NORTH FALLS

Offshore Wind Farm

ENVIRONMENTAL STATEMENT

Chapter 26 Noise and Vibration

Document Reference:	3.1.28
Volume:	3.1
APFP Regulation:	5(2)(a)
Date:	July 2024
Revision:	0

NORTH FALLS
Offshore Wind Farm

Project	North Falls Offshore Wind Farm
Document Title	Environmental Statement Chapter 26 Noise and Vibration
Document Reference	3.1.28
APFP Regulation	5(2)(a)
Supplier	Royal HaskoningDHV
Supplier Document ID	PB9244-RHD-ES-ON-RP-ON-0210

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
0	July 2024	Submission	RHDHV	NFOW	NFOW

Contents

Tables

Figures (Volume 3.2)

Appendices (Volume 3.3)

Appendix 26.1 Baseline Noise Survey and Acoustic Terminology

Appendix 26.2 Road Traffic Noise Assessment

Appendix 26.3 Construction Noise and Vibrations Calculations

Appendix 26.4 Operational Noise Calculations

Glossary of Acronyms

AAWT	Annual Average Weekday Traffic
AIS	Air Insulated Switchgear
BESS	Battery Energy Storage Scheme
BNL	Basic Noise Level
BPM	Best Practicable Means
BRR	Bentley Road Receptor
BS	British Standard
BSI	British Standards Institution
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practice
CoPA	Control of Pollution Act 1974
CRR	Cable Route Receptor
CRTN	Construction of Road Traffic Noise
CTMP	Construction Traffic Management Plan
CTR	Construction Traffic Receptor
dB	Decibel
DCO	Development Consent Order
DEFRA	Department for the Environment and Rural Affairs
DENSZ	Department for Energy Security and Net Zero
DMRB	Design Manual for Roads and Bridges
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
HDD	Horizontal Directional Drill
HGV/s	Heavy Goods Vehicle/s
IEMA	Institute of Environmental Management and Assessment
IPC	Infrastructure Planning Commission
ISO	International Standards Organisation
km	Kilometre
LFR	Landfall Receptor
LOAEL	Lowest Observed Adverse Effect Level
MMO	Marine Management Organisation
NFOW	North Falls Offshore Wind Farm Limited
NNG	Night Noise Guideline
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework

NPPG	National Planning Practice Guidance
NPS	National Policy Statements
NPSE	Noise Policy Statement for England
NRW	Nature Resources Wales
NSIP	Nationally Significant Infrastructure Project
NVSR	Noise and Vibration Sensitive Receptor
OAE	Observed Adverse Effect
OCoCP	Outline Code of Construction Practice
OEM	Original equipment manufacturer
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
PPV	Peak Particle Velocity
PPW	Planning Policy Wales
PRoW	Public Rights of Way
SNCB	Statutory Nature Conservation Bodies
SOAEL	Significant Observed Adverse Effect Level
SSR	Substation Receptor
TANs	Technical Advice notes
TCC	Temporary Construction Compound
TDC	Tendring District Council
TRRL	Transport and Road Research Laboratory
UK	United Kingdom
VEOWL	Five Estuaries Offshore Wind Farm Limited
WHO	World Health Organisation

Glossary of Terminology

The Applicant	North Falls Offshore Wind Farm Limited (NFOW)
The Project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Bentley Road improvement works	Works involving the widening and improvement of the carriageway along Bentley Road, required to facilitate heavy goods vehicle and abnormal indivisible load access to the onshore cable route and the onshore substation.
Cable ducts	Housing for the onshore export cables, typically comprising plastic high-density polyethylene (HDPE) pipes buried underground. Each cable circuit will require up to seven individual ducts (i.e. one per cable).
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Horizontal directional drill (HDD)	Trenchless technique to bring the offshore export cables ashore at landfall. The technique will also be one of the trenchless techniques used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Jointing bays	Underground structures, constructed at regular intervals along the onshore cable route to connect the sections of cable together so that each cable is a continuous length, as well as facilitating the installation of the cables into the buried cable ducts.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Landfall compound	Compound at landfall within which horizontal directional drill (HDD) or other trenchless technique would take place.
National grid connection point	The grid connection location for the Project. National grid are proposing to construct new electrical infrastructure (a new substation) to allow the Project to connect to the grid, and this new infrastructure will be located at the national grid connection point.
National grid substation connection works	North Falls infrastructure required to connect the Project to the new substation at the National grid connection point.
Offshore cable corridor	The corridor of seabed from array areas to the landfall within which the offshore export cables will be located.
Onshore cable route	Onshore route within which the onshore export cables and associated infrastructure would be located.
Onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
Onshore project area	The boundary in which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and national grid substation extension), as considered within the ES.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the national grid.
Onshore substation construction compound	Area set aside to facilitate construction of the onshore substation. Will be located adjacent to the onshore substation and within the onshore substation works area.
Onshore substation works area	Area within which all temporary and permanent works associated within the onshore substation are located, including onshore substation, construction compound, access, landscaping, drainage and earthworks.
Trenchless crossing compound	Areas within the cable corridor which will house trenchless crossing (e.g. HDD) entry or exit points.

Temporary construction compound	Area set aside to facilitate construction of the onshore cable route. Will be located adjacent to the onshore cable route, with access to the highway where required.

26 Noise and Vibration

26.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the likely significant effects of the North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project') on noise and vibration. The chapter provides an overview of the existing environment for the proposed onshore project area, followed by an assessment of likely significant effects for the construction, operation, and decommissioning phases of the Project.
2. This chapter has been written by Royal HaskoningDHV, with the assessment undertaken with specific reference to the relevant legislation and guidance, of which the primary sources are the National Policy Statements (NPS). Details of these, and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effects Assessment (CEA), are presented in Section 26.4.
3. The assessment should be read in conjunction with following linked chapters (Volume 3.1):
    - ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25);
    - ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26);
    - ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27);
    - ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29);
    - ES Chapter 28 Human Health (Document Reference: 3.1.30);
    - ES Chapter 31 Socio-Economics (Document Reference: 3.1.33); and
    - ES Chapter 32 Tourism and Recreation (Document Reference: 3.1.34).
4. Additional information to support the noise and vibration assessment (Volume 3.3):
    - ES Appendix 26.1 Baseline Noise Survey and Acoustic Terminology (Document Reference: 3.3.60);
    - ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61);
    - ES Appendix 26.3 Construction Noise and Vibrations Calculations (Document Reference: 3.3.62); and
    - ES Appendix 26.4 Operational Noise Calculations (Document Reference: 3.3.63).

26.2 Consultation

5. Consultation with regard to noise and vibration has been undertaken in line with the general process described in ES Chapter 6 EIA Methodology (Document Reference: 3.1.8). The key elements to date have included scoping and the

ongoing technical consultation via the Traffic and Transport, Air Quality, Climate Change and Noise and Vibration Expert Topic Group (ETG). The feedback received has been considered in preparing the ES as summarised in Table 26.1.

6. This chapter has been updated following the consultation on the Preliminary Environmental Information Report (PEIR) in order to produce the final assessment submitted within the Development Consent Order (DCO) application. Full details of the consultation process will also be presented in the Consultation Report as part of the DCO application.

Table 26.1 Consultation responses

Consultee	Date / Document	Comment	Response / where addressed in the ES
Tendring District Council	ETG Meeting 1, July 2021	Tendring District Council (TDC) were presented with the proposed data collection and assessment methodologies. No comments were provided.	N/A
Essex County Council	August 2021, North Falls Scoping Opinion (p. 137) (Document Reference: 7.26).	In accordance with Regulation 14 of the EIA Regulations, the ES should provide a statement about the relevant expertise or qualifications of the competent experts involved in its preparation.	This has been provided in ES Chapter 1 Introduction (Document Reference: 3.1.3).
	August 2021, North Falls Scoping Opinion (p. 111) (Document Reference: 7.26).	WIIA COMPONENTS - Potential sensitivity of proposed development as a result of the operation of existing or allocated safeguarded infrastructure • Distance of the development from the safeguarded site at its closest point, to include the safeguarded facility and any access routes. • The presence of any existing buildings or other features which naturally screen the proposed development from the safeguarded facility • Evidence addressing the ability of vehicle traffic to access, operate within and vacate the safeguarded development in line with extant planning permission. • Impacts on the proposed development in relation to: o Noise; o Dust; o Odour; o Traffic; o Visual; and o Light.	No elements of the Project are sensitive to noise impacts; hence there is no potential to introduce noise related restrictions on existing or allocated mineral sites and infrastructure.
Historic England	August 2021, North Falls Scoping Opinion (p. 210) (Document Reference: 7.26).	The setting of heritage assets is not just restricted to visual impacts and other factors should be considered, in particular noise, vibration, light, odour, traffic assessments, during construction and operation. Where relevant, the cultural heritage chapter should also be cross-referenced to other relevant chapters, and we advise that all supporting technical heritage information is included as appendices.	Likely significant effects of the Project on the setting of onshore heritage assets, which includes noise impacts, are assessed in ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27).

