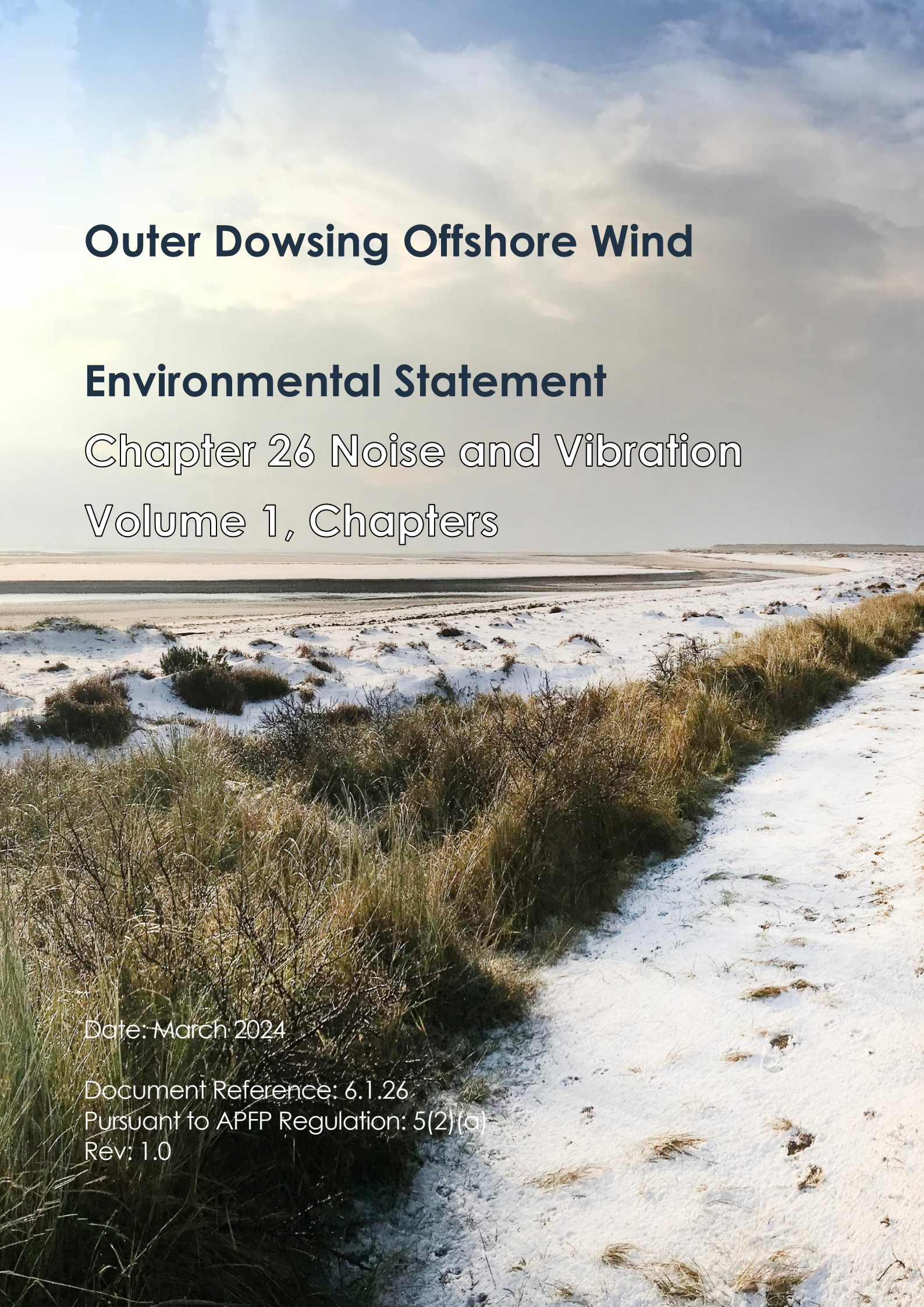

Outer Dowsing Offshore Wind

Environmental Statement

Chapter 26 Noise and Vibration

Volume 1, Chapters

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Acronyms & Terminology

Acronyms

Abbreviation / Acronym	Description
AAWT	Annual Average Weekday Traffic
AIS	Air Insulated Switchgear
AQTAG09	Air Quality Technical Advisory Group 09
BAEF	Boston Alternative Energy Facility
BBC	Boston Borough Council
BNL	Basic Noise Level
BS	British Standard
CBS	Cost Breakdown Structure
CIC	Cable Installation Compound
CLO	Community Liaison Officer
CNG	Community Noise Guideline
CoCP	Code of Construction Practice
CoPA	The Control of Pollution Act 1974
CRTN	Calculation of Road Traffic Noise
DCO	Development Consent Order
DECC	Department of Energy & Climate Change, now the Department for Energy Security and Net Zero (DESNZ)
DESNZ	Department for Energy Security and Net Zero, formerly Department of Business, Energy and Industrial Strategy (BEIS), which was previously Department of Energy & Climate Change (DECC)
DMRB	Design Manual for Roads and Bridges
DRC	Domestic Reverse Charge
EA	Environment Agency
ECC	Export Cable Corridor
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
ELDC	East Lindsay District Council
EPA	The Environmental Protection Act 1990
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Technical Group
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HVAC	High Voltage Alternating Current
IEMA	The Institute of Environmental Management and Assessment
LCC	Lincolnshire County Council
LOAEL	Lowest Observed Adverse Effect Level
LPA	Local Planning Authority
MDS	Maximum Design Scenario

Abbreviation / Acronym	Description
NGESO	National Grid Electrical System Operator
NGET	National Grid Electricity Transmission
NGSS	National Grid Substation
NNR	National Nature Reserve
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPSE	National Policy Statement for England
NSIP	Nationally Significant Infrastructure Project
NSR	Noise Sensitive Receptor
NVMP	Noise and Vibration Management Plan
ODOW	Outer Dowsing Offshore Wind (The Project)
OnRCS	Onshore Reactive Compensation Station
OnSS	Onshore Substation
OS	Ordnance Survey
PEIR	Preliminary Environmental Information Report
PPC	Pollution Prevention and Control
PPG	Planning Practice Guidance
PPV	Peak Particle Velocity
SAC	Special Area of Conservation
SELP	South East Lincolnshire Partnership
SHDC	South Holland District Council
SOAEL	Significant Observed Adverse Effect Level
SoS	Secretary of State
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SWL	Sound Power Level
TC	Trenchless Cut
TCC	Temporary Construction Compounds
TJB	Transition Joint Bays
TKES	Triton Knoll Electrical System
UKAS	United Kingdom Accreditation Service
VSR	Vibration Sensitive Receptor
WHO	World Health Organisation
WMS	Weston Marsh South

Terminology

Term	Definition
400kV cables	High-voltage cables linking the OnSS to the NGSS.
400kV cable corridor	The 400kV cable corridor is the area within which the 400kV cables connecting the onshore substation to the NGSS will be situated.
The Applicant	GT R4 Ltd. The Applicant making the application for a DCO. The Applicant is GT R4 Limited (a joint venture between Corio Generation, TotalEnergies and Gulf Energy Development (GULF)), trading as Outer Dowsing Offshore Wind. The Project is being developed by Corio Generation (a wholly owned Green Investment Group portfolio company), TotalEnergies and GULF.
Baseline	The status of the environment at the time of assessment without the development in place.
Cable ducts	A duct is a length of underground piping which is used to house the Cable Circuits.
Connection Area	An indicative search area for the NGSS.
Cumulative effects	The combined effect of the Project acting additively with the effects of other developments, on the same single receptor/resource.
Cumulative impact	Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of an impact with the sensitivity of a receptor, in accordance with defined significance criteria.
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Environmental Impact Assessment Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	The suite of documents that detail the processes and results of the Environmental Impact Assessment (EIA).
Evidence Plan	A voluntary process of stakeholder consultation with appropriate Expert Topic Groups (ETGs) that discusses and, where possible, agrees the detailed approach to the Environmental Impact Assessment (EIA) and information to support Habitats Regulations_Assessment (HRA) for those relevant topics included in the process, undertaken during the pre-application period.
Export cables	High voltage cables which transmit power from the Offshore Substations (OSS) to the Onshore Substation (OnSS) via an Offshore

Term	Definition
	Reactive Compensation Platform (ORCP) if required, which may include one or more auxiliary cables (normally fibre optic cables).
Haul Road	The track within the onshore ECC which the construction traffic would use to facilitate construction.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Intertidal	The area between Mean High-Water Springs (MHWS) and Mean Low Water Springs (MLWS)
Joint bays	An excavation formed with a buried concrete slab at sufficient depth to enable the jointing of high voltage power cables.
Landfall	The location at the land-sea interface where the offshore export cables and fibre optic cables will come ashore.
Maximum Design Scenario	The project design parameters, or a combination of project design parameters that are likely to result in the greatest potential for change in relation to each impact assessed
Mitigation	Mitigation measures are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the Project design) or secondarily added to reduce impacts in the case of potentially significant effects.
National Grid Onshore Substation (NGSS)	The National Grid substation and associated enabling works to be developed by the National Grid Electricity Transmission (NGET) into which the Project's 400kV cables would connect.
National Policy Statement (NPS)	A document setting out national policy against which proposals for Nationally Significant Infrastructure Projects (NSIPs) will be assessed and decided upon
Onshore Export Cable Corridor (ECC)	The Onshore Export Cable Corridor (Onshore ECC) is the area within which the export cable running from the landfall to the onshore substation (OnSS) will be situated.
Onshore Infrastructure	The combined name for all onshore infrastructure associated with the Project from landfall to grid connection.
Onshore substation (OnSS)	The Project's onshore HVAC substation, containing electrical equipment, control buildings, lightning protection masts, communications masts, access, fencing and other associated equipment, structures or buildings; to enable connection to the National Grid
Order Limits	The area subject to the application for development consent. The limits shown on the works plans within which the Project may be carried out.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).

Term	Definition
Pre-construction and post-construction	The phases of the Project before and after construction takes place.
Preliminary Environmental Information Report (PEIR)	The PEIR was written in the style of a draft Environmental Statement (ES) and provided information to support and inform the statutory consultation process in the pre-application phase.
Project	Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure.
Project design envelope	A description of the range of possible elements that make up the Project's design options under consideration, as set out in detail in the project description. This envelope is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Study Area	Area(s) within which environmental impact may occur – to be defined on a receptor-by-receptor basis by the relevant technical specialist.
Transboundary impacts	Transboundary effects arise when impacts from the development within one European Economic Area (EEA) state affects the environment of another EEA state(s)
Transition Joint Bay (TJB)	The offshore and onshore cable circuits are jointed on the landward side of the sea defences/beach in a Transition Joint Bay (TJB). The TJB is an underground camber constructed of reinforced concrete which provides a secure and stable environment for the cable.
Trenchless technique	Trenchless technology is an underground construction method of installing, repairing and renewing underground pipes, ducts and cables using techniques which minimize or eliminate the need for excavation. Trenchless technologies involve methods of new pipe installation with minimum surface and environmental disruptions. These techniques may include Horizontal Directional Drilling (HDD), thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.

Units

Term	Definition
Decibel (dB)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e., 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L_{Aeq}	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{10} & L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
L_{Amax}	L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
PPV	Peak Particle Velocity - Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV) in mm/s.
hr	Hour
km	Kilometre
m	Metre
mm/s	Millimetres per second
mph	Miles Per Hour
km/h	Kilometres Per Hour
m/s	Metres per second

Reference Documentation

Document Number	Title
6.1.3	Project Description
6.1.6	Technical Consultation
6.1.21	Onshore Ecology
6.1.22	Onshore Ornithology
6.1.27	Traffic and Transport
6.3.5.3	Onshore Cumulative Effects Assessment Approach
6.3.26.1	Sound Level Meter Calibration Certificates
6.3.26.2	Full Baseline Survey Results
6.3.26.3	Construction Plant Sound Levels
6.3.26.4	Noise Model Outputs

26 Onshore Noise and Vibration

26.1 Introduction

1. This chapter of the Environmental Statement (ES) presents the Environmental Impact Assessment (EIA) process and results, for the potential impacts of Onshore Noise and Vibration from Outer Dowsing Offshore Wind ("the Project"). Specifically, this chapter considers the potential impact of the onshore elements of Project including Landfall, the Onshore Export Cable Corridor (Onshore ECC), 400kV cable corridor, and the Onshore substation (OnSS) during the construction, operation and maintenance, and decommissioning phases.
2. The Project will include both offshore and onshore infrastructure including an offshore generating station (windfarm) located approximately 54km from the Lincolnshire coastline, export cables to landfall, onshore cables, an onshore substation, connection to the electricity transmission network, and ancillary and associated development (see Volume 1, Chapter 3: Project Description 6.1.3 for full details (document reference 6.1.3).
3. This chapter describes the scope, relevant legislation, assessment methodology, and the baseline conditions existing at the site and its surroundings. It considers any potential significant environmental effects the proposed development would have on this baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. Cumulative noise and/or vibration effects with other proposed developments that may also have an impact on the sensitive receptors close to the Project are also considered.
4. This chapter is supported by, and summarises, the information contained within the following Volume 3 documents:
   - Appendix 26.1: Sound Level Meter Calibration Certificates (document reference 6.3.26.1);
   - Appendix 26.2: Full Baseline Survey Results (document reference 6.3.26.2);
   - Appendix 26.3: Construction Plant Sound Levels (document reference 6.3.26.3); and
   - Appendix 26.4: Noise Model Outputs (document reference 6.3.26.4).
5. This chapter should be read alongside the following Volume 1 chapters:
   - Chapter 21: Onshore Ecology (document reference 6.1.21);
   - Chapter 22: Onshore Ornithology (document reference 6.1.22); and
   - Chapter 27: Traffic and Transport (document reference 6.1.27).

26.2 Statutory and Policy Context

26.2.1 Legislation

6. There are two legislative instruments which address the effects of environmental noise regarding construction noise and vibration, and nuisance: the Environmental Protection Act 1990 (EPA), and The Control of Pollution Act 1974 (CoPA).
7. The EPA provides a requirement for local authorities to investigate noise from industrial, trade or business premises, or vehicles, machinery or equipment in the street, and to determine if the noise is detrimental to health or constitutes a statutory nuisance. If the local authority determines that noise is detrimental to health or constitutes a statutory nuisance, the EPA gives the local authority the power to issue an abatement notice that requires the person responsible for producing the noise to prevent the noise from occurring (see Table 26.1 in which these are considered further).
8. The CoPA provides two means of controlling construction noise and vibration. Section 60 provides the local authority with the power to impose, at any time, operating conditions on the development site. Section 61 allows the developer to negotiate a set of operating procedures with the local authority prior to commencement of site works (see Table 26.1 in which these are considered further).
9. The assessment work completed in this chapter will inform the Secretary of State (SoS) and the relevant Local Planning Authorities (LPA) as to benchmark baseline sound levels and construction sound levels which may be referred to in a Section 60 or 61 application.

26.2.2 National Planning Policy

10. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs) is provided by the National Policy Statements (NPSs) EN-1 '*Overarching National Policy Statement for Energy*' (Department of Energy and Climate Change (DECC, 2023a) and EN-3 '*National Policy Statement for Renewable Energy Infrastructure*' (DECC, 2023b) and '*National Policy Statement for Electricity Networks Infrastructure*' (EN-5) (DECC, 2023c).
11. The NPSs are a series of principal decision-making documents to appropriately assess Nationally Significant Infrastructure Projects (NSIP). As such, this assessment has made explicit reference to the relevant NPSs requirements.
12. In addition to the current NPS, previous NPSs have been considered through the progress of the Project, as much of the Project development occurred before the publication of the current NPSs. This includes the Overarching NPSs EN-1 (2011a), EN-3 (2011b) and EN-5 (2011c).
13. Details of the policies of relevance to this assessment are provided in Table 26.1 together with an indication of where each requirement is addressed.
14. The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. With regards to noises, it states that planning policies and decisions should aim to; avoid significant adverse effects, mitigate and reduce to a minimum, other adverse impacts, recognise that development will create some noise, and

identify and protect areas of tranquillity.

15. With regard to significant adverse effects, the NPPF refers to the Noise Policy Statement for England (NPSE). The first aim of the NPSE, states that significant adverse impacts on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between the Lowest Observed Adverse Effect Level (LOAEL), and Significant Observed Adverse Effect Level (SOAEL), and it requires that all reasonable steps are taken to mitigate and minimise the adverse effects of noise. However, this does not mean that such adverse effects cannot occur.
16. The web-based Planning Practice Guidance (PPG) advises on how planning can manage potential impacts in new development. The section on noise within the PPG includes a table that summarises "the noise exposure hierarchy" which offers "examples of outcomes" relevant to the 'No Observed Effect Level' (NOEL), LOAEL and SOAEL effect levels described in the NPSE. These outcomes are in descriptive form, there is no numerical definition of the NOEL, LOAEL and SOAEL.

26.2.3 Nationally Significant Infrastructure Projects

17. The relevant legislation and planning policy for offshore renewable energy NSIPs, specifically in relation to Onshore Noise and Vibration, is outlined in Table 26.1 below.

Table 26.1 Legislation and policy context

Legislation/ policy	Key provisions	Section where comment addressed
EPA	Part III of the EPA provides powers for Local authorities to issue abatement notices where a statutory nuisance exists.	Statutory nuisance cannot be assessed at this stage of the development and therefore is not considered further in this chapter. The control of significant effects would be expected to minimise the risk of nuisance.
CoPA	Sections 60 and 61 of Part III of the CoPA provide powers to Local authorities for controlling noise from construction activities.	Construction noise impacts are considered in Section 26.7.1 of this chapter.
EN-1 Paragraph 5.12.6	Paragraph 5.12.6 of EN-1 is reproduced below: *"Where noise impacts are likely to arise from the proposed development, the Applicant should include the following in the noise assessment:* ▪ a description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal characteristics, if the noise is impulsive, whether the noise contains	The assessment has considered all the aspects identified, as detailed in Sections 26.4 to 26.7 of this chapter.

Legislation/ policy	Key provisions	Section where comment addressed
	particular high or low frequency content or any temporal characteristics of the noise; ▪ identification of noise sensitive premises and noise sensitive areas that may be affected; ▪ the characteristics of the existing noise environment; ▪ a prediction of how the noise environment will change with the proposed development o in the shorter term such as during the construction period; o in the longer term during the operating life of the infrastructure; o at particular times of the day, evening and night (and weekends) as appropriate, and at different times of year. ▪ an assessment of the effect of predicted changes in the noise environment on any noise sensitive receptors, including an assessment of any likely impact on health and quality of life/well-being where appropriate, particularly among those disadvantaged by other factors who are often disproportionately affected by noise-sensitive areas; ▪ if likely to cause disturbance, an assessment of the effect of underwater or subterranean noise (noise below ground level); ▪ all reasonable steps taken to mitigate and minimise potential adverse effects on health and quality of life."	
EN-1 Paragraph 5.12.7	The nature and extent of the noise assessment should be proportionate to the likely noise impact.	This is addressed in Sections 26.4 to 26.7 of this chapter.
EN-1 Paragraph 5.12.8	Applicants should consider the noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation.	Section 26.7.8 considers the noise impact of increased construction traffic levels on receptors.
EN-1 Paragraph 5.12.9	Operational noise, with respect to human receptors, should be assessed using the principles of the relevant guidance and British Standards (for example BS 4142, BS 6472 and BS 8233) and other	The assessment has been undertaken in accordance with the principles in the relevant technical guidance

Legislation/ policy	Key provisions	Section where comment addressed
Previously EN-1 Paragraph 5.11.6	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 is 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 (for example BS 5228) and other guidance which also give examples of mitigation strategies.	and British Standards as outlined in Section 26.2.5.
EN-1 Paragraph 5.12.10	Some noise impacts will be controlled through environmental permits and parallel tracking is encouraged where noise impacts determined by an environmental permit interface with planning issues (i.e., physical design and location of development). The Applicant should consult the EA and/or the SNCB, and other relevant bodies, such as the MMO or NRW, as necessary**,** and in particular regarding 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 considered.	Sections 26.7.6 and 26.7.14 considers the potential construction and operational noise impacts on ecological receptors.
EN-1 Paragraph 5.12.12	Applicants should submit a detailed impact assessment and mitigation plan as part of any development plan, including the use of noise mitigation and noise abatement technologies during construction and operation.	The siting of the proposed OnSS has taken into account the locations of the nearest sensitive receptors. The embedded measures adopted to avoid and mitigate effects are set out in Section 26.5.3. The operational and construction noise assessments have included mitigation and reduced the potential adverse impacts as far as reasonably practicable (see Section 26.7).
EN-1 Paragraph 5.12.13	The Secretary of State should consider whether mitigation measures are needed both for operational and construction noise over and above any which may form part of the Project application. In doing so the Secretary of State may wish to impose mitigation measures. Any such mitigation measures should take account of the NPPF or any successor to it and the Planning Practice Guidance on Noise.	
EN-1 Paragraph 5.12.14	Mitigation measures may include one or more of the following: ▪ engineering: reducing the noise generated at source and/or containing the noise generated;	

Legislation/ policy	Key provisions	Section where comment addressed
	▪ lay-out: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening; ▪ by natural or purpose-built barriers, or other buildings; ▪ administrative: using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise limits/noise levels, differentiating as appropriate between different times of day, such as evenings and late at night, and taking into account seasonality of wildlife in nearby designated sites; ▪ insulation: mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building.	
EN-1 Paragraph 5.12.15	The Project should demonstrate good design through the selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible, taking into account any other adverse impact that such containment might cause (e.g., on landscape and visual impacts; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission).	
EN-1 Paragraph 5.12.17	The Secretary of State should not grant development consent unless they are satisfied that the proposals will meet the following aims, through the effective management and control of noise: ▪ avoid significant adverse impacts on health and quality of life from noise; ▪ Mitigate and minimise other adverse impacts on health and quality of life from noise; ▪ where possible, contribute to improvements in health and quality of life through the effective management and control of noise.	

Legislation/ policy	Key provisions	Section where comment addressed
EN-3 Paragraph 2.7.98	The Secretary of State should consider the noise and vibration impacts according to Section 5.12 of EN-1 and be satisfied that noise and vibration will be adequately mitigated through requirements attached to the consent.	As agreed in the Scoping Opinion with the Planning Inspectorate, operational noise from the 'wind turbines' has been scoped out of the assessment, as significant effects are unlikely to occur as referenced in Table 26.5.
EN-3 Paragraph 2.7.99	The Secretary of State will need to take into consideration the extent to which operational noise will be separately controlled by the EA or NRW.	
EN-3 Paragraph 2.7.100	The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the aims set out in 5.12 of EN-1.	
NPPF Paragraphs 174(e) and 185	The NPPF states in Paragraph 191 that planning policies and decisions *"should:* ▪ mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life; and ▪ identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason." Paragraph 180(e) states: *"Planning policies and decisions should contribute to and enhance the natural and local environment by: …* *e) 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 or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans".*	The design of the Project has taken into account the locations of the sensitive receptors. The embedded measures adopted to avoid and mitigate effects are set out in Section 26.5.3. The methodology used to identify all effects is set out in Section 26.6. The operational and construction noise assessments have included mitigation and reduced the potential adverse impacts as far as reasonably practicable (see Section 26.7).
PPG Paragraph: 003 Reference ID:	When determining noise impacts, PPG recommend identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or	

Legislation/ policy	Key provisions	Section where comment addressed
30-003-20190722	would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.	
PPG Paragraph: 005 Reference ID: 30-005-20190722	Noise exposure hierarchy table is used in order to establish whether noise is likely to be a concern. This is based upon whether the noise causes any changes in behaviour and attitude, with consideration needing to be given to mitigating noise levels that cause an observable adverse effect.	

26.2.4 Local Planning Policy

18. Lincolnshire County Council (LCC) provides various environment and planning strategy documents as part of their policies, strategies and plans. There are no known formal overarching policy guidance documents in relation to new development and noise for LCC.
19. The Project falls within land areas under the Boston Borough Council (BBC), South Holland District Council (SHDC), and East Lindsey District Council (ELDC), all of which are part of the South East Lincolnshire Partnership (SELP) and are covered under the South East Lincolnshire Local Plan 2011-36 as adopted in 2019 (the Local Plan).
20. The Local Plan describes in Section 7.4, Pollution, that all new development must take into account the potential environmental impacts from noise.
21. Policy 30: Pollution, in relation to various potential environmental impacts including noise, states:

"Development proposals will not be permitted where, taking account of any proposed mitigation measures, they would lead to unacceptable adverse impacts upon… noise including vibration…".

22. As part of the Local Plan renewable energy strategy, it is acknowledged that proposals should consider various potential environmental impacts (including from noise) individually and cumulatively with other similar developments in the context of supporting sustainable development.

26.2.5 Standards and Guidance

23. A summary of the relevant British Standards and guidance utilised within this chapter is given below.

26.2.5.1 British Standard 5228:2009+A1:2014 – Part 1: Noise

24. The impact of construction noise from onshore sources, arising from the Project, upon residential receptors will be determined with reference to British Standard 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*

(BS 5228-1).

25. BS 5228-1 sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.
26. Compliance with BS 5228-1 is expected as a minimum standard when assessing the impact of construction noise upon the existing noise environment at nearby sensitive receptors.
27. Noise levels generated by construction operations and experienced at local receptors will depend upon a number of variables, the most significant of which are likely to be:
    - The amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
    - The periods of operation of the plant at the development site, known as the "on-time";
    - The distance between the noise source and the receptor, known as the "stand-off";
    - The attenuation due to ground absorption or barrier screening effects; and
    - Reflections of noise due to the presence of hard vertical faces such as walls.
28. BS 5228-1 gives several examples of acceptable noise limits for construction or demolition noise. For this assessment, as baseline noise data is available, it is proposed that the ABC method given in Section E.3.2 of BS 5228-1 will be used to determine the threshold value at the receptor locations.
29. Under the ABC method, a threshold value noise level is determined by establishing the existing ambient noise level at each location. This measured ambient noise level is then rounded to the nearest whole 5dB(A), and the threshold noise value for each receptor is then established from Table E.1 of BS 5228-1. This threshold value is the $L_{Aeq,T}$ noise level that should not be exceeded at the receptor location by operations at the site.
30. If the threshold value is exceeded, then the effect of construction noise upon nearby receptors may be significant. BS 5228-1 states that the significance of the effect will depend upon *"other project-specific factors, such as the number of receptors affected and the duration and character of the impact."* Professional judgement will be used to determine whether an effect is considered to be significant, and commentary explaining the reasons for this judgement will be provided. In accordance with this method, the threshold noise levels for a potentially significant effect are as detailed in Table 26.2.

Table 26.2: Construction noise residential receptors – example threshold values

Assessment Category and Threshold Value Period	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
Day-time (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 5dB) are less than these values.

Assessment Category and Threshold Value Period	Threshold Value in Decibels (dB) Category A[A)]	Category B[B)]	Category C[C)]

[B)] Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
[C)] Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
[D)] 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.

31. Note that the threshold values in Table 26.2 above, are considered to be guideline noise limits externally at the closest noise sensitive window. They are not considered as internal noise limits within the relevant building.

26.2.6 British Standard 5228:2009+A1: 2014 – Part 2: Vibration

32. The impact of vibration from onshore sources arising during construction of the Project upon residential receptors, will be determined with reference to British Standard 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (BS 5228-2).
33. BS 5228-2 provides recommendations for basic methods of vibration control, relating to construction and open sites where work activities/operations generate significant vibration levels.
34. The majority of people are known to be very sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of between 0.14mm/s and 0.30mm/s. Vibration levels above these values can cause disturbance. BS 5228-2 provides guidance on the effects of vibration as shown in Table 26.3.

Table 26.3 Risk of complaints from vibration levels

Vibration Level, PPV mm/s [A), B), C)]	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30	Vibration might be just perceptible in residential environments.
1.00	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10.00	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

[A)] The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.
[B)] A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.
[C)] Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where

Vibration Level, PPV mm/s [A), B), C)]	Effect
these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.	

35. High vibration levels generally arise from 'heavy' construction works such as piling, deep excavation, dynamic ground compaction or drilling.
36. Annex E of BS 5228-2 contains empirical formulae derived by Hiller and Crabb (2000) from field measurements relating to resultant PPV, with a number of 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.
37. 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 guidance vibration levels shown in Table 26.3.

26.2.7 British Standard 4142:2014+A1:2019

38. The impact of operational noise from the OnSS on residential receptors will be determined with reference to British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142).
39. BS 4142 provides guidance on assessing the potential adverse impact of sound, of an industrial and/or commercial nature, at nearby sensitive receptor locations within the context of the existing sound environment.
40. Where the specific sound contains tonality, impulsivity and/or other sound characteristics, corrections should be applied depending on the perceptibility. For tonality, a correction of between 0 and 6dB should be added; for impulsivity, a correction of between 0 and 9dB should be added, and if the sound contains identifiable operational and non-operational periods that are readily distinguishable against the existing sound environment (i.e. intermittency), a correction of 3dB should be applied.
41. In addition, if the sound contains specific sound features which are neither tonal, impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a further correction of 3dB should be added.
42. The assessment of impacts contained in BS 4142 is undertaken by comparing the sound rating level, i.e., the specific sound level of the source plus any character corrections, to the measured representative background sound level immediately outside the sensitive receptor location. Consideration is then given to the context of the existing sound environment at the sensitive

receptor location to assess the potential impact.

43. Once an initial estimate of the impact is determined, by subtracting the measured background sound level from the rating sound level, BS 4142 states that the following should be considered:
    - Typically, the greater the difference, the greater the magnitude of the impact;
    - A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
    - A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and
    - The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. It is an indication that the specific sound source has a low impact when the rating level does not exceed the background sound level, depending on the context.
44. BS 4142 outlines guidance for the consideration of the context of the potential impact, including consideration of the existing residual sound levels, location and/or absolute sound levels.

26.2.8 British Standard 8233:2014

45. The impact of operational noise from the OnSS on residential receptors will also make reference to British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (BS 8233).
46. BS 8233 provides guidance and recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate. However, it is considered the guidance values are useful for context to absolute noise levels. The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as outlined below.
    - An ambient day-time noise level of 35dB $L_{Aeq,16hr}$ or less is suitable for day-time resting; and
    - An ambient night-time noise level of 30dB $L_{Aeq,8hr}$ or less is suitable for sleeping.
47. Section G.1 of Annex G within BS 8233:2014 states that:

"If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB, resulting in the target levels being exceeded. (Footnote: Note that the level difference through a window partially open for ventilation can vary significantly depending on the window type and the frequency content of the external noise. If the specific details of the window and external noise are known the value for insulation may be adjusted accordingly.)".

26.2.9 Guidelines for Environmental Noise Impact

48. The Institute of Environmental Management and Assessment (IEMA) *Guidelines for Environmental Noise Impact Assessment*, Version 1.2 published in November 2014, addresses the key principles of a noise impact assessment and are applicable to "*all development*

proposals where noise effects are likely to occur" and "are relevant to all types of projects, regardless of size".

49. The guidelines provide specific support on how noise impact assessments fit within the EIA process but can also apply to developments which do not require an EIA. They cover:
    - How to scope a noise assessment;
    - Issues to be considered when defining the baseline noise environment;
    - Prediction of changes in noise levels as a result of implementing development proposals; and
    - Definition and evaluation of the significance of the effect of changes in noise levels.

26.2.10Calculation of Road Traffic Noise

50. The former Department of Transport memorandum *Calculation of Road Traffic Noise* (CRTN) published in 1988 sets out standard methods and procedures to predict and measure road traffic noise. These procedures were primarily intended to enable entitlement under the Noise Insulation Regulations 1975 to be determined, but they also provide guidance appropriate to the calculation of traffic noise for more general applications, for example haul routes.
51. Road traffic noise is predicted and measured in terms of a statistical measure. Termed the L_{A10}, this measure of noise is equivalent to the noise level exceeded for 10% of the measurement period. Most legislation that refers to road traffic noise uses this noise index over an 18-hour period, from 06:00 hours to 00:00 hours.

