landfall location are not considered likely.

#### 25.1.17.2 Cumulative Impact 2: Construction Noise and Vibration along Onshore Cable Corridor

216. The onshore cable corridor construction phases of DEP/SEP, Hornsea Project Three Offshore Windfarm, Norfolk Vanguard and Norfolk Boreas Offshore Windfarms, could all overlap at various time and, therefore, there is the potential for cumulative noise and vibration impacts during construction where the proposed cable corridors intersect or in locations where concurrent cable corridor construction works associated are being undertaken nearby.

217. The current construction programme for DEP and SEP assumes onshore cable corridor works would be undertaken in years 1-3 (2025 - 2027) for DEP or SEP in isolation and DEP and SEP concurrent scenarios and additionally in Years 5-6 (2029 - 2030) for the DEP and SEP sequentially scenario.

218. Hornsea Project Three is reported to undertake onshore cable works between 2023-2025 (single phase built out) and additional in 2028 (for the two phase build out). Norfolk Vanguard and Boreas are reported to have onshore cable works occurring between 2022-2024. Based on these timings it is considered unlikely that construction works would be undertaken simultaneously for DEP/SEP and these projects. However, Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas have all been subject to delays to consenting decisions and Norfolk Vanguard has subsequently had its consent quashed in the high court.

219. This uncertainty in the timings of these similar projects suggests that the potential for these works to overlap should be assumed as a precaution.

220. The proposed onshore cable corridor associated with DEP and SEP directly intersects Norfolk Vanguard and Norfolk Boreas cable corridors south of Oulton Airfield, with CCR17 as a common NSR considered within the construction noise assessments. Construction noise predictions at this NSR for Norfolk Vanguard and Norfolk Boreas indicate no impact for all associated works as they are below the BS 5228 thresholds; therefore, it is considered that there is no mechanism for cumulative construction noise impacts at this intersection of the onshore cable corridor with DEP and SEP.

221. The potential for cumulative construction noise impacts along the onshore cable corridor with Hornsea Project Three construction activities were identified at NSRs in Attlebridge, Ringland and Swardeston, discussed further in **Appendix 25.2**.

222. No impact is predicted at the NSRs for construction activities associated with the DEP and SEP during the daytime and evenings and weekends reference periods therefore, there is no mechanism for cumulative impacts at these receptor locations.

223. During the night-time, the potential for trenchless crossings may give rise to cumulative impacts should night-time construction works associated with Hornsea Project Three be required. However, after employing the mitigation measures provided for Impact 2, the residual impact for DEP and SEP is reduced to no impact and therefore, there is no potential for cumulative impacts at these NSRs.

#### 25.1.17.3 Cumulative Impact 3: Construction Phase Road Traffic Noise

224. As detailed in Cumulative Impact 2 there is uncertainty with the timings of Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas due to recent consenting issues. However, there are shared road links between these projects and DEP and SEP that are required for the respective construction phases.

225. This uncertainty in the timings of these similar projects suggests that as a precaution the potential for these works to overlap should be assumed. The potential for cumulative construction traffic noise impacts on shared road links will be assessed and presented in the ES to accompany the DCO application. This will allow the refined DEP and SEP onshore cable corridor to be factored into the assessment and to better understand any updates to the timings of these other three projects.

#### 25.1.17.4 Cumulative Impact 4: Operational Phase Noise at the Onshore Substation

226. There is potential for cumulative noise impacts between the onshore substation for DEP and SEP and Hornsea Project Three Offshore Windfarm during the operational phase.

227. Two common operational phase NSR locations are shared between the projects; SSR7 and SSR8. At these locations the predicted rating level after mitigation for DEP and SEP in operation is below the existing background noise level; indicating no impact associated with DEP.

228. Therefore, DEP and SEP, after mitigation will not contribute to a cumulative noise impact at these receptors.

## 25.8 Transboundary Impacts

229. Transboundary impacts associated with noise and vibration were scoped out of the assessment, as detailed in **Table 25-1**.

## 25.9 Inter-relationships

230. The chapters outlined in **Table 25-26** were identified as having inter-relationships with noise and vibration.

*Table 25-26 Noise and vibration inter-relationships*

| Topic and description | Where addressed in this chapter | Rationale |
|---|---|---|
| **Chapter 22 Onshore Ecology** | Not applicable in this chapter | Potential noise impacts at ecological receptors addressed separately in **Chapter 22 - Onshore Ecology**. |
| **Chapter 26 Traffic and Transport** | **Section 25.6** | Influence of noise associated with construction traffic on local amenity. |
| **Chapter 30 Health** | **Section 25.6** | Potential human health impacts related to increase in noise at NSRs. |

## 25.10 Interactions

231. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The areas of potential interaction between impacts are presented in **Table 25-27**.

232. Within **Table 25-28** the impacts are assessed relative to each development phase (Phase assessment, i.e. construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the level of impact upon that receptor. Following this, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across all development phases.