Consultee	Date / Document	Comment	Response / where addressed in the ES
Planning Inspectorate	August 2021, North Falls Scoping Opinion (paragraph 3.3.2) (Document Reference: 7.26).	Paragraph 86 of the Scoping Report (detailing the overarching assessment methodology for the EIA) states that study areas defined for each receptor are based on the Zone of Influence (ZoI) and relevant characteristics of the receptor (e.g. mobility / range). Inspectorate notes that for many of the aspect chapters included, study areas and ZoIs have not been stated. Where this detail has been provided, it is not clear how these study areas relate to the extent of the impacts and likely significant effects associated with the Proposed Development, how they have been used to determine a ZoI, and what receptors have been identified within the ZoI. The ES should provide a robust justification as to how study areas have been defined and why the defined study areas are appropriate for assessing potential impacts.	Explanation for basis for buffers used to scope in sites is provided in Section 26.3.1.
	August 2021, North Falls Scoping Opinion (paragraph 3.3.3) (Document Reference: 7.26).	Where aspect chapters and assessments of the ES are separated into onshore and offshore assessments, it is unclear to what extent such assessments consider the potential for impacts to overlap and interrelate. Furthermore, there are instances whereby cross- references are made to impacts that have not been addressed in the appropriate aspect(s) of the Scoping Report. For example, the Ground Conditions and Contamination aspect chapter highlights the potential for direct impacts to surface water receptors and associated ecological habitats from contamination, however, this impact is not addressed within Onshore Ecology. There are similar examples of other cross-cutting matters (e.g. Unexploded Ordnance (UXO) clearance, underwater noise, spread of invasive non-native species (INNS), etc.) that have not been appropriately cross- referenced. The ES should assess impacts that overlap or interrelate between offshore and onshore receptors where there is a likely significant effect and consider the potential for such impacts to act cumulatively. Where appropriate, study areas should be refined based on the results of updated survey data.	Interactions (where effects identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic effects with different disciplines as a result of that interaction) are discussed in Section 26.10. Interrelationships (where effects identified and assessed in this chapter have the potential to interrelate with each other) are addressed in Section 26.11.
	August 2021, North Falls Scoping Opinion (paragraph	Figures presented in the ES and used to support the assessment should be legible and show all relevant information, including receptors considered in the	The receptors used in the noise and vibration assessment are identified in ES Figures 26.1 – 26.4 (Document Reference: 3.2.22).

Consultee	Date / Document	Comment	Response / where addressed in the ES
	3.3.6) (Document Reference: 7.26).	assessment. The ES should include figures illustrating designated and non-designated ecological sites, including SSSIs and Impact Risk Zones where relevant, ancient woodland, and receptors used in the assessment of air quality, noise and vibration.	
	August 2021, North Falls Scoping Opinion (paragraph 3.3.9) (Document Reference: 7.26).	Some aspect sections of the Scoping Report have identified specific receptors, whereas others identify broad categories of receptors only. Specific receptors should be identified within the ES, alongside categorisation of their sensitivity and value. Section 1.8.2.1 of the Scoping Report explains the generic approach to defining receptor sensitivity in order to assess the potential impacts upon each receptor. The inspectorate expects a transparent and reasoned approach to be applied to assigning receptor sensitivity to be defined and applied across the aspect chapters.	The classification of receptor sensitivity to noise and vibration impacts is provided in Section 26.4.3.2.
	August 2021, North Falls Scoping Opinion (paragraph 3.3.14) (Document Reference: 7.26).	The ES should include details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Section 26.4.6 of this chapter details assumptions and limitations made during the assessment.
	August 2021, North Falls Scoping Opinion (paragraph 3.3.17) (Document Reference: 7.26).	Section 1.7.2 and Table 1.4 of the Scoping Report explains that an Evidence Plan Process (EPP) with specialist stakeholders commenced in 2021 to agree the 'detailed methodologies for data collection and undertaking the impact assessments' in respect of certain aspects to be scoped into the ES. This approach to agreeing the finer details of the assessment is welcomed. Other aspects, including fisheries, aviation and radar, and shipping and navigation, would fall outside of the EPP but the Applicant has committed to consultation at an early stage of the assessment process. The Applicant should ensure that any agreements reached during EPP, or other consultation process are evidenced within the ES.	Noted – responses to points made during the EPP are detailed in this section.
	August 2021, North Falls Scoping Opinion (paragraph	Section 1.9.3 of the Scoping Report sets out the planning policy and legislation context for the Proposed Development. It would be beneficial for the aspect chapters of the ES to also include reference to aspect specific	See Section 26.4.1 for details of planning and legislative context relevant to this chapter.

Consultee	Date / Document	Comment	Response / where addressed in the ES
	3.3.18) (Document Reference: 7.26).	planning policy and legislation, where this has been used to inform the methodology used for assessment.	
	August 2021, North Falls Scoping Opinion (paragraph 3.3.23) (Document Reference: 7.26).	Any mitigation relied upon for the purposes of the assessment should be explained in detail within the ES. The likely efficacy of the mitigation proposed should be explained with reference to residual effects. The ES should also address how any mitigation proposed is secured, with reference to specific DCO requirements or other legally binding agreements.	See Section 26.3.3 for embedded mitigation and Section 26.6 for additional mitigation in relation to each receptor. See also Summary Table 26.43.
	August 2021, North Falls Scoping Opinion (paragraph 5.8.1) (Document Reference: 7.26).	The Scoping Report states that the onshore substation will be designed to achieve negligible levels of ground borne vibration, including through use of isolation pads / mounts in accordance with industry standards. The Inspectorate acknowledges that it is unlikely that there would be significant effects arising from vibration impacts, however, at this stage the location of the onshore substation has not been confirmed, and it is therefore not possible to confirm the distance to any potentially affected human and ecological receptors. The Scoping Report also notes potential for emergency generators at the onshore substation, and it is unclear whether this would result in vibration impact. This matter should therefore be scoped into the ES where significant effects are likely.	The closest noise and vibration sensitive receptors (NVSRs) to the onshore substation within the scope of this assessment are identified in Section 26.5.1. The minimum distance from any NVSR to the onshore substation zone is over 200m. As discussed in Section 26.4.3.7, any operational vibration emissions from the onshore substation plant will be significantly attenuated by propagation over this distance, such that perceptible levels of vibration will not occur at the identified NVSRs. Noise and vibration impacts on terrestrial protected species are considered within ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25) and ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26).
	August 2021, North Falls Scoping Opinion (paragraph 5.8.2) (Document Reference: 7.26).	The Inspectorate notes that vibration affecting human receptors is scoped into the construction and decommissioning phases of the Proposed Development, but no reference is made to vibration affecting ecological receptors. As the onshore components of the Proposed Development are still subject to areas of search, and there is potential for activity that would generate vibration impacts to be located in proximity to identified ecological receptors, the Inspectorate does not consider that sufficient information is available to conclude that there would be no likely significant effects and this matter should not be scoped out of the ES.	Noise and vibration impacts on terrestrial protected species are considered within ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25) and ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26).
	August 2021, North Falls Scoping	On the basis that road traffic associated with operational maintenance of the underground cables and onshore	Details of operational phase road traffic movements are provided in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29), which