26.2.11World Health Organisation

52. The World Health Organisation *2018 Environmental Noise Guidelines for the European Region*, published in 2018, do not cover industrial noise. However, the previous 1999 Community Noise Guidelines remain valid for industrial noise, i.e., "… all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid".
53. The 1999 guidelines are therefore still valid when referring to external day-time (07:00 – 23:00) ambient noise level limits, with an upper limit of 55dB $L_{Aeq,16hour}$ considered acceptable. External night-time (2300 – 0700) level of 45dB $L_{Aeq,8hour}$ is when sleep disturbance, with windows open, starts to occur.
54. The 2018 guidelines also "complement" the WHO Night Noise Guidelines from 2009.
55. The WHO Night Noise Guidelines 2009 define effect thresholds or *'lowest observed adverse health effect levels'* for both immediate physiological reactions during sleep and long-term adverse health effects. The Guidelines state:
    - An $L_{night,outside}$ level of less than 30dB(A): No effects expected to occur.
    - An $L_{night,outside}$ level of 40dB(A): Adverse effects start to occur. $L_{night,outside}$ 40dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise.
    - An $L_{night,outside}$ level of 55dB(A): Adverse effects such as sleep disturbance are likely and occur frequently.

26.2.12Air Quality Technical Advisory Group 09

56. *Air Quality Technical Advisory Group 09* (AQTAG09) provides guidance on the effects of industrial noise on wildlife and is intended to be used to assess the potential adverse impact of sound, of an industrial and/or commercial nature on wildlife (i.e., the OnSS). The guidance assists officers involved with the determination of Pollution Prevention and Control (PPC) applications for installations with relevant noise emissions.

57. The guidance specifies that, where specific noise from industry, measured at the habitat is below the levels in Table 26.4 it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded further, more detailed assessment will be required.

Table 26.4 AQTAG Specific Noise Levels

Parameter	Noise Level, dB
$L_{Amax,F}$	80
$L_{Aeq,1hr}$	55

26.3 Consultation

58. Consultation is a key part of the Development Consent Order (DCO) application process. Consultation regarding Onshore Noise and Vibration has been conducted through following processes:

- the Evidence Plan Process (EPP) including Expert Topic Group (ETG) meetings;
- the EIA scoping process (ODOW, 2022);
- Bilateral engagement with relevant stakeholders;
- Section 47 consultation process (all public consultation phases including phase 1 and 1a); and
- Section 42 consultation process (Phase 2 Consultation, the Autumn Consultation and the Targeted Winter Consultation).

59. An overview of the Project's consultation process with reference to technical considerations is presented within Volume 1, Chapter 6: Technical Consultation (document reference 6.1.6). Further information on the Project's consultation phases can be found in the Project's Consultation Report (document reference 5.1).

60. A summary of the key issues raised during consultation to date, specific to Onshore Noise and Vibration, is outlined in Table 26.5 overleaf, together with how these issues have been considered in the production of this ES.

Table 26.5 Summary of consultation relating to Noise and Vibration

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
Scoping opinion comments[1]		
The Planning Inspectorate Scoping Opinion, September 2022	The Planning Inspectorate agrees that, given the array will be 54km from the shore and any onshore noise sensitive receptors, noise from construction and decommissioning of the offshore elements on onshore noise sensitive receptors can be scoped out of the assessment, as significant effects from noise over this distance is unlikely to occur.	Construction and decommissioning assessments of the array have not been included within this chapter.
The Planning Inspectorate Scoping Opinion, September 2022	Given the uncertainty around the location and design of the OnSS (and Onshore Reactive Compensation Station (OnRCS), if required) and thus the potential sensitive receptors that could be affected, the Planning Inspectorate does not agree that operational vibration can be scoped out of the assessment. The Environmental Statement (ES) should provide an assessment of effects associated with vibration for OnSS during operation, where likely significant effects could occur.	Section 26.7.15 provides further evidence to justify the reasons why an operational vibration assessment of the OnSS has not been undertaken. The proposed plant, at the distances involved, are considered incapable of causing significant vibration levels at the vibration sensitive receptors (VSR). Additionally, an OnRCS is no longer part of the proposed development.
The Planning Inspectorate Scoping Opinion, September 2022	The Planning Inspectorate agrees that once buried, there is unlikely to be any significant noise or vibration effects from the underground cabling. The Planning Inspectorate agrees that this matter can be scoped out of the assessment.	Construction and operational assessments of the underground cable have not been included within this chapter.
The Planning Inspectorate Scoping Opinion, September 2022	The Planning Inspectorate agrees that, given the array will be 54km from the shore and therefore a considerable distance from relevant onshore noise sensitive receptors, offshore operational noise affecting onshore noise sensitive receptors	An operational assessment of the array has not been included within this chapter.

[1] The scoping opinion was published by the Planning Inspectorate, September 2022 and can be found in Appendix 2 of the Consultation Report (document reference 5.1.2).

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	(NSR) can be scoped out of the assessment as significant effects are unlikely to occur.	
The Planning Inspectorate Scoping Opinion, September 2022	The Planning Inspectorate agrees that given the localised nature of any noise and vibration effects, significant transboundary effects are unlikely to occur and can be scoped out of the assessment.	Transboundary impacts have not been considered within this chapter.
The Planning Inspectorate Scoping Opinion, September 2022	The ES should explain the relevant details of the Triton Knoll Electrical System that have been used to inform the baseline in addition to its location. This is to enable understanding of how the Triton Knoll Electrical System (TKES) is also comparable in terms of (for example) size, scale, and levels of noise generation.	The noise and vibration chapter has not referred to the Triton Knoll Electrical System to inform the baseline noise environment. It was anticipated in the ODOW Scoping Report that baseline noise data collected for the TKES would be utilised in the Project, however this became unnecessary.
The Planning Inspectorate Scoping Opinion, September 2022	The scoping report identifies that designated sites such as Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI) are of 'medium' sensitivity. The Planning Inspectorate advises the that designated sites with noise-sensitive ecological receptors, such as bird species at coastal sites, should be identified as receptors of 'high' sensitivity.	Table 26.36 defines the sensitivity of Ecological receptors as 'high' sensitivity.
The Planning Inspectorate Scoping Opinion, September 2022	The construction noise and vibration assessment should also incorporate effects arising from the construction and use of construction site compounds, where significant effects are likely to occur.	Section 26.7 describes how the noise from site construction compounds have been considered.
The Planning Inspectorate Scoping Opinion, September 2022	In addition to the potential for noise and vibration at railway and major road crossings, the ES should assess the noise and vibration impacts on sensitive receptors at watercourse crossings due to drilling, where likely significant effects could occur.	Section 26.5 states that trenchless techniques have been considered at watercourse crossings.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
The Planning Inspectorate Scoping Opinion, September 2022	The Scoping Report states that cumulative noise and vibration will be scoped into the assessment in the ES for construction and operational noise. The cumulative assessment should encompass the effects from all elements of the onshore works including those that are listed as options in Section 3.7 of the Scoping Report, where significant effects are likely to occur.	Section 26.8 outlines the cumulative assessment that has been undertaken as part of this chapter, based on Volume 3, Appendix 5.3: Cumulative Effects Assessment Approach Onshore (document reference 6.3.5.3).
Expert topic meeting, October 2022		
ETG Meeting with LCC, 13 October 2022	LCC enquired whether East Lindsay and South Holland Environmental Health Teams had provided feedback on the proposed noise and vibration assessments.	The text in the row below describes the feedback provided by the relevant LPAs.
Scoping with the relevant LPAs on survey methodology via a document issued , October 2022	No specific comments from BBC, ELDC or SHDC; however, the Environmental Health Officer (EHO) at SHDC requested that a period of attended (subjective) monitoring should be included to identify the predominant noise sources at each monitoring location.	Table 26.13 and Table 26.29 outline the prevailing soundscape at each of the monitoring locations where unattended monitoring was undertaken and Table 26.19 details the soundscape at the attended monitoring locations.
Phase 2 Consultation (Section 42 consultation on the PEIR) Comments		
PEIR Review – Section 42 Response	An SHDC Environmental Health Officer has reviewed the information put forward (PEIR) and the following comments were provided: - Please provide SHDC Environmental Protection with appropriate contact details in event of complaints. - Ensure SHDC EP Team & all relevant NSR in the immediate area are informed of any proposed works outside of normal working hours. - Maintain sound barriers in good order. - Vibration, ensure SHDC EP Team & all Vibration Sensitive Receptors in immediate area are informed of operations such	These comments relate to noise and vibration management actions which are incorporated into the Outline Noise and Vibration Management Plan (Ref: Document 8.1.1). The Project has also committed to appoint a Community Liaison Officer (CLO) in order to act as a representative for the community to be kept informed of project progress.

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	as piling where vibration is likely to exceed 0.3mms and ensure appropriate monitoring equipment is used in vicinity of works.	
PEIR Review – Section 42 Response	BBC reviewed the PEIR and made the following comments: *'Having reviewed the information put forward within the PEIR, the approach taken appears reasonable in the methodology and we have the below comments to offer.* *- The Council should be provided with contact details in the event of complaints to assist in the management of complaints and concerns.* *- The Council and all relevant noise sensitive receptors in the immediate area to any proposed works are to be informed ahead of these works should they occur outside of normal working hours.* *- The Council and all relevant vibration sensitive receptions in the immediate area to any proposed works are to be informed ahead of these works. Additionally appropriate monitoring equipment is to be used in the vicinity of works in order to assess the level of vibration propagating from the works site.'*	These comments relate to noise and vibration management actions which are incorporated into the Outline Noise and Vibration management Plan. (Ref: Document 8.1.1).
PEIR Review – Section 42 Response	ELDC reviewed the PEIR and made the following comments: *'Having reviewed the information put forward within the PEIR, the approach taken appears reasonable in the methodology and we have the below comments to offer.* *- The Council should be provided with contact details in the event of complaints to assist in the management of complaints and concerns.*	These comments relate to noise and vibration management actions which are incorporated into the Outline Noise and Vibration management Plan. (Ref: Document 8.1.1).

Date and consultation phase/type	Consultation and key issues raised	Section where comment addressed
	- The Council and all relevant noise sensitive receptors in the immediate area to any proposed works are to be informed ahead of these works should they occur outside of normal working hours. *- The Council and all relevant vibration sensitive receptions in the immediate area to any proposed works are to be informed ahead of these works. Additionally appropriate monitoring equipment is to be used in the vicinity of works in order to assess the level of vibration propagating from the works site.'*	
Phase 2 Consultation (the Autumn Consultation) Comments		
Autumn 2023 - S42 Response	BBC and SHDC made the following comment with regards to onshore noise: *'it is important that noise impacts are properly assessed and the management plans that will be a requirement by the DCO provide suitable protection from noise and dust impacts from installing the cable and storing soil during the process that satisfies the Environmental Health teams in BBC and SHDC.'*	Section 26.7 describes all the noise assessment undertaken including any identified impacts and mitigation measures. In conjunction with any mitigation measures a detailed Noise and Vibration Management Plan (NVMP) will be submitted as part of the DCO application.

61. As identified in Chapter 3 (document reference 6.1.3) and Volume 1, Chapter 4: Site Selection and Alternatives (document reference 6.1.4) the Project design envelope has been refined throughout the stages of the Project prior to DCO submission. This process has been reliant on stakeholder consultation feedback.
62. The main design refinements relating to noise and vibration from PEIR to ES are described below:
    - Landfall – the location of the landfall has been identified. In addition, the construction methods and construction plant have been determined.
    - Cable corridor – the route of the cable corridor has been identified. In addition, the construction methods, working times, trenchless drilling locations and construction methods have been refined.
    - OnSS – the location and footprint of the OnSS has been identified and construction methods refined. In addition, the items of operational plant and layout have been identified including associated sound power levels.

26.4 Baseline Environment

26.4.1 Study Area

63. The existing baseline noise environment has been determined by a number of attended and unattended baseline sound surveys, the methodologies of which were reviewed by the LPAs following the submission of a baseline survey scoping document, as outlined in Table 26.5.
64. For the purposes of this chapter, the baseline environment has been divided into the following separate study areas, the relevant figure reference which illustrates the study areas is shown in brackets:
    - The landfall (Volume 2, Figure 26.1 (document reference 6.2.26.1));
    - The onshore ECC and 400kV Cable corridor; and National Grid Connection Point Area (Volume 2, Figure 26.1 (document reference 6.2.26.1));
    - The OnSS (Volume 2, Figure 26.1 (document reference 6.2.26.1)).
65. Based on the above, the following is provided for each study area within this section:
    - A description of study area;
    - A description of the baseline monitoring locations utilised;
    - The monitoring equipment, and the indices measured;
    - The measurement duration;
    - A description of the weather conditions experienced during the baseline survey;
    - The baseline sound survey results;
    - A description of the baseline soundscape at each monitoring location; and
    - An evaluation of the baseline sound levels.

26.4.2 The Landfall

26.4.2.1 Study Area Description

66. The landfall area is located to the south of Anderby Creek. The local environment in the vicinity of the landfall can be characterised as a rural/agricultural land environment, with a small number of individual dwellings located to the south. Anderby Creek comprises a small mixture of residential dwellings and holiday homes.

67. The landfall study area is shown in Volume 2, Figure 26.1 (document reference 6.2.26.1).

26.4.2.2 Baseline Sound Monitoring Locations

68. Baseline sound levels were measured at three locations which are considered representative of the receptors closest to the landfall area. The locations are described in Table 26.6 below and shown on Volume 2, Figure 26.2 (document reference 6.2.26.2).

69. The monitoring locations were selected based on their proximity to residential locations.

Table 26.6 Baseline Sound Monitoring Locations - Landfall

Location ID	Description	OS Grid Ref	
L001	South boundary of Anderby Creek Park, representative of the mobile/holiday homes and the other associated residential properties.	555147	375947
L002	At a location representative of the residential properties on Romans Bank/Sea Road, to the west of the Landfall Area.	554736	375785
L003	At a location representative of the nearest coastal residential property to the south of landfall area on Anderby Road.	555549	374694

26.4.2.3 Monitoring Equipment and Indices Measured

70. The measurements were carried out in accordance with BS 7445-1:2003 as described below utilising the equipment listed in Table 26.7 below.

Table 26.7 Baseline Sound Monitoring Equipment - Landfall

Location ID	Equipment	Serial Number
L001	Cirrus CR:171B Class 1 Sound Level Meter	G079816
	Cirrus CR:515 Acoustic Calibrator	81268
L002	Cirrus CR:171B Class 1 Sound Level Meter	G400059
	Cirrus CR:515 Acoustic Calibrator	99960
L003	Cirrus CR:171B Class 1 Sound Level Meter	G303390
	Cirrus CR:515 Acoustic Calibrator	97661

71. The sound level meters were calibrated before and after each measurement, and no significant drift was observed. The calibration chain is traceable via the United Kingdom Accreditation Service (UKAS) to National Standards held at the National Physical Laboratory.

72. The calibration certificates for all the noise monitoring equipment utilised are shown in Appendix 26.1 (document reference 6.3.26.1).

73. At the monitoring location, the microphone was placed 1.5m above the ground in free-field conditions, i.e., at least 3.5m from the nearest vertical, reflecting surface with the following noise level indices being recorded. This is in accordance with the measurement procedure outlined in BS 4142:2014+A1:2019.

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period time (T);
- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;
- L_{A10}: The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

26.4.2.4 Measurement Duration

74. At Location L001, the prevailing sound levels were measured continuously between the 8th and 13th of November 2022 with noise levels being logged every 15-minutes. This duration ensured that a representative baseline noise environment would be determined.

75. At locations L002 and L003, the prevailing sound levels were measured continuously between the 3rd and 9th of February 2023 with noise levels being logged every 15-minutes.

26.4.2.5 Weather Conditions

76. The prevailing weather conditions were recorded using a Larson Davis weather station and a summary of the results are shown in Table 26.8. The Table also indicates whether any unsuitable weather conditions were removed from the data set – this is based on the analysis of the measured weather conditions which were logged every 15-minutes and the guidance that noise monitoring should not be undertaken if wind speeds are above 5.0m/s or during periods of prolonged precipitation.

77. The weather station was installed at Location L001 as shown on Volume 2, Figure 26.2 (document reference 6.2.26.2).

Table 26.8 Summary of weather conditions – Landfall 8 to 13 November 2022

Date	Average Temp, °C	Precipitation, mm	Average Wind Speed, m/s	Predominant Wind Direction	Unsuitable Periods Identified and Removed from Data Set
08/11/2022	11	0.76	4.5	E	Yes
09/11/2022	10	1	3.3	E	No
10/11/2022	12	0	5.1	E	Yes
11/11/2022	14	0	4.6	E	Yes
12/11/2022	11	0	1.4	ENE	No
13/11/2022	11	0.5	0.8	NE	No

78. A summary of prevailing weather conditions between 3rd and 9th February 2023 are shown in Table 26.9. The Table also indicates whether any unsuitable weather conditions were removed from the data set – this is based on the analysis of the measured weather conditions which were logged every 15-minutes and the guidance that noise monitoring should not be undertaken if wind speeds are above 5.0m/s or during periods of prolonged precipitation.

79. The weather station was installed at Location L002 as shown on Volume 2, Figure 26.2 (document reference 6.2.26.2).

Table 26.9 Summary of weather conditions – Landfall 3 to 9 February 2023

Date	Average Temp, °C	Precipitation, mm	Average Wind Speed, m/s	Predominant Wind Direction	Unsuitable Periods Identified and Removed from Data Set
03/02/2023	11	0	0.8	W	No
04/02/2023	8	0	1.2	W	No
05/02/2023	3	0	1.7	NNW	No
06/02/2023	1	0	1.4	WSW	No
07/02/2023	2	0	0.4	WSW	No
08/02/2023	2	0	2.3	SW	No
09/02/2023	3	0	1.8	WSW	No

80. Table 26.8 and Table 26.9 have provided a summary of the measured prevailing weather conditions; further details of the unsuitable weather conditions identified which were removed from the dataset are shown in Appendix 26.2 (document reference 6.3.26.2).

26.4.2.6 Survey Results

81. A summary of the survey results is included in Table 26.10, Table 26.11 and Table 26.12 and are shown in full in Appendix 26.2 (document reference 6.3.26.2).

82. It should be noted that the survey results have been divided into day-time (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00) periods to be consistent with BS 5228-1:2009+A1:2014.

83. The $L_{Aeq,T}$ level is the logarithmic average ambient noise level during each time period, the L_{A10} and L_{A90} levels shown are the median levels. The L_{Amax} is the highest measured L_{Amax} during each period.

Table 26.10 Summary of baseline survey results – Location L001

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
08/11/22	Day-time*	46.4	39.4	49.4	62.5
	Evening	46.2	39.1	49.6	64.8
	Night-time	37.3	32.3	39.5	60.3
09/11/22	Day-time	45.0	33.5	44.3	78.8
	Evening	36.0	28.5	37.5	65.2
	Night-time	39.3	31.5	41.8	60.4
10/11/22	Day-time	45.2	36.3	47.5	66.3
	Evening	39.8	34.1	42.7	57.0
	Night-time	44.5	36.0	48.3	64.2
11/11/22	Day-time	44.2	35.3	45.0	74.8
	Evening	37.9	32.2	40.2	56.6
	Night-time	33.4	30.5	34.1	53.1
12/11/22 (Saturday)	Day-time	39.8	33.4	40.9	71.3
	Evening	36.8	33.5	37.6	66.1
	Night-time	34.3	32.5	35.1	66.7
13/11/22	Day-time	38.2	31.4	37.9	71.8
	Evening	35.8	33.5	36.5	65.2
	Night-time**	33.5	31.8	34.7	50.0
*Measurement started at 16:15 **Measurement stopped at 03:00 on the 14/11/22					

Table 26.11 Summary of baseline survey results – Location L002

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
03/02/2023	Day-time*	46.8	34.8	49.4	71.1
	Evening	42.9	29.6	39.8	76.4
	Night-time	34.9	30.4	33.9	62.9
04/02/2023 (Saturday)	Day-time	45.7	30.4	47.7	72.4
	Evening	39.6	27.9	38.4	62.5
	Night-time	41.7	37.3	40.4	78.9
05/02/2023	Day-time	47.8	37.2	50.0	79.1
	Evening	44.5	39.2	45.7	68.7
	Night-time	40.0	37.3	40.7	63.3
06/02/2023	Day-time	46.6	32.2	47.9	76.9
	Evening	40.9	32.4	40.4	67.5
	Night-time	37.6	28.9	33.9	71.2
07/02/2023	Day-time	48.3	30.9	48.8	75.9
	Evening	38.4	24.1	35.9	62.7
	Night-time	36.6	27.9	35.8	69.1

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
08/02/2023	Day-time	46.1	35.2	48.2	73.8
	Evening	45.3	30.6	37.2	77.6
	Night-time	38.1	29.3	38.2	67.9
09/02/2023	Day-time**	49.3	30.6	49.0	78.9
	Evening	-	-	-	-
	Night-time	-	-	-	-
*Measurements started at 11:00 **Measurement stopped at 11:15					

Table 26.12 Summary of baseline survey results – Location L003

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
03/02/2023	Day-time*	44.0	36.2	47.2	66.5
	Evening	39.3	35.7	41.2	59.1
	Night-time	41.3	37.8	40.8	53.0
04/02/2023 (Saturday)	Day-time	40.3	31.7	41.2	70.8
	Evening	37.4	30.5	36.9	68.4
	Night-time	43.3	41.6	44.5	61.2
05/02/2023	Day-time	55.3	42.1	48.2	84.6
	Evening	49.2	46.3	51.2	62.4
	Night-time	37.1	34.9	37.9	54.9
06/02/2023	Day-time	42.8	33.3	42.7	81.2
	Evening	36.7	31.4	36.1	61.0
	Night-time	36.4	31.5	35.8	59.6
07/02/2023	Day-time	47.2	31.2	44.0	79.5
	Evening	33.8	26.4	33.1	55.2
	Night-time	32.9	28.3	30.8	66.7
08/02/2023	Day-time	42.5	34.9	43.7	73.6
	Evening	41.9	32.6	39.2	73.7
	Night-time	36.7	31.5	38.0	63.1
09/02/2023	Day-time**	50.1	33.1	44.2	84.4
	Evening	-	-	-	-
	Night-time	-	-	-	-
*Measurements started at 11:30 **Measurement stopped at 11:45					

26.4.2.7 Soundscape

84. The general soundscape at the measurement locations was recorded during equipment installation and collection and is shown in Table 26.13.

Table 26.13 General soundscape

Location	Soundscape
L001	Trees rustling in wind, planes and jets overhead, sound of cows in the field. Occasional car travelling down Roman Bank Road, approximately 30-40mph.
L002	Trees rustling in wind dominant. Occasional car travelling down Roman Bank Road approx. 30mph. Intermittent sound of farmyard machinery next door. Bird song. Planes overhead.
L003	Trees and grass rustling in wind. Birdsong in distance. Gunshots in distance. Occasional car audible driving along Anderby Road.

26.4.2.8 Evaluation of Landfall Baseline Sound Levels

85. The noise-sensitive receptors situated close to the landfall area would potentially be impacted by noise during construction operations.

86. It has been confirmed in Requirement 19 of the Code of Construction Practice (CoCP) that, at the landfall, construction works are not subject to the general restriction to construction between 07:00 hours and 19:00 hours Monday to Saturday with no activity on Sundays or bank holidays.

87. Receptors will therefore potentially be impacted during the day-time (07:00-19:00 Monday to Friday and 07:00-13:00 Saturday), evening (19:00-23:00 Monday to Sunday), weekend (13:00-19:00 on a Saturday and 07:00-19:00 on a Sunday) and night-time (23:00-07:00 Monday to Sunday) periods from construction operations, including trenchless drilling techniques. Therefore, it is necessary to evaluate the measured baseline levels in conjunction with the ABC Method contained in BS 5228-1 to calculate the construction noise threshold limits.

88. With reference to Table 26.10, Table 26.11, and Table 26.12 above, the lowest measured average ambient level at each location during the day-time, weekend and night-time, and the calculated threshold limits are shown in Table 26.14.

89. It should be noted that the measured ambient sound levels have been rounded to the nearest decibel.

Table 26.14 Calculated construction noise threshold limits, dB

Location	Period	Lowest Measured Average Ambient Level $L_{Aeq,T}$	Calculated Threshold Value $L_{Aeq,T}$
Noise sensitive receptors representative of Location L001	Day-time	44	65
	Evening/Weekend	36	55
	Night-time	33	45

Location	Period	Lowest Measured Average Ambient Level $L_{Aeq,T}$	Calculated Threshold Value $L_{Aeq,T}$
Noise sensitive receptors representative of Location L002	Day-time	46	65
	Evening/Weekend	38	55
	Night-time	35	45
Noise sensitive receptors representative of Location L003	Day-time	43	65
	Evening/Weekend	34	55
	Night-time	33	45
Note: Day-time period defined as 07:00-19:00 Monday to Friday and 07:00-13:00 Saturday, evening as 19:00-23:00 Monday to Sunday, weekend period as 13:00-19:00 Saturday and 07:00-19:00 Sunday, and night-time as 23:00-07:00 Monday to Sunday.			

26.4.3 The Onshore ECC and 400kV cable corridor

26.4.3.1 Study Area Description

90. The onshore ECC will have a length of approximately 70km, extending from Anderby Creek in the north, to the OnSS at Surfleet Marsh. The 400 kV cables will then connect to the National Grid at Weston Marsh in the south known as 'The Connection Area', the Order Limits comprising the onshore ECC and 400kV cable corridor is shown in Volume 2, Figure 26.1 (document reference 6.2.26.1).

91. Due to the linear footprint of the Project, the Survey Area for some receptors is relatively large-scale; therefore, to assist with the interpretation and explanation of associated data, the Order Limits have been split into segments. The extent of these segments has been aligned with key geographical features such as roads or rivers which cross the Order Limits. The segments are described below.

- ECC 1 - Landfall to A52 – Hogsthorpe
- ECC 2 - A52 - Hogsthorpe to Marsh Lane
- ECC 3 - Marsh Lane to A158 - Skegness Road
- ECC 4 - A158 - Skegness Road to Low Road
- ECC 5 - Low Road to Steeping River
- ECC 6 - Steeping River to Fodder Dike Bank/Fen Bank
- ECC 7 - Fodder Dike Bank/Fen Bank to Broadgate
- ECC 8 - Broadgate to Ings Drove
- ECC 9 - Ings Drove to Church End Lane
- ECC 10 - Church End Lane to The Haven
- ECC 11 - The Haven to Marsh Road
- ECC 12 - Marsh Road to Fosdyke Bridge

- ECC 13 - Fosdyke to Surfleet Marsh OnSS/Marsh Drove
- ECC 14 - Surfleet Marsh OnSS/Marsh Drove to the Connection Area

92. The local environment in the vicinity of the ECC, 400kv cable corridor and grid connection point can be characterised as rural and agricultural, avoiding the towns of Skegness and Boston.

93. The NSRs which are located within the study area primarily comprise of individual dwellings, and a number of small hamlets/villages, where noise and vibration from construction operations could have a potential impact.

26.4.3.2 Baseline Sound Monitoring Locations

94. Baseline sound levels were measured at 16 locations across the ECC. These locations are described in Table 26.15 below and shown on Volume 2, Figure 26.3 (document reference 6.2.26.3). It should be noted that the monitoring locations were chosen based on the distribution of receptors and their likelihood of experiencing baseline sound levels which would lead to construction noise threshold levels greater than Category A as shown in Table 26.2.

Table 26.15 Onshore ECC Monitoring Locations

Location ID	Description	OS Grid Ref	
ECC001	At a location representative of the farm located to the east of the ECC boundary within the ECC 2 segment.	553157	372164
ECC002	At a location representative of the residential properties located to the east of the ECC boundary within the ECC 2 segment.	553300	371802
ECC003	At a location representative of the residential properties located to the east of the ECC boundary within the ECC 3 segment.	552971	365945
ECC004	At a location representative of the residential property located to the south and east of the ECC boundary within the ECC 5 segment.	551875	360837
ECC005	At a location representative of a residential property located to the south of the ECC boundary within the ECC 5 segment.	550350	360547
ECC006	At a location representative of a residential property located to the south of the ECC boundary within the ECC 5 segment.	549343	360133
ECC007	At a location representative of a residential property located to the south of the ECC boundary within the ECC 6 segment.	546868	357252
ECC008	At a location representative of a residential property located to the south of the ECC boundary within the ECC 7 segment.	545981	356047
ECC009	At a location representative of a residential property located to the north of the ECC boundary within the ECC 8 segment.	542720	352972
ECC010	At a location representative of a residential property located to the east of the ECC boundary within the ECC 8 segment.	541109	351549
ECC011	At a location representative of a residential property located to the east of the ECC boundary within the ECC 8 segment.	539813	350870

Location ID	Description	OS Grid Ref	
ECC012	At a location representative of a residential property located to the east of the ECC boundary within the ECC 9 segment.	538045	348502
ECC013	At a location representative of a residential property located to the east of the ECC boundary within the ECC 9 segment.	537595	345334
ECC014	At a location representative of a residential property located to the west of the ECC boundary within the ECC 9 segment.	538223	343923
ECC015	At a location representative of the residential property located to the north of the ECC boundary within the ECC 10 segment	536913	341402
ECC016	At a location representative of the residential property located on the west of the ECC boundary within the ECC 11 segment.	535541	340093

26.4.3.3 Monitoring Equipment and Indices Measured

95. The measurements were carried out utilising the equipment listed in Table 26.16 below.

Table 26.16 Noise Monitoring Equipment – ECC

Location ID	Equipment	Serial Number
ECC001	Cirrus CR:171B Class 1 Sound Level Meter	G300561
	Cirrus CR:515 Acoustic Calibrator	87922
ECC002	Cirrus CR:171B Class 1 Sound Level Meter	G301839
	Cirrus CR:515 Acoustic Calibrator	93674
ECC003	Cirrus CR:171B Class 1 Sound Level Meter	G300561
	Cirrus CR:515 Acoustic Calibrator	87922
ECC004	Cirrus CR:171B Class 1 Sound Level Meter	G301839
	Cirrus CR:515 Acoustic Calibrator	93674
ECC005	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC006	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC007	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC008	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC009	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC010	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC011	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC012	Cirrus CR:171B Class 1 Sound Level Meter	G0302667

Location ID	Equipment	Serial Number
	Cirrus CR:515 Acoustic Calibrator	94806
ECC013	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC014	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
ECC015	Cirrus CR:171B Class 1 Sound Level Meter	G301839
	Cirrus CR:515 Acoustic Calibrator	93674
ECC016	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806

96. The sound level meters were calibrated before and after each measurement, and no significant drift was observed. The calibration chain is traceable via the UKAS to National Standards held at the National Physical Laboratory.

97. The calibration certificates for all the noise monitoring equipment utilised are shown in Appendix 26.1 (document reference 6.3.26.1).

98. At the monitoring locations, the microphone was placed 1.5m above the ground in free-field conditions, i.e., at least 3.5m from the nearest vertical, reflecting surface with the following noise level indices being recorded.

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period;
- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;
- L_{A10}: The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

26.4.3.4 Measurement Duration

99. The baseline sound survey at all the locations associated with the onshore ECC consisted of a 1-hour fully attended measurement during a midweek day-time period, with noise levels being logged every 1-minute. Measurements were only taken during the day-time as it is understood that normal construction works associated with the ECC would only take place during the hours between 07:00 and 19:00 Monday to Saturday.

100. If construction operations are proposed to occur outside of these hours (e.g. trenchless crossings of longer distances (major drills)), then the construction noise threshold limits will be based on Category A limits contained in Table 26.2 to represent a worst-case scenario.

26.4.3.5 Weather Conditions

101. The prevailing weather conditions were noted by the qualified acoustician[2] during the attended surveys and are shown in Table 26.17 below. The Table also indicates whether any unsuitable data due to weather conditions were removed from the data set – this is based on the observations made by the acoustician on the prevailing weather conditions during the attended surveys and the guidance that noise monitoring should not be undertaken if wind speeds are above 5.0m/s or during periods of prolonged precipitation.

Table 26.17 Summary of weather conditions – Onshore ECC.

Date	Temperature °C	Precipitation Y/N	Maximum Wind Speed, m/s	Predominant Wind Direction	Unsuitable Periods Identified and Removed from Data Set
09/11/22	11	No	4.0	NE	No
22/11/22	9	No	2.0	NW	No
17/01/23	1	No	1.3	NW	No
18/01/23	2	No	3.1	NW	No
28/02/23	8	No	3.0	SW	No
01/03/23	7	No	4.0	NE	No
02/03/23	7	No	2.0	NE	No
03/03/23	6	No	4.0	NE	No

102. It can be seen from Table 26.17 that during the entire survey period there were no identified periods where the weather conditions were unsuitable for undertaking environmental sound measurements.

26.4.3.6 Survey Results

103. A summary of the survey results is shown in Table 26.18 below and detailed in full in Appendix 26.2 (document reference 6.3.26.2).

104. The $L_{Aeq,T}$ level is the logarithmic average ambient noise level, and the L_{A10} and L_{A90} levels are the median levels during each time period. The L_{Amax} is the highest measured L_{Amax} during each period.