*Table 25-27 Interaction between impacts - screening*

| **Potential Interaction between Impacts** | | | | | |
|---|---|---|---|---|---|
| **Construction** | | | | | |
| | Impact 1: Construction Noise at Landfall Location | Impact 2: Construction Noise along Onshore Cable Corridor | Impact 3: Construction Noise at Onshore Substation | Impact 4: Construction Road Traffic Noise | Impact 5: Construction Vibration |
| Impact 1: Construction Noise at Landfall Location | - | Yes | No | Yes | Yes |
| Impact 2: Construction Noise along Onshore Cable Corridor | Yes | - | Yes | Yes | Yes |
| Impact 3: Construction Noise at Onshore Substation | No | Yes | - | Yes | Yes |
| Impact 4: Construction Road Traffic Noise | Yes | Yes | Yes | - | Yes |
| Impact 5: Construction Vibration | Yes | Yes | Yes | Yes | - |
| **Operation** | | | | | |
| | Impact 6: Operation of Onshore Substation | | | | |
| Impact 6: Operation of Onshore Substation | - | | | | |
| **Decommissioning** | | | | | |
| It is anticipated that the decommissioning impacts would be similar in nature to those of construction. | | | | | |

*Table 25-28 Interaction between impacts - phase and lifetime assessment*

| Receptor | Highest significance level | | | | |
|---|---|---|---|---|---|
| | Construction | Operation | Decommissioning | Phase assessment | Lifetime assessment |
| Residential | Minor adverse | Minor adverse | Minor adverse | **No greater than individually assessed impact**<br>The impacts (Impacts 1-6) are considered to range from no impact to minor adverse impact significance at residential receptors. Given the predicated impact significance and that each impact will be managed with standard and best practice methodologies it is considered that there would either be no interactions or that these would not result in greater impact than assessed individually. | **No greater than individually assessed impact**<br>There will only be potential noise impacts during construction and decommissioning phases at the landfall location and onshore cable route; therefore, it is considered that over the lifetime of the project these impacts would not combine to increase the significance level of any impacts identified in this assessment.<br>At the onshore substation, the assessment indicates minor adverse impacts for throughout the project lifetime which is considered not significant in EIA terms; therefore, it is considered that these impacts would not combine to increase the significance level of any impacts identified in this assessment. |

Potential Monitoring Requirements

233. Monitoring requirements will be described in the ES submitted alongside the DCO application and further developed and agreed with stakeholders prior to construction based on the final detailed design of the Projects.

## 25.11 Assessment Summary

234. A summary of the findings of the for noise and vibration assessment is presented in **Table 25-29**. In accordance with the assessment methodology presented in **Section 25.4**, this table should only be used in conjunction with the additional narrative explanations provided in **Section 25.6**.

*Table 25-29: Summary of potential impacts on Noise and Vibration topic*

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| **Construction** | | | | | | |
| Impact 1: Construction Noise at Landfall Location | Residential | Medium | Daytime - no impact<br><br>Evenings and weekends - no impact<br><br>Night-time - medium | Daytime - no impact<br><br>Evenings and weekends - no impact<br><br>Night-time - moderate adverse | Temporary screening to be installed around the work area or construction compound so that no part of the noise source is visible at the NSR. | Daytime - no impact<br><br>Evenings and weekends - no impact<br><br>Night-time - no impact |
| Impact 2: Construction Noise along Onshore Cable Corridor | Residential | Medium | High | Major | Implementation of CNMP. Where significant impacts remain, the use of temporary screens, silencers, acoustic enclosures and a change in equipment/methodology will be explored where applicable. | Minor adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| Impact 3: Construction Noise at Onshore Substation | Residential | Medium | No impact | No impact | n/a | Negligible |
| Impact 4: Construction Road Traffic Noise | Residential | Medium | High | Major adverse | Development of a Construction Traffic Management Plan to reduce the peak construction traffic flows along the identified links will reduce the impact magnitude and the relative noise change. | Minor adverse |
| Impact 5: Construction Vibration | Residential | Medium | Medium | Minor adverse | n/a | Minor adverse |
| **Operation** | | | | | | |
| Impact 6: Operation of Onshore Substation (Option 1) | Residential | Medium | Medium | Moderate adverse | SGT and SHR components designed to achieve source noise levels of 80 dB $L_{WA}$. | Negligible adverse |

| Potential impact | Receptor | Sensitivity | Magnitude | Pre-mitigation impact | Mitigation measures proposed | Residual impact |
|---|---|---|---|---|---|---|
| Impact 6: Operation of Onshore Substation (Option 2) | Residential | Medium | Medium | Moderate adverse | SGT and SHR components designed to achieve source noise levels of 80 dB $L_{WA}$.<br>ACRs designed to achieve source noise level of 82 dB $L_{WA}$. | Minor adverse |
| **Decommissioning** | | | | | | |
| As per construction. | | | | | | |

## 25.12References


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