Consultee	Date / Document	Comment	Response / where addressed in the ES
	Opinion (paragraph 5.8.3) (Document Reference: 7.26).	substation would be minimal as described in paragraph 672 of the Scoping Report and would therefore not result in a large increase from the baseline conditions as described in section 3.9.1.1 of the Scoping Report, the Inspectorate agrees that significant effects in respect of road traffic noise are unlikely to occur. However, the ES should clarify the anticipated number and routeing of road vehicle movements during the operational phase, including those associated with operational maintenance of offshore components.	confirms that significant operational phase traffic and transport effects are not anticipated. Hence, significant road traffic noise effects during the operational phase are also not anticipated and therefore scoped out.
	August 2021, North Falls Scoping Opinion (paragraph 5.8.4) (Document Reference: 7.26).	On the basis that the only components of the Proposed Development located in nearshore locations would be buried cable at the landfall site, which would not result in any operational noise, the Inspectorate agrees that this matter would not give rise to likely significant effects and can therefore be scoped out of the ES.	Agreed.
	August 2021, North Falls Scoping Opinion (paragraph 5.8.5) (Document Reference: 7.26).	Table 3.22 identifies broad categories of receptors and their sensitivity value in respect of noise. The ES should also identify receptors and their sensitivity value for the purposes of the assessment of vibration impacts.	Receptor sensitivity to noise and vibration has been identified, as described in Section 26.4.3.2.
	August 2021, North Falls Scoping Opinion (paragraph 5.8.6) (Document Reference: 7.26).	The Scoping Report states that a baseline noise survey will be undertaken to establish baseline conditions once the onshore scoping area has been refined but does not explain how the baseline vibration conditions will be established. The ES should explain how the baseline vibration conditions have been established which may require completion of a baseline vibration survey or confirmation that the vibration baseline will be assumed as negligible or zero.	Baseline vibration levels are assumed to be negligible, as discussed in Section 26.5.2.
	August 2021, North Falls Scoping Opinion (paragraph 5.8.7) (Document Reference: 7.26).	The Inspectorate notes that there is reference to the results of geophysical surveys and grab sampling informing the methodologies required for installing offshore infrastructure and the assessment process for offshore airborne noise. This contradicts the information presented in section 2.1 of the Scoping Report, which states that the impact of offshore airborne noise to onshore receptors is scoped out of the ES on the basis that the distance of activity from receptors (approximately 22.5km) would result in no likely significant	At its closest point, the boundary of the array area is approximately 40km from shore. Due to this large separation distance, airborne noise impacts from works in the array area will be negligible at the identified onshore NVSRs and are therefore scoped out of this assessment. There is the potential for noise impacts on the identified NVSRs from nearshore works; these are discussed in Section 26.6.1.1. As discussed in Section 26.3.2, decommissioning noise impacts are anticipated to be no worse than those during construction of the Project.

Consultee	Date / Document	Comment	Response / where addressed in the ES
		effects. The approach should be clarified in the ES, and where there is potential for likely significant effects to onshore receptors from offshore airborne noise this should be assessed in the ES. The Inspectorate notes that the impact of nearshore airborne noise to human and ecological receptors during construction and decommissioning is scoped into the ES.	Hence, the construction phase impacts are used as a proxy for those predicted during decommissioning.
	August 2021, North Falls Scoping Opinion (paragraph 5.8.8) (Document Reference: 7.26).	Information should be provided in the ES on the types of vehicles and plant to be used during the construction phase. Where uncertainty exists over the likely vehicles and equipment to be used the assessment should adopt a 'worst case' for receptors, i.e. that within the application boundary the vehicles and plant are at the closest possible point to a receptor.	Information on construction vehicles and plant is provided in ES Appendix 26.3 (Document Reference: 3.3.62). The vehicles and plant have been assumed to be at a worst case location for a receptor; further details on the calculation procedures are provided in ES Appendix 26.3 (Document Reference: 3.3.62).
Essex County Council	ETG Meeting 2, May 2022	ECC were presented with the identified noise sensitive receptors and proposed baseline noise measurement locations around the onshore substation zone and landfall. No baseline monitoring proposed along the onshore cable corridor(s). ECC requested an additional monitoring point in Great Holland.	Final monitoring locations are shown in Figures 26.1 and 26.2 (Document Reference: 3.2.22) . Monitoring locations have changed since the consultation due to access restrictions, as discussed in ES Appendix 26.1 Baseline Noise Survey and Acoustic Terminology (Document Reference: 3.3.60). Agreed that construction road traffic noise impact assessment would be based on calculated noise level changes and would not require measurement of baseline noise levels.
Tendring District Council	ETG Meeting 2, May 2022	TDC were invited to ETG Meeting 2 but did not attend. TDC were subsequently presented with the proposed alterations to the baseline noise measurement locations. No response was received.	N/A
Little Bromley Parish Council	July 2023, Consultation Response Letter	An onshore development would … generate significant construction and ongoing noise, and affect residents and community amenities. There is concern that the development will negatively affect sale potential and sale value of properties in the area.	Construction and operational noise impacts have been assessed in accordance with industry good practice and mitigation measures identified, as required, such that significant adverse effects are not anticipated at human receptors, which includes the dwellings in the Little Bromley parish.
		Operational Noise - LBPC note that you have not provided any estimates for actual noise from the substation as equipment is not yet selected. However you suggest an upper limit of 35dBA (as measured at the nearest receptor). LBPC believes that this is too high. LBPC believe that it is essential that residents have a clear understanding of noise	Section 26.4.3.6 discusses the proposed approach to assessment of operational noise impacts and provides evidence based on accepted standards and guidance that, where *background sound levels* are low, the Lowest Observed Adverse Effect Level should be a rating level of 35dB $L_{Ar,Tr}$ for the substation sound. This approach has been agreed with Tendring District Council through the ETG process. As discussed in Section

Consultee	Date / Document	Comment	Response / where addressed in the ES
		levels and mitigation measures in place. As can be seen from background noise measurements, Little Bromley is a very quiet area, and LBPC believe that any noise increase with consequent reduction in quality of life for residents is unacceptable.	26.8.3.1.3, cumulative substation noise levels will be controlled to not exceed 35dB $L_{Ar,Tr}$ at any residential property by DCO Requirement and this will avoid a reduction in quality of life for residents.
		Construction Noise - The construction period of 12-hours per day, 6 days a week for many years will be hugely disruptive to the village and surrounding area. LBPC believes that construction noise will be intrusive to the village and surrounding areas. You have identified a number of NVSR's in the Parish who will be affected even after designed mitigation. LBPC also believe that different noise types can be particularly penetrating - for example a back-up alarm or vehicle motion alarm can be clearly heard over a long distance. It would be helpful to understand what additional mitigation measures could be included to reduce construction noise.	Embedded mitigation measures to reduce construction noise impacts are discussed in Section 26.3.3, with additional mitigation measures discussed as required relevant to each construction phase impact assessed in Section 26.6.1.
Zoe Fairley (Ardleigh & Little Bromley Councillor)	July 2023, Statutory Consultation Feedback.	Noise both during and post construction will adversely affect residents, especially those closer to development areas for both the route and sub station. What will the noise levels be both during and post construction? What will the cumulative impact for all developments be for noise both during and post construction? In such a quiet area, noise levels need to be effectively managed and non-intrusive so as to not adversely affect residents' well being.	Construction noise and traffic noise impacts have been assessed, as reported in Section 26.6.1. Operational noise impacts have been assessed, as reported in Section 26.6.2. Cumulative construction and operational noise impacts have also been assessed, as reported in Section 26.8. Residual effects on residents are considered to be not significant.
Tendring District Council	July 2023, Consultation Response Letter	The Council, as previously stated, is extremely concerned about the health risks posed to residents within proximity to electro-magnetic fields - as demonstrated through considerable research and peer-reviewed scientific data in relation to childhood cancer. There will be considerable noise emanating from substations - again raising concern about proximity to people's homes. The sterilisation of agricultural land along the route of the underground power connections seems to have been given little weight in consideration of the preferred options for both Norwich to Tilbury and, consequently, this project – which could be avoided through achieving an offshore solution.	Operational noise impacts from the proposed onshore substation have been assessed, as reported in Section 26.6.2. The assessment of cumulative effects of operational noise from all three substations is reported in Section 26.8.3.1.3 and residual effects are not significant.