Table 26.18 Summary of baseline survey results, dB – Onshore ECC

Date	Location ID	$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
09/11/22	ECC001	43.1	39.4	44.1	60.6
18/01/23	ECC002	55.6	40.4	51.3	76.6
09/11/22	ECC003	44.1	40.2	45.9	62.0

[2] The acoustician holds the I.o.A diploma in acoustics and noise control and has over two years noise surveying experience.

Date	Location ID	$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
18/01/23	ECC004	58.8	52.0	61.9	67.5
28/02/23	ECC005	52.1	44.4	53.9	73.2
	ECC006	54.2	42.0	53.8	76.9
03/03/23	ECC007	56.2	33.9	48.4	81.4
	ECC008	45.6	36.5	44.4	68.3
02/03/23	ECC009	47.2	33.8	46.0	68.9
	ECC010	46.0	31.6	41.8	69.6
	ECC011	52.5	42.1	54.4	70.9
	ECC012	51.0	38.5	53.4	68.6
01/03/23	ECC013	64.7	54.8	68.1	77.0
	ECC014	55.6	42.0	52.5	81.1
17/01/23	ECC015	46.2	33.7	41.1	68.7
22/11/22	ECC016	38.6	31.5	35.2	67.3

26.4.3.7 Soundscape

105. The general soundscape at the measurement locations was recorded by the qualified acoustician during the attended surveys and is shown in Table 26.19.

Table 26.19 General soundscape

Location ID	Soundscape
ECC001	Road noise in distance dominant noise source. Bird song, hedges rustling in wind, high altitude aircraft overhead. Resident was undertaking roofing works in back garden and so any drilling/banging was excluded from results.
ECC002	Road noise in distance audible – low. Planes flying low overhead. Gunshots in distance. Cars travelling down Sloothby High Lane around 30mph – approx. 1-2 per minute.
ECC003	Road noise in distance dominant (possibly A158) - steady traffic flow. High altitude aircraft overhead, grass rustling in wind. Occasional car travelling down Youngers Lane – approximately 1 per minute. Gunshots in distance, birdsong, ducks in lake quacking/flying away.
ECC004	Road noise from A52 dominant – steady traffic flow travelling approx. 50mph. Planes overhead. Some military jets. Gunshots in distance. Trees rustling in wind.
ECC005	Trees rustling in wind dominant noise source. Occasional car driving past meter approximately 20mph. High altitude aircraft. Dog barking in distance - occasionally playing with squeaky toy. Birdsong. Gunshots in distance. Occasional car driving down adjacent road approximately 30mph - non steady.

Location ID	Soundscape
ECC006	Dogs in one of nearby houses barking – constant through survey. Gunshots nearby. Trees and grass rustling in wind. Cars driving past, approx. 30-40mph.
ECC007	Location predominantly birdsong and trees/grass rustling. Occasional car driving down Old Fen Rd approximately 30mph. Around 1 car a minute. Some gunshots in distance. Cyclists riding past. Occasional HGV driving past around 20-30mph. Some road noise audible in distance.
ECC008	Grass and trees rustling in wind. Birdsong. Gunshots in distance. Aircraft overhead. Road noise in distance.
ECC009	Occasional car driving down Broadgate Road approximately 30mph. Trees and grass rustling in wind. Sound of farmyard machinery in distance. Occasional noise from livestock nearby.
ECC010	Bird song dominant. Grass, hedges and trees occasionally rustling in wind. Road noise in distance. Occasional car passing down road (approximately 30mph) however very little traffic in area.
ECC011	Cars driving down B1184 – dominant noise source. Non steady traffic, speed approximately 30-40mph. Primarily cars but some HGVs driving by. Farmyard machinery in distance. Road noise in distance audible. Birdsong. Dog barking in distance.
ECC012	Occasional car travelling down Ings Road approximately 40-50mph. Grass rustling in wind. Bird song, planes overhead. Farmyard machinery audible in distance. Gunshots in distance.
ECC013	Road noise from A52 dominant. Steady traffic flow, approx. 30-40mph. Mainly cars but some HGVs and tractors passing. Grass rustling in wind. Birdsong. Gunshots in distance.
ECC014	Grass and trees rustling in wind. Birdsong. Occasional car driving past 40 - 50mph. Approx 3-5 per minute. Occasional gunshots in distance. Some distance road noise traffic.
ECC015	Road noise in distance audible. Bird song, gunshots in distance, dogs barking. Some construction noise in distance – excavator and reverse bleepers. Occasional car driving down Cut End Road, approx. 1-2 per minute at 20mph. Chainsaw sometimes audible in distance. Light aircraft overhead.
ECC016	Sound of extractor fan running in farmyard next door. Dogs barking in houses nearby. Trees rustling in wind and birdsong. Road noise audible in distance but very low. Occasional jet overhead.

26.4.3.8 Evaluation of ECC Sound Levels

106. The noise-sensitive receptors situated close to the onshore ECC would potentially be impacted from day-time construction operations, therefore it is necessary to evaluate the measured baseline levels in conjunction with the ABC Method contained in BS 5228-1 to calculate the day-time construction noise threshold values, it must be noted that the day-time

includes the period from 07:00 to 13:00 on a Saturday.

107. The noise threshold limits for any proposed construction operations proposed to occur outside of these hours will be based on Category A limits contained in Table 26.2 to represent a worst-case scenario.

108. With reference to Table 26.2 of this Chapter and the measured ambient noise levels, the threshold limits have been calculated at each monitoring location during the day-time and are shown in Table 26.20.

109. It should be noted that the measured sound levels have been rounded to the nearest decibel.

Table 26.20 Calculated construction noise threshold noise limits, dB

Location ID	Period	Measured Average Ambient Level $L_{Aeq,T}$	Calculated Day-time Threshold Value $L_{Aeq,T}$
ECC001	Day-time	43	65
ECC002		56	65
ECC003		44	65
ECC004		59	65
ECC005		52	65
ECC006		54	65
ECC007		56	65
ECC008		46	65
ECC009		47	65
ECC010		46	65
ECC011		53	65
ECC012		51	65
ECC013		65	70
ECC014		56	65
ECC015		46	65
ECC016		39	65

26.4.4 The OnSS

26.4.4.1 Study Area Description

110. The OnSS is located approximately 9km to the northeast of Spalding, and 3.5km to the east of Gosberton, as shown on Volume 2, Figure 26.1 (document reference 6.2.26.1). The A16 is located directly to the west of the OnSS, with the River Welland located to the south and southeast.

111. The local environment within the study area can be characterised as rural, with land which is predominately used for agricultural purposes.

112. The study area extends to the residential dwellings located closest to the OnSS, in all directions. At its closest point, the OnSS footprint will be located approximately 580m from the nearest receptor.

113. The noise and vibration study area includes the residential dwellings located closest to the OnSS, where construction and operational activities could have a potential impact.

26.4.4.2 Baseline Sound Monitoring Locations

114. Baseline sound levels were measured at four locations which are considered representative of the receptors closest to the OnSS. The locations are described in Table 26.21 and shown on Volume 2, Figure 26.4 (document reference 6.2.26.4).

Table 26.21 Baseline Sound Monitoring Locations – OnSS

Location ID	Description	OS Grid Ref	
OnSS001	At a location representative of Woad Farm to the south of the substation footprint.	527833	330478
OnSS002	At a location representative of Big Tree Farm to the southeast of the substation footprint.	528613	330820
OnSS003	At a location representative of the Hills Farm to the west of the substation footprint.	527374	331328
OnSS004	At a location representative of the 172 Marsh Road to the north of the substation footprint.	528486	332442

26.4.4.3 Monitoring Equipment and Indices Measured

115. The measurements were carried out utilising the equipment listed in Table 26.22.

Table 26.22 Baseline Sound Monitoring Equipment – OnSS

Location ID	Equipment	Serial Number
OnSS001	Cirrus CR:171B Class 1 Sound Level Meter	G0302667
	Cirrus CR:515 Acoustic Calibrator	94806
OnSS002	Rion NL-52 Class 1 Sound Level Meter	00976174
	Cirrus CR:515 Acoustic Calibrator	94806
OnSS003	Cirrus CR:171B Class 1 Sound Level Meter	G300561
	Cirrus CR:515 Acoustic Calibrator	87922
OnSS004	Cirrus CR:171B Class 1 Sound Level Meter	G300561
	Cirrus CR:515 Acoustic Calibrator	87922

116. The sound level meters were calibrated before and after each measurement, and no significant drift was observed. The calibration chain is traceable via the UKAS to National Standards held at the National Physical Laboratory.

117. The calibration certificates for all the noise monitoring equipment utilised are shown in Appendix 26.1 (document reference 6.3.26.1).

118. At the monitoring locations, the microphone was placed 1.5m above the ground in free-field conditions, i.e., at least 3.5m from the nearest vertical, reflecting surface with the following noise level indices being recorded.

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period;
- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;
- L_{A10}: The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

26.4.4.4 Measurement Duration

119. At the monitoring locations, sound levels were measured continuously with levels being logged every 15-minutes over the following periods:

- OnSS001 – between 2nd and 9th February 2023;
- OnSS002 – between 11th and 16th of November 2022;
- OnSS003 – between 10th and 15th November 2022; and
- OnSS004 – between 2nd and 9th February 2023.

26.4.4.5 Weather Conditions

120. The prevailing weather conditions between the 10th and the 16th November 2022 were recorded using a Larson Davis weather station and are shown in Table 26.23. The table also indicates whether any unsuitable weather conditions were removed from the data set – this is based on the analysis of the measured weather conditions which were logged every 15-minutes and the guidance that noise monitoring should not be undertaken if wind speeds are above 5.0m/s or during periods of prolonged precipitation.

121. The weather station was installed at Location OnSS001 as shown on Volume 2, Figure 26.4 (document reference 6.2.26.4).

Table 26.23 Summary of weather conditions – OnSS 10 to 16 November 2022

Date	Average Temp, °C	Precipitation, mm	Average Wind Speed, m/s	Predominant Wind Direction	Unsuitable Periods Identified and Removed from Data Set
10/11/2022	12	0	3.6	SW	Yes
11/11/2022	14	0	3.0	SW	No
12/11/2022	11	0	1.9	SSW	No
13/11/2022	11	0.25	0.8	SSW	No
14/11/2022	10	0.5	0.4	SSW	No
15/11/2022	10	9.14	2.9	SSW	Yes
16/11/2022	7	0	2.0	SSW	No

122. The prevailing weather conditions between the 2nd and 9th of February 2023 were recorded using a Larson Davis weather station and are shown in Table . The table also indicates whether any unsuitable weather conditions were removed from the data set – this is based on the analysis of the measured weather conditions which were logged every 15-minutes and the guidance that noise monitoring should not be undertaken if wind speeds are above 5.0m/s or during periods of prolonged precipitation.

123. Between the 2nd and the 9th February 2023 the weather station was installed at Location OnSS001 as shown on Volume 2, Figure 26.4 (document reference 6.2.26.4).

Table 26.24 Summary of weather conditions – OnSS 2 to 9 February 2023

Date	Average Temp, °C	Precipitation, mm	Average Wind Speed, m/s	Predominant Wind Direction	Unsuitable Periods Identified and Removed from Data Set
02/02/2023	10	0	3	WNW	No
03/02/2023	10	0	3	NNW	No
04/02/2023	8	0	1	WNW	No
05/02/2023	4	0	2	N	No
06/02/2023	2	0	1	W	No
07/02/2023	2	0.25	1	WSW	No
08/02/2023	2	0	2	WSW	No
09/02/2023	4	0	2	NNW	No

124. Table 26.23 and Table 26.24 have provided a summary of the measured prevailing weather conditions; further details of the unsuitable weather conditions identified which were removed from the data set are shown in Appendix 26.2 (document reference 6.3.26.2).

26.4.4.6 Survey Results

125. A summary of the survey results is included in Table 26.25 to Table 26.28 and are shown in full in Appendix 26.2 (document reference 6.3.26.2).

126. It should be noted that the survey results have been divided into day-time (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00) periods to be consistent with BS 5228-1:2009+A1:2014.

127. The $L_{Aeq,T}$ level is the average ambient noise level in each period, the L_{A10} and L_{A90} levels shown are the median levels in each indices during each measurement period. The L_{Amax} is the highest measured L_{Amax} during each period.

Table 26.25 Summary of baseline survey results – Location OnSS001

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
02/02/23	Day-time*	54.8	48.7	54.4	67.9
	Evening	48.7	43.1	51.6	57.5
	Night-time	51.7	43.1	51.2	63.6

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
03/02/23	Day-time	54.9	50.1	55.4	70.1
	Evening	54.9	46.6	59.0	61.0
	Night-time	53.3	41.0	54.7	61.7
04/02/23 (Saturday)	Day-time	52.0	47.4	53.1	69.1
	Evening	48.3	41.5	50.5	57.7
	Night-time	48.4	40.1	51.5	60.7
05/02/23	Day-time	49.6	44.7	51.1	71.1
	Evening	46.0	37.9	48.9	55.7
	Night-time	48.7	34.6	50.9	60.6
06/02/23	Day-time	52.4	46.4	52.8	67.2
	Evening	47.6	38.9	49.6	56.3
	Night-time	51.5	37.2	51.3	62.1
07/02/23	Day-time	57.3	44.0	50.7	70.5
	Evening	47.1	40.6	49.5	55.4
	Night-time	48.4	35.4	51.6	61.5
08/02/23	Day-time	53.2	44.7	51.3	68.4
	Evening	46.2	41.0	48.9	56.3
	Night-time	48.7	37.1	47.8	59.2
09/02/23	Day-time**	55.3	49.4	56.1	67.5
	Evening	-	-	-	-
	Night-time	-	-	-	-
*Measurement started at 10:30 **Measurement stopped at 13:30					

Table 26.26 Summary of baseline survey results – Location OnSS002

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
11/11/22	Day-time*	46.8	44.7	48.0	66.4
	Evening	44.4	39.9	47.0	57.2
	Night-time	41.3	33.9	43.9	63.5
12/11/22 (Saturday)	Day-time	49.4	39.0	43.7	81.7
	Evening	40.8	36.6	43.8	54.1
	Night-time	37.3	29.8	34.7	73.3
13/11/22	Day-time	39.7	32.0	37.8	79.1
	Evening	35.5	30.1	35.3	46.3
	Night-time	33.6	25.8	31.0	61.8
14/11/22	Day-time	43.7	30.5	39.6	78.1
	Evening	33.2	28.1	33.4	62.7

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
	Night-time	40.0	34.4	41.9	64.9
15/11/22	Day-time	47.2	44.0	48.3	71.2
	Evening	48.3	37.6	42.7	84.5
	Night-time	41.0	34.2	40.3	63.5
16/11/22	Day-time**	59.9	44.4	48.6	89.4
	Evening	-	-	-	-
	Night-time	-	-	-	-
*Measurement started at 12:30 **Measurement stopped at 12:00					

Table 26.27 Summary of baseline survey results – Location OnSS003

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
10/11/22	Day-time*	54.5	48.6	56.8	72.3
	Evening	53.3	45.9	56.6	70.2
	Night-time	51.2	42.4	53.9	70.6
11/11/22	Day-time	56.0	49.9	57.7	86.0
	Evening	55.4	47.9	58.4	69.2
	Night-time	54.8	43.0	57.2	67.8
12/11/22 (Saturday)	Day-time	59.0	54.0	61.0	74.6
	Evening	56.3	48.6	59.4	67.9
	Night-time	52.6	44.3	55.9	66.4
13/11/22	Day-time	58.9	55.1	61.0	81.2
	Evening	55.7	49.2	58.7	66.4
	Night-time	53.5	38.8	55.6	66.0
14/11/22	Day-time	53.3	47.4	53.6	81.7
	Evening	53.9	46.1	57.3	69.4
	Night-time	55.1	40.8	56.9	68.5
15/11/22	Day-time	58.4	54.0	60.5	71.7
	Evening**	56.9	47.3	59.4	82.8
	Night-time	-	-	-	-
*Measurement started at 15:15 **Measurement stopped at 23:00					

Table 26.28 Summary of baseline survey results – Location OnSS004

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
02/02/23	Day-time*	65.6	59.5	67.9	92.4
	Evening	61.5	48.3	65.6	76.1
	Night-time	60.2	42.7	62.8	73.6
03/02/23	Day-time	66.2	61.0	68.5	91.0

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
	Evening	62.6	51.9	66.0	75.7
	Night-time	59.8	40.9	63.3	74.5
04/02/23 (Saturday)	Day-time	64.4	57.4	67.2	93.9
	Evening	60.4	46.4	64.2	80.7
	Night-time	59.8	43.0	63.4	87.9
05/02/23	Day-time	61.2	55.5	64.0	83.7
	Evening	62.0	50.6	65.1	75.3
	Night-time	59.5	39.3	61.8	75.1
06/02/23	Day-time	63.2	57.1	65.5	89.0
	Evening	60.6	48.9	63.3	72.7
	Night-time	60.1	41.6	62.4	72.9
07/02/23	Day-time	62.6	56.7	64.3	87.1
	Evening	61.6	52.1	65.3	74.1
	Night-time**	58.4	39.5	61.9	72.7
*Measurement started at 10:15**Measurement stopped at 06:45 on the 08/02/22					

26.4.4.7 Soundscape

128. The general soundscape at the measurement locations was recorded during equipment installation and collection and is shown in Table 26.29.

Table 26.29 General soundscape

Location ID	Soundscape
OnSS001	Road noise from A16 dominant. Steady traffic approx 60mph. Planes overhead. Birdsong. Occasional vehicle driving down road nearby.
OnSS002	Trees rustling in wind, sirens in the distance. Road traffic noise from A16 dominant noise source when no wind. Birdsong.
OnSS003	Road noise from A16 dominant noise source. Trees rustling in wind. Sound of farmyard machinery. Cows audible. Faint hum from powerline nearby.
OnSS004	Road noise dominant from A16. Steady flow of traffic approx. 60mph. Mainly cars and HGVs. High altitude aircraft overhead and military jets.

26.4.4.8 Evaluation of OnSS Baseline Sound Levels

129. The noise-sensitive receptors situated close to the OnSS would potentially be impacted from both construction and operational activities, therefore it is necessary to evaluate the measured baseline levels in conjunction with:

- The ABC Method contained in BS 5228:2009+A1:2014 Part 1 to calculate the day-time and weekend (between 13:00 and 19:00 on a Saturday) construction noise threshold limits; and
- BS 4142:2014+A1:2019 to calculate the background sound levels to be utilised for the operational assessment at the residential receptors.

OnSS - Ambient Levels and Threshold Limits for Construction Noise Assessment

130. It has been confirmed that normal construction of the onshore works and construction-related traffic movements to or from the site of the relevant work shall only take place between 07:00 hours and 19:00 hours Monday to Saturday with no activity on Sundays or bank holidays.

131. Receptors will therefore potentially be impacted during the day-time and weekend periods (between 13:00 and 19:00 on a Saturday) from construction operations. Where construction activity, such as trenchless drilling at major crossings, falls outside these hours, they will be assessed separately, however the Project has committed to no construction operations associated with OnSS during on Sundays or evening/night time periods. Therefore, it is necessary to evaluate the measured baseline levels during the day-time and between 13:00 and 19:00 on a Saturday in conjunction with the ABC Method contained in BS 5228-1 to calculate the construction noise threshold limits for the OnSS.

132. With reference to Table 26.2 and the lowest measured average ambient level at each monitoring location during the day-time and for weekends (13:00 to 19:00 on a Saturday), the calculated threshold limits are shown in Table 26.30.

133. It should be noted that the measured ambient sound levels have been rounded to the nearest decibel.

Table 26.30 Calculated construction noise threshold limits, dB

Location ID	Period	Lowest Measured Average Ambient Level $L_{Aeq,T}$	Calculated Threshold Value $L_{Aeq,T}$
Noise sensitive receptors representative of Location OnSS001	Day-time	50	65
	Weekend	52	55
Noise sensitive receptors representative of Location OnSS002	Day-time	40	65
	Weekend	49	55
Noise sensitive receptors representative of Location OnSS003	Day-time	53	65
	Weekend	59	65
Noise sensitive receptors representative of Location OnSS004	Day-time	61	65
	Weekend	64	65
Note: Weekend period defined as between 13:00 and 19:00 on a Saturday			

OnSS – Residential Receptor Background Sound Levels

134. The representative day-time and night-time (defined in BS 4142 as 07:00-23:00 and 23:00-07:00 respectively background sound levels (L_{A90}) which will be utilised as the basis for the operational noise assessment of the OnSS on the residential receptors are shown in Table 26.31.

135. The representative background levels are the lowest day-time and night-time median L_{A90} levels measured and are shown in Table 26.31 with the lowest measured average ambient sound level for day- and night-time periods. The day-time and evening periods are averaged together (weighted with respect to their durations) to determine the BS 4142 time periods.

136. It should be noted that the measured background sound levels have been rounded to the

nearest decibel.

Table 26.31 Representative background sound levels, dB

Location ID	Period	Lowest Measured Average Ambient Level $L_{Aeq,T}$	Representative Background Sound Level L_{A90}
Noise sensitive receptors representative of Location OnSS001	Day-time	49	41
	Night-time	48	35
Noise sensitive receptors representative of Location OnSS002	Day-time	39	30
	Night-time	34	26
Noise sensitive receptors representative of Location OnSS003	Day-time	54	47
	Night-time	51	39
Noise sensitive receptors representative of Location OnSS004	Day-time	62	54
	Night-time	58	39
Note: The BS 4142 day-time period is the average of the day-time and evening periods (weighted with respect to their durations).			

26.4.5 Baseline Data Limitations and Uncertainty

137. As advised in BS 4142:2014+A1:2019, areas of uncertainty associated with the measurement of baseline sound levels include:

- The complexity and level of variability of the residual acoustic environment;
- The location(s) selected for taking the measurements;
- The distance between sources of sound and the measurement location and intervening ground conditions;
- The number of measurements taken;
- The measurement time intervals;
- The range of times when the measurements have been taken;
- The range of suitable weather conditions during which measurements have been taken;
- The measurement method and variability between different practitioners in the way the method is applied;
- The level of rounding of each measurement recorded; and
- The instrumentation used.

138. With reference to the above, the measurement uncertainty was minimised during the baseline sound survey as follows:

- Baseline sound measurements were taken at positions representative of the noise-sensitive receptors to the landfall, the onshore ECC and the OnSS;

- The measurement positions were located away from reflecting surfaces and as far as reasonably practicable leafy vegetation;
- The long-term measurements included day-time and night-time periods for typical midweek and weekend periods;
- A weather station was installed at two locations representative of the long-term monitoring locations so the prevailing weather conditions could be determined and help inform the assessment; and
- The instrumentation was suitable according to BS EN 61672-1.

139. Further to above, and following the completion of the baseline monitoring, the following has been noted regarding the baseline data limitations and uncertainty:

- Baseline sound levels were measured at all the locations as described in Section 26.4, and the results were issued to the relevant LPAs following the submission of a baseline survey scoping document in October 2022 for their comment, no comments were received;
- The sound level meters were field calibrated before the start of relevant measurement period and at the end of the measurement and no significant drifts in calibration were observed;
- All the sound level meters utilised for the measurements operated normally throughout the survey period and to the best of The Applicant's knowledge were not interfered with; and
- Following analysis of the data, it is considered that the measured baseline sound levels throughout the survey were representative of the prevailing sound climate at the nearest noise-sensitive receptors to the landfall, the ECC and the OnSS.

140. With reference to the above, it is therefore considered that the uncertainty and limitations regarding the baseline data were kept to a minimum as far as reasonably practicable.

26.4.6 Worst-Case Approach to Establish Baseline

141. As outlined within this section, the baseline data has been utilised to calculate limits for both the construction and operational assessments. The limits have been based on:

- The lowest average ambient sound levels measured at the relevant locations for the construction noise threshold limits; and
- The lowest median background sound levels measured at the relevant locations for the operational noise from the OnSS.

142. With reference to the above, it is therefore considered that a robust approach has been adopted regarding the baseline data.

26.4.7 Evolution of the Baseline (Future Baseline)

143. The baseline noise conditions are not expected to evolve significantly between now and the point of impact over the Project lifetime.

144. It also considered that the other proposed developments in the area, considered within the cumulative assessment, would not have a significant impact on the evolution of the baseline sound levels.

145. Provided the noise and vibration levels generated by the construction and the operation of the Project development are mitigated suitably (i.e., so, at worst, a minor impact magnitude is predicted) then it is considered that there would be no significant impact on the future baseline due to the construction and operation of the Project development.

26.5 Basis of the Assessment

26.5.1 Impacts Scoped in for Assessment

146. In-line with the Scoping Opinion, and based on the receiving environment, expected parameters of the Project (see Chapter 3 (document reference 6.1.3)), and expected scale of impact/potential for a pathway for effect on the environment, the following impacts have been scoped into the assessment:

- Construction:
  - Impact 1: Temporary noise effects of construction of landfall on human and ecological receptors;
  - Impact 2: Temporary noise effects of construction of the onshore ECC on human and ecological receptors;
  - Impact 3: Temporary noise effects of construction of OnSS on human and ecological receptors;
  - Impact 4: Temporary noise effects of construction traffic on human receptors;
  - Impact 5: Temporary noise and vibration effects of trenchless techniques to include watercourse crossings on human and ecological (noise only) receptors; and
  - Impact 6: Temporary vibration effects of the foundation construction (piling) of the OnSS on human receptors.
  - Impact 7: Temporary cumulative construction noise effects of the Project and 'other developments' on human receptors (see Section 26.8).
- Operation and maintenance:
  - Impact 1: Operational noise effects of the OnSS on human and ecological receptors; and
  - Impact 2: Vibration effects of the OnSS on human receptors.
  - Impact 3: Cumulative operational noise effects of the OnSS and 'other developments' on human receptors.
- Decommissioning:
  - Impact 1: Noise and vibration effects of all decommissioning activities on human and ecological receptors.

26.5.1.1 Impacts Scoped out of Assessment

147. In-line with the Scoping Opinion (The Planning Inspectorate, September 2022), and based on the receiving environment, expected parameters of the Project (see Chapter 3 (document

reference 6.1.3)), and expected scale of impact/potential for a pathway for effect on the environment, the following impacts have been scoped out of the assessment:

- Construction:
  - Impact 1: Noise and vibration from construction and decommissioning of the offshore elements on onshore noise sensitive receptors. This includes the works associated with the reactive compensation station which will be no closer than approximately 12km from the Mean Low Water Springs.
- Operation and maintenance:
  - Impact 1: Noise and vibration from the underground cable;
  - Impact 2: Operation of the offshore elements on onshore noise sensitive receptors; and
  - Transboundary noise and vibration effects.

26.5.2 Realistic Worst-case Scenario

The maximum design scenarios (MDS) identified in Table 26.32 Maximum design scenario for Noise and Vibration for the Project

148. have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the Project Description (Chapter 3). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project design envelope, be taken forward in the final design scheme.

With regards to trenchless techniques, to represent a MDS for noise and vibration it has been assumed that trenchless techniques will be undertaken at all the crossing points including water crossings. As outlined within Table 26.32 Maximum design scenario for Noise and Vibration for the Project

149. the trenchless techniques have been separated into two different scenarios; ‘major’ drills and ‘minor’ drills.

Table 26.32 Maximum design scenario for Noise and Vibration for the Project

Potential effect	Maximum adverse scenario assessed	Justification
Construction		
Temporary noise effects of construction of landfall	Landfall construction area, items of operational plant, plant locations and associated on-times based on indicative layout and plant as shown in Plate 26.3 of Volume 3, Appendix 26.4: Noise Model Outputs (document reference 6.3.26.4). Weekend (19:00 to 23:00 on a Saturday and 07:00 to 23:00 on a Sunday), evening (19:00 to 23:00 Monday to Friday) and night-time assessment (23:00 to 07:00) undertaken for landfall construction operations including trenchless drilling.	Weekend and night-time assessments consider lower noise thresholds limits in conjunction with the measured baseline sound levels and the ABC method contained in BS 5228-1 and therefore have greater potential for adverse impacts.
Temporary noise effects of construction of the onshore ECC and 400kV cable corridor	Construction plant and associated on-times for each phase of the ECC construction works based on an indicative plant list for each phase. For each phase, it has been assumed that all the plant is operating in the same location at the same time. Resultant noise level for each phase compared and the noisiest selected. Area source measuring 100m long by 40m wide generating the combined sound power level for the noisiest activity (haul road removal) placed at the extents of the onshore ECC boundary.	Considered a MDS as plant associated with the nosiest phase (haul road removal) of onshore ECC construction works operating within a relatively small area. Construction activities operating at the extents of the onshore ECC boundary which will result in greater noise impacts.
	Weekend (Saturday afternoon 13:00 to 19:00 hours) assessment undertaken for onshore ECC construction operations. (no evening or night-time construction operations are proposed).	Weekend assessment considers lower noise thresholds limits in conjunction with the measured baseline sound levels and the ABC method contained in BS 5228-1 and therefore have greater potential for adverse impacts.

Potential effect	Maximum adverse scenario assessed	Justification
	Trenchless drilling works divided into two different scenarios, 'minor drills' and 'major drills' based on an indicative plant list and on-times. Minor drills modelled as an area source in a cable installation compound (CIC) measuring 80m by 50m. The area source would generate the total noise level from all trenchless drilling operations at each minor trenchless drilling location. Major drills modelled as an area source in each identified major drill CIC. The area source would generate the total noise level from all trenchless drilling operations at each trench major drill location. Assessment considered nearest NSRs to each minor and major drilling CIC in all directions.	Minor drills – approximately 400 possible minor drill CIC locations identified; therefore, modelling a typically sized drilling compound represents a realistic representative scenario. Major drills – only six trenchless cut (TC) locations where major drills are required have been identified, therefore can be considered individually, to represent a realistic scenario. Assessing nearest NSRs in all directions represents an MDS.
	Weekend (Saturday afternoon 13:00 to 19:00 hours) assessment undertaken for minor drills. (no evening or night-time construction operations are proposed).	Weekend assessment considers lower noise thresholds limits in conjunction with the measured baseline sound levels and the ABC method contained in BS 5228-1 and therefore have greater potential for adverse impacts.
	Weekend (19:00 to 23:00 on a Saturday and 07:00 to 23:00 on a Sunday), evening (19:00 to 23:00 Monday to Friday) and night-time assessment (23:00 to 07:00) undertaken for major drills.	Weekend, evening and night-time assessments consider lower noise thresholds limits in conjunction with the measured baseline sound levels and the ABC method contained in BS 5228-1 and therefore have greater potential for adverse impacts.

Potential effect	Maximum adverse scenario assessed	Justification
Temporary noise effects of construction of OnSS	Assumed all elements of plant used in each phase operating in the same location at the same time. Resultant noise level for each phase compared and the noisiest phase for each workflow selected. Area source of the combined sound power level for the noisiest phase (ground works) placed at the extents of the OnSS footprint. Each area source approximately 25% of the total area of the OnSS footprint.	Nosiest phase of construction operations (ground works) being undertaken at the extents of the OnSS footprint will result in greater noise impacts.
	Weekend (Saturday afternoon 13:00 to 19:00 hours) assessment undertaken for OnSS construction operations (no evening or night-time construction operations are proposed).	Weekend assessment considers lower noise thresholds limits in conjunction with the measured baseline sound levels and the ABC method contained in BS 5228-1 and therefore have greater potential for adverse impacts.
	The construction noise and vibration assessments assume that impact piling will be required to construct OnSS foundations.	Impact piling is likely to generate relatively high levels of noise and vibration compared to other types of foundation construction methods.
Temporary noise effects of construction traffic	Maximum flows expected on each link within the study area assessed.	The values presented will result in the highest noise impact which would occur during the busiest month for each link.
Temporary vibration effects of trenchless drilling	Trenchless drilling will be carried out at the landfall and various locations along the onshore ECC as outlined in ES Volume 2 Figure 3.4 Indicative Onshore Infrastructure (document reference 6.2.3.4)	Drilling activities at the extents of the CICs and TCs will result in greater vibration impacts.

Potential effect	Maximum adverse scenario assessed	Justification
	Assessment assumes drilling rig will be positioned at the extents of the CICs and TCs	
	Night-time vibration assessment undertaken for trenchless drilling for major drills.	The sensitivity of the receptors increases in the night-time period therefore have greater potential for adverse impacts.
Temporary vibration effects of vibratory piling	Vibratory piling will be associated with all the major drills (excluding the landfall, where 'silent' piling methods will be utilised) Assessment assumes piling will be positioned at the extents of the major drilling CICs	Piling activities at the extents of the major drill CICs will result in greater vibration impacts
Temporary vibration effects of the construction of the OnSS's foundations	Impact piling will be required for the OnSS foundations at the footprint boundary closest to each VSR.	Impact piling is likely to generate relatively high levels of vibration compared to other types of foundation construction methods. Piling activities at the extents of the OnSS footprint will result in greater vibration impacts.
Operation and Maintenance		
Operational noise effects of the OnSS	Predictions of operational noise have assumed an Air Insulated Switchgear (AIS) OnSS layout and that all the plant associated with the OnSS is operating 100% of the time. The assessed layout avoids placing buildings between noise emitting equipment and NSRs in order to present a worst-case for assessment.	AIS technology, with equipment located outside of buildings, and plant operating 100% of the time will lead to greater noise impacts, compared to a Gas Insulated Switchgear (GIS) technology layout.
Operational vibration effects of the OnSS	Closest receptor to the OnSS considered for the assessment of operational vibration.	Considering closest receptor represents a MDS as impacts would be less at receptors located at greater distances away from the OnSS.

Potential effect	Maximum adverse scenario assessed	Justification
Decommissioning		
Noise and vibration effects of all decommissioning activities	Decommissioning activities are not anticipated to exceed the construction phase worst-case criteria assessed. In addition, it is also recognised that policy, legislation and local sensitivities constantly evolve, which will limit the relevance of undertaking an assessment at this stage.	Decommissioning considered less intense than construction operations. Assumed that no night-time or piling operations would be associated with decommissioning works.

26.5.3 Embedded Mitigation

150. Mitigation measures that were identified and adopted as part of the evolution of the Project design (embedded into the Project design) and that are relevant to Noise and Vibration are listed in Table 26.33. General mitigation measures, which would apply to all parts of the Project, are set out first. Thereafter mitigation measures that would apply specifically to Noise and Vibration issues associated with the landfall, ECC, and the OnSS are described separately.

Table 26.33 Embedded mitigation relating to noise and vibration

Project phase	Mitigation measures embedded into the Project design
General	
Project Design	As far as reasonably practicable, routing of the ECC and locations of the TCCs and OnSS to avoid key areas of sensitivity.
Construction	
Construction noise and vibration all onshore elements	Commit to reducing noise and vibration to the equivalent of a minor level of effect which may include mitigation such as acoustic screening, use of quieter plant, limiting traffic movements to specific times or routes. Indicative measures have been described in the Outline Noise and Vibration Management Plan (NVMP, document reference 8.1.1) and specific measures will be detailed in the final NVMP.
	Commit to reducing noise and vibration using measures detailed in the final Noise and Vibration Management Plan.
	Development of, and adherence to, a CoCP.
	The adoption of Best Practicable Means (BPM) which may include the following measures: ▪ Consideration will be given to the recommendations set out in Annex B of BS5228-1:2009+A1:2014 with respect to noise sources, remedies and their effectiveness; ▪ Plant and materials will be operated and handled in a proper manner with respect to minimising noise emissions, e.g. no unnecessary revving of engines, minimising drop heights, etc.; and ▪ Plant will be subject to regular maintenance and kept in good working order in meet manufacturers' noise emission levels. BPM will also be implemented to minimise the effects of vibration from construction activities. Measures provided to illustrate the range of techniques available may include: ▪ Where practicable, stationary plant will be isolated using resilient mountings, e.g. for generators, pumps, etc.; ▪ Plant will be operated in a proper manner with respect to minimising vibrations, e.g. low vibration working methods will be employed; ▪ Consideration will be given to the most suitable plant and hours of working for the operations which may give rise to perceptible vibrations and where practicable, these will be replaced by less intrusive plant and/or working methods; and

Project phase	Mitigation measures embedded into the Project design
	▪ Control of vibration at sources, where practicable, by reducing the speed of plant, e.g. limiting the rotational speed or progress rate of any rotary drill rigs.
	Retail buildings will be avoided (i.e. no physical works are undertaken to the building structure).
	Construction hours 16.— (1) Save as otherwise agreed in the code of construction practice and subject to paragraphs (2) and (3), construction of the onshore works and construction-related traffic movements to or from the site of the relevant work shall only take place between 0700 hours and 1900 hours Monday to Saturday with no activity on Sundays or bank holidays. (2) If agreed in advance with the relevant planning authority construction of the onshore works and construction related traffic movements to or from the site of the relevant work may take place outside the hours specified in paragraph (1) for certain identified works, including— (a) where continuous periods of construction are required for works such as concrete pouring and finishing, electrical circuit pulling and jointing, and testing; (b) for the delivery and unloading of abnormal loads; (c) for the landfall works; (d) any other time critical element of the onshore works; and (e) or as otherwise agreed in the code of construction practice. (3) Save for paragraph (4), all construction works which are to be undertaken outside the hours specified in paragraph (1) must be agreed in advance with the relevant planning authority. (4) In respect of trenchless techniques— (a) where continuous 24-hour working is required, the undertaker shall notify the relevant planning authority in advance of such works; and (b) where a trenchless technique is to take place within 100m of an occupied dwelling, the works shall take place in accordance with the construction hours specified in paragraph (1) unless otherwise agreed in advance with the resident of that dwelling and notified to the relevant planning authority.
	Compliance with the final Noise and Vibration Management Plan to be drafted in line with the Outline Noise and Vibration Management Plan
Operation and Maintenance	
Operational noise from the OnSS	As far as reasonably practicable, OnSS sited at a location to avoid key areas of sensitivity.
	Plans for operation and maintenance to be in place before the associated phase of activities commence.

Project phase	Mitigation measures embedded into the Project design
Decommissioning	
Noise and vibration levels generated by decommissioning operations	Not anticipated that any further mitigation measures would be required, other than those associated with construction operations.
	Plans for decommissioning to be in place before the associated phase of activities commence.

151. During the detailed design, additional mitigation measures can be specified (and agreed with the LPAs through approval of the final NVMP), to further reduce the noise impact of the Project. These measures relate to the specifics of the detailed design, and so cannot be accurately included in the assessment at this stage. However, examples of what these mitigation measures may be, and an indication of how much mitigation they may provide, are given in Table 26.34 below.

Table 26.34 Potential detailed design mitigation measures relating to noise and vibration

Mitigation Measure	Indicative Noise Level Reduction	Justification for indicative Noise Level Reduction
Localised acoustic screening providing partial line of sight between noise source and receiver	Up to 5dB(A)	Section F.2.2.2 of BS 5228:2009+A1:2014 states: *'if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10dB when the noise screen completely hides the sources from the receiver'*
Localised acoustic screening preventing any line of sight between noise source and receiver	Up to 10dB(A)	
Fitting more efficient exhaust sound reduction equipment to earth moving plant	5 to 10dB(A)	Table B.1 of BS 5228:2009+A1:2014
Enclose breakers and rock drills in portable or fixed acoustic enclosures with suitable ventilation	Up to 20dB(A)	Table B.1 of BS 5228:2009+A1:2014
Use rotary drills and boring plant inside acoustic shed with adequate ventilation	Up to 15dB(A)	Table B.1 of BS 5228:2009+A1:2014
Reduction of simultaneous use of plant	Up to 3dB(A)	Halving the amount of plant being utilised simultaneously thus halving the sound energy being generated could provide a 3dB reduction.
Re-positioning plant as far away from NSRs as reasonably practicable	Up to 6dB(A)	Doubling the distance between a noise source and a receiver can provide up to a 6dB reduction.

Mitigation Measure	Indicative Noise Level Reduction	Justification for indicative Noise Level Reduction
Not using particularly noisy items of plant pieces at night as far as reasonably practicable	Up to 3dB(A)	Re-scheduling operations to remove noisy works from sensitive time periods will reduce noise impact.
Limiting or eliminating certain works during more sensitive periods	Varies	Would depend on what works/plant was limited or eliminated.
Use of electric or hybrid construction plant	Varies	Dependent on item of plant.

152. With reference to Table 26.34, Table 26.35 provides a worked example of the performances of the mitigation measures at an example receptor where the construction noise thresholds values have been exceeded during the day-time, weekend and night-time.

153. Final measures would be informed by detailed design post-consent and included within the final NVMP which would be submitted for approval to the relevant LPAs as part of the final CoCP that is secured within the DCO.

Table 26.35 Worked Example of Appropriate Mitigation, dB

`	BS 5228-1 Category A Construction Noise Threshold	Example Predicted Construction Noise Level at Receptor	Screening at source, completely hiding noise sources	Reduction of simultaneous use of plant	Selection of low-noise plant for close working	Resultant Construction Noise Level and Magnitude of Impact
Midweek Day-time Construction	65	70 (+5dB above threshold level)	-10	N/A	N/A	60 (-5dB below threshold level)
Evening/Weekend Construction	55	68 (+13dB above threshold level)	-10	-3	N/A	55 (equal to threshold level)
Night-Time Construction (Landfall/major drills)	45	63 (+18dB above threshold level)	-10	-3	-5 (i.e. efficient exhaust sound reduction equipment to earth moving plant)	45 (equal to threshold level)

26.6 Assessment Methodology

154. The Noise and Vibration assessment methodologies, set out in the following sections, were approved by The Planning Inspectorate within their Scoping Opinion as outlined in Table 26.5.

26.6.1 Construction Noise and Vibration Assessments

155. Construction noise and vibration assessments have been undertaken for the landfall area, the onshore ECC (including the 400kV Cable Corridor) and the OnSS. The assessments have been undertaken in compliance with the requirements of BS 5228:2009+A1:2014, *Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1 Noise and Part 2 Vibration*.

156. Where applicable, noise limits have been set at the identified NSRs in accordance with the measured baseline levels and the ABC Method contained in BS 5228-1:2009+A1:2014.

157. Construction noise levels have been predicted at the identified NSRs using the Cadna/A noise modelling software and the calculation algorithms contained in BS 5228:2009+A1:2014, Part 1 and assessed against the specified limits.

158. The assessment includes consideration of noise from the construction activities, including the use of plant and machinery, construction delivery traffic and excavation works at the landfall, along the ECC and at the OnSS substation. In addition, trenchless drilling activities have been included at the landfall and along the ECC.

159. Vibration from operations associated with the trenchless drilling activities and construction of the OnSS have been assessed.

160. Vibration levels from construction works have been predicted at the nearest VSRs in accordance with the methodologies contained in BS 5228:2009+A1:2014, Part 2 and assessed against the guidance levels shown in Table B.1 of the guidance.

161. Construction related traffic using the local road network has been assessed in accordance with the Design Manual for Roads and Bridges (DMRB). The assessment undertaken includes all roads where it is anticipated that noise levels may change from construction traffic.

162. For each link, the Basic Noise Level (BNL) has been established for the "*With Construction Traffic"* and *"Without Construction Traffic"* scenarios. The BNL is the $L_{A10,T}$ dB noise level at 10m from the kerb of the road assessed.

163. The BNL results for each link have been tabulated and the impact and significance determined.

164. It is noted that DMRB has since been superseded by *LA 111 – Noise and Vibration*; however, as the calculations associated with the assessment are being undertaken in conjunction with CRTN and the impact significance contained within *LA 111* is identical to the one contained within DMRB, this method remains valid.

165. Where adverse impacts have been identified, specific mitigation measures, a suite of measures, or further design refinement have been proposed for consideration.

26.6.2 Operational Noise

166. Noise generated by the OnSS has been predicted at the nearest residential NSRs using the

Cadna/A noise modelling software and the methodology in ISO 9613-2:1996, *Acoustics – Attenuation of Sound during Propagation Outdoors*, and assessed at any identified residential receptors in accordance with BS 4142:2014+A1:2019 – *Methods for Rating and Assessing Industrial and Commercial Sound*, whereby sound levels associated with the operation of the OnSS are compared to measured day-time and night-time background sound levels at the closest receptors.

167. A subjective opinion of the potential acoustic features has also been included, and this considers corrections for tonal, impulsive and/or intermittent characteristics.

168. The results of the assessment have been used to determine whether noise levels generated by the OnSS would lead to adverse noise impacts at the nearest NSRs.

169. The assessment indicates whether additional mitigation is required to reduce any identified impacts. As with construction noise, where adverse impacts have been identified, specific mitigation measures are detailed. It is expected that design refinement and/or mitigation options can be applied to the design presented within this ES to reduce the impact to a level that is not significant.

26.6.3 Assessment of Ecological Receptors

170. The noise generated by all construction operations and the operational noise from the OnSS on International or National ecological sites situated near the landfall, ECC and OnSS have been predicted and assessed in accordance with the limits contained in AQTAG09 (Air Quality Technical Advisory Group 09), *Guidance on the effects of industrial noise on wildlife,* which is intended to be used to assess the potential adverse impact of sound, of an industrial and/or commercial nature on wildlife.

171. In addition, construction noise impacts from the landfall have been considered separately at the Anderby Nature Reserve due to the close proximity of the reserve to the identified landfall location.

26.6.4 Cumulative Impact Assessment

172. The impact of the construction operations associated with the landfall and ECC and the construction and operation of the OnSS are assessed cumulatively with other planned developments in the vicinity. Refer to Section 26.8 for details.

26.6.5 Assessment Criteria, Assignment of Significance and Magnitude

173. The criteria for the construction and operational noise and vibration assessments and the associated assignment of significance is outlined in Table 26.36 to Table 26.43.

26.6.5.1 Sensitivity of the Environment

174. The sensitivity/importance of the environment is defined in Table 26.36. The sensitivity/importance of the receptor is a major consideration within the assessment and will be used to inform the significance of effect, as shown in Table 26.43.

Table 26.36 Sensitivity/importance of the environment

Receptor Sensitivity/Importance	Description/Reason
High	Residential properties (night-time), schools and healthcare buildings (day-time). Designated Ecological Sites such as Special Areas of Conservation (SAC), SPA, SSSI.
Medium	Residential properties (day-time), leisure facilities.
Low	Offices and other non-noise producing employment areas.
Negligible	Industrial areas.

26.6.5.2 Overall Impact Magnitude

175. The overall magnitude of impact is defined in Table 26.37. The impact magnitude categories outlined below will be used to inform the significance of effect, as shown in Table 26.43.

Table 26.37 Overall impact magnitude definitions

Magnitude	Description/reason
High	Fundamental, permanent/irreversible changes over the whole receptor, and/or fundamental alteration to key characteristics or features of the particular receptor's character or distinctiveness.
Medium	Considerable, permanent/irreversible changes over the majority of the receptor, and/or discernible alteration to key characteristics or features of the particular receptor's character or distinctiveness.
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 particular receptor's character or distinctiveness.
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 particular receptor's character or distinctiveness.

26.6.5.3 Construction Noise Impact Magnitude

176. The impact of construction noise upon existing residential receptors will be determined with reference to the ABC method presented in BS 5228-1:2009+A1:2014. The impact of construction noise upon existing residential receptors is as detailed in Table 26.38.

Table 26.38 Construction noise impact magnitude

Impact Magnitude	Exceedance in the $L_{Aeq,T}$ Noise Level
High	Threshold value exceeded by 5dB or more.
Medium	Threshold value exceeded by a maximum of 4dB.
Low	Threshold value exceeded by a maximum of 2dB.
Negligible	Threshold value not exceeded.

26.6.5.4 Construction Traffic Noise Impact Magnitude

177. The impact of the change in noise level will be determined with reference to the

classification of magnitude of impacts used in short-term traffic noise assessments presented in the DMRB Volume 11 Section 3 Part 7 Noise and Vibration and is shown in Table 26.39.

Table 26.39 Construction traffic noise impact magnitude

Impact Magnitude	Description
High	Change in $L_{A10, 18\ hour}$ noise level of 5.0dB or more.
Medium	Change in $L_{A10, 18\ hour}$ noise level between 3.0 and 4.9dB.
Low	Change in $L_{A10, 18\ hour}$ noise level between 0.1 and 2.9dB.
Negligible	No change in $L_{A10, 18\ hour}$ noise level.

26.6.5.5 Construction Vibration Impact Magnitude

178. The impact of construction vibration upon existing residential receptors will be determined with reference to BS 5228-2:2009+A1:2014. The impact of construction vibration upon residential receptors is as detailed in Table 26.40.

Table 26.40 Construction Vibration Impact Magnitude

Impact Magnitude	Description
High	10.00mm/s or more
Medium	Between 1.0 to 9.9mm/s
Low	Between 0.3 to 0.9mm/s
Negligible	Between 0.01 to 0.3mm/s

26.6.5.6 Operational Noise Impact Magnitude

179. The impact of operational noise from the OnSS upon existing residential receptors will be determined with reference to BS 4142:2014+A1:2019 and the changes in the total ambient (absolute level) noise levels.

180. Based on the guidance presented in BS 4142:2014+A1:2019 and the changes in the total ambient (absolute level) noise levels, the impact of operational noise upon existing residential receptors is detailed in Table 26.41.

Table 26.41 Operational noise impact magnitude – residential receptors

Impact Magnitude	Description
High	Rating level is 10dB(A) or more above the rating level limit or change in ambient noise level (L_{Aeq}) of 10dB or more.
Medium	Rating level is between 6 and 9dB(A) above the rating level limit or change in ambient noise level (L_{Aeq}) of between 6 and 9dB.
Low	Rating level is between 1 and 5dB(A) above the rating level limit or change in ambient noise level ($_{LAeq}$) of between 1 and 5dB.
Negligible	Rating level is equal to or below the rating level limit, or no change in ambient noise level (L_{Aeq}).

26.6.5.7 Ecological Receptors

181. The impact of construction and operational noise on ecological receptors will be

determined with reference to the AQTAG 09 guidance. The impact of construction noise upon ecological receptors is as detailed in Table 26.42.

Table 26.42 Construction and operational noise impact magnitude – ecological receptors

Impact Magnitude	Exceedance in the $L_{Aeq,T}$ Noise Level	Exceedance in the L_{Amax} Noise Level
High	Threshold value exceeded by 5dB or more.	Maximum noise limit exceeded by 5dB or more.
Medium	Threshold value exceeded by a maximum of 4dB.	Maximum noise limit exceeded by a maximum of 4dB.
Low	Threshold value exceeded by a maximum of 2dB.	Maximum noise limit exceeded by a maximum of 2dB
Negligible	Threshold value not exceeded.	Maximum noise limit not exceeded.

26.6.6 Significance of Effect

182. Sensitivity of the receptor and magnitude of impact have then been considered collectively to determine the potential effect and its significance. The collective assessment represents a 'considered assessment' by the assessor, based on the likely sensitivity of the receptor to the change (e.g., is a receptor present which would be affected by the change), and then the magnitude of that change.

183. Table 26.43 is used as a guide to determine the level of effect; '*major'* and '*moderate'* effects are considered to be *'significant'* in terms of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations).

184. Further to the above and in conjunction with the NPPF and the NPSE it is considered that '*negligible'* and *'minor'* level of effects would equate to a NOEL, a *'moderate'* level of effect would equate to a LOAEL and a *'major'* level of effect would equate to a SOAEL.

185. It is considered that the Project would not lead to any beneficial noise and vibration effects; therefore, this has not been considered within Table 26.43.

186. In addition, based on professional judgement, it is considered that, for the construction phase, operational phase and decommissioning phase, short-term is defined as less than one-month, medium-term is defined as one-month to two years, and long-term is defined as greater than two-years.

Table 26.43 Matrix to determine effect significance

		Magnitude of impact			
		Negligible	*Low*	*Medium*	*High*
Sensitivity of receptor	*Negligible*	Negligible (Not significant)	Negligible (Not significant)	Minor (Not significant)	Minor (Not significant)
	Low	Negligible (Not significant)	Minor (Not significant)	Minor (Not significant)	Moderate (Significant)
	Medium	Minor (Not significant)	Minor (Not significant)	Moderate (Significant)	Major (Significant)
	High	Minor (Not significant)	Moderate (Significant)	Major (Significant)	Major (Significant)

26.6.7 Assumptions and Limitations

187. The main uncertainties and technical difficulties encountered during the completion of the noise and vibration assessment are outlined below. For the purposes of this chapter, they have been divided into:

- Construction Noise and Vibration Assessment; and
- Operational Noise and Vibration Assessment.

26.6.7.1 Construction Noise and Vibration Assessments

188. Construction noise and vibration predictions are based on the anticipated programme and construction methods. It has been necessary to make assumptions with the advice of the design team regarding some aspects of the construction process. These are considered to be precautionary and reflect the level of information that is typically available at this stage of the proposed development noting that only indicative equipment layouts were available to inform assessment. Further information on the anticipated construction programme is provided in Chapter 3 (document reference 6.1.3).

189. With reference to the above, the construction noise and vibration assessments have been based on the following methodology for each aspect of the development considered:

- Landfall – noise assessment based on an indicative construction area and associated plant therefore noise impacts assessed at the nearest identified sensitive receptors. Vibration assessment (underground tunnelling) based on standoff distances from the boundary of the landfall area vibration impacts are likely to occur. Landfall assessments have considered day-time, evening, weekend and night-time construction operations.
- ECC – assessment based on standoff distances from the extents of the ECC boundary which define where adverse noise and vibration impacts are likely to occur and has considered day-time and weekend (13:00 to 19:00 on a Saturday) construction operations.
- Trenchless Drilling (Minor Drills) – noise assessment based on standoff distances from the extents of the minor drilling CICs which define where adverse noise impacts are likely to occur and have considered day-time and weekend (13:00 to 19:00 on a Saturday) drilling operations. Vibration assessment for underground drilling also based on standoff distances from the extents of the minor drill CICs and TCs which define where adverse noise impacts are likely to occur.
- Trenchless Drilling (Major Drills) – noise based on defined major drill CICs and indicative plant list, therefore noise impacts assessed at the nearest identified sensitive receptors. Noise assessment has considered day-time, evening, weekend and night-time underground drilling operations. Vibration assessment based on standoff distances from the extents of the major drill CICs and TCs which define where adverse vibration impacts are likely to occur and includes day-time and night-time assessments.
- Trenchless Drilling (Major Drills - Sheet Piling) vibration assessment based on standoff distances from the extents of the major drill CICs which define where adverse vibration impacts are likely to occur and includes a day-time assessment only.
- OnSS – construction noise assessment has assumed that all the construction plant is working in an area equivalent to 25% of the defined footprint closest to each NSR. The vibration assessment has assumed that the piling rig would be operating at the extents of the defined OnSS footprint at its closest approach to VSR. OnSS assessments have considered day-time and weekend construction operations.

190. Further information on the anticipated construction programme is provided in Chapter 3 (document reference 6.1.3).

26.6.7.2 Operational Noise Assessment

191. The operational noise predictions for the OnSS have been based on an indicative footprint and plant layout and therefore provides a representative scenario with regards to plant location in relation to the nearest NSRs as far as reasonably practicable.

192. The predictions have been based on an indicative list of operational noise levels for each item of plant; however, these levels are considered indicative and do not contain any octave band data (Hz) therefore this is a limitation within the assessment and assumptions have been made regarding the frequency content of the noise being generated by the OnSS.

26.7 Impact Assessment

26.7.1 Construction Noise

193. A development of this nature has the potential to generate noise and vibration during the construction phases should appropriate mitigation not be employed. However, disruption due to construction-related noise and vibration is a localised phenomenon and is both temporary and intermittent in nature. The techniques available to predict the likely noise and vibration effects from construction sites are necessarily based on quite detailed information on the type and number of plant being used, their location within the site and the length of time they are in operation.

194. During the construction of the Project, noise from construction activities will inevitably be generated and will, during certain phases of construction, be audible at residential receptors in the vicinity of construction activities. The purpose of this section of the chapter is therefore to:

- Quantify the likely levels of construction noise that can be expected at the nearest residential and ecological receptor locations to construction works;
- Provide comment as to the magnitude of the potential construction noise impacts, the resulting level of effect and whether this is significant in EIA terms; and
- Where relevant, identify those impacts that would require specific mitigation measures in order for the potential noise effects to be reduced to a level considered acceptable.

26.7.2 Construction Noise Plant Levels

195. The list of construction plant, operational noise levels and associated on-times for the construction activities/operations have been provided within Appendix 26.3: (document reference 6.3.26.3).

196. Based on the above, the construction plant for each aspect of the development considered are shown in Table 26.44, Table 26.45, and Table 26.46. In Table 26.45 and Table 26.46. The combined sound power levels (SWL) shown in Table 26.45 and Table 26.46 have been calculated for each construction activity/phase considering the number of plant and associated on-times. All values have been rounded to the nearest decibel.

Table 26.44 Construction plant for landfall, dB

Vehicle/Equipment	Sound Power Level, dB(A)	Indicative Number	Estimated Percentage of Operation During Activity or Movements in hour	Resultant Sound Power Level, dB(A)	Maximum Noise Level, dB
Generator	102	1	100	102	102
Telehandler	107	1	75 (day-time only)	106	117
Silent Piling Rig	97	2	10 (day-time only)	87 (per rig)	97
Directional Drill Generator	105	2	100	105 (per generator)	105

Vehicle/Equipment	Sound Power Level, dB(A)	Indicative Number	Estimated Percentage of Operation During Activity or Movements in hour	Resultant Sound Power Level, dB(A)	Maximum Noise Level, dB
Excavator (25 tonne)	105	1	10 movements in an hour (day-time only)	-	116
Small Dump Truck	104	1	10 movements in an hour (day-time only)	-	117
Mud Pump	108	2	100	108 (per pump)	108
Mixing Tank	103	1	100	103	103
Shaker System	98	1	100	98	98
Cuttings/Recycling Tank	108	1	100 (day-time only)	108	108

Table 26.45 Combined sound power levels – construction plant for onshore ECC, TCCs and trenchless drilling, dB

Stage	Activity	Combined Sound Power Level (SWL)
1 – Pre-construction works	Pre-construction works consists of environmental works that are non-intrusive i.e. without the use of construction plant	N/A
2 – Enabling Works	Topsoil Stripping and Site Prep	114
	Pre-Construction Drainage	111
	Haul Road Installation	114
3 – Cable Infrastructure Installation	Trenchless Drilling – Minor Drill	114
	Trenchless Drilling – Major Drill	116
	Trench Works	112
	Trench Backfilling	111
4 – Cable Installation	Joint Bays Excavation and Backfill	111
	Cable Pulling	108
5 – Reinstatement Works and Demobilisation	Post Construction Drainage Installation	111
	Haul Road Removal	115
	Topsoil Reinstatement	112

Table 26.46 Combined sound power levels – construction plant for OnSS, dB

Activity	Combined Sound Power Level (SWL)
Ground Works	123
Building Foundation	119
Access Road and Carparks	116
Building Fabric and High Voltage Plant	118

197. The impact of construction noise will be assessed for each study area and design option

and has been divided into the following sections:

- The landfall;
- The onshore ECC including the 400kV Cable Corridor;
- Trenchless Drilling;
- The OnSS; and
- Impacts on ecological receptors.

26.7.3 Landfall Construction Noise Assessment

198. A summary programme of the landfall construction works is described in Chapter 3 (document reference 6.1.3).

199. However, an indicative summary of the construction works associated with the landfall is given below:

- Construction of a temporary construction compound, referred to as the Landfall Compound [PCC-1] including the construction of a 4m high soil bund for noise mitigation;
- Construction of a section of haul road between the A52 and the Landfall Compound [PCC-1];
- Provision of a Temporary Duct Storage Compound [SCC-2];
- Construction of Transition Joint Bays (TJBs) including the use of sheet pilling such as the use of silent pile method or similar;
- Construction of Horizontal Directional Drilling (HDD) launch pits;
- Excavation of temporary sub-tidal exit pits offshore, HDD works and duct installation activities;
- Installation and testing of offshore export cables and jointing to onshore export cables (including cable pulling); and
- Backfilling and re-instatement works.

200. The landfall works are anticipated to take up to 51-months to complete. The landfall HDD operations as a base case will take up to 12-months, with a 3-month contingency in the event of delay. The following indicative programme is described below:

- Up to 3-months for site set up;
- Up to 5-months for drilling and ducting operations, with the options of dual drilling and with the assumption of 24/7 operations during main drilling operations; and
- A 4-month reinstatement period.

201. With reference to the above and the resultant sound power levels for the landfall construction plant contained in Table 26.44, day-time, weekend, evening and night-time (main drilling works) construction noise levels have been predicted at the nearest NSRs to the landfall, the predictions have been based on the following inputs and assumptions:

- The locations of the plant within the landfall construction area based on an indicative layout, which is shown in Appendix 26.4 (document reference 6.3.26.4).

- During the night-time the items of plant described as ‘day-time only’ in Table 26.44 will not be operational.
- The attenuation provided by the 4m high earth bund located on the eastern boundary of the landfall construction area.
- All sources at height of 2m above ground level, a receptor height of 1.5m above ground level during the day-time and 4m above ground level during the night-time.
- An average ground absorbency factor of 0.8 between the sources and the receivers.
- Relevant topographical data.
- Predictions made to ‘free-field’ locations so façade reflections are not considered.
- Downwind propagation between the source and the receivers.
- 70 % humidity and an average temperature of 10^0C.

202. The NSRs considered for the landfall are shown in Table 26.47. The Table also shows the grid co-ordinates and the distance from the receptor to the closest working area.

203. The receptors considered are those that are closest to the landfall and therefore would be subject to the greatest potential impacts. It must be noted however that in the majority of cases these receptors are located in close proximity to other NSRs which could also be subject to potential impacts, though not as great.

204. The day-time period is defined as 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on a Saturday, the evening and weekends period is defined as 19:00 to 23:00 Monday to Friday, 13:00 to 23:00 on a Saturday and 07:00 to 23:00 on a Sunday, and the night-time period is defined as 23:00 to 07:00 during all days of the week.

Table 26.47 NSRs considered – landfall construction noise.

NSR ID	Approximate Grid Reference X/Y		Day-time/Night-time Receptor Sensitivity	Approximate Distance to Closest Working Area (m)
L001	555147	375947	Medium – Day-time/Evening/Weekend High - Night-time	590
L002	554736	375785		540
L003	555549	374694		610

205. The locations of the NSRs described above mirror those utilised for the baseline sound survey and are shown in Volume 2, Figure 26.2 (document reference 6.2.26.2).

206. The predicted noise levels from worst-case day-time, evening/weekend and night-time landfall construction operations, including trenchless drilling, are shown in Table 26.48. The Table also compares the predicted noise levels to the threshold limits and with reference to Table 26.36, Table 26.38 and Table 26.43 defines the level of effect and significance.

207. It must be noted that the assessment is based on the calculated threshold limits contained in Table 26.14 and the predicted noise levels have been rounded to the nearest decibel.

Table 26.48 Landfall construction noise – Day-time, evening/weekend, and night-time assessment

NSR ID	Period	Predicted Noise Level, dB $L_{Aeq,T}$	Threshold Limit	Diff.	Impact Magnitude	Level of Effect
L001	Day-time	45	65	-20	Negligible	Minor
	Evening/Weekend		55	-10	Negligible	Minor
	Night-time	44	45	-1	Negligible	Minor
L002	Day-time	46	65	-19	Negligible	Minor
	Evening/Weekend		55	-9	Negligible	Minor
	Night-time	45	45	0	Negligible	Minor
L003	Day-time	44	65	-21	Negligible	Minor
	Evening/Weekend		55	-11	Negligible	Minor
	Night-time	42	45	-3	Negligible	Minor

208. It can be seen from Table 26.48 that during the day-time, weekend and night-time periods the worst-case magnitude of impact would be *negligible* for *medium* or *high* (residential night-time) sensitivity receptors, giving rise to a temporary *'minor adverse'* worst-case level of effect at the nearest NSRs from landfall construction operations, which is not significant in terms of the EIA Regulations.

26.7.4 Onshore ECC and 400kV cable corridor Construction Noise Assessment

209. Installation of onshore cable ducts and export cables is anticipated to take up to 42-months. In any given location, once the cable ducts are installed, the trench will be backfilled, and the work front will continue moving onto the next section to minimise the amount of land work being done at any one time. A summary programme of works is described in Chapter 3 (document reference 6.1.3).

210. The cable installation will be split into five key stages: pre-construction works, enabling works, cable infrastructure installation, cable installation and reinstatement works. The duration of each activity during each phase is dependent on the nature of the construction activity being undertaken.

211. A summary of the construction works associated with the onshore ECC and 400kV cable corridor works is provided below.

212. Site enabling works are required before construction within each ECC section can commence. These may include:

- Fencing;
- Vegetation clearance;
- Preparation of access routes;
- Drainage works;
- Topsoil removal and storage;
- Construction of haul road;
- Archaeological and ecological mitigation works as necessary; and
- Establishment of TCCs, offices, welfare facilities, security, wheel wash, lighting and signage.