Consultee	Date / Document	Comment	Response / where addressed in the ES
Essex County Council	July 2023, Consultation Response Letter Appendix One	ECC consider it necessary that the NF project includes the submission of a detailed Construction Management Plan (CMP) to mitigate and compensate against any as proposed construction impact on health and wellbeing. The CMP should have regard to BS 5228:2009 Code of Practice of Noise and Vibration Control on Construction and Open Sites.	An Outline Code of Construction Practice (OCoCP) (Document Reference: 7.13) have been submitted with the DCO application. As discussed in Section 26.3.3, measures to mitigate construction noise impacts will be detailed in the final Code of Construction Practice (CoCP), as secured by a DCO Requirement.
	July 2023, Consultation Response Letter Appendix One	It is necessary that an appropriate noise assessment is undertaken and this will need to address the construction phases of the proposal and the operational noise. Methodology of the aforementioned assessment shall be agreed once specific details of the proposal are known. A lighting assessment will also be necessary.	Construction noise and traffic noise impacts have been assessed, as reported in Section 26.6.1. Operational noise impacts have been assessed, as reported in Section 26.6.2. Cumulative impacts have also been assessed, as reported in Section 26.8. Residual effects on residents are considered to be not significant.
Ardleigh Parish Council	Consultation Response Letter - additional concerns	Operational and Construction Noise and Light Pollution.	Construction noise and traffic noise impacts have been assessed, as reported in Section 26.6.1. Operational noise impacts have been assessed, as reported in Section 26.6.2. Cumulative impacts have also been assessed, as reported in Section 26.8. Residual noise and vibration effects on residents are considered to be not significant.
Tendring District Council	ETG Meeting 3, October 2023	TDC were presented with responses to the Section 42 consultation comments, clarifications to the proposed assessment scope and updated noise and vibration study areas and impact assessment methodologies. It also included the proposed approaches for managing cumulative effects via a proposed cumulative limit of 35dB $L_{Ar,Tr}$ to substation operational sound. TDC supported the adoption by NFOW of 35dB $L_{Ar,Tr}$ cumulative limit and commended the project using the lower limit in comparison to the standard 40dB L_{Aeq} limit used by other projects. Discussions were also held regarding the proposed post-consent work by NFOW, VEOW and NGET to develop a joint noise management and complaints procedure.	N/A

26.3 Scope

26.3.1 Study area

7. The study area for noise and vibration has been defined on the basis of the nearest NVSRs to the onshore project area including the landfall and nearshore works, onshore cable route, Bentley Road improvement works, national grid substation connection and onshore substation works area. Details of maximum distances to NVSRs from the Project, which effectively define the study area for each identified impact, are provided in the relevant assessment methodology (Section 26.4.3).

8. The nearest NVSRs to the onshore substation works area, landfall, onshore cable route and those with the potential to be affected by road traffic noise are shown on Figures 26.1, 26.2, 26.3 and 26.4 (Document Reference: 3.2.22) respectively. The noise and vibration study area also includes road traffic links with the potential to be affected by the Project during the construction phase, as defined in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29).

26.3.2 Realistic worst case scenario

9. The final design of North Falls will be confirmed through detailed engineering design studies that will be undertaken post-consent. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst case scenarios have been defined in terms of the likely significant effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in the Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst case scenario for each individual impact, so that it can be safely assumed that all other scenarios within the design envelope will have less impact. Further details are provided in ES Chapter 6 EIA Methodology (Document Reference: 3.1.8).

10. The realistic worst case scenarios for the likely significant effects scoped into the EIA for the noise and vibration assessment are summarised in Table 26.2. These are based on North Falls parameters described in ES Chapter 5 Project Description (Document Reference: 3.1.7), which provides further details regarding specific activities and their duration.

11. The main grid connection options considered in the ES are outlined below:

    - Option 1: Onshore electrical connection at a national grid connection point within the Tendring peninsula of Essex, with a project alone onshore cable route and onshore substation infrastructure;
    - Option 2: Onshore electrical connection at a national grid connection point within the Tendring peninsula of Essex, sharing an onshore cable route and onshore cable duct installation (but with separate onshore export cables) and co-locating separate project onshore substation infrastructure with Five Estuaries Offshore Wind Farm ('Five Estuaries'); or
    - Option 3: Offshore electrical connection, supplied by a third party.

Grid connection Option 2 is considered the realistic worst case scenario for the noise and vibration assessment because the build out requires four sets of cable ducts and associated joint bays to be installed, requiring the greatest intensity of noise-generating activity of the three options.

12. Under Option 2, the Project's onshore infrastructure comprises the following elements:

- Landfall, where the offshore export cables are brought ashore;
- Onshore cable route, which includes space for temporary works for the installation of cable ducts and buried onshore export cables, including areas for temporary construction compounds (TCCs), construction and operation and maintenance accesses (including Bentley Road improvement works);
- Onshore substation, proposed to be located west of Little Bromley;
- Onshore substation works area, which includes land required for temporary construction, export cables, means of access, drainage, landscaping and environmental mitigation for the onshore substation; and
- The search area for the East Anglia Connection Node (EACN) (the Project's national grid connection point), within which will be located the Project's national grid substation connection works.

13. Collectively, the footprint of the Project's onshore infrastructure is referred to herein as the 'onshore project area', and is shown on Figure 5.2 (Document Reference: 3.2.3). The Project's onshore infrastructure outlined above is proposed to be located entirely within the Tendring peninsula of Essex.

Table 26.2 Realistic worst case scenario of effects arising from development of North Falls alone - Option 2 (installation of ducts for a second project)

Element of the project infrastructure	Parameter	Notes
Construction works causing noise or vibration level increases at sensitive receptors	Standard working hours are 07:00 to 19:00 hours, Monday to Saturday, with no activities on Sundays or bank holidays.[1] Trenchless crossing works e.g. Horizontal Directional Drill (HDD) to include 24 hour / 7 days working where required <u>Landfall HDD (temporary works) physical parameters:</u> • Landfall construction compound dimensions (two circuits) = 75 x 150m; • Individual Transition Joint Bay (TJB) dimensions = 4 x 15m • No. of TJBs = two; • Maximum HDD depth = 20m;	The significance of a construction noise effect depends on the noise level and duration of exposure. Consideration should be given to both the spatial impacts (proximity to receptors) and temporal (duration) aspect of each of the activities. Construction works noise emissions from the works are primarily a function of the type and number of plant required, as detailed

[1] The OCoCP (Document Reference: 7.13) submitted with the DCO application commits that on Saturdays between 13:00 and 19:00 no high impact works (e.g. piling/breaking out) shall take place (e.g. piling/breaking out), and that no activity where noise is audible beyond the onshore project area will take place outside the stated working hours unless required by the following circumstances:

- Continuous periods of operation that are required as assessed in the environmental statement, such as concrete pouring, drilling, dewatering, cable jointing and pulling cables (including fibre optic cables) through ducts;
- Delivery to the onshore works of abnormal loads that may otherwise cause congestion on the local road network, where the relevant highway authority has been notified prior to such works 72 hours in advance;
- works required that may necessitate the temporary closure of roads;
- onshore works requiring trenchless installation techniques;
- onshore works at the landfall, including where works are being carried out in the marine environment and maybe tidally restricted;
- commissioning or outage works associated with the National Grid substation connection works;
- electrical installation, testing and commissioning;
- activity necessary in the instance of an emergency where there is a risk to persons, the environment, delivery of electricity or property, as otherwise agreed in writing with the local planning authority;
- security monitoring;
- fitting out works associated with the onshore substation; and
- daily start up or shut down.

Element of the project infrastructure	Parameter	Notes
	• Construction duration 13 months (of which HDD = six months); • Maximum indicative length of HDD = 1.1km; and • Drill exit location = subtidal exit below MHWS (up to 8m depth). <u>Onshore cable route construction physical parameters:</u> • Working width = 72m (open cut trenching), 90m (trenchless crossings), 130m (complex trenchless crossings); • Corridor length = Up to 24km; • Cable trench dimensions = 3.75 – 1.2 x 2m (tapered top to bottom); • No. of trenches = 4; • Maximum cable trench depth = 2m; • Minimum cable burial depth = 0.9m; • Haul road width = 6m wide road, 10m wide total including verges, drainage and passing places; • Jointing bays = Up to 192 (approximately every 500m) buried below ground; • Jointing bay construction footprint (per bay) = 15 x 4m; • TCC footprint = 150 x 150m (main) to 100 x 100m (satellite); • No. of compounds (est.) = 11; • Trenchless crossing compound dimensions = 75 x 150m; • Bentley Road improvement works = six – nine months; • Onshore cable route works = 18 – 27 months; • Major trenchless crossings (assumed to be HDD (each location)) = eight months (of which HDD = four months)); and • Minor trenchless crossings (assumed to be HDD) = two months. <u>Onshore substation (temporary works) physical parameters:</u> • Onshore substation platform maximum footprint = 280 x 210m; • Construction compound indicative dimensions = 150 x 250m; and • Construction duration = 21 – 27 months.	in ES Appendix 26.3 (Document Reference: 3.3.62). Overall duration of onshore cable route works includes establishing / reinstating TCCs and haul roads, cable installation (trench excavation, duct installation, cable jointing and pulling), trenchless crossing works (e.g. HDD) (includes compound establishment, HDD (which is a worst case of potential crossing methods), and reinstatement).
Onshore substation operation causing noise or vibration level increases at sensitive receptors	<u>Onshore substation physical parameters:</u> • Air Insulated Switchgear (AIS); and • Permanent substation footprint = 280 x 210m.	Refer to ES Appendix 25.4 Operational Noise Calculations (Document Reference: 3.3.63) for further details regarding sound power levels from various elements of onshore substation infrastructure.