213. Construction activities for each section of the onshore ECC may include:

- Open cut method of cable construction (trenching);
- Trenchless duct installation below obstacles (roads, railways, watercourse crossings and drains) incorporating trenchless drilling;
- Topsoil and subsoil removal (to edge of working area) and storage in bunds along the cable corridor;
- Temporary haul road installation along all sections of the route;
- Trench excavation (up to two, one for each circuit);
- Trench backfilling;
- Installation of header or interceptor drains at cable corridor boundaries;
- Duct and tile installation;
- Existing field drainage repairs (where disruption occurs);
- Joint bay installation (including French drains to prevent water pooling above joint bay);
- Cable installation (pulled through ducts from each joint bay);
- Cable jointing; and
- Cable testing and commissioning.

214. Demobilisation and reinstatement activities are expected to consist of:

- Removal of haul road;
- Joint bay ground re-instatement;
- Reinstatement of topsoil;
- Landscaping and hedge re-planting; and
- Demobilisation of welfare, temporary construction compound and fence removal.

215. Based on the above, the construction noise assessment for the onshore ECC has considered 'normal' construction activities and trenchless drilling activities separately.

26.7.4.1 Onshore ECC & 400kV cable corridor– Normal Construction Operations

216. As previously stated within the bullet points associated with Paragraph 189 the construction noise assessment for the onshore ECC is based on standoff distances from the extents of the ECC boundary which define where adverse noise impacts are likely to occur and has considered day-time and weekend (between 13:00 and 19:00 on a Saturday) construction operations.

217. Based on the above the construction noise levels for the onshore ECC have assumed the following:

- All the plant associated with haul route removal (noisiest activity) would be located on the extents of the onshore ECC boundary; and
- All the plant would be operating in an area measuring 100m long by 40m wide. This is based on the assumption that construction operations might occur within half the typical construction working width (as described in Table 1 of Chapter 3 (document reference 6.1.3) and a reasonable assumption on the working length.

218. Based on the above, standoff distances have been calculated where adverse noise impacts are likely to be experienced using the Cadna/A noise modelling software, the model has assumed and is based on the following:

- The operational construction plant area (100m by 40m) has been modelled as an area source which emits a total noise level of 115dB (haul route removal) at an average height of 2m above ground level;
- Receptor height of 1.5m for day-time and weekend assessments (a night-time assessment has not been considered for normal onshore ECC construction operations);
- Ground absorbency factor of 0.5 between the source and the receivers;
- Downwind propagation between the source and the receiver;
- 70 % humidity and an average temperature of 10°C;
- Predictions made to 'free-field' locations so façade reflections are not considered;
- Flat ground (i.e., no topography) between the source and the receiver; and
- No intervening structures between the source and the receiver.

219. With reference to Table 26.36 and Table 26.38, the standoff distances have considered the following scenarios:

- A midweek day-time standoff distance showing the extents of a *low* magnitude of impact, i.e., receptors within this distance would be subject to a *low* magnitude of impact.
- A midweek day-time standoff distance showing the extents of a *medium* magnitude of impact. i.e., receptors within this distance would be subject to a *medium* magnitude of impact.
- A midweek day-time standoff distance showing the extents of a *high* magnitude of impact. i.e., receptors within this distance would be subject to a *high* magnitude of impact.
- A weekend standoff distance showing the extents of a *low* magnitude of impact.
- A weekend standoff distance showing the extents of a *medium* magnitude of impact.
- A weekend standoff distance showing the extents of a *high* magnitude of impact.

220. With reference to the above, it must be noted that any receptors located outside the extents where a *low* magnitude of impact would be experienced would be subject to a *negligible* magnitude of impact.

221. With reference to Table 26.43, a *negligible* impact magnitude for receptors of all sensitivities, and a *low* impact magnitude for receptors of *medium* sensitivity and below, would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

222. It must be noted that the midweek day-time standoff distances have been based on the calculated threshold limits contained in Table 26.20, with the exception of at ECC013 where the calculated threshold limit is 70dB $L_{Aeq,T}$; however providing a standoff distance to 65dB $L_{Aeq,T}$ represents an MDS for this location.

223. With regards the weekend threshold limits (13:00 to 19:00 on a Saturday) and standoff distances these have been based on the *Category A Threshold Levels* for weekend construction operations shown in Table 26.2, which is considered representative based on the observations made by the surveyor during the midweek baseline sound survey.

224. The standoff distances are shown in Table 26.49 and Volume 2, Figure 26.5 (document reference 6.2.26.5).

Table 26.49 Standoff Distances for Onshore ECC Construction Noise

Scenario	Standoff Distances to Extent of Magnitude of Impact, Metres			
	Noise Threshold Limit, dB $L_{Aeq,T}$	Low*	Medium**	High***
Midweek Day-time Construction	65	80	60	45
Weekend Construction	55	261	210	166
** Predicted noise level equal to the Threshold limit*				
*** Predicted noise level 2 dB above the Threshold limit.*				
**** Predicted noise level 4 dB above the Threshold limit.*				

225. With reference to Table 26.49, the defined Onshore ECC segments described in the bullet points associated with Paragraph 90 and the OS address data base which has identified the location of the sensitive receptors located along the ECC (including TCCs and temporary construction access roads); the number of residential NSRs within each segment of the ECC which could be subject to a *medium* magnitude of impact or greater (i.e. are within 60m of the ECC during day-time construction operations and 210 from the ECC during weekend construction operations) is shown in Table 26.50.

226. It also must be noted that the number of NSRs specified includes other residential led developments which have been granted planning permission and have the potential to be impacted by noise from ECC construction operations, namely:

- The Hogsthorpe development located at the western boundary of the village of Hogsthorpe and to the east of the landfall to A52 Hogsthorpe section of the ECC; and
- The Puttock Gate development located on the southern boundary of the village of Puttock Gate and to the north of The Haven to Marsh Road section of the ECC.

227. With reference to the above each of the proposed developments has been considered as a single NSR.

228. The locations of the developments described above are shown in Volume 3, Appendix 5.3 (document reference 6.3.5.3).

229. A *medium* magnitude of impact has been considered as a minimum for this count as, for *medium* sensitivity receptors (e.g. residential receptors during the day-time), this would equate to a temporary *'moderate'* level of effect which is considered significant in EIA terms (see Table 26.36, Table 26.38 and Table 26.43).

Table 26.50 Onshore ECC receptors subject to a medium magnitude of impact or greater from construction noise

ECC Segment	Period	Number of NSRs Subject to Medium Magnitude of Impact or Greater
ECC 1 - Landfall to A52 – Hogsthorpe	Midweek Day-time	7
	Weekend	15
ECC 2 - A52 - Hogsthorpe to Marsh Lane	Midweek Day-time	2
	Weekend	8
ECC 3 - Marsh Lane to A158 - Skegness Road	Midweek Day-time	0
	Weekend	16
ECC 4 - A158 - Skegness Road to Low Road	Midweek Day-time	0
	Weekend	2
ECC 5 - Low Road to Steeping River	Midweek Day-time	4
	Weekend	25
ECC 6 - Steeping River to Fodder Dike Bank/Fen Bank	Midweek Day-time	0
	Weekend	8
ECC 7 - Fodder Dike Bank/Fen Bank to Broadgate	Midweek Day-time	3
	Weekend	25
ECC 8 – Broadgate to Ings Drove	Midweek Day-time	4
	Weekend	28
ECC 9 - Ings Drove to Church End Lane	Midweek Day-time	0
	Weekend	16
ECC 10 - Church End Lane to The Haven	Midweek Day-time	3
	Weekend	27
ECC 11 - The Haven to Marsh Road	Midweek Day-time	1
	Weekend	19
ECC 12 - Marsh Road to Fosdyke Bridge	Midweek Day-time	1
	Weekend	35
ECC 13 - Fosdyke to Surfleet Marsh OnSS/Marsh Drove	Midweek Day-time	7
	Weekend	11
ECC 14 - Surfleet Marsh OnSS/Marsh Drove to the Connection Area	Midweek Day-time	2
	Weekend	17

230. It can be seen from Table 26.50 that there are a number of NSRs within each ECC segment that would be subject to a *medium* magnitude of impact or greater, especially during the weekend period; however, the predictions and associated standoff distances have assumed a worst-case scenario where construction activities are being undertaken at the extent of the ECC boundary.

231. In reality, for much of the time construction operations would be undertaken at greater distances away from the NSRs; consequently, for most of the construction phase, noise from construction operations would be lower therefore reducing the extent of the standoff distances.

232. Any identified adverse noise impacts could be reduced further through the use of the

potential detailed design mitigation shown in Table 26.34 and reference to the worked mitigation example shown in Table 26.35; however, these mitigation measures would be determined once the exact construction details and methods have been confirmed. Final mitigation measures would be informed by detailed design post-consent and included within the final NVMP which would be submitted for approval by the relevant LPAs as part of the final CoCP that is secured within the DCO.

233. With regards to timescales and potential noise impacts for the onshore ECC works, as an approximation it is proposed that:

- Works associated with haul road creation and removal (loudest phase) would take place at their closest approach to any one NSR for a total of approximately eight days per activity, (though this would not be a continuous period) i.e. after this period haul road creation or removal works would be located further away from any one NSR and thus any worst-case noise impacts would be reduced.

234. Based on the above it is considered that worst-case noise impacts experienced at any one of the NSRs identified would be short-term in nature, i.e. though the works would not be undertaken in a continuous basis the *total* amount to working days where worst-case impacts would be experienced would equate to less than one-month.

235. It is considered that with reference to the timescales above and with the implementation of relevant mitigation measures within Table 26.34, the magnitude of impact could be reduced to *negligible* or *low* for receptors of medium sensitivity which would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

26.7.4.2 Onshore ECC & 400kV cable corridor– Trenchless Drilling Activities

Minor Drills

236. As previously stated within the bullet points associated with Paragraph 189 the construction noise assessment for minor drills is based on standoff distances from the extents of the minor drilling CICs which define where adverse noise impacts are likely to occur and has considered day-time and weekend (between 13:00 and 19:00 on a Saturday).

237. Based on the above the construction noise levels for the minor drills have assumed the following:

- As the direction (south to north or north to south) of the drilling has not been determined, all the identified minor drilling CICs have been considered to be noise generating.
- All the plant associated with the minor drilling operations would be operating within each identified minor drill CICs independently i.e. though there may be more than one minor drill operating along the ECC at any one time they would be separated at a distance where there would be no cumulative impacts.

238. Based on the above, standoff distances have been calculated where adverse noise impacts are likely to be experienced using the Cadna/A noise modelling software, the model has assumed and is based on the following:

- The typical drilling CIC area measuring 80 by 50m has been modelled as an area source which emits a total noise level of 114dB at an average height of 2m above ground level;

- Receptor height of 1.5m for day-time and weekend assessments a night-time assessment has not been considered for minor drilling operations;
- Ground absorbency factor of 0.5 between the source and the receivers;
- Downwind propagation between the source and the receiver;
- 70 % humidity and an average temperature of 10^0C;
- Predictions made to 'free-field' locations so façade reflections are not considered;
- Flat ground (i.e., no topography) between the source and the receiver; and
- No intervening structures between the source and the receiver.

239. With reference to Table 26.36 and Table 26.38, the standoff distances have considered the following scenarios.

- A midweek day-time standoff distance showing the extents of a *low* magnitude of impact, i.e., receptors within this distance would be subject to a *low* magnitude of impact.
- A midweek day-time standoff distance showing the extents of a *medium* magnitude of impact. i.e., receptors within this distance would be subject to a *medium* magnitude of impact.
- A midweek day-time standoff distance showing the extents of a *high* magnitude of impact. i.e., receptors within this distance would be subject to a *high* magnitude of impact.
- A weekend standoff distance showing the extents of a *low* magnitude of impact.
- A weekend standoff distance showing the extents of a *medium* magnitude of impact.
- A weekend standoff distance showing the extents of a *high* magnitude of impact.

240. With reference to the above, it must be noted that any receptors located outside the extents where a *low* magnitude of impact would be experienced would be subject to a *negligible* magnitude of impact.

241. With reference to Table 26.43 a *negligible* impact magnitude for receptors of all sensitivities, and a *low* impact magnitude for receptors of *medium* sensitivity and below, would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

242. It must be noted that the day-time standoff distances have been based on the calculated threshold limits contained in Table 26.20, with the exception of at ECC013, where the calculated threshold limit is 70dB $L_{Aeq,T}$; however providing a standoff distance to 65dB $L_{Aeq,T}$ represents an MDS for NSRs representative of this location.

243. With regards to the weekend standoff distances (13:00 to 19:00 on a Saturday), these are based on *Category A Threshold Levels* contained in Table 26.2 which is considered a robust approach as it is based on the observations made on the prevailing soundscape at the ECC monitoring locations and the rural nature of the receptors.

244. The standoff distances are shown in Table 26.51 and Volume 2, Figure 26.6 (document reference 6.2.26.6).

Table 26.51 Standoff Distances for Onshore ECC Trenchless Drilling – Minor Drill

		Standoff Distances to Extent of Magnitude of Impact, Metres		
	Noise Threshold Limit, dB $L_{Aeq,T}$	Low*	Medium**	High***
Midweek Day-time Construction	65	66	50	40
Weekend Construction	55	235	185	145
** Predicted noise level equal to the Threshold limit*				
*** Predicted noise level 2 dB above the Threshold limit.*				
**** Predicted noise level 4 dB above the Threshold limit.*				

245. With reference to Table 26.51, the defined Onshore ECC segments described in the bullet points associated with Paragraph 90 and the OS address data base which has identified the location of the sensitive receptors located along the ECC, the number of residential NSRs within each segment of the ECC which could be subject to a *medium* magnitude or greater of impact (i.e. are within 50m of any minor drill CIC during day-time drilling operations and within 185m of any minor drill CIC during weekend drilling operations) is shown in Table 26.52.

246. It also must be noted that the number of NSRs specified include other residential led developments which have been granted planning permission and have the potential to be impacted by noise from Onshore ECC construction operations, namely:

- The Hogsthorpe development located to the western boundary of the village of Hogsthorpe and to the east of the landfall to A52 Hogsthorpe section of the ECC; and
- The Puttock Gate development located on the southern boundary of the village of Puttock Gate and to the north of The Haven to Marsh Road section of the ECC.

247. With reference to the above each of the proposed developments above have been considered as a single NSR.

248. The exact locations of the developments described above are shown in Volume 3, Appendix 5.3 (document reference 6.3.5.3).

249. A *medium* magnitude of impact has been considered as a minimum as with reference to Table 26.36, Table 26.38 and Table 26.43; for *medium* sensitivity receptors this would equate to a temporary *'moderate (significant)'* effect which is considered significant in EIA terms.

Table 26.52 Onshore ECC receptors subject to a medium magnitude of impact or greater from minor drill operations

ECC Segment	Period	Number of NSRs Subject to Medium Magnitude of Impact or Greater
ECC1 - Landfall to A52 – Hogsthorpe	Midweek Day-time	0
	Weekend	7
ECC2 - A52 - Hogsthorpe to Marsh Lane	Midweek Day-time	1

ECC Segment	Period	Number of NSRs Subject to Medium Magnitude of Impact or Greater
	Weekend	5
ECC3 - Marsh Lane to A158 - Skegness Road	Midweek Day-time	0
	Weekend	5
ECC4 - A158 - Skegness Road to Low Road	Midweek Day-time	0
	Weekend	2
ECC5 - Low Road to Steeping River	Midweek Day-time	3
	Weekend	12
ECC6 - Steeping River to Fodder Dike Bank/Fen Bank	Midweek Day-time	0
	Weekend	6
ECC7 - Fodder Dike Bank/Fen Bank to Broadgate	Midweek Day-time	0
	Weekend	15
ECC8 - Broadgate to Ings Drove	Midweek Day-time	1
	Weekend	26
ECC9 - Ings Drove to Church End Lane	Midweek Day-time	0
	Weekend	10
ECC10 - Church End Lane to The Haven	Midweek Day-time	0
	Weekend	16
ECC11 - The Haven to Marsh Road	Midweek Day-time	0
	Weekend	14
ECC12 - Marsh Road to Fosdyke Bridge	Midweek Day-time	0
	Weekend	22
ECC13 – Fosdyke to Surfleet Marsh OnSS/Marsh Drove	Midweek Day-time	0
	Weekend	9
ECC14 - Surfleet Marsh OnSS/Marsh Drove to the Connection Area	Midweek Day-time	0
	Weekend	0

250. It can be seen from Table 26.52 that there are a number of NSRs within each ECC segment that would be subject to a *medium* magnitude of impact or greater from minor drilling operations, especially during the weekend period.

251. However, any identified adverse noise impacts could be reduced through the use of the potential detailed design mitigation shown in Table 26.34 and reference to the worked mitigation example shown in Table 26.35; however, these mitigation measures would be determined once the exact construction details and methods have been confirmed. Final mitigation measures would be informed by detailed design post-consent and included within the final NVMP which would be submitted for approval by the relevant LPAs as part of the final CoCP that is secured within the DCO.

252. With regards to timescales and potential noise impacts from the minor drill works, as an approximation it is proposed that each minor drill would take two weeks complete; therefore it is considered that any noise impacts experienced at any one of the NSRs from minor drill noise

would be short-term (less than one-month) in nature.

253. It is considered that with reference to the timescales above and the implementation of relevant mitigation measures in Table 26.34, the magnitude of impact could be reduced to *negligible* or *low* for receptors of medium sensitivity and below which would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

Major Drills

254. As previously stated within the bullet points associated with Paragraph 189, the construction noise assessment for major drills is based on defined major drill CICs and an indicative plant list; therefore, impacts have been assessed at the nearest identified NSRs to each major drill CIC.

255. Based on the above the construction noise levels for the major drills have assumed the following:

- In instances where the direction (south to north or north to south) of the drilling of the TC has not been determined yet, both scenarios where each of the identified major drilling CICs for these TCs are noise generating have been considered.
- All the plant associated with the major drilling operations would be operating within each identified major drill CIC independently i.e. though there may be more than one major drill operating any one time they would be separated at a distance where there would be no cumulative impacts.

256. Based on the above, noise levels from major drilling operations have been predicted at the nearest NSRs to each major drilling compound using the Cadna/A noise modelling software; the model has assumed and is based on the following:

- Each major drill CIC has been modelled as an area source which emits a total noise level of 116dB at an average height of 2m above ground level.
- Receptor height of 1.5m for day-time and weekend assessments and 4m for a night-time assessment has been considered for major drilling operations.
- Ground absorbency factor of 0.8 between the source and the receivers;
- Relevant topographical data;
- Downwind propagation between the source and the receiver;
- 70 % humidity and an average temperature of 10^0C; and
- Predictions made to 'free-field' locations so façade reflections not considered.

257. The relevant TC, major drilling CICs and associated NSRs considered are shown in Table 26.53 and Volume 2, Figure 26.7 (document reference 6.2.26.7). The table also shows the grid co-ordinates for each NSR and the distance from the receptor to the closest working area.

Table 26.53 Major Drill CICs and NSRs

TC ID	CIC ID	Nearest NSRs	Approximate Grid Reference X/Y		Approx Distance to Closest Working Area (m)
TC26	35	Slackholme House Farm	553389	370632	185
		Meadowcroft, South Ings Lane	553449	370935	315
		Somer Leyton Cottage	553389	370632	315
	36	Fair Acers, South Ings Lane	553231	370107	325
		Ash Lea, South Ings Lane	553243	370052	300
		Jasmine Cottage, South Ings Lane	553235	369917	335
		Bridge Farm Caravan Park	553816	369555	500
TC72	111	1 Council House, Wainfleet Road	549352	360138	275
		Mill View, Green Lane	548635	360606	490
		The Beeches, Green Lane	548675	360701	545
	112	Utah, Brewster Lane	549138	359561	440
		19 Gatehouse, Brewster Lane	548252	359847	600
TC77	117	Kevean Cottage, Collison Gate	548650	359429	185
		3 Crows Bridge	548316	359191	150
		Laurel Cottage, Haven Bank, Wainfleet Street	548631	359027	140
		The Bungalow, Chop Hills	548766	359015	225
		24 Gatehouse, Matt Pits Lane	549113	359159	520
	118	Laurel Cottage, Haven Bank, Wainfleet Street	548631	359027	110
		Lilac Cottage, Washdyke Lane	548764	358912	235
		Wynrush, Wainfleet Bank, Wainfleet Street	548038	359133	385
TC167	245	Pilgrim Farm, Cut End Road	536800	341529	310
		Audrey Villa, Cut End Road	536889	341401	200
		Potterdale, Cut End Road	536887	341349	155
		2 Cut End Road	537191	341129	370
		Saxon Willows, Cut End Road	537099	341064	300
		Old House Farm, Cut End Road	537183	340832	475
	246	The White House, Pinfold Lane	536481	341476	295
		Vine House Farm, Scalp Road	536187	341389	365
		Appleside, Scalp Road	536102	341306	385
		Marjon, Southfield Lane	536268	341154	170
		Sunnyside/Eventide, Southfield Lane	536274	341016	130
		Annexe, Southfield Farm, Southfield Lane	536275	340909	175

TC ID	CIC ID	Nearest NSRs	Approximate Grid Reference X/Y		Approx Distance to Closest Working Area (m)
TC170	250	Southfield Farm, Southfield Lane	536206	340903	470
		Bank House Farm, Scalp Road	535802	340843	390
		Haven House, Scalp Road	535778	340759	315
		3 Coastguard Cottage, Hobhole Bank	536376	339979	510
TC208	318	Welland Farm House, Marsh Drove	529465	330891	560
		Big Tree Farm, Marsh Drove	528696	330718	375
	319	Wraggs Marsh House, Marsh Road	529877	33044	700
		1 School Cottages, Marsh Road	529235	329827	380

258. The predicted noise levels from day-time, evening, weekend and night-time major drill operations are shown in Table 26.54. The Table also compares the predicted noise levels to the threshold limits and with reference to Table 26.36, Table 26.38 and Table 26.43 defines the level of effect and significance. The text highlighted in bold is where a significant level of effect is predicted in terms of the EIA Regulations.

259. It must be noted that as baseline monitoring has not been undertaken at all the identified NSRs closest to the major drill CICs the assessment is based *Category A Threshold Levels* contained in Table 26.2 which is considered a robust approach as it is based on the observations made on the prevailing soundscape at the ECC monitoring locations and the rural nature of the receptors.

Table 26.54 Major Drill Noise Assessment, dB

CIC ID	NSR ID	Period	Predicted Noise Level, $L_{Aeq,1\text{-hour}}$	Threshold Limit $L_{Aeq,T}$	Difference	Impact Magnitude	Level of Effect
35	Slackholme House Farm	Day-time	57	65	-8	Negligible	Minor
		Weekend /Evening	57	55	+2	Low	Minor
		Night-time	58	45	+13	**High**	**Major**
	Meadowcroft	Day-time	52	65	-13	Negligible	Minor
		Weekend /Evening	52	55	-3	Negligible	Minor
		Night-time	53	45	+8	**High**	**Major**
	Somer Leyton Cottage	Day-time	53	65	-12	Negligible	Minor
		Weekend /Evening	53	55	-2	Negligible	Minor
		Night-time	53	45	+8	**High**	**Major**
36	Fair Acers	Day-time	52	65	-13	Negligible	Minor
		Weekend /Evening	52	55	-3	Negligible	Minor
		Night-time	53	45	+8	**High**	**Major**
	Ash Lea	Day-time	53	65	-12	Negligible	Minor
		Weekend /Evening	53	55	-2	Negligible	Minor
		Night-time	53	45	+8	**High**	**Major**
	Jasmine Cottage	Day-time	52	65	-13	Negligible	Minor
		Weekend /Evening	52	55	-3	Negligible	Minor
		Night-time	52	45	+7	**High**	**Major**
	Bridge Farm Caravan Park	Day-time	48	65	-17	Negligible	Minor
		Weekend /Evening	48	55	-7	Negligible	Minor
		Night-time	49	45	+4	**Medium**	**Major**
111	1 Council House	Day-time	53	65	-12	Negligible	Minor
		Weekend /Evening	53	55	-2	Negligible	Minor
		Night-time	53	45	+8	**High**	**Major**
	Mill View	Day-time	48	65	-17	Negligible	Minor

CIC ID	NSR ID	Period	Predicted Noise Level, $L_{Aeq,1\text{-hour}}$	Threshold Limit $L_{Aeq,T}$	Difference	Impact Magnitude	Level of Effect
		Weekend /Evening	48	55	-7	Negligible	Minor
		Night-time	49	45	+4	**Medium**	**Major**
	The Beeches	Day-time	47	65	-18	Negligible	Minor
		Weekend /Evening	47	55	-8	Negligible	Minor
		Night-time	48	45	+3	**Medium**	**Major**
112	Utah	Day-time	49	65	-16	Negligible	Minor
		Weekend /Evening	49	55	-6	Negligible	Minor
		Night-time	49	45	+4	**Medium**	**Major**
	19 Gatehouse	Day-time	46	65	-19	Negligible	Minor
		Weekend /Evening	46	55	-9	Negligible	Minor
		Night-time	46	45	+1	**Low**	**Moderate**
117	Kevean Cottage	Day-time	57	65	-8	Negligible	Minor
		Weekend /Evening	57	55	+2	Low	Minor
		Night-time	57	45	+12	**High**	**Major**
	3 Crows Bridge	Day-time	58	65	-7	Negligible	Minor
		Weekend /Evening	58	55	+3	**Medium**	**Moderate**
		Night-time	58	45	+13	**High**	**Major**
	Laurel Cottage	Day-time	58	65	-7	Negligible	Minor
		Weekend/Evening	58	55	+3	**Medium**	**Moderate**
		Night-time	58	45	+13	**High**	**Major**
	The Bungalow	Day-time	54	65	-11	Negligible	Minor
		Weekend /Evening	54	55	-1	Negligible	Minor
		Night-time	55	45	+10	**High**	**Major**
	24 Gatehouse	Day-time	47	65	-18	Negligible	Minor
		Weekend /Evening	47	55	-8	Negligible	Minor
		Night-time	48	45	+3	**Medium**	**Major**

CIC ID	NSR ID	Period	Predicted Noise Level, $L_{Aeq,1\text{-hour}}$	Threshold Limit $L_{Aeq,T}$	Difference	Impact Magnitude	Level of Effect
118	Laurel Cottage	Day-time	60	65	-5	Negligible	Minor
		Weekend /Evening	60	55	+5	**High**	**Major**
		Night-time	60	45	+15	**High**	**Major**
	Lilac Cottage	Day-time	54	65	-11	Negligible	Minor
		Weekend /Evening	54	55	-1	Negligible	Minor
		Night-time	54	45	+9	**High**	**Major**
	Wynrush	Day-time	50	65	-15	Negligible	Minor
		Weekend /Evening	50	55	-5	Negligible	Minor
		Night-time	51	45	+6	**High**	**Major**
245	Pilgrim Farm	Day-time	52	65	-13	Negligible	Minor
		Weekend /Evening	52	55	-3	Negligible	Minor
		Night-time	52	45	+7	**High**	**Major**
	Audrey Villa	Day-time	56	65	-9	Negligible	Minor
		Weekend /Evening	56	55	+1	Low	Minor
		Night-time	56	45	+11	**High**	**Major**
	Potterdale	Day-time	58	65	-7	Negligible	Minor
		Weekend /Evening	58	55	+3	**Medium**	**Moderate**
		Night-time	58	45	+13	**High**	**Major**
	2 Cut End Road	Day-time	51	65	-14	Negligible	Minor
		Weekend /Evening	51	55	-4	Negligible	Minor
		Night-time	52	45	+7	**High**	**Major**
	Saxon Willows	Day-time	53	65	-12	Negligible	Minor
		Weekend /Evening	53	55	-2	Negligible	Minor
		Night-time	54	45	+9	**High**	**Major**
	Old House Farm	Day-time	49	65	-16	Negligible	Minor
		Weekend /Evening	49	55	-6	Negligible	Minor

CIC ID	NSR ID	Period	Predicted Noise Level, $L_{Aeq,1\text{-hour}}$	Threshold Limit $L_{Aeq,T}$	Difference	Impact Magnitude	Level of Effect
		Night-time	49	45	+4	**Medium**	**Major**
246	The White House	Day-time	51	65	-14	Negligible	Minor
		Weekend /Evening	51	55	-4	Negligible	Minor
		Night-time	52	45	+7	**High**	**Major**
	Vine House Farm	Day-time	50	65	-15	Negligible	Minor
		Weekend /Evening	50	55	-5	Negligible	Minor
		Night-time	51	45	+6	**High**	**Major**
	Appleside	Day-time	50	65	-15	Negligible	Minor
		Weekend /Evening	50	55	-5	Negligible	Minor
		Night-time	51	45	+6	**High**	**Major**
	Marjon	Day-time	57	65	-8	Negligible	Minor
		Weekend /Evening	57	55	+2	Low	Minor
		Night-time	57	45	+12	**High**	**Major**
	Sunnyside	Day-time	58	65	-7	Negligible	Minor
		Weekend /Evening	58	55	+3	**Medium**	**Moderate**
		Night-time	58	45	+13	**High**	**Major**
	Annexe, Southfield Farm,	Day-time	56	65	-9	Negligible	Minor
		Weekend /Evening	56	55	+1	Low	Minor
		Night-time	56	45	+11	**High**	**Major**
250	Southfield Farm	Day-time	49	65	-16	Negligible	Minor
		Weekend /Evening	49	55	-6	Negligible	Minor
		Night-time	49	45	+4	**Medium**	**Major**
	Bank House Farm	Day-time	50	65	-15	Negligible	Minor
		Weekend /Evening	50	55	-5	Negligible	Minor
		Night-time	50	45	+5	**High**	**Major**
	Haven House	Day-time	51	65	-14	Negligible	Minor

CIC ID	NSR ID	Period	Predicted Noise Level, $L_{Aeq,1\text{-hour}}$	Threshold Limit $L_{Aeq,T}$	Difference	Impact Magnitude	Level of Effect
		Weekend /Evening	51	55	-4	Negligible	Minor
		Night-time	52	45	+7	**High**	**Major**
	3 Coastguard Cottage	Day-time	47	65	-18	Negligible	Minor
		Weekend /Evening	47	55	-8	Negligible	Minor
		Night-time	48	45	+3	**Medium**	**Major**
318	Welland Farm House	Day-time	47	65	-18	Negligible	Minor
		Weekend /Evening	47	55	-8	Negligible	Minor
		Night-time	47	45	+2	**Low**	**Moderate**
	Big Tree Farm	Day-time	51	65	-14	Negligible	Minor
		Weekend /Evening	51	55	-4	Negligible	Minor
		Night-time	52	45	+7	**High**	**Major**
319	Wraggs Marsh House	Day-time	44	65	-21	Negligible	Minor
		Weekend /Evening	44	55	-11	Negligible	Minor
		Night-time	45	45	0	Negligible	Minor
	1 School Cottages	Day-time	51	65	-14	Negligible	Minor
		Weekend /Evening	51	55	-4	Negligible	Minor
		Night-time	51	45	+6	**High**	**Major**

260. It can be seen from Table 26.54 that:

- During the day-time period the predicted noise levels from major drills would lead to a *'minor'* level of effect at all of NSRs considered, which is not significant in terms of the EIA Regulations.
- During the weekend and evening periods the predicted noise levels from major drills would lead to a *'minor'* level of effect at the majority of the NSRs considered, which is not significant in terms of the EIA Regulations.
- During the weekend and evening periods the predicted noise levels from major drills would lead to a *'moderate'* level of effect at four of the NSRs considered and a *'major'* level of effect at one of the NSRs considered, which is significant in terms of the EIA Regulations.
- During the night-time period the predicted noise levels from major drills would lead to '*moderate'* or *'major'* level of effect at all but one (Wraggs Marsh House) of the NSRs considered, which is significant in terms of the EIA Regulations.

261. With reference to the above it can be seen that there has been a number of significant impacts identified. Such impacts could be reduced through the use of the potential detailed design mitigation shown in Table 26.34 and reference to the worked mitigation example shown in Table 26.35. However, these mitigation measures could only be determined once the exact construction details and methods have been confirmed. Final mitigation measures would be informed by detailed design post-consent and be included within the final NVMP which would be submitted for approval by the relevant LPA as part of the final CoCP that is secured within the DCO.

262. In addition, and as stated within the bullet points associated with Paragraph 255 as the direction (south to north or north to south) of the drilling has not been determined yet all the identified major drilling compounds have been considered to be noise generating, therefore the identified impacts could be reduced further if drilling was undertaken within the major drilling compound where lesser impacts have been identified.