Element of the project infrastructure	Parameter	Notes
Decommissioning works causing noise or vibration level increases at sensitive receptors	No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable route and onshore substation. It is also recognised that legislation and industry good practice change over time. However, it is likely that the onshore project equipment, including the cables, will be removed, reused, or recycled where practicable and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the purposes of a worst case scenario, the impacts will be no greater than those identified for the construction phase.	

26.3.3 Summary of mitigation embedded in the design

14. This section outlines the embedded mitigation relevant to the noise and vibration assessment, which has been incorporated into the design of North Falls (Table 26.3). Where other mitigation measures are proposed, these are detailed in the impact assessment (Section 26.6), where applicable.

Table 26.3 Embedded mitigation measures

Parameter	Mitigation measures embedded into North Falls design
Mitigation by site selection	The onshore project area and onshore substation works area have been defined following an extensive site selection process, which has accounted for environmental, engineering, planning and land requirements to identify an optimal project location. The site selection process is described in detail in ES Chapter 4 Site Selection and Assessment of Alternatives (Document Reference: 3.1.6). The site selection process has included consideration of the nearby residential properties and other NVSRs and sought to include sufficient distance to mitigate significant effects through design, particularly in relation to the location of the onshore substation works area. As part of ongoing project design refinement post-consent, where potentially significant noise effects have been identified, onshore project infrastructure will be moved wherever practicable to a location a sufficient distance from NVSRs to reduce likely significant effects to a non-significant level. The current design provides necessary flexibility for the detailed design process to select the final locations of the onshore cable route, jointing bays, TCCs and HDDs. Where feasible, this design process would prioritise potential noise effects, but in many situations, other constraints (such as ground conditions, access restrictions etc.) which are currently unknown factors, may need to take priority. The impacts have therefore been assessed based on the potential worst case locations for these elements of the Project. Attempts will be made to avoid significant effects in this way before use of other mitigation measures, such as noise mitigation screening, are considered.
Construction phase noise and vibration	Commitment to Best Practicable Means (BPM) implemented during the construction phase, detailed in the CoCP secured through a DCO Requirement. An OCoCP (Document Reference: 7.13) has been submitted with the DCO application. The OCoCP (Document Reference: 7.13) identifies the normal working hours for the Project as 07:00 and 19:00 hours Monday to Saturday, except in emergency or unplanned situations. The period between 13:00 and 19:00 on a Saturday is classified as an evening, see Table 26.7, and as such is subject to a more stringent construction noise limit than the daytime. The OCoCP (Document Reference: 7.13) specifies that construction work carried out during Saturday afternoon between the hours of 13:00 and 19:00 will be lighter duties that are much quieter than those carried out at other times, except for trenchless crossing works. The proposed trenching construction works include the creation of top soil bunds. These have been assumed to reduce noise emissions from the following construction activities by 5dB: • Trench excavation and backfill; • Jointing bay excavation and backfill; and • Trenchless crossing works.
Operational substation vibration	The onshore substation plant will be designed and installed to minimise vibration transmission from any plant items which might generate vibration. This control of vibration at source is necessary to maximise life of the plant and minimise maintenance. The measures that will be implemented will be determined during the detailed design of the onshore substation. As an example, placing vibration isolation mounts into concrete pads would ensure that groundborne vibration is not perceptible beyond the immediate area of the onshore substation.

26.4 Assessment methodology

26.4.1 Legislation, guidance and policy

26.4.1.1 National Policy Statements

15. The assessment of likely significant noise and vibration effects has been made with specific reference to the relevant NPS. These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to the Project are:

    - Overarching NPS for Energy (EN-1) (Department for Energy Security & Net Zero (DESNZ) 2023a);
    - NPS for Renewable Energy Infrastructure (EN-3) (DESNZ, 2023b);
    - NPS for Electricity Networks Infrastructure (EN-5) (DESNZ, 2023c);

16. The specific assessment requirements for noise and vibration, as detailed in the NPS, are summarised in Table 26.4 together with an indication of the section of the ES chapter where each is addressed.

Table 26.4 NPS assessment requirements

NPS requirement	NPS reference	ES reference
Overarching NPS for Energy (EN-1)		

Where noise impacts are likely to arise, the applicant should include:
• 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 particular high or low frequency content or any temporal characteristics of the noise;
• Identification of noise sensitive receptors 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;
  ○ In the shorter term, such as during the construction period;
  ○ In the longer term, during the operating life of the infrastructure;
  ○ 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; and
• All reasonable steps taken to mitigate and minimise potential adverse effects on health and quality of life
	EN-1, paragraph 5.12.6 and 5.12.7	Refer to Section 26.4.3 for the assessment methodology for assessing potential noise and vibration impacts, Section 26.5 for details on the existing noise environment including the identification of NVSRs and Section 26.6 where any changes in noise levels, as a result of North Falls, are assessed, and any likely significant effects and potential mitigation measures are identified.
		
		Underwater noise effects on protected species in the marine environment are considered in ES Chapter 11 Fish and Shellfish Ecology (Document Reference: 3.1.13) and es Chapter 12 Marine Mammals (Document Reference: 3.1.14).

NPS requirement	NPS reference	ES reference
The nature and extent of the noise assessment should be proportionate to the likely noise impact.		
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.	EN-1, paragraph 5.12.8	Refer to Section 26.6.1.2 where any changes in noise levels as a result of North Falls from ancillary works, for example vehicle movements, are assessed and any likely significant effects and potential mitigation measures are identified.
Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on assessment of particular noise sources may be contained in the technology specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there 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 and other guidance which also give examples of mitigation strategies.	EN-1, paragraph 5.12.9	Any changes in noise levels as a result of North Falls are assessed in Section 26.6, and any likely significant effects and potential mitigation measures are identified. The current relevant British Standards (BS) have been used within this assessment, as detailed in Section 26.4.
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 Environmental Assessment (EA) and / or the Statutory Nature Conservation Bodies (SNCB), and other relevant bodies, such the Marine Management Organisation (MMO) or Nature Resource Wales (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.	EN-1, paragraph 5.12.10	Noise impacts on human receptors from the Project are not anticipated to be controlled through environmental permits; hence, specific consultation with the Environment Agency on this topic is not required. Noise effects on terrestrial protected species is considered within ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25) and ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26).
In the marine environment, applicants should consider noise impacts on protected species, as well as other noise sensitive receptors, both at the individual project level and in-combination with other marine activities.	EN-1, paragraph 5.12.11	Underwater noise effects on protected species in the marine environment are considered in ES Chapter 11 Fish and Shellfish Ecology (Document Reference: 3.1.13) and ES Chapter 12 Marine Mammals (Document Reference: 3.1.14).
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. Mitigation 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	EN-1, paragraph 5.12.12 to 5.12.15	The embedded mitigation measures described in Section 26.3.3 and proposed mitigation measures described in Section 26.6 demonstrate good design has been adopted.

NPS requirement	NPS reference	ES reference
successor to it and the Planning Practice Guidance on Noise. 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; • 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; and • insulation: mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building. 5.12.15 The project should demonstrate good design through selection of the quietest or most acceptable cost-effective plant available; containment of noise within buildings wherever possible, taking into account any other adverse impacts 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).		
A development must be undertaken in accordance with statutory requirements for noise. Due regard must be given to the relevant sections of the Noise Policy Statement for England, the NPPF, and the government's associated planning guidance on noise. In Wales the relevant policy will be Planning Policy Wales (PPW) and the Technical Advice notes (TANs), as well as the Welsh Government's Noise and Soundscape Action Plan.	EN-1, paragraph 5.12.16	The quoted relevant policy and planning guidance has been taken into account in developing the assessment methodology described in Section 26.4.3.
The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the following aims: • 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; and • where possible, contribute to improvements to health and quality of life through the effective management and control of noise.	EN-1, paragraph 5.12.17	These aims are met by adoption of the embedded and proposed mitigation as discussed above, as shown in Section 26.6 which concludes that significant residual effects are not anticipated.
NPS for Renewable Energy Infrastructure (EN-3)		
EN-3 contains relevant policy in relation to the assessment of offshore wind projects; however, the only information it contains in relation to noise and vibration for these projects is specific to effects on protected species. There is no information in this NPS which is relevant to this noise and vibration chapter.		