263. For example, with reference to TC26 it is recommended that drilling should be undertaken within drilling compound 36 rather than 35 as the predicted noise levels at the most effected NSR are lower and would be easier to mitigate where a significant level of effect has been identified.

264. With regards to timescales and potential noise impacts from the major drill works, as an approximation it is proposed that each major drill would take between six to eight weeks complete; therefore it is considered that any noise impacts experienced at any one of the NSRs from major drill noise would be medium-term (between one-month and two-years) in nature.

265. It is considered that with reference to the timescales above the implementation of relevant mitigation measures in Table 26.34 and Paragraph 263 the magnitude of impact could be reduced to *negligible* or *low* for receptors of *high* or *medium* sensitivity which would result in a temporary *'minor adverse'* level of effect at worst, which is not significant in terms of the EIA Regulations.

26.7.5 The OnSS

266. A summary programme of the OnSS construction works is described in Chapter 3 (document reference 6.1.3).

267. A summary of the construction works associated with the OnSS is given below. It is anticipated that OnSS construction works will take up to 51-months.

268. The likely sequence of activities at the OnSS is:

- Site investigation works, pre-construction archaeological and ecological surveys and mitigation;
- Site enabling works, including:
  - Detailed site investigation;
  - Ground level grading, including cut and fill;
  - Establishment of the Primary Construction Compound and Security Compound; and
  - Establishment of services
- Formation of substation platform consisting of:
  - Ground works including cable ducting and new site drainage;
  - Ground raising and establishment of the stoned site platform;
  - Laying of foundations;
  - Installation of below ground services.
- Erection of Building;
- Installation of Equipment, including:
  - Electrical equipment such as switchgear, busbars, capacitors, reactors, reactive power compensation equipment, filters and cooling equipment.
  - Other equipment includes noise enclosures, operational roads, control buildings, car parking, security fencing and external lighting.

269. With reference to the above, the predicted construction noise levels for the OnSS have therefore assumed the following:

- All the plant associated with ground works (noisiest activity, see Table 26.46) would be located within the nearest 25% of the OnSS area closest to each NSR;
- Average source height of 2m, receptor height of 1.5m;
- Ground absorbency factor of zero within the OnSS defined footprint and 0.9 between the boundaries of the OnSS footprint and the receivers;
- Relevant topographical data;
- Predictions made to 'free-field' locations so façade reflections are not considered;
- Downwind propagation between the source and the receiver; and
- 70 % humidity and an average temperature of 10^0C.

270. Based on the above, the worst-case noise levels from construction operations associated with the OnSS have been predicted at the nearest NSRs.

271. As the footprint for the OnSS has been determined, it has been possible to identify the closest NSRs to the OnSS.

272. The NSRs considered for the OnSS are shown in Table 26.55. The Table also shows the grid co-ordinates and the distance from the receptor to the closest working area.

273. The receptors considered are those that are closest to the OnSS and therefore would be subject to the greatest potential impacts. It must be noted however that in the majority of cases these receptors are located in close proximity to other NSRs which could also be subject to potential impacts, though not as great.

Table 26.55 NSRs considered – OnSS construction noise

NSR ID	Approximate Grid Reference X/Y		Day-time/Weekend Receptor Sensitivity	Approximate Distance to Closest Working Area (m)
OnSS001	527833	330478	Residential - Medium	800
OnSS002	528613	330820	Residential - Medium	730
OnSS003	527374	331328	Residential - Medium	580
OnSS004	528486	332442	Residential - Medium	740

274. The locations of the NSRs described above mirror those utilised for the baseline sound survey and are shown in Volume 2, Figure 26.4 (document reference 6.2.26.4).

275. The predicted noise levels from worst-case day-time and weekend (between 13:00 and 19:00 on a Saturday) OnSS construction operations are shown in Table 26.56. The Table also compares the predicted noise levels to the threshold limits and with reference to Table 26.36, Table 26.38 and Table 26.43 defines the level of effect and significance.

276. It must be noted that the assessment is based on the calculated threshold limits contained in Table 26.30, the predicted noise levels have been rounded to the nearest decibel.

Table 26.56 OnSS construction noise assessment

NSR ID	Construction Activity	Predicted Noise Level, $L_{Aeq,T}$	Period	Threshold Limit	Diff.	Impact Magnitude	Level of Effect
OnSS001	Groundworks within OnSS	49	Day-time	65	-16	Negligible	Minor
			Weekend	55	-6	Negligible	Minor
OnSS002		51	Day-time	65	-14	Negligible	Minor
			Weekend	55	-4	Negligible	Minor
OnSS003		52	Day-time	65	-13	Negligible	Minor
			Weekend	65	-13	Negligible	Minor
OnSS004		50	Day-time	65	-15	Negligible	Minor
			Weekend	65	-15	Negligible	Minor

277. It can be seen from Table 26.56 that the worst-case noise magnitude of impact would be *negligible* for *medium* sensitivity receptors giving rise to a temporary *'minor adverse'* worst-case level of effect at the nearest NSRs from OnSS construction operations which is not significant in terms of the EIA Regulations.

26.7.6 Ecological Receptors

278. With reference to Chapter 21 (document reference 6.1.21) and Chapter 22 (document reference 6.1.22), it is considered that the identified Internationally and Nationally Designated Sites which have the potential to be impacted from Noise from the Project are as follows:

- The Chapel Point to Wolla Bank SSSI;
- The Greater Wash SPA;
- The Gibraltar Point National Nature Reserve (NNR);
- The Gibraltar Point SSSI;
- The Gibraltar Point Site Ramsar;
- The Gibraltar Point SPA;
- The Wash Ramsar; and
- The Wash SSSI.

279. In addition, the Anderby Marsh Nature Reserve has been considered separately due to its proximity to the landfall area and its sensitive nature regarding breeding birds.

280. The locations of the above identified ecological sites, including the Anderby Nature Reserve, are shown in Volume 2, Chapter 21, Figure 21.1 (document reference 6.2.21.1).

281. The construction noise assessment for ecological receptors has been divided into the following aspects:

- Potential impacts of the landfall construction noise in the Anderby Nature Reserve.
- Potential impacts of onshore ECC construction noise (excluding trenchless drilling) on the designated sites.
- Potential impacts of minor drills on the designated sites
- Potential impact of major drills on the designated sites.
- Potential impact of OnSS construction on the designated sites.

26.7.6.1 Landfall Construction Noise – Anderby Nature Reserve

282. With reference to the above and the resultant sound power levels and the maximum noise levels for the landfall construction plant contained in Table 26.44 construction noise levels have been predicted at the closest area of the Anderby Nature Reserve to the landfall, the predictions have been based on the following inputs and assumptions:

- As there is limited published data regarding the maximum (L_{Amax}) noise levels from plant; these have been based on the following assumptions;

- All static plant (i.e., generators, pumps, mixer tanks, shaker system) maximum noise levels are equal to sound power levels as these are constant noise sources without any significant variations;
- All mobile plant (i.e., telehandler, dumper, excavator) maximum noise levels derived from maximum pass-by levels contained in BS 5228-1;
- All maximum levels from mobile plant modelled as point sources at a worst-case approach to the Anderby Marsh Nature Reserve to the east of the Site;
- Piling operations - it is understood that silent piling methods (i.e. no hammer impact or vibration) will be utilised, therefore it has been assumed that the maximum noise levels are equal to the sound power levels; and
- The maximum noise levels from all plant assume a 100% on-time.

- The locations of the plant within the landfall construction area which are shown in Appendix 26.4 (document reference 6.3.26.4).
- The attenuation provided by the 4m high earth bund located on the eastern boundary of the landfall construction area.
- All sources at height of 2m above ground level and a receptor height of 0.5m for ground level birds.
- An average ground absorbency factor of 0.8 between the sources and the receivers.
- Relevant topographical data.
- Predictions made to 'free-field' locations so façade reflections are not considered.
- Downwind propagation between the source and the receivers.
- 70% humidity and an average temperature of 10°C.

283. The predicted ambient (L_{Aeq}) and maximum (L_{amax}) noise levels from landfall construction operations, including trenchless drilling, are shown in Table 26.57. The Table also compares the predicted noise levels to the threshold limits and with reference to Table 26.36, Table 26.42 and Table 26.43 defines the level of effect and significance.

Table 26.57 Landfall Construction Noise – Anderby Nature Reserve, dB

NSR ID	Noise Indices Considered	Predicted Noise Level	Threshold Limit	Diff.	Impact Magnitude	Level of Effect
Anderby Nature Reserve	Ambient ($L_{Aeq,T}$) Level	51	55 $L_{Aeq,T}$	-4	Negligible	Minor
	Maximum (L_{Amax}) Level	60	80 L_{Amax}	-20	Negligible	Minor

284. It can be seen from Table 26.57 that the predicted magnitude of impact would be *negligible* for *high* sensitivity receptors giving rise to a temporary *'minor adverse'* worst-case level of effect at the Anderby Nature Reserve from landfall construction operations which is not

significant in terms of the EIA Regulations.

285. It must be noted however that as there is limited published data regarding the maximum (L_{Amax}) noise levels from plant (as previously stated in the bullet points associated with Paragraph 282) the predicted maximum noise levels should be treated with a degree of caution.

26.7.6.2 ECC Construction Noise – Designated Sites

286. Table 26.49 provides standoff distances for ECC construction noise, though these distances apply to human receptors, the weekend threshold limit of 55dB $L_{Aeq,T}$ is identical to the AQTAG09 ambient noise threshold limit, therefore this standoff distance can be referred to for Ecological receptors.

287. With reference to the above the standoff distance is shown in Table 26.58.

Table 26.58 Standoff Distances for ECC Construction Noise – Ecological Receptors

Activity	Noise Threshold Limit, dB $L_{Aeq,T}$	Standoff Distance
ECC Construction	55	261

288. The locations of the designated sites have been analysed in conjunction with the location of the ECC and the standoff distance shown above.

289. The results of the analysis have shown that all the designated sites are located at a distance greater than 261m away from the ECC with the exception of one area of The Wash SSSI located close to the River Haven as shown in Volume 2, Figure 26.8 (document reference 6.2.26.8).

290. Within this area of The Wash, *low*, *medium* or *high* magnitudes of impact could be experienced which would be significant in EIA terms as ecological receptors are considered to be of *'high'* sensitivity.

291. These impacts could be reduced through the use of the potential detailed design mitigation shown in Table 26.34 and reference to the worked mitigation example shown in Table 26.35; however, these mitigation measures would be determined once the exact construction details and methods have been confirmed. Final mitigation measures would be informed by detailed design post-consent and be included within the final NVMP which would be submitted to the relevant LPAs for approval as part of the final CoCP that is secured within the DCO.

292. It also should be noted that with reference to Section 1.8.1.3 of Chapter 22: Onshore Ornithology (document reference 6.1.22) additional mitigation has been specified comprising of a seasonal restriction to construction activity, to avoid works during the period of October to March inclusive within 400m of The Wash SPA and Ramsar.

293. It is considered that with reference to the seasonal restrictions specified in paragraph 292 and the implementation of relevant mitigation measures in Table 26.34; the predicted noise levels within this area of The Wash could be reduced to a level below the threshold level. The magnitude of impact could therefore be reduced to *negligible* for receptors of *'high'* sensitivity which would result in a temporary *'minor adverse'* level of effect at worst, which is not

significant in terms of the EIA Regulations.

26.7.6.3 Minor Drill Noise – Designated Sites

294. Table 26.51 provides standoff distances for ECC trenchless minor drilling noise; although these distances apply to human receptors, the weekend threshold limit of 55dB $L_{Aeq,T}$ is identical to the AQTAG09 ambient noise threshold limit. Therefore, this standoff distance can be referred to for ecological receptors.

295. With reference to the above, the standoff distance is shown in Table 26.59.

Table 26.59 Standoff Distances for ECC Trenchless Minor Drill Noise – Ecological Receptors

Activity	Noise Threshold Limit, dB $L_{Aeq,T}$	Standoff Distance
Minor Drill	55	235

296. The locations of the designated sites have been analysed in conjunction with the location of the minor drill compounds and the standoff distance shown above.

297. The results of the analysis have shown that all the designated sites are located at a distance greater than 235m away from minor drill compounds; therefore, the noise levels generated by minor drills are likely to be below the threshold limits within all areas of the designated sites.

298. With reference to the above and Table 26.36, Table 26.42 and Table 26.43, it can be concluded that with regards to the noise generated by minor drills on ecological receptors, there would be a *'negligible'* impact of magnitude for receptors of *'high'* sensitivity which would result in a temporary *'minor adverse'* level of effect at worst, which is not significant in terms of the EIA Regulations.

26.7.6.4 Major Drill Noise – Designated Sites

299. As previously stated within the bullet points associated with Paragraph 189, the construction noise assessment for major drills is based on defined major drill CICs, therefore impacts have been assessed at the nearest identified NSRs to each major drill CIC.

300. With reference to the above the location of the major drill CICs have been analysed in conjunction with the location of the designated Sites.

301. The results of this analysis have shown that the only major drill CIC which could have a potential impact is compound 250 associated with Trenchless Cut 170, the River Haven crossing located near The Wash SSSI.

302. In view of the above, noise levels from major drill CIC250 has been predicted at the closest extents of The Wash SSSI as shown in Table 26.60. The Table also compares the predicted noise level to the threshold limits and with reference to Table 26.36, Table 26.42 and Table 26.43 defines the level of effect and significance.

Table 26.60 Major Drill Assessment – Ecological Receptors, dB

Activity	Major Drill CIC ID	Predicted Noise Level	Threshold Limit	Diff.	Impact Magnitude	Level of Effect
Major Drill	250	50	55 $L_{Aeq,T}$	-5	Negligible	Minor

303. It can be seen from Table 26.60 that the predicted magnitude of impact would be *negligible* for *high* sensitivity receptors giving rise to a temporary *'minor adverse'* worst-case level of effect within The Wash SSSI from major drill operations which is not significant in terms of the EIA Regulations.

26.7.6.5 OnSS Construction Noise – Designated Sites

304. With reference to Chapter 21 (document reference 6.1.21) and Chapter 22 (document reference 6.1.22), it has been determined that there are no International or National ecological sites situated within 3.5 kilometres of the OnSS.

305. Therefore, assuming the same methodology of OnSS construction noise as outlined in Paragraph 269 is utilised, the predicted noise level at 3.5 kilometres would be 44dB(A) due to geometric attenuation only. In reality, air absorption and ground absorption over this magnitude of distance would result in a level significantly below this.

306. In view of the above, it is considered that noise generated by construction of the OnSS would be significantly below the limit of 55dB $L_{Aeq,1hr}$ contained in the AQTAG09 guidance, therefore a detailed assessment has not been undertaken. This is further justified with reference to Table 26.56 which shows that the predicted noise levels from construction of the OnSS are below this threshold level at the NSRs located close to the OnSS.

307. With reference to Table 26.36, Table 26.42 and Table 26.43 it can be concluded that the OnSS construction would equate to a *negligible* magnitude of impact upon *high* sensitivity receptors, resulting in a level of effect of temporary *'minor adverse'* which is not considered significant in terms of the EIA Regulations.

26.7.6.6 Maximum (L_{Amax}) Noise Levels – Ecological Receptors

308. With reference to Table 26.4 the AQTAG09 guidance also provides limits for maximum noise levels (L_{Amax}), however it is considered that the 55dB $L_{Aeq,T}$ limit is more onerous and if this is met it is likely that the maximum noise level limit will not be exceeded.

309. To further justify the above a worked example is shown below which references the sound power levels and maximum noise levels for construction operations at the landfall shown in Table 26.44.

310. The highest sound power level (SWL) of the plant shown in the second column of Table 26.44 is 108dB (mud pump/cuttings recycling tank), the highest maximum (L_{Amax}) level[3] of the

[3] Limited published data regarding the maximum (L_{Amax}) noise levels from plant, therefore this level should be treated with a degree of caution.

plant shown in the sixth column of Table 26.44 is 117dB (small dump truck/telehandler).

311. Based on the above standoff distances where the limit of 55dB $L_{Aeq,-1\text{-}hour}$ and 80dB L_{Amax} are achieved have been calculated based on the following assumptions:

- Each item of plant considered has been modelled as a point source at height of 2m above ground level.
- Receptor height of 1.5m.
- Ground absorbency factor of 0.5 between the source and the receiver;
- Downwind propagation between the source and the receiver;
- 70 % humidity and an average temperature of 10°C;
- Flat ground (i.e., no topography) between the source and the receiver; and
- No intervening structures between the source and the receiver.

312. Based on the above the calculated standoff distances are shown in Table 26.61 below.

Table 26.61 Standoff Distances for $L_{Aeq,1\text{-}Hour}$ and L_{Amax} Levels, dB

Plant Considered	Noise Level Considered	AQTAG Limit, dB	Approximate Standoff Distance where Limit Achieved.
Mud pump/cuttings recycling tank	108.0 dB(A) SWL	55.0 $L_{Aeq,\ 1\text{-}hour}$	140
Small dump truck/telehandler	117.0 L_{Amax}	80.0 L_{Amax}	30

313. It can be seen from Table 26.61 that the stand-off distance to achieve the 55.0dB $L_{Aeq,\ 1\text{-}hour}$ limit are far greater than those to achieve the 80.0 L_{Amax} limit which further justifies the hypothesis that if the 55dB $L_{Aeq,T}$ limit is this is met it is likely that the maximum noise level limit will not be exceeded.

314. It is considered that the above applies to construction operations with the exception of the noise generated by impact piling operations which have the potential to generate high maximum noise levels.

315. However, it has been assumed that impact piling operations would only be associated with the foundations of the OnSS, which are located approximately 3.5km from the closest identified ecological receptor. Therefore, it is considered that these piling operations would not cause an exceedance over the 80 dB L_{Amax} noise limits.

26.7.7 Construction Vibration

316. Ground level plant is not considered to generate significant levels of vibration, with levels below those which would be likely to cause cosmetic damage.

317. However, the following construction vibration activities have been considered:

- The underground drilling activities associated with the trenchless drilling operations at the landfall and at various locations along the onshore ECC;

- The vibratory piling activities associated with the trenchless drilling operations at the landfall and at various locations along the onshore ECC.
- Piling associated with the OnSS foundations.

318. Where applicable the potential vibration impact of these working methods has been assessed upon the closest VSRs to each construction activity.

26.7.7.1 Trenchless Drilling – Underground Drilling – Minor Drills

319. Underground drilling will be utilised at a number of locations along the ECC, used as an alternative methodology to open-cut trenching, to cross significant environmental and physical features such as watercourses, utilities, and roads.

320. For minor drills it has been confirmed that underground drilling will only take place during the day-time, therefore only potential day-time impacts have been considered.

321. Depending on the progress rates and techniques employed, vibration effects due to tunnelling and drilling are relatively short-lived; in addition, levels of vibration are found to decrease rapidly with distance.

322. Desktop predictions of ground borne vibration due to drilling works have therefore been undertaken. The predictions have been completed in accordance with calculation algorithms associated with underground tunnelling operations included in Table E.1 of BS 5228-2.

323. The results of the desktop predictions have shown that at distances more than 55m away from tunnelling works, the vibration levels generated are unlikely to cause complaints, i.e., with reference to Table 26.3 PPV vibration levels would be between 0.3 and 1.0mm/s.

324. With reference to Table 26.36 and Table 26.40, as a worst-case, any VSRs located more than 55m away from trenchless drilling would be subject to a day-time vibration level which would lead to a *low* impact magnitude.

325. The results of the desktop predictions have shown that at distances more than 140m away from tunnelling works, the vibration levels generated are likely to be below the perceivable vibration level, i.e., with reference to Table 26.3 PPV vibration levels would be below 0.3mm/s.

326. With reference to Table 26.36 and Table 26.40, any VSRs located more than 140m away from trenchless drilling would be subject to a vibration level which would lead to a *negligible* impact magnitude.

327. With reference to Table 26.43, a *negligible* impact magnitude for receptors of all sensitivities, and a *low* impact magnitude for receptors of medium sensitivity and below, would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

Standoff Distances

328. As previously stated within the bullet points associated with Paragraph 189 the construction vibration assessment for the ECC is based on standoff distances from the extents of the relevant boundaries which define where adverse noise impacts are likely to occur and has considered day-time and weekend construction operations.

329. Consequently, a day-time standoff distance of 55m from the ECC boundaries, outside of which only a *'minor adverse'* level of effect would be experienced at worst, is shown in Volume 2, Figure 26.9 (document reference 6.2.26.9).

330. With reference to the above, the defined ECC segments described in the bullet points associated with Paragraph 90 and the OS address data base has identified the location of the sensitive receptors located along the ECC. The number of residential VSRs within each segment of the ECC which could be subject to a *medium* magnitude of impact or greater from vibration associated with underground drilling is shown in Table 26.62.

331. It also must be noted that the number of VSRs specified includes other residential led developments which have been granted planning permission and have the potential to be impacted by vibration from ECC construction operations, namely:

- The Hogsthorpe development located to the western boundary of the village of Hogsthorpe and to the east of the landfall to A52 Hogsthorpe section of the ECC; and
- The Puttock Gate development located on the southern boundary of the village of Puttock Gate and to the north of The Haven to Marsh Road section of the ECC.

332. With reference to the above each of the proposed developments above have been considered as a single VSR.

333. The locations of the developments described above are shown in Volume 3, Appendix 5.3 (document reference 6.3.5.3).

334. A *medium* magnitude of impact has been calculated as with reference to Table 26.36, Table 26.40 and Table 26.43, this would equate to a temporary *'moderate'* level of effect which is considered significant in EIA terms.

Table 26.62 ECC receptors subject to a medium magnitude of impact from underground drilling (Minor) vibration

ECC Segment	Period	Number of VSRs Subject to Medium Magnitude of Impact
ECC 1 - Landfall to A52 – Hogsthorpe	Day-time	7
ECC 2 - A52 - Hogsthorpe to Marsh Lane		2
ECC 3 - Marsh Lane to A158 - Skegness Road		0
ECC 4 - A158 - Skegness Road to Low Road		0
ECC 5 - Low Road to Steeping River		3
ECC 6 - Steeping River to Fodder Dike Bank/Fen Bank		0
ECC 7 - Fodder Dike Bank/Fen Bank to Broadgate		0
ECC 8 - Broadgate to Ings Drove		4
ECC 9 - Ings Drove to Church End Lane		0
ECC 10 - Church End Lane to The Haven		0
ECC 11 - The Haven to Marsh Road		0
ECC 12 - Marsh Road to Fosdyke Bridge		0

ECC Segment	Period	Number of VSRs Subject to Medium Magnitude of Impact
ECC 13 - Fosdyke to Surfleet Marsh OnSS/Marsh Drove		5
ECC 14 - Surfleet Marsh OnSS/Marsh Drove to the Connection Area		0

335. It can be seen from Table 26.62 that there are a number of VSRs within each ECC segment that would be subject to a *medium* magnitude of impact; however, the predictions and associated standoff distances have assumed a worst-case scenario where trenchless drilling activities are being undertaken at the extents of the ECC boundary.

336. In reality, for much of the time, trenchless drilling operations would be undertaken at greater distances away from VSRs. For most of the construction phase vibration from trenchless drilling would be reduced therefore reducing the extents of the standoff distances.

337. In addition, at distances greater than 10m the predicted vibration levels from underground drilling are below 10mm/s and it has been determined are no VSRs within 10m of the extents of the ECC boundary. Therefore with reference to Table 26.3 the predicted vibration levels from underground tunnelling at all the VSRs is below the level where vibration levels are likely to be intolerable and with reference to Table 26.36, Table 26.40 and Table 26.43 under a level where *major* magnitude of impact would be experienced.

338. It should also be noted that drilling would be temporary in nature, and worst-case vibration levels could be tolerated if warning has been given to the residents of the relevant VSRs prior to the commencement of the trenchless drilling operations.

339. With regards to timescales and potential vibration impacts from the minor drill works, as an approximation it is proposed that each minor drill would take two weeks complete, therefore it is considered that any vibration impacts experienced at any one of the VSRs from minor drill noise would be short-term (less than one-month) in nature.

340. Based on all of the above it is considered that assuming prior warning has been given to the residents to the relevant VSRs the identified impacts would be reduced, so at worst this would equate to a *'low'* impact magnitude for receptors of *medium* sensitivity which would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

26.7.7.2 Trenchless Drilling – Underground Drilling – Major Drills and Landfall

341. With regards to the major drills and at the landfall, it has been confirmed that underground drilling operations could be undertaken during the night-time period; therefore, potential night-time impacts have been considered as a worst-case assessment.

342. The results of the desktop predictions have shown that at distances more than 140m away from tunnelling works, the vibration levels generated are likely to be below the perceivable vibration level, i.e., with reference to Table 26.3 PPV vibration levels would be below 0.3mm/s.

343. With reference to Table 26.36 and Table 26.40, as a worst-case, any VSRs located more than 140m away from trenchless drilling would be subject to a night-time vibration level which would lead to a *negligible* impact magnitude.

344. With reference to Table 26.43, a *negligible* impact magnitude for receptors of *high* sensitivity, would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

345. The approximate distances from the sensitive receptors to the major drill CICs and the associated TCs have been determined.

346. The VSRs located within 140m of the major drill cable installation compounds and the associated trenchless working area are shown in Table 26.63 and Volume 2, Figure 26.7 (document reference 6.2.26.7). It should be noted that the majority of these VSRs are included in Table 26.53 (Major Drill CICs and NSRs) with the exception of Eventide, Southfield Lane and 1 Bleak House Farm, Wyberton Roads. These two receptors have been labelled as 'VSRs' in Volume 2, Figure 26.7 (document reference 6.2.26.7).

347. It also should be noted that there are no VSRs within 140m of the landfall.

Table 26.63 VSRs within 140m of the Major Drill Working Areas

TC ID	CIC ID	Nearest VSRs	Approximate Grid Reference X/Y		Approx Distance to Closest Working Area (m) and working Area ID
TC26	35 & 36	Slackholme House Farm, South Ings Lane	553389	370632	100 – TC26
TC77	117 & 118	Laurel Cottage, Haven Bank, Wainfleet Street	548631	359027	60 – TC77
TC167	245 & 246	Eventide, Southfield Lane	536271	341032	130 – CIC246
		Sunnyside, Southfield Lane	536274	341016	130 – CIC246
TC170	250	1 Bleak House Farm, Wyberton Roads	535533	340081	55 – TC170

348. Table 26.64 shows the predicted vibration level at each receptor shown in Table 26.63, and also compares the predicted vibration levels to the threshold limits and with reference to Table 26.36, Table 26.40 and Table 26.43 defines the level of effect and significance. The text highlighted in bold is where a significant level of effect is predicted in terms of the EIA Regulations.

349. It must be noted that as a night-time assessment is being undertaken the sensitivity of the receptors are defined as *'high'* as defined in Table 26.36.

Table 26.64 Predicted Vibration Levels at VSRs within 140m of the Major drill Working Areas, PPV

TC ID	CIC ID	Nearest VSRs	Approx Distance to Closest Working Area (m)	Predicted Vibration Level PPV mm/s	Impact Magnitude	Level of Effect
TC26	35 & 36	Slackholme House Farm, South Ings Lane	100	0.5	**Low**	**Moderate**
TC77	117 & 118	Laurel Cottage, Haven Bank, Wainfleet Street	60	0.9	**Low**	**Moderate**
TC167	244 & 245	Eventide, Southfield Lane	140	0.3	**Low**	**Moderate**
		Sunnyside, Southfield Lane	140	0.3	**Low**	**Moderate**
TC170	250	1 Bleak House Farm, Wyberton Roads	55	1.0	**Medium**	**Major**

350. As shown in Table 26.64, the maximum predicted vibration level from night-time underground tunnelling operations associated with major drills is 1.0mm/s at 1 Bleak House farm. With reference to Table 26.36, Table 26.40 and Table 26.43 this would equate to *'medium'* impact magnitude for receptors of high sensitivity, which would result in a temporary *'major adverse'* level of effect, which is significant in terms of the EIA Regulations.

351. With regards to the remaining VSRs in Table 26.64, the predicted vibration levels are all between 0.3 mm/s and 0.9 mm/s which, with reference to Table 26.36, Table 26.40 and Table 26.43, would equate to *'low'* impact magnitude for receptors of high sensitivity, resulting in a temporary *'moderate adverse'* level of effect, which is significant in terms of the EIA Regulations.

352. With regards to the identified impacts at these receptors, it should be noted that the predictions have been based on a worst-case situation where underground drilling is being taken at the closest approach from each major drill CIC and the associated TC; in addition, the underground drilling would be temporary in nature (i.e. major drills will take approximately six to eight weeks to complete (medium-term)) and, with reference to Table 26.3, vibration levels of the magnitude predicted could be tolerated if warning has been given to the residents prior to the commencement of the underground drilling operations.

353. However, due to the increased sensitivity during the night-time period it is recommended that once detailed design has been undertaken and the exact drilling methodologies are available, further vibration predictions are undertaken to identify any impacts with more certainty. Any mitigation measures would then be included within the final NVMP.

354. Based on all of the above it is considered that assuming prior warning has been given to the residents to the relevant VSRs the identified impacts would be reduced, so at worst this

would equate to a *'negligible'* impact magnitude for receptors of *high* sensitivity which would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

26.7.7.3 Trenchless Drilling – Vibratory Piling

355. As part of the trenchless drilling operations, piling will be utilised to install sheet piles. This would also apply where ground conditions dictate that it is necessary to install sheet piles to support joint bay excavations. Depending on the progress rates and techniques employed, vibration effects due to piling installation are relatively short-lived. In addition, levels of vibration are found to decrease rapidly with distance.

356. It has been confirmed that silent piling or vibration free methods would be utilised for sheet pile installation at the landfall and vibratory piling would not be required for the minor drills.

357. However, it has also been confirmed that vibratory piling would be required at a number of the major drill trenchless cuts along the ECC, it has also been confirmed that vibratory piling operations would take place in the day-time only. The locations of the major drill CICs and the nearest sensitive receptors have been previously identified within Table 26.53.

358. Desktop predictions of ground borne vibration due to vibratory piling have therefore been completed in accordance with Table E.1 of BS 5228-2.

359. The results of the desktop predictions have shown that at distances more than 75m away from piling works, the vibration levels generated are unlikely to cause complaints, i.e. with reference to Table 26.3 PPV vibration levels would be between 0.3 and 1.0mm/s (at a 95% confidence level).

360. With reference to Table 26.36, Table 26.40, and Table 26.43 as a worst-case, any VSRs located more than 75m away from trenchless drilling would be subject to a day-time vibration level which would lead to a *low* impact magnitude.

361. The results of the desktop predictions have shown that at distances more than 190m away from piling works, the vibration levels generated are likely to be below the perceivable vibration level, i.e., with reference to Table 26.3 PPV vibration levels would be below 0.3mm/s (at a 95% confidence level).

362. With reference to Table 26.36, Table 26.40, and Table 26.43, as a worst-case, any VSRs located more than 190m away from trenchless drilling would be subject to a day-time vibration level which would lead to a *negligible* impact magnitude.

363. With reference to Table 26.43, a *negligible* impact magnitude for receptors of all sensitivities, and a *low* impact magnitude for receptors of medium sensitivity and below, would result in a temporary *'minor adverse'* level of effect, which is not significant in terms of the EIA Regulations.

364. The approximate distances from the sensitive receptors to the closest working area of the major drills are shown in the sixth column of Table 26.53. It can be seen that of the receptors are more than 75m away from the working area therefore as a worst-case, there would be a

temporary *'minor adverse'* level of effect from vibratory piling, which is not significant in terms of the EIA Regulations.

26.7.7.4 OnSS Foundations

365. The most significant source of vibration during the construction works will be the potential for percussive piling operations to be undertaken for the OnSS foundations.

366. BS 5228-2 provides guidance for the prediction of an upper estimate of vibration from piling operations which is based on the energy per blow or cycle (determined by the type of piler and ram weight), the distance of the receptor from piling and generalised soil conditions.

367. Based on the calculation formulae provided in Table E.1 in Annex E of BS 5228-2, hammer energies and associated percussive pling standoff distances have been calculated from the piling location to achieve a PPV level of 0.3mm/s, i.e., below the level of perceptibility and at 0.9mm/s i.e. below the level of complaint in residential environments.

368. Calculations have been made for percussive piling 'not at refusal' and as a worst-case 'at refusal' and shown in Table 26.65 below.

Table 26.65 Estimated maximum hammer energies and standoff distances from percussive piling

Threshold Value, PPV mm/s	Piling Scenario	Hammer Energy (KJ)	Standoff Distance (m)
0.3	Not as refusal	20	275
		50	375
		85	475
	Refusal	20	400
		50	560
		85	700
0.9	Not as refusal	20	115
		50	165
		85	200
	Refusal	20	170
		50	245
		85	300

369. It should be noted that the hammer energies utilised are within the valid prediction range included within BS 5228-2, which states that the limit of the equation utilises a minimum and maximum hammer energy of 1.1 and 85kJ respectively.

370. However, it should be noted that trying to accurately predict the vibration levels generated from high hammer energies through predominantly unknown ground conditions over distances greater than 100m is extremely difficult and therefore the standoff distances shown in Table 26.65 should be treated with a degree of caution.

371. Further to the above, the closest VSR to the OnSS footprint is approximately 580m (Location OnSS003). This would suggest that a piling rig with a maximum hammer energy of 50KJ or below should be utilised so that the level of vibration is below the level of perceptibly of

below 0.3mm/s at the nearest VSR and hammer energies in excess of 85KJ may be acceptable to avoid complaints (below 0.9mm/s) at the nearest VSRs, however it is not possible to determine this with certainty through prediction.

372. As noted in Chapter 3 (document reference 6.1.3), at this stage in the Project development process, decisions on exact locations of infrastructure and the precise technologies and construction methods that will be employed have not been finalised. This includes whether or not percussive piling will be required during construction as well as the type of piler and ram weight (if required). These will be determined during detailed design that will take place between a decision on the application for development consent and the start of construction.

373. It is anticipated however that the PPV levels from piling operations would be below 1.0mm/s at the nearest VSR to the OnSS , and that percussive piling works would only take place during the day-time period. The final NVMP will include predictions for PPV arising from percussive piling operations that will be informed by detailed design, for approval by the relevant planning authority through approval of the final NVMP and CoCP secured by DCO requirement), in advance of any percussive piling taking place.

374. On the basis that the levels from piling operations would be below 1.0mm/s at the nearest VSRs to the OnSS, the nearest receptors would be *medium* sensitivity and the piling works would only take place during the day-time period. With reference to Table 26.36, Table 26.40, and Table 26.43, as a worst-case, this would lead to a *low* impact magnitude for *medium* sensitivity receptors, equating to a temporary *'minor adverse'* level of effect which is not significant in terms of the EIA Regulations.

26.7.8 Construction Traffic Noise Assessment – Local Road Network

375. Construction traffic from the development proposals may temporarily alter noise levels near the affected local road network. In accordance with the DMRB Volume 11 Section 3 Part 7 Noise and Vibration, a noise assessment has been undertaken to include the identified affected links.

376. The most affected links have been identified within Chapter 27 (document reference 6.1.27) and shown on Figure 27.1.1 in Volume 3, Appendix 27.1: Transport Assessment (document reference 6.3.27.1).

377. With reference to Chapter 27 (document reference 6.1.27), for each link the Annual Average Weekday Traffic (AAWT) and percentage of Heavy Goods Vehicles (HGVs) have been determined "With Scheme" (i.e. with the development proposals) and "Without Scheme" (i.e. without the development proposals).

378. Based on the AAWTs and percentage of HGVs e, the BNL has been established for the "With Scheme" and "Without Scheme". Scenarios for the base year 2022 and base year

including the development have been assessed. The BNL is the dB $L_{A10, 18hr}$ noise level[4] at 10m from the kerb of the road assessed.

379. The assessment of each link is shown in Table 26.66. As the majority of receptors along the highway routes are residential receptors, and only day-time and weekend construction is proposed, the receptors along the traffic links have been categorised as *medium* sensitivity. The Table also compares the predicted changes in noise levels to the defined threshold limits and with reference to Table 26.36, Table 26.39 and Table 26.43, defines the level of effect and significance.

380. The text highlighted in bold is where a significant level of effect is predicted in terms of the EIA Regulations.

[4] Termed the $L_{A10,}$ this measure of noise is equivalent to the noise level exceeded for 10% of the measurement period. Most legislation that refers to road traffic noise uses this noise index over an 18-hour period, from 06:00 hours to 00:00 hours.

Table 26.66 Construction traffic noise assessment

Link	Without Scheme				With Scheme				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
B1449 Thurlby Road	4540	3.1	94	68.3	4623	4.6	94	68.6	+0.3	Negligible	Minor (not significant)
B1449 Long Lane	2724	4.0	79	64.8	2808	6.5	79	65.5	+0.7	Negligible	Minor (not significant)
A1104	7894	3.7	66	68.2	7977	4.6	66	68.5	+0.3	Negligible	Minor (not significant)
A52 (west of Hogsthorpe)	4254	2.4	90	67.5	4337	4.1	90	67.9	+0.4	Negligible	Minor (not significant)
A52 (between Marsh Lane and Skegness)	4268	3.0	52	64.0	4272	3.0	52	64.0	0.0	Negligible	Minor (not significant)
Listoft Lane	79	6.6	48	47.3	106	26.7	48	52.1	**+4.8**	**Medium**	**Moderate (significant)**
Sloothby High Lane	1652	2.1	48	59.1	1678	3.3	48	59.6	+0.5	Negligible	Minor (not significant)
S Ings Lane	1189	2.3	90	61.9	1226	4.8	90	62.5	+0.6	Negligible	Minor (not significant)
Marsh Lane (between ECC and A52)	4886	2.5	101	69.1	4888	2.5	101	69.1	0.0	Negligible	Minor (not significant)
Marsh Lane (between ECC and A158)	4886	2.5	74	66.6	4960	3.8	74	67.0	+0.4	Negligible	Minor (not significant)

Link	Without Scheme				With Scheme				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
A158 Skegness Road (east of ECC)	13899	2.5	52	68.9	13973	3.0	52	69.1	+0.2	Negligible	Minor (not significant)
A158 Skegness Road (west of ECC)	13899	2.5	94	73.0	14188	4.3	94	73.5	+0.5	Negligible	Minor (not significant)
A52 (north of Low Road)	8508	2.4	83	69.9	8611	3.1	83	70.1	+0.2	Negligible	Minor (not significant)
A52 (South of Low Road)	8508	2.4	86	70.1	8621	3.1	86	70.3	+0.2	Negligible	Minor (not significant)
A52 (Holland Lane)	5127	4.6	79	67.7	5217	5.2	79	67.9	+0.2	Negligible	Minor (not significant)
A52 (Wrangle)	6788	5.0	88	69.9	6901	5.5	88	70.0	+0.1	Negligible	Minor (not significant)
A52 (Butterwick)	9101	6.8	64	69.3	9214	7.1	64	69.5	+0.2	Negligible	Minor (not significant)
A52 Wainfleet Road (Haltoft End)	10196	4.9	65	69.5	10467	6.7	65	70.0	+0.5	Negligible	Minor (not significant)
A52 Wainfleet Road (Haltoft End)	10196	4.9	65	69.5	10468	6.7	65	70.0	+0.5	Negligible	Minor (not significant)
Church Lane	832	4.0	56	57.6	849	5.6	56	58.1	+0.5	Negligible	Minor (not significant)

Link	Without Scheme				With Scheme				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
Gunby Lane	1159	5.0	70	60.5	1233	10.1	70	61.8	+1.3	Low	Minor (not significant)
B1195 (Irby in the Marsh)	1232	3.4	68	60.3	1307	8.3	68	61.6	+1.3	Low	Minor (not significant)
B1195 (Thorpe St. Peter)	911	2.8	67	58.6	1000	9.2	67	60.5	+1.9	Low	Minor (not significant)
Boston Road (Wainfleet)	1404	0.3	65	59.5	1423	0.3	65	59.6	+0.1	Negligible	Minor (not significant)
Brewster Lane	38	3.3	49	43.3	67	35.2	49	51.0	**+7.7**	**High**	**Major (significant)**
Collision Gate	7	0.0	48	36.4	38	72.3	48	51.9	**+15.5**	**High**	**Major (significant)**
Scald Gate	28	4.5	41	41.7	31	4.1	41	42.0	+0.3	Negligible	Minor (not significant)
Horbling Lane	1399	13.7	48	61.4	1462	17.2	48	62.2	+0.8	Negligible	Minor (not significant)
Fen Bank	684	3.6	65	57.4	747	11.3	65	59.4	+2.0	Low	Minor (not significant)
Howgarth Lane	136	1.5	52	48.5	157	12.8	52	52.0	**+3.5**	**Medium**	**Moderate (significant)**
Low Road	890	4.4	67	59.0	907	5.9	67	59.3	+0.3	Negligible	Minor (not significant))
Common Road	226	4.2	85	54.6	314	26.9	85	59.2	**+4.6**	**Medium**	**Moderate (significant)**

Link	Without Scheme				With Scheme				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
Common Road (near A52)	265	2.3	39	50.4	353	23.0	39	56.5	**+6.1**	**High**	**Major (significant)**
Ings Road	310	4.0	79	55.5	398	21.8	79	59.3	**+3.8**	**Medium**	**Moderate (significant)**
West End Road	638	9.6	53	57.5	727	18.7	53	59.7	+2.2	Low	Minor (not significant)
Cut End Road	244	5.4	85	55.2	264	11.3	85	56.5	+1.3	Low	Minor (not significant)
Millfield Lane East/Low Road/Streetway/ Wyberton Roads	237	4.0	79	54.3	280	16.5	79	57.1	+2.8	Low	Minor (not significant)
Station Road/ Skeldyke Road/ Nidd's Lane/Marsh Road	353	3.8	70	55.0	431	18.7	70	58.6	**+3.6**	**Medium**	**Moderate (significant)**
Wash Road/Craven's Lane	239	2.2	40	50.0	275	13.1	40	53.8	**+3.8**	**Medium**	**Moderate (significant)**
A16 (south of Boston)	23194	4.2	50	71.5	23301	4.4	50	71.6	+0.1	Negligible	Minor (not significant)
A16 (south of Boston)	23194	4.2	50	71.5	23412	4.8	50	71.7	+0.2	Negligible	Minor (not significant)
A17 (south of River Welland)	21118	8.1	63	73.2	21247	8.6	63	73.3	+0.1	Negligible	Minor (not significant)

Link	Without Scheme				With Scheme				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
A17 (north of River Welland)	21118	8.1	77	74.4	21245	8.5	77	74.5	+0.1	Negligible	Minor (not significant)
A17 (between A16 and A1121)	19763	10.0	77	74.5	19940	10.7	77	74.6	+0.1	Negligible	Minor (not significant)
A17 (west of A1221)	24789	13.1	64	74.9	24997	13.7	64	75.0	+0.1	Negligible	Minor (not significant)
A16 (south of A17)	16853	10.2	64	72.7	17125	11.0	64	72.9	+0.2	Negligible	Minor (not significant)
A1121 (between Boston and A17)	9013	7.2	64	69.4	9071	7.7	64	69.5	+0.1	Negligible	Minor (not significant)
A16 (between A52 (Boston) and A155)	7358	4.7	90	70.3	7588	7.0	90	70.9	+0.6	Negligible	Minor (not significant)
A16 (between A155 and A158)	10428	8.1	96	73.0	10655	9.7	96	73.3	+0.3	Negligible	Minor (not significant)
A16 (between A158 and A1028)	6142	9.2	96	70.8	6452	13.3	96	71.6	+0.8	Negligible	Minor (not significant)
A16 (north of A1028/A1104)	9942	7.3	96	72.6	10251	9.9	96	73.2	+0.6	Negligible	Minor (not significant)
A1028 (between A158 and A16)	6336	4.8	96	70.2	6540	7.7	96	70.9	+0.6	Negligible	Minor (not significant)
A158 (between A1028 and A16)	12215	3.8	96	72.9	12436	5.3	96	73.3	+0.4	Negligible	Minor (not significant)
A158 (west of A16)	7934	4.2	103	71.7	8239	7.6	103	72.4	+0.7	Negligible	Minor (not significant)

Link	Without Scheme				With Scheme				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
A1104 (north of B1149)	4747	4.9	98	69.2	4747	4.9	98	69.2	0.0	Negligible	Minor (not significant)
A16 (Boston)	41268	6.0	64	75.7	41504	6.3	64	75.8	+0.1	Negligible	Minor (not significant)
A52 (Boston)	19445	3.8	64	71.9	19537	4.1	64	72.0	+0.1	Negligible	Minor (not significant)
Lincoln Road, Skegness	9000	10.4	55	69.3	9073	11.1	55	69.5	+0.2	Negligible	Minor (not significant)
Low Road, East of Croft	616	1.4	80	57.9	729	10.0	80	60.4	+2.5	Low	Minor (not significant)
Marsh Road, Surfleet Bank	47	4.4	48	44.4	124	21.4	48	52.1	**+7.7**	**High**	**Major (significant)**

381. It can be seen from Table 26.66 that:

- The worst-case magnitude of impact would be *high* for four *medium* sensitivity receptors (Brewster Lane, Collision Gate, Common Road (near A52) and Marsh Road) and the level of effect for these NSRs from noise levels generated by construction related traffic would be temporary *'major adverse'*, which is significant in terms of the EIA Regulations;
- Six other *medium* sensitivity receptors (Listoft Lane, Howgarth Lane, Common Road, Ings Road, Station Road/Skeldyke Road/Nidd's Lane/Marsh Road and Wash Road/ Craven's Lane) would experience a magnitude of impact of *medium,* and the level of effect for these NSRs from noise levels generated by construction related traffic would be temporary *'moderate adverse'*, which is significant in terms of the EIA Regulations; and
- Otherwise, the magnitude of impact would be *low* or *negligible* for *medium* sensitivity receptors and the level of effect at the nearest NSRs from noise levels generated by construction related traffic would be temporary *'minor adverse'*, which is not significant in terms of the EIA Regulations.

382. With regards to the identified adverse impacts above the following should also be noted.

383. The noise level generated by construction traffic would be temporary in nature and the assessment has been based on a maximum design scenario where the maximum flows on each link has been assessed, in reality the flows on the roads are likely to be lower therefore reducing the identified impacts;

- The assessment has predicted a change in noise levels 10m away from the kerb of the road assessed, it is considered that in the majority of cases the NSRs located close to each haul route would 'front-on' to the road; consequently, the noise levels within the main amenity spaces (rear gardens) would be reduced due to the noise attenuation provided by the properties themselves;
- With regards to internal noise levels, the building fabric of each NSR would provide noise attenuation from construction traffic, as a minimum a partially open window would provide approximately 13dB[5] and a standard single glazed window would provide approximately 20dB of attenuation, consequently the noise impacts experienced in internal amenity areas (living/dining rooms) would be considerably less than externally.

384. With regards to mitigation measures to reduce the identified impacts, there are no physical measures that could easily be implemented due to the fact that access routes are on the public highway and associated NSRs are not within the Order Limits and/or are on private land. Re-routing the construction traffic away from the most affected links where adverse impacts have been identified would remove any impacts; however, this may add traffic to other links which in-turn may lead to increased noise impacts on these routes.

385. Further to the above, the final NVMP will set out how noise levels from construction traffic

[5] Section 2.7 of the IEMA Guidelines for Environmental Noise Impact Assessment state that a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions
It is suggested within Section G.1 of BS 8233:2014 that the noise attention provided by a partially open window is approximately 15 dB.

will be monitored and mitigation measures be implemented (through liaison with the relevant LPA) should they be required, for anticipated peaks in construction traffic activity.

386. Example management actions which could be implemented are as follows:

- Vehicles not waiting or queuing up with engines running on the site or the public highway;
- Vehicles properly maintained to comply with noise emissions standards;
- Deliveries will be restricted to be within agreed working hours;
- Coordination between construction phases to reduce the maximum daily constriction vehicle movements, wherever practicable; and
- Temporary sound barriers (Table 26.34 provides an approximation of the amount of attenuation these could provide).

387. It is considered that with reference to the above and with the implementation of final NVMP the magnitude of impact could be reduced to *negligible* or *low* for receptors of *medium* sensitivity which would result in a temporary *'minor adverse'* level of effect at worst, which is not significant in terms of the EIA Regulations.

26.7.9 Inter-related Construction Effects

388. It is considered that there could be inter-related construction effects relating to the following construction activities:

- Inter-relation between Landfall and ECC construction noise affecting human receptors,
- Inter-relation between Landfall and ECC construction noise affecting ecological receptors,
- Inter-relation between ECC and OnSS construction noise affecting human receptors.

389. An inter-relation between ECC and OnSS construction noise affecting ecological receptors is not considered necessary due to the large distances (approximately 3.5km) between the OnSS and the nearest ecological receptor.

390. The sections below will assess these potential inter-related effects.

26.7.9.1 Inter-Relation Between Landfall and Onshore ECC Construction Works Affecting Human Receptors

391. The distance between the boundary of the ECC and the noise sensitive receptors identified for Landfall construction works (as outlined in Table 26.47) and their distances from the ECC are shown in Table 26.67.

Table 26.67 NSRs considered – Inter-relation between Landfall and ECC construction noise

NSR ID	Approximate Grid Reference X/Y		Approximate Distance to Landfall Working Area (m)	Approximate Distance to ECC Working Area (m)
L001	555147	375947	590	750
L002	554736	375785	540	635
L003	555549	374694	610	635

392. In order to determine whether any additional impact on the receptors at the Landfall would occur due to concurrent ECC construction works, an area source, with properties as

detailed in the first bullet of Paragraph 218, has been introduced at the north-easternmost extent of the ECC to the model for Landfall noise impacting on human receptors, which is outlined in Section 26.7.3.

393. The predicted worst-case sound level from the ECC construction and the predicted sound level from Landfall construction for the day-time and weekend periods (between 13:00 and 19:00 on a Saturday) are shown in Table 26.68 below; the cumulative level has been calculated by logarithmically adding the predicted noise levels from the ECC works to the landfill works. The cumulative level has then been used as the basis of the assessment which is shown in Table 26.68 below.

394. An evening or night-time assessment has not been considered for inter-related construction effects from the Landfall and ECC as no evening or weekend works are associated with the ECC works.

Table 26.68 Inter-relation of Landfall and ECC construction noise – Human receptors assessment Day-time

NSR ID	Period	Predicted Noise Level, dB $L_{Aeq,T}$			Threshold Limit	Diff.	Impact Magnitude	Level of Effect
		ECC Works	Landfall Works	Cumulative Level				
L001	Day-time	43	45	47	65	-18	Negligible	Minor
	Weekend				55	-8	Negligible	Minor
L002	Day-time	44	46	48	65	-17	Negligible	Minor
	Weekend				55	-7	Negligible	Minor
L003	Day-time	45	44	48	65	-17	Negligible	Minor
	Weekend				55	-7	Negligible	Minor

395. It can be seen from Table 26.68 that that the cumulative noise level from inter-related construction effects from the Landfall and ECC would give rise to a temporary *'minor adverse'* worst-case level of effect at the nearest NSRs which is not significant in terms of the EIA Regulations.

26.7.9.2 Inter-Relation Between Landfall and ECC Construction Works Affecting Ecological Receptors

396. In order to determine whether any additional impact on ecological receptors at the Landfall would occur due to concurrent ECC construction works, an area source, with properties as detailed in the first bullet of Paragraph 218, has been introduced at the north-eastern most extent of the ECC to the model for Landfall noise impacting on ecological receptors, which is outlined in Section 26.7.6.1.

397. The predicted worst-case sound level from the ECC construction and the predicted sound level from Landfall construction are shown in Table 26.69 below; the cumulative level has been calculated by logarithmically adding the predicted noise levels from the ECC works to the landfill works. The cumulative level has then been used as the basis of the assessment and is shown in Table 26.69 below.

Table 26.69 Inter-relation of Landfall and ECC construction noise – Ecological receptors assessment

NSR ID	Predicted Noise Level, dB $L_{Aeq,T}$			Threshold Limit, dB $L_{Aeq,T}$	Diff.	Impact Magnitude	Level of Effect
	ECC Works	Landfall Works	Cumulative Level				
Anderby Nature Reserve	48	51	53	55	-2	Negligible	Minor

398. It can be seen from Table 26.69 that that the cumulative noise level from inter-related construction effects from the Landfall and ECC would give rise to a temporary *'minor adverse'* worst-case level of effect at the nearest NSRs which is not significant in terms of the EIA Regulations.

26.7.9.3 Inter-Relation Between ECC and OnSS Construction Works Affecting Human Receptors

399. The distance between the boundary of the ECC and the noise sensitive receptors identified for OnSS construction works (as outlined in Table 26.47) and their distances from the ECC are shown in Table 26.70 below.

Table 26.70 NSRs considered – Inter-relation between ECC and OnSS construction noise.

NSR ID	Approximate Grid Reference X/Y		Approximate Distance to OnSS Working Area (m)	Approximate Distance to ECC Working Area (m)
OnSS001	527833	330478	800	680
OnSS002	528613	330820	730	75
OnSS003	527374	331328	580	450
OnSS004	528486	332442	740	675

400. In order to determine whether any additional impact on the receptors associated with the OnSS in Table 26.70 would occur due to concurrent ECC construction works, an area source, with properties as detailed in the first bullet of Paragraph 218, has been input into the OnSS model at the closest approach of the ECC to each of the receptors in Table 26.70.

401. The predicted worst-case sound level from the ECC construction and the predicted sound level from OnSS construction for the day-time and weekend (between 13:00 and 19:00 on a Saturday) periods are shown in Table 26.71 below; the cumulative level has been calculated by logarithmically adding the predicted noise levels from the ECC works to the OnSS works. The cumulative level has then been used as the basis of the assessment.

Table 26.71 Inter-relation of ECC and OnSS construction noise – Day-time and weekend assessment

NSR ID	Period	Predicted Noise Level, dB $L_{Aeq,T}$			Threshold Limit	Diff.	Impact Magnitude	Level of Effect
		ECC Works	OnSS Works	Cumulative Level				
OnSS001	Day-time	44	49	50	65	-15	Negligible	Minor
	Weekend				55	-5	Negligible	Minor
OnSS002	Day-time	61	51	61	65	-4	Negligible	Minor
	Weekend				55	+6	**High**	**Major**
OnSS003	Day-time	46	52	53	65	-12	Negligible	Minor
	Weekend				55	-2	Negligible	Minor
OnSS004	Day-time	43	50	51	65	-14	Negligible	Minor
	Weekend				55	-4	Negligible	Minor

402. It can be seen from Table 26.71 that that the cumulative noise level from inter-related construction effects from the ECC and OnSS would give rise to a temporary *'minor adverse'* worst-case level of effect at NSRs OnSS001, OnSS003 and OnSS004 which is not significant in terms of the EIA Regulations.

403. It can also be seen from Table 26.71 that at OnSS002 the cumulative noise level from inter-related construction effects from the ECC and OnSS would give rise to a temporary *'major adverse'* worst-case level of effect during the weekend period which is significant in terms of the EIA Regulations.

404. However, it must be noted that that a '*major adverse'* level of effect would be experienced at OnSS002 from the ECC operations alone (the predicted noise level from ECC operations are already +6dB(A) above the weekend limit) and the contribution from the OnSS is not therefore causing an increase in the cumulative level.

405. With reference to Paragraph 232 the identified adverse noise impacts from ECC construction have already been addressed through potential detailed design measures and the final NVMP.

406. It is considered that once these mitigation measures have been implemented the contribution from the ECC construction noise at OnSS002 would be reduced so only a '*minor adverse'* worst-case level of effect would be experienced and therefore the cumulative impact would also be reduced to a level where only a *minor adverse'* worst-case level of effect would be experienced.

26.7.10Operational Phase

26.7.10.1 Residential Receptor Assessment

407. An assessment has been made in accordance with the guidance contained in BS 4142:2014+A1:2019 to determine whether noise emissions associated with the operation of the proposed OnSS are likely to give rise to adverse impacts at the closest residential receptors.

408. Noise levels from the OnSS have been predicted at the nearest residential receptors. The

modelling has been undertaken on the basis of the type, quantity and size of plant that is likely to be required at an OnSS of the size in the application. It should, however, be noted that the final design of the OnSS has not been determined and so a maximum envelope has been assessed. In particular, there is the potential for two possible types of OnSS, AIS and GIS, to be utilised.

In accordance with the MDS shown in Table 26.32 Maximum design scenario for Noise and Vibration for the Project

409. , the modelling has assumed that the AIS OnSS would be chosen, as this has the potential to generate higher noise levels as the OnSS equipment is not housed within a building. In addition, as set out in the MDS, a layout for an AIS OnSS that does not place substation buildings between noise emitting equipment and NSRs has been considered in order to undertake a worst-case assessment.

410. The operational noise levels of the plant associated with the OnSS are shown in Table 26.72 below.

Table 26.72 Operational plant associated with the OnSS

OnSS Option	Item of Plant	Sound Power Level (SWL) dB	Quantity
AIS Switchgear	400/275/33 kV supergrid auto transformer	95	4
	275kV harmonic filters	95	4
	400kV harmonic filters	95	2
	275kV shunt reactor	85	8
	Emergency Generator	85	1
	33kV statcom	75	4
	Earthing/auxiliary transformer 33/0,4kV	65	4
	275kV voltage transformer	40	16
	400kV voltage transformer	40	2

411. The specific noise levels have been predicted utilising the Cadna/A modelling software and are shown in Table 26.73. The predictions have been based on the methodology and assumptions outlined in Appendix 26.4 (document reference 6.3.26.4).

412. The NSRs described in Table 26.73 have previously been identified in Table 26.55, and are shown in Volume 2, Figure 26.4 (document reference 6.2.26.4).

413. Images of the noise models for the OnSS are shown in Appendix 26.4 (document reference 6.3.26.4). The predicted noise levels have been rounded to the nearest decibel.

Table 26.73 Predicted specific sound levels from OnSS, dB

OnSS	Receptor	Period	Receptor Sensitivity	Predicted Specific Sound Level, L_{Aeq}, T dB
OnSS	OnSS001	Day-time	Medium	29
		Night-time	High	33
	OnSS002	Day-time	Medium	31
		Night-time	High	34

OnSS	Receptor	Period	Receptor Sensitivity	Predicted Specific Sound Level, L_{Aeq}, T dB
	OnSS003	Day-time	Medium	31
		Night-time	High	36
	OnSS004	Day-time	Medium	28
		Night-time	High	29

414. In conjunction with BS 4142, the acoustic character of the sound being generated by the source needs to be considered at the nearest NSRs, which requires corrections for tonal, impulsive or intermittent sounds to be added to the specific levels where required.

415. In the absence of octave band or third octave band operational data for the OnSS, it is considered that a +6dB character correction would need to be added to the specific sound levels to account for the potential tonal aspects of the sound being generated by the OnSS.

416. However, it is considered that no further character corrections would apply as the sound being generated by the OnSS is neither intermittent nor impulsive in nature.

417. With reference to the above, 6 dB has been added to the predicted specific sound level shown in Table 26.73 to calculate the rating level (L_{Ar}) at each NSR.

418. Rating level limits (taking into account the representative background sound levels for the residential properties) have been established below for the residential properties to compare the rating levels to, and assessments undertaken in accordance with BS 4142, which states:

"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."

419. The standard does not indicate at what level background and rating levels are low but BS 4142:1997 (which is a previous version of BS 4142:2014+A1:2019) stated:

"The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low. NOTE. For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low".

420. With reference to Table 26.31, it can be seen that the representative background sound level measured at Locations OnSS001 and OnSS002 during the night-time was 35 and 26dB L_{A90} respectively and therefore considered to be low, as defined in accordance with BS4142:2014+A1:2019.

421. In recognition of this, the substation for the approved Triton Knoll project, which is located approximately 10km to the northwest of the OnSS, had requirements placed on the operational noise levels permissible at the nearest noise sensitive receptor which were included within the DCO for the development. Requirement 18 of the DCO limited the rating level of the substation operation to 35dB $L_{Ar,T}$ at the nearest NSRs.

422. It is therefore proposed to use either the representative background sound level or these

limits (whichever is higher) for operational noise from the substation in this assessment. The predicted rating level from the substation operations will be assessed against this limit.

423. In view of the above and in addition to the rating level, the change in the absolute $L_{Aeq,T}$ sound level is also presented. For the assessment to be robust, when undertaking the calculation, the lowest baseline ambient sound level presented in Table 26.31 has been used.

424. The results of this assessments are shown in Table 26.74, where the predicted rating levels and background sound levels have been rounded to the nearest decibel.

425. The absolute $L_{Aeq,T}$ sound level has been calculated by logarithmically adding the predicted specific sound level from the OnSS to the baseline ambient (residual $L_{Aeq,T}$) level at each NSR considered.

426. The absolute level is then compared to the measured baseline ambient (residual $L_{Aeq,T}$) levels and any changes assessed accordingly.

Table 26.74 BS 4142:2014+A1:2019 OnSS operational assessment for residential receptors

Receptor	Period	Rating Level Limit, dB $L_{Ar,T}$	Predicted Specific Sound Level, L_{Aeq}	Rating Level, $L_{Ar\,T}$	Difference	Measured Residual $L_{Aeq,T}$	Calculated Ambient $L_{Aeq,T}$ (absolute level)	Change in $L_{Aeq,T}$
OnSS001	Day-time	41	29	35	-6	49	49	0
	Night-time	35	33	39	+4	48	48	0
OnSS002	Day-time	35	31	37	+2	39	40	+1
	Night-time	35	34	40	+5	34	37	+3
OnSS003	Day-time	47	31	37	-10	54	54	0
	Night-time	39	36	42	+3	51	51	0
OnSS004	Day-time	54	28	34	-20	62	62	0
	Night-time	39	29	35	-4	58	58	0

427. It can be seen from the sixth column of Table 26.74 that during the day-time and night-time the predicted rating levels are between 20dB below and 5dB above the rating level limits at the NSRs considered at the OnSS.

428. With reference to Table 26.36, Table 26.41 and Table 26.43 when referring to the difference between the operational rating level and the rating level limits, this would equate to a *negligible* to *low* magnitude of impact upon high sensitivity receptors resulting in a maximum level of effect of a permanent *'moderate adverse'* which is considered significant in terms of the EIA Regulations.

429. In addition when the specific $L_{Aeq,T}$ sound level of the OnSS is added to the existing baseline ambient $L_{Aeq,T}$ sound level, as a worst-case, the OnSS is calculated to increase the baseline ambient $L_{Aeq,T}$ sound level by a maximum of 3dB at NSR OnSS002 during the night-time (as shown in the ninth column of Table 26.74). With reference to Table 26.36, Table 26.41 and Table 26.43 this would equate to a *low* magnitude of impact upon *high* sensitivity receptors (residential night-time) resulting in a level of effect of a permanent *'moderate adverse'* which is considered significant in terms of the EIA Regulations.

430. With consideration of the above, further mitigation measures are considered in the following section to reduce the identified impacts from operational noise associated with the OnSS along with the resulting residual effects.

26.7.11 OnSS Operational Noise Mitigation Measures

431. The operational noise assessment for the OnSS has indicated that mitigation measures are required to reduce the identified impacts.

432. The noise model allows the contribution from each noise source to be determined at each of the NSRs considered.

433. Based on the analysis, Table 26.75 below outlines the noise reduction required at each of the identified noise sources within the OnSS to reduce the specific noise level at the nearest NSRs to a level where the identified impacts would be reduced.

Table 26.75 OnSS mitigation requirements, dB

OnSS Option	Item of Plant	Mitigation Required	Possible Measure
AIS Switchgear	400/275/33 kV supergrid auto transformer	-10	Acoustic enclosure
	275kV harmonic filters	-10	Equipment covered/screened
	400kV harmonic filters	-10	Equipment covered/screened
	275kV shunt reactor	None required	N/A
	Emergency Generator	None required	N/A
	33kV statcom	None required	N/A
	Earthing/auxiliary transformer 33/0,4kV	None required	N/A
	275kV voltage transformer	None required	N/A
	400kV voltage transformer	None required	N/A

26.7.12 Mitigated Operational Assessment

434. Table 26.76 repeats the operational assessment for the OnSS assuming that the mitigation measures shown in Table 26.75 have been implemented.

Table 26.76 BS 4142:2014+A1:2019 OnSS operational assessment for residential receptors, including mitigation

Receptor	Period	Rating Level Limit, dB $L_{Ar,T}$	Predicted Specific Sound Level, L_{Aeq}	Rating Level, $L_{Ar\,T}$	Difference	Measured Residual $L_{Aeq,T}$	Calculated Ambient $L_{Aeq,T}$ (absolute level)	Change in $L_{Aeq,T}$
OnSS001	Day-time	41	21	27	-14	49	49	0
	Night-time	35	25	31	-4	48	48	0
OnSS002	Day-time	35	23	29	-6	39	39	0
	Night-time	35	26	32	-3	34	35	+1
OnSS003	Day-time	47	23	29	-18	54	54	0
	Night-time	39	27	33	-6	51	51	0
OnSS004	Day-time	54	21	27	-27	62	62	0
	Night-time	39	22	28	-11	58	58	0

435. It can be seen from the sixth column of Table 26.76, that assuming the mitigation measures have been correctly implemented, the predicted rating levels are below the rating level limits during the day-time and the night-time at all the NSRs considered.