NPS requirement	NPS reference	ES reference
NPS for Electricity Networks Infrastructure (EN-5)		
These sections of EN-5 provide detailed requirements on the assessment of noise effects from overhead lines, including to consider impacts under both dry and wet weather conditions.	EN-5, paragraph 2.9.26 to 2.9.36 and 2.9.40 to 2.9.42	North Falls does not include any requirement for additional overhead lines. As such, these requirements are not relevant to this noise and vibration chapter
Audible noise effects can also arise from substation equipment such as transformers, quadrature boosters and mechanically switched capacitors. Transformers are installed at many substations, and generate low frequency hum. Whether the noise can be heard outside a substation depends on a number of factors, including transformer type and the level of noise attenuation present (either engineered intentionally or provided by other structures). For the assessment of noise from substations, standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory	EN-5, paragraph 2.9.37 to 2.9.39	Operational noise from onshore substation equipment has been assessed, as reported in Section 208, in accordance with the relevant British Standards as identified in Section 26.4.1.4. The NPS refers to BS 4142 as a relevant standard for this assessment and this has been used, as detailed in Section 26.4.3.6.

26.4.1.2 Other legislation, policy and guidance

17. In addition to the NPS, there are a number of pieces of legislation, policy and guidance applicable to the assessment of noise and vibration.

26.4.1.2.1 Environmental Protection Act 1990

18. The Environmental Protection Act 1990 prescribes 'noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance' as a statutory nuisance.

19. Local authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either the abatement of the nuisance; or works to abate the nuisance to be carried out; or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence. A right of appeal to the Magistrates Court exists within 21 days of the service of a noise abatement notice.

20. No statutory noise limits exist for determining a nuisance; therefore, the local authority can take account of various guidance documents and existing case law when investigating complaints. Lower noise level limits are generally applied when considering the acceptability of a planning permission than those which would be used when considering whether an existing noise source amounts to a statutory nuisance. Demonstrating the use of BPM to minimise noise levels is an accepted defence against a noise abatement notice.

21. When considering a planning application, local authority environmental health officers are obliged to consider whether the development under consideration has the potential to cause a statutory nuisance and to use the planning process to avoid this outcome if practicable.

26.4.1.2.2 Control of Pollution Act 1974

22. The Control of Pollution Act 1974 (CoPA) requires that BPM (as defined in Section 72 of CoPA) are adopted to control construction noise on any given site as far as reasonably practicable. Sections 60 and 61 of the CoPA provide the main legislation regarding enabling works and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by Tendring District Council with instructions to cease work until specific conditions to reduce noise have been adopted.

23. Section 61 of the CoPA provides a means to apply for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, this can act as a defence in respect of any proceedings brought pursuant to a Section 60 provided the agreed conditions are maintained on-site.

24. Whilst construction noise and vibration are factors which can be considered during the planning process, local authorities have alternative powers under Sections 60 and 61 of CoPA to regulate these issues if complaints arise.

26.4.1.2.3 National Planning Policy Framework

25. The National Planning Policy Framework (NPPF) (as updated in 2023) forms the basis of the Government's planning policies for England and how these should be applied. Section 15, Paragraph 180 of the NPPF 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……"

26. Furthermore, Section 15, Paragraph 191 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) 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;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason….."

26.4.1.2.4 Noise Policy Statement for England, 2010

27. The Noise Policy Statement for England (NPSE) document was published by the Department for the Environment and Rural Affairs (Defra) in 2010 and paragraph 1.7 states three policy aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;

- Mitigate and minimise adverse impacts on health and quality of life; and
- Where practicable, contribute to the improvement of health and quality of life."

28. The Explanatory Note contained within the NPSE introduces the following concepts to aid in the establishment of significant effects:

- No Observed Effect Level (NOEL): the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur.

29. The aims of the NPSE can therefore be interpreted as follows (within the context of Government policy on sustainable development):

- The first aim is to avoid noise levels above the SOAEL; and
- To consider situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur.

30. The NPSE states:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations". (Paragraph 2.22, NPSE, March 2010).

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

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

26.4.1.2.5 National Planning Practice Guidance (NPPG) 2019

32. The National Planning Practice Guidance (NPPG, July 2019), states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or making decisions about new development, there may also be opportunities to consider improvements to the acoustic environment. No material changes were made to the clauses in the NPPF relating to noise during updates made in 2023, and no update to the NPPG is expected.

26.4.1.3 Local planning policy

33. The onshore project area falls under the jurisdiction of the following county council and local planning authorities:

- Essex County Council; and
- Tendring District Council.

34. No Essex County Council policies have been identified which are relevant to the potential noise and vibration impacts of the Project.

35. The Tendring District Council Core Strategy (2011 – 2031) is the key document in the Local Plan. The document provides a detailed framework for the control of development and use of land that guides planning decisions in the Tendring district.

36. Policy DP1 of the Core Strategy, Part C, Impacts and Compatibility, states "New development should be compatible with surrounding uses and minimise any adverse environmental impacts. The following criteria must be met:

- The development will not have a materially damaging impact on the privacy, daylight or other amenities of occupiers of nearby properties;
- The development, including any additional road traffic arising, will not have a materially damaging impact on air, land, water (including ground water), amenity, health or safety through noise, smell, dust, light, heat, vibration, fumes of other forms of pollution or nuisance; and
- The health, safety or amenity of any occupants or users of the Project will not be materially harmed by any pollution from an existing or committed use."

26.4.1.4 Guidance documents

26.4.1.4.1 BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

37. This standard describes a method for rating and assessing sound of an industrial and / or commercial nature. This method uses a *rating level* to assess the likely effects from sound of an industrial or commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

26.4.1.4.2 BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: noise

38. Part 1 of BS 5228 provides recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities / operations generate significant noise and / or vibration levels. It also provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.

26.4.1.4.3 BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: vibration

39. Part 2 of BS 5228 gives recommendations for basic methods of vibration control on construction and open sites where work activities generate significant vibration levels. It also provides guidance on predicting and assessing vibration levels from construction and a database of measured vibration levels during piling activities.

26.4.1.4.4 BS 7385-2: 1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration

40. This standard provides guidance regarding the potential for vibration to result in building damage, including basic principles for carrying out vibration measurements and processing the data. It includes guide values for transient and continuous vibration, above which there is a likelihood of cosmetic damage.

26.4.1.4.5 BS 7445:2003 Part 1 and BS 7445:1991 Part 2 – Description and measurement of environmental noise

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

26.4.1.4.6 BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings

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

26.4.1.4.7 Calculation of Road Traffic Noise (CRTN) 1988

43. Provides a method for calculating noise levels from the Annual Average Weekday Traffic (AAWT) flows and from measured noise levels. Since publication in 1988 this document has been the accepted standard for predicting noise levels from road traffic in the UK. The calculation methods take account of variables including percentage of heavy goods vehicles (HGVs), road surfacing, gradient, screening by barriers and relative height of source and receiver.

26.4.1.4.8 Design Manual for Roads and Bridges (DMRB), LA 111 Noise and Vibration, Revision 2 (2021)

44. LA111 Noise and Vibration provides detailed methodologies for the assessment of construction and operational noise and vibration impacts from major road schemes. It provides guideline significance criteria in terms of both absolute noise and vibration levels (LOAELs and SOAELS for use in relation to the NPSE) and the change in noise levels due to a scheme.

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

45. Specifies an engineering method for calculating the attenuation of sound due to propagation outdoors, enabling prediction of sound levels at a specified distance from a source.

26.4.1.4.10 WHO (1999) Guidelines for Community Noise

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

47. In Section 4 ‘Guideline Values’, these guidelines state:

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

26.4.1.4.11 WHO (2009) Night Noise Guidelines for Europe

48. These guidelines provide an extension to the WHO Guidelines for Community Noise (1999). Based on evidential review, in Section 5.6 'Recommendations for Health Protection', they conclude that:

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

    Therefore, 40dB $L_{night,outside}$ is equivalent to the LOAEL for night noise."