436. With reference to Table 26.36, Table 26.41 and Table 26.43 when referring to the difference between the rating level and the baseline background sound levels, this would equate to *negligible* magnitude of impact upon *high* sensitivity receptors resulting in a level of effect of a permanent *'minor adverse'* which is not considered significant in terms of the EIA Regulations.

437. However, as outlined in paragraphs 418, 419 and 420, the measured background sound levels are considered objectively low and therefore the change in the absolute $L_{Aeq,T}$ sound levels have been considered.

438. As shown in the ninth column of Table 26.76, the mitigated noise levels being generated by the OnSS causes a change in the baseline ambient noise level at OnSS002 of +1dB(A) at night. With reference to Table 26.36, Table 26.41 and Table 26.43 when referring to the change in ambient noise levels this would equate to a maximum *low* magnitude of impact upon *high* sensitivity receptors resulting in a level of effect of a permanent *'Moderate Adverse'* which is considered significant in terms of the EIA Regulations.

439. It should be noted that ambient sound level at OnSS002 is only predicted to increase by 1dB(A) which is unlikely to be perceptible to the human ear[6]. It has subsequently been considered in context that noise being generated by the OnSS will be largely indistinguishable for most of the time as the lowest baseline ambient sound level presented in Table 26.31 has been used in the assessment.

440. In addition, with reference to the desirable internal noise levels contained in BS 8233:2014 at receptors OnSS001, OnSS003 and OnSS004 mitigated noise levels being generated by the OnSS do not cause a change in the external baseline ambient noise level, therefore internal levels at these receptors will also remain unchanged.

441. As previously stated at receptor OnSS002 the mitigated noise levels being generated by the OnSS causes a change in the baseline ambient noise level of +1dB during the night-time. The calculated total ambient level, including the contribution from the OnSS, is 35dB(A) at OnSS002 during the night-time, this would equate to an internal level of approximately 22dB(A) when accounting for the attenuation provided by a partially open window of approximately 13dB[7].

442. An internal level of 22dB(A) is well below the desirable ambient night-time noise level of 30dB $L_{Aeq, 8hr}$ or less considered suitable for sleeping contained in BS 8233:2014 (see Paragraph 46).

443. With reference to the WHO Night Noise Guidelines 2009, an external level of 35dB(A)

[6] Section 2.7 of the IEMA *Guidelines for Environmental Noise Impact Assessment* state that a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions

[7] It is suggested within Section G.1 of BS 8233:2014 that the noise attention provided by a partially open window is approximately 15 dB, 13 dB is therefore considered a conservative estimate.

would also be below *'the level where adverse effects start to occur'* and subsequently below the LOAEL as defined in the guidelines, therefore no effects would be expected to occur (see Paragraph 55).

444. With reference to all of the above, it is considered that the mitigation measures recommended would be sufficient to reduce the noise from the OnSS, so a *negligible* magnitude of impact would be experienced upon all the *high* sensitivity receptors considered, resulting in a level of effect of a permanent *'minor adverse'* which is not considered significant in terms of the EIA Regulations.

26.7.12.1 Draft DCO Requirement

445. Based on the results and conclusions of the mitigated operational assessment a DCO requirement relating to the *'Control of Noise during the Operational Phase'* has been drafted and is replicated below.

31 — (1) The rating level for the standard operational noise of Work No. 16(a) must not exceed—

(a) 35 dB $L_{Ar,15\ min}$ at any time at a position representative of the façade, in free-field conditions, of any building lawfully occupied for residential or accommodation purposes at the date of the granting of this Order, at each of the locations set out in (i) to (iv) below:
  (i) Woad Farm, Surfleet Bank, Surfleet, Spalding, PE11 4DP (OS: 527809, 330462).
  (ii) Big Tree Farm, Marsh Drove, Surfleet Marsh, Spalding,PE11 4DW (OS: 528672, 330701).
  (iii) Hills Farm, Gosberton Bank, Spalding, Gosberton, PE11 4PB (OS: 527338, 331388).
  (iv) 172 Marsh Road, Sutterton, Boston, PE20 2LT (OS: 528468,332471).

(2) The rating level set out in sub-paragraph (1) are to be measured:

(a) in accordance with British Standard BS 4142:2014+A1:2019, *Methods for rating and assessing industrial and commercial sound*; and
(b) with the microphone placed 1.5m above the ground in free-field conditions (being at least 3.5m from the nearest vertical reflecting surface).

(3) Work No. 16(a) must not commence operation until a scheme for monitoring compliance with the rating levels set out in sub-paragraph (1) above has been submitted to and approved by the relevant planning authority. To demonstrate that the rating levels have been achieved after Work No. 16(a) is operating at full capacity, the scheme must identify—

(a) the required meteorological and other conditions under which the measurements will be taken, acknowledging that data obtained during emergency operation or testing of certain plant and equipment is not to be taken in to account;
(b) suitable monitoring locations (or alternative surrogate locations if appropriate); and
(c) times when the monitoring is to take place.

(4) The monitoring scheme must be implemented as approved.

(5) For the purposes of this requirement—

(a) "operating at full capacity" means the ordinary operation of the substations excluding emergency operation and the testing of plant and equipment associated with emergency operation.

26.7.13Uncertainties Relating to Noise Sources and Predicted Noise Levels

446. The operational assessment of the OnSS has been undertaken in conjunction with BS 4142:2014+A1:2019, which requires consideration of uncertainty associated with the operational levels of the various noise sources utilised in the assessment and the subsequent predicted noise levels.

26.7.13.1 Operational Plant and Noise Levels

447. The items of operational plant, plant locations and associated noise levels for the OnSS utilised within the noise model have been sourced by the Outer Dowsing Offshore Wind Engineering design team which has experience from other similar projects and therefore are as representative as reasonably practicable at this stage.

448. As no octave band data was available for the noise sources associated with the OnSS all the predictions and subsequent mitigation measures have been based on the 500Hz band, it is acknowledged that this is a limitation of the assessment and therefore enhances the amount of uncertainty. However, to reduce this uncertainty a +6dB character correction has been added to the specific sound levels to account for the potential tonal aspects of the sound being generated by the OnSS.

26.7.13.2 Predicted Noise Levels

449. The predictions have assumed a worst-case scenario where:

- An AIS layout has been assessed.
- All the plant is operating 100% of the time during the day-time and the night-time.
- There is downwind propagation between the noise sources associated with the OnSS and each receptor.

450. With reference to the above, it is considered that the assessment has been based on conservative noise predictions and therefore reducing any uncertainty of the results as far as reasonably practicable.

Noise Model

451. Based on the accuracy of the prediction methodology, i.e., ISO9613-2, the uncertainty of the CadnaA model accuracy, i.e., barrier corrections for buildings, etc., it is considered that the results of the assessment are as accurate as reasonably practicable.

26.7.14Ecological Receptor Assessment

452. With reference to Chapter 21 (document reference 6.1.21) and Chapter 22 (document reference 6.1.22), it has been determined that there are no International or National ecological sites situated within 3.5 kilometres from the OnSS.

453. Therefore, with a total *mitigated* sound power level of the OnSS of 98dB(A) (sum of sources including mitigation as outlined in Table 26.75, the sound pressure level at 3.5 kilometres would be 19dB(A) due to geometric attenuation only. In reality, air absorption and ground absorption would result in a level significantly below this.

454. In view of the above it is considered that the operational noise generated by the OnSS

would be significantly below the limit of 55dB $L_{Aeq,1hr}$ contained in the AQTAG09 guidance, therefore a detailed assessment has not been undertaken. This is further justified with reference to Table 26.73 which shows that the predicted noise levels from the OnSS are well below this level at the NSRs located close to the OnSS.

455. With reference to Table 26.36, Table 26.42 and Table 26.43 it can be seen that the operational noise being generated by the OnSS would equate to a *negligible* magnitude of impact experienced upon *high* sensitivity receptors, resulting in a level of effect of permanent *'minor adverse'* which is not considered significant in terms of the EIA Regulations.

26.7.15 Operational Vibration

456. The minimum distance to the nearest VSR from the boundary of the OnSS is 580m (labelled as NSR OnSS003 as shown in Volume 2, Figure 26.4 (document reference 6.2.26.4). For vibration to be perceived over this distance a substantial force would need to be applied which can only be achieved through a very high-energy impact; for example, the predicted vibration level for percussive piling using a 50kJ hammer impact at refusal would be 0.29mm/s which with reference to Table 26.3 is below the level of perceptibility.

457. The OnSS do not contain any mechanically moving parts that are capable of generating a fraction of the energy required to transmit such levels of vibration. Therefore, operational vibration has not been considered any further in this assessment.

26.7.16 Decommissioning Phase

458. Details surrounding the decommissioning phase are yet to be fully clarified. In addition, it is also recognised that policy, legislation and local sensitivities constantly evolve, which will limit the relevance of undertaking an assessment at this stage. Nevertheless, decommissioning activities are not anticipated to exceed the construction phase worst-case criteria which have been assessed. In addition, there is potential for onshore cables to remain in-situ which would see a reduction in impacts and resulting level of effect and significance in comparison to the assessment of construction effects.

459. Decommissioning activities are expected to occur for up to three years, however this will be driven primarily by offshore works. Landfall infrastructure is expected to be left in-situ where appropriate, to abate potential future impacts. This will be reviewed over the design life of the Project, and adapt to local sensitivities, policy and legislation.

460. The decommissioning methodology would be finalised nearer to the end of the lifetime of the Project, to be in-line with current guidance, policy and legislation. Any such methodology would be agreed with the relevant authorities and statutory consultees. The draft DCO includes a requirement to submit a written decommissioning plan for onshore infrastructure to the relevant planning authority within six-months of the permanent cessation of the transmission works.

26.8 Cumulative Impact Assessment

461. This cumulative impact assessment for noise and vibration has been undertaken in

accordance with the methodology provided in Volume 3, Appendix 5.3: Onshore Cumulative Effects Assessment Approach (document reference 6.3.5.3).

462. The projects, plans and activities scoped in as relevant 'other developments' to the assessment of cumulative impacts of noise and vibration are based upon a screening exercise undertaken on an initial long list of reasonably foreseeable other developments located within the Project's zone of influence; be it consented schemes not built out, or schemes for which planning consent is actively being sought.

463. Each project, plan, or activity has been considered and scoped in or out on the basis of effect-receptor pathway, data confidence, and the temporal and spatial scales involved.

464. The determination of the short list of other developments is documented in Appendix 5.3 (document reference 6.3.5.3).

465. For the purposes of assessing the cumulative impact of noise and vibration from the Project a number of projects and plans were screened in as presented in Table 26.77.

Table 26.77 Projects considered within the Noise and Vibration cumulative effect assessment.

Development type	Project	Status	Data confidence assessment/phase	Tier
Energy from Waste	Boston Alternative Energy Facility	Consent granted on the 6th July 2023.	High – Published information.	Tier 1
Plant based protein extraction facility and anaerobic digestor plant	Naylor Farm	Pre-determination	Low – No data available.	Tier 3
Substation	National Grid Substation (NGSS)	Pre-submission/pre-application	Low – conservative data used	Tier 3
Residential led Development	Hogsthorpe	Outline planning permission granted	High – Published information.	Tier 1
Residential led Development	Fishtoft Boston	Pre-determination	High – Published information.	Tier 1

466. The cumulative MDS for each Project is described in Table 26.77 is outlined in Table 26.78.

Table 26.78 Cumulative MDS

Impact	Scenario	Justification
Boston Alternative Energy Facility - Cumulative construction traffic noise impact	Peak hour operational traffic from Boston Alternative Energy Facility utilising the same routes as construction traffic for the Project.	Boston Noise and Vibration and Traffic and Transport chapters identify traffic links in common with the Project.
Hogsthorpe - Cumulative construction traffic noise impact	Peak hour operational phase traffic from Hogsthorpe utilising the same routes as construction traffic for the Project.	Estimated 24-hour traffic flows based on a typical daily trip rate for residential development.

Impact	Scenario	Justification
Fishtoft Boston - Cumulative construction traffic noise impact	Peak hour operational phase traffic from Fishtoft Boston utilising the same routes as construction traffic for the Project.	Estimated 24-hour traffic flows based on a typical daily trip rate for residential development.
Naylor Farm – Cumulative Construction and Operational Noise	Construction operations being undertaken simultaneously with the ODOW OnSS. Qualitative assessments for construction and operational noise.	Naylor Farm development located to the south of the OnSS. No existing data/noise and vibration assessments available for project.
NGSS - Cumulative construction noise and vibration impact	Construction operations being undertaken simultaneously with the ODOW OnSS. Qualitative assessments for construction noise and vibration. Use of ODOW OnSS data as a proxy.	NGSS indicative connection area located approximately 2.5km from ODOW OnSS thus potential for cumulative impacts at receptors. No existing data/noise and vibration assessments available for project.
	Construction operations being undertaken simultaneously with the ECC 14 (400kV cables associated with the connection area).	End of ECC 14 located directly to the north of the NGSS construction area. No existing data/noise and vibration assessments available for project.
NGSS – Cumulative construction traffic noise impact.	Construction operations being undertaken simultaneously with the ODOW OnSS. Qualitative assessments for construction traffic. Use of ODOW Weston Marsh South (WMS) OnSS search zone option (from PEIR) traffic data as a proxy.	Potential for cumulative impact of traffic on shared links. No existing traffic data or assessments available for project.
NGSS - Cumulative operational noise impact	NGSS Operating simultaneously with the ODOW OnSS. Qualitative assessments for operational noise. Use of ODOW Weston Marsh South (WMS) OnSS search zone option (from PEIR) data as a proxy.	NGSS indicative connection area located approximately 2.5km ODOW OnSS so potential for cumulative impacts at receptors. No existing noise data and assessments available for project.

26.8.1 Cumulative Traffic Noise Assessment

467. An assessment of cumulative traffic noise impact has been undertaken which includes the vehicle movements associated with the developments outlined Table 26.78 above. Table 26.79 overleaf shows the cumulative 2027 traffic noise assessments for traffic links which would be affected by the Project and cumulative schemes.

Table 26.79 Cumulative traffic noise assessment

Link	Without Scheme				With Scheme and Cumulative Scheme Traffic				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
B1449 Thurlby Road	4540	3.1	94	68.3	4868	4.4	94	68.8	+0.5	Negligible	Minor (not significant)
B1449 Long Lane	2724	4.0	79	64.8	3053	6.0	79	65.8	+1.0	Low	Minor (not significant)
A1104	7894	3.7	66	68.2	8222	4.4	66	68.6	+0.4	Negligible	Minor (not significant)
A52 (west of Hogsthorpe)	4254	2.4	90	67.5	4582	3.8	90	68.1	+0.6	Negligible	Minor (not significant)
A52 (between Marsh Lane and Skegness)	4268	3.0	52	64.0	4517	2.9	52	64.1	+0.1	Negligible	Minor (not significant)
A52 (north of Low Road)	8508	2.4	83	69.9	8915	3.0	83	70.2	+0.3	Negligible	Minor (not significant)
A52 (South of Low Road)	8508	2.4	86	70.1	8925	3.0	86	70.4	+0.3	Negligible	Minor (not significant)
A52 (Holland Lane)	5127	4.6	79	67.7	5521	4.9	79	68.1	+0.4	Negligible	Minor (not significant)
A52 (Wrangle)	6788	5.0	88	69.9	7205	5.2	88	70.2	+0.3	Negligible	Minor (not significant)
A52 (Butterwick)	9101	6.8	64	69.3	9518	6.9	64	69.6	+0.3	Negligible	Minor (not significant)
A52 Wainfleet Road (Haltoft End)	10196	4.9	65	69.5	10771	6.5	65	70.1	+0.6	Negligible	Minor (not significant)

Link	Without Scheme				With Scheme and Cumulative Scheme Traffic				Change in BNL, dB	Impact Magnitude	Level of Effect and Significance
	AAWT	% HGV	Average Speed km/h	BNL dB	AAWT	% HGV	Average Speed km/h	BNL dB			
A52 Wainfleet Road (Haltoft End)	10196	4.9	65	69.5	10772	6.5	65	70.1	+0.6	Negligible	Minor (not significant)
A16 (south of Boston)	23194	4.2	50	71.5	23634	4.6	50	71.7	+0.2	Negligible	Minor (not significant)
A16 (south of Boston)	23194	4.2	50	71.5	23538	5.1	50	72.1	+0.6	Negligible	Minor (not significant)
A16 (south of A17)	16853	10.2	64	72.7	17521	11.4	64	73.0	+0.3	Negligible	Minor (not significant)
A1121 (between Boston and A17)	9013	7.2	64	69.4	9203	7.6	64	69.6	+0.2	Negligible	Minor (not significant)
A16 (north of A1028/A1104)	9942	7.3	96	72.6	10496	9.7	96	73.2	+0.6	Negligible	Minor (not significant)
A16 (Boston)	41268	6.0	64	75.7	42009	6.4	64	75.9	+0.2	Negligible	Minor (not significant)
A52 (Boston)	19445	3.8	64	71.9	20042	4.3	64	72.2	+0.3	Negligible	Minor (not significant)

468. It can be seen from Table 26.79 that the magnitude of impact would be *negligible* or *low* for *medium* sensitivity receptors and the level of effect at the nearest NSRs from noise levels generated by cumulative traffic from the Project construction and cumulative MDS would be temporary *'minor adverse'*, which is not significant in terms of the EIA Regulations.

469. This cumulative magnitude of impact and level of effect are the same as from solely the Project construction traffic; therefore, the cumulative implications are no greater than those from only the Project.

26.8.2 Naylor Farm

470. The proposed Naylor Farm development is located to the south of the OnSS, the proposed Order Limits is shown in the P & R Architects drawing '*Existing Location Plan'* (Ref: LP01). The drawing shows that the Naylor Farm Site is to be located directly to the west of one the receptors associated with the OnSS, namely NSR OnSS001, and approximately 540m to the southeast of another receptor associated with the OnSS, namely NSR OnSS003; consequently there is the potential for cumulative construction and operational impacts.

26.8.2.1 Construction Noise and Vibration.

Construction Noise

471. The proposed Naylor Farm development is located approximately 30m from OnSS001 whereas the OnSS is located approximately 800m from OnSS001. The construction noise assessment for the OnSS has shown that at OnSS001 there would, at worst be a temporary *'minor adverse'* level of effect as shown in Table 26.56.

472. As Naylor Farm is much closer to OnSS001 than the OnSS, the identified impacts from the Naylor Farm development would be significantly greater than those from the OnSS, therefore it is considered unlikely that there would be a cumulative construction noise impact from the OnSS and the Naylor Farm development at OnSS001.

473. The Naylor Farm development is also located approximately 150m to the southeast of another residential receptor (not considered in the OnSS assessment). Any construction noise from the Naylor Farm development would therefore have to be mitigated so no adverse impacts would occur at this location.

474. Mitigation of Naylor Farm construction noise to this Receptor will ensure that Naylor Farm construction noise will not impact on OnSS003, which is located approximately a further 390m away from the Naylor Farm development. Therefore, it is considered unlikely that there would be a cumulative construction noise impact from the OnSS and the Naylor Farm development at OnSS003.

Construction Vibration

475. As outlined in paragraphs 471 and 473 the Naylor Farm development is located significantly closer to the relevant receptors than the OnSS. Therefore, any vibration impact from the OnSS is likely to be significantly lower than any vibration impact from the Naylor Farm development. The cumulative impact is unlikely to be elevated by the construction of the OnSS.

26.8.3 Operational Noise

476. As outlined in paragraphs 471 and 473 the Naylor Farm development is located significantly closer to the relevant receptors than the OnSS, any noise from the Naylor Farm development would have to be mitigated so there are no adverse impacts at these receptors.

477. The mitigated operational noise assessment for the OnSS has determined that at all the NSRs there would be, at worst, a permanent *'minor adverse'* level of effect which is not considered significant in terms of the EIA Regulations. It also should be noted that the mitigated specific noise levels from the OnSS at the NSRs are considered to be low in conjunction with BS4142:2014+A1:2019 (22 to 27dB(A)).

478. Consequently, it is considered that noise from either development would not change the level of impact and effect identified in each respective assessment if assessed cumulatively.

26.8.4 NGSS

479. The National Grid Electrical System Operator (NGESO) has confirmed that the grid connection point for ODOW will be into a new substation in the vicinity of Weston Marsh. This will be developed and consented by National Grid Electricity Transmission (NGET).

480. The study area for the NGSS is shown in Volume 2, Figure 26.10 (document reference 6.2.26.10).

481. A cumulative assessment of the NGSS, which could potentially occur concurrently with the Project has been undertaken.

482. It has been confirmed that the location of the NGSS would be within the ODOW Weston Marsh South (WMS) search zone from the PEIR (June 2023) which will be referred to as 'the indicative connection area.'

26.8.4.1 Development of NGSS - Construction Noise and Vibration

NGSS and OnSS

483. As stated above the location of the indicative connection area for the NGSS mirrors that of the WMS search zone which was included within the PEIR. As no specific details of the construction methods and associated plant for the NGSS is available at this stage the construction noise and vibration assessments for the NGSS have been based on the WMS OnSS inputs and associated conclusions from the PEIR.

484. The ODOW OnSS construction footprint area and the NGSS indicative connection area are at least 2.5km apart from each other; at these distances it has been determined that there are no human or ecological receptors where the cumulative level of effect would be greater than from solely the Project even if the two OnSSs are being constructed concurrently.

485. In view of the above the cumulative construction noise and vibration from the development of the NGSS and the OnSS has not been considered any further within this Chapter.

NGSS and Onshore ECC (ECC 14 - Surfleet Marsh OnSS/Marsh Drove to the Connection Area, 400kV Cable Corridor)

486. Based on the results of the PEIR the predicted noise level from NGSS construction operations at the nearest NSR to the onshore ECC was 57dB(A) at WMS_OnSS002 (Weston Barn House, Marsh Road, National Grid ref. 529882, 329052) which is above the threshold limit for weekend construction works of 55dB(A); however it must be noted that this assumed that the construction works were being undertaken at the extents the Order Limit as no WMS OnSS footprint was available.

487. In order to determine whether there would be any additional impact on this receptor associated with the concurrent ECC construction works, an area source, with properties as detailed in the first bullet of Paragraph 218, has been positioned at the closest approach to WMS_OnSS002.

488. The predicted worst-case sound level from the ECC construction and the predicted sound level from NGSS construction for the day-time and weekend (between 13:00 and 19:00 on a Saturday) periods are shown in Table 26.80 below; the cumulative level has been calculated by logarithmically adding the predicted noise levels from the ECC works to the NGSS works. The cumulative level has then been used as the basis of the assessment.

Table 26.80 Cumulative assessment of ECC and NGSS construction noise – Day-time and weekend assessment

NSR ID	Period	Predicted Noise Level, dB $L_{Aeq,T}$			Threshold Limit	Diff.	Impact Magnitude	Level of Effect
		ECC Works	NGSS Works	Cumulative Level				
WMS_ OnSS002	Day-time	32	57	57	65	-8	Negligible	Minor
	Weekend				55	+2	Low	Minor

489. It can be seen from Table that that the cumulative noise level from cumulative effects from the ECC and NGSS construction noise would give rise to a temporary *'minor adverse'* worst-case level of effect at NSR WMS_OnSS002 which is not significant in terms of the EIA Regulations.

26.8.4.2 Development of NGSS – Construction Traffic Noise

490. It has been assumed that the number of construction traffic movements associated with the NGSS would mirror those associated with the OnSS.

491. Though no formal traffic assessment has been undertaken for the NGSS, with reference to the Chapter 27 (document reference 6.1.27), it has been determined that the majority of the traffic would be routed on the A16 and A17, on the following links:

- A17 – South of River Welland;
- A17 – North of River Welland;
- A17 – between A16 and A1121;
- A17 – West of A1221; and
- A16 – South of A17.

492. With reference to Chapter 27 (document reference 6.1.27) and Table 26.66 it can be seen that these are major links with relatively high volumes of traffic even without the Project (referenced as 'without scheme' in the table), Table 26.66 also indicates that on these links the predicted level of effect including traffic associated with the Project is *'minor'* with only very small increases in the BNL levels.

493. In view of the above it is considered that the additional construction traffic associated with the NGSS would again only cause relatively small increases in the BNLs and would not lead to significant impacts or level of effects. i.e. for a *'medium'* magnitude of impact (change in the BNL level of 3.0dB or more) to be experienced on the A17 – south of River Welland link the HGV % would have to increase from 8.6% to 30%, or in numerical terms from approximately 1818 HGVs in the 18-hour traffic flow to approximately 6374 HGV over the same period; which is considered to be significantly higher than the actual amount of additional HGVs that would be associated with the construction of the NGSS on this link.

26.8.4.3 Development of NGSS – Operational Noise

494. As previously stated in Paragraph 482, the indicative connection area for the NGSS mirrors that of the WMS search zone which was included within the PEIR; as no specific details of the operational plant for the NGSS is available at this stage the operational noise assessment for the NGSS has been based on the WMS OnSS inputs and associated conclusions from the PEIR.

495. The ODOW OnSS footprint area and the NGSS indicative connection area are at least 2.5km apart from each other; at these distances it has been determined that there are no human or ecological receptors where the cumulative level of effect would be greater than from solely the Project even if the two OnSSs are in operation concurrently.

496. In view of the above the cumulative operational noise from the development of the NGSS has not been considered any further within this Chapter.

26.9 Transboundary Effects

497. There are no national transboundary implications with regards to local noise and vibration; transboundary effects have been scoped out of the assessment from the consultation and The Planning Inspectorate comments shown in Table 26.5.

26.10 Conclusions

498. This assessment has considered the potential noise and vibration effects arising from onshore activities associated with the Project. Consideration has been given to potential worst-case effects arising from onshore construction, operational and decommissioning activities based upon available information. Worst-case parameters have been adopted to provide a robust assessment.

499. The approach undertaken was based upon The Planning Inspectorate's Scoping Opinion which was subsequently agreed with LCC at the ETG meeting on 13th October 2022. The assessment has considered feedback received in response to the consultation with stakeholders that was undertaken in September 2022, the Section 42 responses following the PEIR review

and the Phase 2 consultation (the Autumn consultation).

500. A summary of the impacts, mitigation measures and the resultant residual effects are described in Table 26.81.

501. It should be noted that the mitigation measures described in Table 26.81 are in addition to the embedded mitigation measures described in Table 26.33.

Table 26.81 Summary of effects

Description of effect	Effect	Additional mitigation measures	Residual impact
Construction			
Noise levels generated from landfall construction including trenchless drilling	Temporary ***Minor Adverse*** **(not significant)**	Non specified however further reference should be made to the detailed design measures relating to noise mitigation, as outlined in Table 26.34 to further reduce the potential for noise impacts. Implementation of final NVMP.	Temporary ***Minor Adverse*** **(not significant)**
Noise levels generated from onshore ECC construction	Temporary ***Minor Adverse*** **(not significant)** to ***Major Adverse*** **(significant)**	Relevant detailed design measures relating to noise mitigation, as outlined in Table 26.34. Implementation of final NVMP.	Temporary ***Minor Adverse*** **(not significant)**
Noise levels generated from onshore ECC trenchless drilling (minor drills).	Temporary ***Minor Adverse*** **(not significant)** to ***Major Adverse*** **(significant)**	Relevant detailed design measures relating to noise mitigation, as outlined in Table 26.34. Implementation of final NVMP.	Temporary ***Minor Adverse*** **(not significant)**
Noise levels generated from onshore ECC trenchless drilling (major drills).	Temporary ***Minor Adverse*** **(not significant)** to ***Major Adverse*** **(significant)**	Relevant detailed design measures relating to noise mitigation, as outlined in Table 26.34. Implementation of final NVMP.	Temporary ***Minor Adverse*** **(not significant)**
Noise levels generated by OnSS construction	Temporary ***Minor Adverse*** **(not significant)**	Non specified however further reference should be made to the detailed design measures relating to noise mitigation, as outlined in Table 26.34 to further reduce the potential for noise impacts. Implementation of final NVMP.	Temporary ***Minor Adverse*** **(not significant)**
Vibration levels generated by trenchless drilling operations (Minor Drills)	Temporary ***Minor Adverse*** **(not significant)** to ***Moderate Adverse*** **(significant)**	Notification of trenchless drilling works given to any receptors within 55m of the trenchless drilling operations during the day-time and weekend periods. Implementation of final NVMP.	Temporary ***Minor Adverse*** **(not significant)**
Vibration levels generated by	Day-time - Temporary ***Minor Adverse*** **(not**	Notification of trenchless drilling works given to any receptors within	Temporary ***Minor Adverse***

Description of effect	Effect	Additional mitigation measures	Residual impact
trenchless drilling operations (Major Drills)	**significant)** to ***Moderate Adverse* (significant)** Night-time - Temporary ***Minor Adverse* (not significant)** to ***Major Adverse* (significant)**	55m of the trenchless drilling operations during the day-time and weekend periods. Notification of trenchless drilling works given to any receptors within 140m of the trenchless drilling operations associated with major drills during the night-time period. Implementation of final NVMP.	**(not significant)**
Vibration levels generated by trenchless vibratory piling operations at Major Drills.	Temporary ***Minor Adverse* (not significant)** to ***Moderate Adverse* (significant)**	Notification of piling works given to any receptors within 75m of the trenchless drilling operations. Implementation of final NVMP.	Temporary ***Minor Adverse* (not significant)**
Vibration levels generated by OnSS piling operations.	Temporary ***Minor Adverse* (not significant)**	Recommended maximum hammer energies and implementation of final NVMP.	Temporary ***Minor Adverse* (not significant)**
Noise levels generated by construction traffic on the local road network.	Temporary ***Minor Adverse* (not significant)** to ***Major Adverse* (significant).**	Relevant management actions, use of temporary barriers and implementation of final NVMP.	Temporary ***Minor Adverse* (not significant).**
Operation and Maintenance			
Operational noise levels generated by the OnSS on residential receptors.	Permanent ***Minor Adverse* (not significant)** to ***Moderate Adverse* (significant).**	Reduction in operational noise levels through the use of acoustic enclosures, silencers and covers.	Permanent ***Minor Adverse* (not significant).**
Operational noise levels generated by the OnSS on ecological receptors.	Permanent ***Minor Adverse* (not significant).**	Reduction in operational noise levels through the use of acoustic enclosures, silencers and covers.	Permanent ***Minor Adverse* (not significant).**
Decommissioning			
Noise and vibration levels generated by decommissioning activities.	Not anticipated to exceed construction phase worst-case criteria. Potential impacts reduced as it is assumed that no night-time or piling decommissioning operations are required.		

Description of effect	Effect	Additional mitigation measures	Residual impact
Cumulative			
Noise levels generated by construction traffic on the local road network combined with construction traffic from the Boston Alternative Energy Facility and operational traffic from the Hogsthorpe and Fishtoft residential developments.	Temporary ***Minor Adverse*** **(not significant).**	None required.	Temporary ***Minor Adverse*** **(not significant).**
Construction noise and vibration levels generated by the Naylor Farm development.	Temporary ***Minor Adverse*** **(not significant)**	None required.	Temporary ***Minor Adverse*** **(not significant).**
Operational noise levels generated by the Naylor Farm development.	Temporary ***Minor Adverse*** **(not significant)**	None required.	Temporary ***Minor Adverse*** **(not significant).**
Noise levels generated by the construction of the NGSS and OnSS.	Temporary ***Minor Adverse*** **(not significant)**	None required.	Temporary ***Minor Adverse*** **(not significant).**
Noise levels generated by the construction of the NGSS and ECC.	Temporary ***Minor Adverse*** **(not significant)**	None required.	Temporary ***Minor Adverse*** **(not significant).**
Noise levels generated by the operation of the NGSS and OnSS.	Permanent ***Minor Adverse*** **(not significant)**	None required.	Permanent ***Minor Adverse*** **(not significant).**

502. It can be seen from Table 26.81 that, on the basis that the recommended mitigation

measures have been correctly implemented, there would be a *'minor adverse'* residual level of effect for all the potential construction and operational noise and vibration impacts considered with the proposed Project, which is not considered significant in terms of the EIA Regulations.

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