49. Additionally, the Abstract to the guidelines states:

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

26.4.1.4.12 WHO (2018) Environmental Noise Guidelines for the European Region

50. The Abstract to this guidance state:

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

51. These guidelines have not been adopted in any UK policy to date. Paragraph 2.4.3 states "*The GDG [Guideline Development Group] agreed to set guideline exposure levels based on the definition: 'noise exposure levels above which the GDG is confident that there is an increased risk of adverse health effects. … The guideline exposure levels presented are therefore not meant to identify effect thresholds (the lowest observed adverse effect levels for different health outcomes). This is a difference in approach from prior WHO guidelines, like the Night Noise Guidelines for Europe (WHO Regional Office for Europe, 2009), which explicitly aimed to define levels indicating no adverse health effects."* It follows that the guideline exposure levels do not constitute LOAELs or SOAELs as defined in the NPSE.

26.4.1.4.13 Institute of Environmental Management & Assessment (IEMA), Guidelines for Environmental Noise Impact Assessment (2014)

52. The IEMA 'Guidelines for Environmental Noise Impact Assessment' (IEMA Guidelines) provide guidance on how to undertake a noise impact assessment, with particular focus on the context of an EIA. They describe the process of scoping, defining a baseline, prediction of noise level changes and determination of the significance of the effect. They aim to apply to all types of proposed development.

53. Further detail on wider legislation, policy and guidance relevant to this noise and vibration assessment is provided in ES Chapter 3 Policy and Legislative Context (Document Reference: 3.1.5).

26.4.2 Data sources

26.4.2.1 Site-specific

54. To provide site-specific and up to date information on which to base the impact assessment, a baseline sound survey within the vicinity of the landfall and onshore substation was conducted during June 2022, as described in Section 26.5.1. The scope and extent of the baseline survey was agreed with Tendring District Council.

26.4.2.2 Other available sources

55. Other sources that have been used to inform the assessment are listed in Table 26.5.

Table 26.5 Other available data and information sources

Data Set	Spatial Coverage	Year	Notes
Google Maps aerial photography	Onshore Noise and Vibration Study Area	2021	
Environment Agency LiDAR topographical data	Onshore Noise and Vibration Study Area	2020	Open Licence Data
Local Authority Local Plans	Onshore Noise and Vibration Study Area	2008 & 2015	
Ordnance Survey mapping	Onshore Noise and Vibration Study Area	2022	
Onshore construction plant details for Five Estuaries	Five Estuaries Offshore Wind Farm onshore project area	2023	
Noise Impact Assessment, Proposed Battery Energy Storage Site – Land West of Lawford Sub-Station	Land West of Lawford Substation and closest NVSR	2021	

26.4.3 Impact assessment methodology

56. ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) explains the general impact assessment methodology applied to North Falls. The following sections describe the methods used to assess the likely significant effects on noise and vibration.

26.4.3.1 Definitions

57. For each potential impact, the assessment identifies receptors within the study area which are sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors.

58. In general, the potential impacts of noise and vibration in the scope of this assessment can be classified as disturbance to humans and, in the case of vibration, damage to structures.

26.4.3.2 Sensitivity

59. In accordance with the IEMA Guidelines for Environmental Noise Impact Assessment, the sensitivity of receptors to disturbance as a result of noise and vibration effects has been classified. This classification is based on the receptor function, using experience on other projects and professional judgement, as defined in Table 26.6.

Table 26.6 Definition of receptor sensitivity to disturbance-related noise and vibration

Sensitivity	Definition	Example
High	Receptors where noise or vibration level changes will significantly affect their function.	Certain hospital wards (e.g. operating theatres or high dependency units), recording studios, laboratories with highly vibration sensitive equipment.
Medium	Receptors where noise and / or vibration level changes may cause disturbance, protection is required but some tolerance is expected.	Residential accommodation, private gardens, hospital wards, care homes, schools, libraries, universities, research facilities and national parks (during the day).
Low	Receptors where noise and / or vibration level changes may cause some distraction or disturbance.	Offices, shops (including cafes), outdoor amenity areas during the day (including recreation, public amenity space / play areas), long distance footpaths (including Public Rights of Way (PRoW), dog walking routes, bird watching areas, footpaths and other walking routes, visitor attractions, cycling routes including rural roads), doctor's surgeries, sports facilities where spectator noise is not a normal part of the event and places of worship.
Negligible	Receptors where noise and / or vibration level changes are not expected to be detrimental.	Warehouses, light industry, car parks, and agricultural land.

60. Regarding sensitivity to vibration damage, classification by sensitivity is not considered appropriate or necessary. BS 7385-2, Section 5 '*Factors to be considered in building response*' states that this depends on "*the type of foundation, underlying ground conditions, the building construction and the state of repair of the building*". In Section 7.5.2 '*Important buildings'*, the standard states that *"Important buildings which are difficult to repair may require special consideration on a case-by-case basis. A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.*" The adopted magnitude of impact criteria (discussed in Section 26.4.3.5) account for building type.

26.4.3.3 Magnitude of impact: construction noise

61. Annex E of BS 5228-1 contains a number of example methodologies for identifying significant construction noise effects based on fixed thresholds or noise level changes. Impacts on residential receptors have been determined with reference to the 'ABC' method. This approach is based on setting the threshold for the onset of potentially significant adverse effects depending on the existing ambient noise level. Receptors with low existing ambient noise levels (Category A) have a lower threshold than those with high existing ambient noise levels (Category C). Higher thresholds are set for normal daytime

construction working hours, compared to the more sensitive evening / weekend and night-time periods. This is shown in Table 26.7 which duplicates Table E.1 in BS 5228-1.

Table 26.7 Construction noise Threshold Values based on the ABC method (BS 5228-1)

Assessment category and Threshold Value period ($L_{Aeq,T}$)	Threshold Value $L_{Aeq,T}$ dB (façade)		
	Category A [A)]	Category B [B)]	Category C [C)]
Night-time (23.00 – 07.00)	45	50	55
Evenings and weekends [D)]	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75
NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3dB due to site noise. NOTE 3 Applied to residential receptors only.			
[A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values. [B)] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values. [C)] Category C: threshold values to use when 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.			

62. Given the length of the onshore cable route, it was not practical to measure baseline sound levels at receptors along the entire route potentially affected by noise from construction of these elements of the Project. In the absence of these baseline noise data, the existing noise levels at residential receptors have been assumed to be low, so the Category A Threshold Values presented in Table 26.7 are deemed applicable. This is the industry-standard approach for the assessment of construction noise impacts from linear schemes; it considers the worst case possible impacts and was agreed with the ETG.

63. The magnitude of the construction noise impact is based on the difference between the predicted construction noise level and the Threshold Values, as shown in Table 26.8, along with the proposed LOAEL and SOAEL.

Table 26.8 Magnitude criteria for construction noise impacts

Magnitude of impact	Construction noise level (dB, $L_{Aeq,T}$)			NPSE/PPG Category
	Daytime	Evenings and weekends	Night-time	
Negligible	≤65	≤55	≤45	-
Low	>65 to ≤68	>55 to ≤58	>45 to ≤48	Lower end of range is equivalent to LOAEL
Medium	>68 to ≤70	>58 to ≤60	>48 to ≤50	Lower end of range is equivalent to SOAEL
High	>70	>60	>50	-

64. Section E.3.2 of BS 5228-1 states that: “If the site noise level exceeds the appropriate category value [Threshold Value], then a potential significant effect is indicated. The assessor then needs to consider other Project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect.” The following demonstrates how these other factors have been considered to determine the effect significance:

- The duration of the impact – construction noise levels equating to moderate or major impacts for less than 10-days (or 10-evenings / weekends or nights) in any 15, or 40-days (or 40 evenings / weekends or nights) in any six-month period, would not normally be considered significant;
- The timing of the impact – night-time impacts are more likely to be considered significant than daytime impacts;
- The location of the impact at the NVSR – a receptor may contain areas which are more or less sensitive than others. For example in a school, office spaces or kitchens would be considered less sensitive than classrooms; and
- The nature, times of use and design of the receptor, for example a NVSR which is not used at night would not be considered sensitive to night-time construction works.

65. Noise levels for the construction phase have been calculated using the methods and guidance in BS 5228-1. The standard provides methods for predicting receptor noise levels from construction works based on the number and type of construction plant and activities operating on site, with corrections to account for:

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

66. The predictions undertaken are indicative only, as they are based on a preliminary understanding of the likely construction schedule, activities and plant to be used. This information may change once a construction contractor is appointed post-consent.

67. Preliminary worst case noise level calculations identified that the SOAEL is unlikely to be exceeded at distances in excess of 650m from the works. On this basis, and as agreed in consultation with the ETG, the assessment of construction noise impacts only extends to NVSRs which are no further than 650m from the onshore project area.

26.4.3.4 Magnitude of impact: construction phase road traffic noise

68. Construction traffic noise impacts along existing roads have been estimated based on the Calculation of Road Traffic Noise (CRTN) methodology for the calculation of the Basic Noise Level (BNL) at a reference distance of 10m from the nearside carriageway. Calculations have been undertaken for both the 'with' and 'without' construction traffic scenarios for the peak construction year, for each road link in the construction traffic model.

69. To undertake the BNL calculations, details of the road network study area for the construction phase traffic assessment were provided by the traffic EIA specialists, along with AAWT 18hr flows, % HGVs and speed data for each road link, as detailed in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29) and ES Appendix 27.1 Transport Assessment (Document Reference: 3.3.64).

70. In order to determine impacts, the assessment of construction traffic noise compares the calculated BNLs with and without the construction traffic. Any changes in day or night-time noise levels due to a corresponding change in volume and composition have been assessed using the impact magnitude criteria detailed in Table 26.9, which is reproduced from Table 3.17 of the DMRB.

Table 26.9 Magnitude criteria for relative change due to construction road traffic

Magnitude of impact	Increase in BNL of closest public road used for construction traffic (dB)
Negligible	<1.0
Low	≥1.0 to <3.0
Medium	≥3.0 to <5.0
High	≥5.0

71. There are assumed to be residential NVSRs along all the identified remaining road links i.e. receptors of medium sensitivity. Whilst receptors of high sensitivity could be present along these road links, a change of less than 3dB in road traffic noise at such NVSRs would be considered imperceptible and therefore not cause a significant effect, irrespective of receptor sensitivity. Hence, assuming residential receptors are present identifies the potential worst case impact.

72. Where the change in BNL indicates a potentially significant effect, the road traffic noise levels have been compared against absolute noise level criteria. For residential NVSRs, these criteria are the LOAEL and SOAEL, which are defined in the DMRB as 55dB $L_{A10,18hr}$ and 68dB $L_{A10,18hr}$ respectively (daytime only), where the predicted noise level change exceeds 3dB.

73. The calculated BNLs (used to determine the change in road traffic noise levels) represent the traffic noise level at 10m from the carriageway edge, depending on traffic flow parameters only i.e. total flow, vehicle speed and % HGV. The BNL does not account for actual distance to the receptor, the presence of screening, angle of view or road gradient. As these BNLs are not representative of the actual road traffic noise level at a receptor, they cannot be compared directly with the LOAEL and SOAEL. Hence, where the BNL comparison indicates a potentially significant effect, calculations of absolute road traffic noise levels at the identified receptors have been undertaken in accordance with the methodology in CRTN. Computational noise modelling software has been used to predict the ‘baseline’ and ‘with construction’ road traffic noise levels at the NVSRs within 50m of the identified road link.

74. For temporary impacts due to construction traffic noise, predicted 'with project’ road traffic noise levels which are less than the LOAEL are considered to

represent an impact of no worse than minor magnitude (i.e. not significant), irrespective of the change in BNL. For effects between the LOAEL and SOAEL, the duration of the impact must be considered, in addition to the magnitude of the change, when determining whether an impact is significant.

75. As the assessment of construction traffic noise impacts is solely based on noise level calculations, a baseline sound survey is not deemed necessary to inform this assessment.

26.4.3.5 Magnitude of impact: construction vibration

76. Ground-borne vibration can result from construction works and may lead to perceptible levels of vibration at nearby receptors which, at higher levels, can cause annoyance to residents. In extreme cases, cosmetic or structural building damage can occur, but only at extremely high vibration levels and such cases are rare.

77. Typically, perceptible ground-borne vibration is only emitted by 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction.

78. The response of a building to ground-borne vibration is affected by the type of foundation, ground conditions, the building construction and the condition of the building. BS 7385-2 provides guide values for transient vibration which are *"judged to give a minimal risk… of vibration-induced damage."* and is also included in BS 5228-2 (Table B.2), as shown in Table 26.10. BS 5228-2 states that for continuous vibration (such as that induced by vibratory compaction), the thresholds might need to be reduced by up to 50%.

Table 26.10 Transient vibration guide values at the building foundation for cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm.s^{-1} at 4Hz and above	
Un-reinforced or light framed structures Residential or light commercial type buildings	15mm.s^{-1} at 4Hz increasing to 20mm.s^{-1} at 15Hz	20mm.s^{-1} at 15Hz increasing to 50mm.s^{-1} at 40Hz and above
Note 1: Values referred to are at the base of the building. Note 2: For unreinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.		

79. BS 7385-2 states that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration twice that of minor damage. The values in Table 26.10 refer to the likelihood of cosmetic damage. ISO 4866:2010 '*Mechanical Vibration and Shock – Vibration of Fixed Structures – Guidelines for the Measurement of Vibrations and Evaluation of Their Effects on Structures'* defines three different categories of building damage:

- Cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick / concrete block constructions;

- Minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick / block; and
- Major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

80. This guidance can be used to define the potential impact as identified in Table 26.11 for continuous vibration for unreinforced or light framed structures and residential or light commercial buildings. Using the below criteria, reinforced or framed structures, industrial and heavy commercial buildings would be classified as of '*low*' sensitivity to vibration damage. Unreinforced or light framed structures and residential or light commercial buildings are classified as of medium sensitivity to structural vibration damage.

Table 26.11 Construction vibration criteria for assessing structural damage

Damage risk	Impact magnitude	Continuous vibration level (ppv, $mm.s^{-1}$) at the structure foundation		
		Frequency of 4Hz	Frequency of 15Hz	Frequency of 40Hz and above
Major	High	≥30	≥40	≥100
Minor	Medium	15 to <30	20 to <40	50 to <100
Cosmetic	Low	6 to <15	10 to <20	25 to <50
Negligible	Negligible	<6	<10	<25

81. The vibration level and effects presented in Table 26.12 are taken from Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.

Table 26.12 Construction vibration criteria for assessing human perception in buildings

Vibration limit PPV ($mm.s^{-1}$)	Interpreted significance to humans	Magnitude of impact	NPSE/PPG Category
<0.3	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction	Negligible	
≥0.3 to <1.0	Vibration might just be perceptible in residential environments	Low	Lower end of range is equivalent to LOAEL
1.0 to ≤10.0	It is likely that vibration at this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents	Medium	Lower end of range is SOAEL
>10.0	Vibration is likely to be intolerable for any more than a brief exposure to this level	High	

82. Predicted construction vibration levels at receptors which exceed a value of $1mm.s^{1}$ have the potential to result in a significant effect. However, the same additional project-specific factors which can influence the construction noise effect significance (as discussed in Section 26.4.3.3) are considered relevant to

vibration impacts. Hence, the same process for considering these other factors should be used to determine the vibration effect significance.

83. Comparison of the criteria in Table 26.11 and Table 26.12 shows that the levels at which building damage may occur are significantly above those which are considered tolerable by the occupants. The assessment therefore applies the criteria for human annoyance. Assuming that the vibration impacts will be controlled to avoid significant annoyance effects, then building damage is not anticipated. It should be noted however that building damage criteria are absolute values and do not take duration of effect into account.

84. Annex E of BS 5228-2:2009+A1:2014 contains empirical formulae derived by Hiller and Crabb (2000) from field measurements relating to resultant Peak Particle Velocity (PPV), with several other parameters for vibratory compaction, dynamic compaction, percussive and vibratory piling, the vibration of stone columns and tunnel boring operations. Use of these empirical formulae enables resultant PPV to be predicted and for some activities (vibratory compaction, vibratory piling and vibrated stone columns) they provide an indicator of the probability of these levels of PPV being exceeded.

85. Consequently, calculations following these methodologies were carried out for the anticipated construction activities with the potential to result in perceptible vibration at receptors. Reasonable worst case assumptions were applied regarding ground conditions and energy levels to determine set-back distances at which critical vibration levels may occur, as detailed in ES Appendix 26.3 Construction Noise and Vibrations Calculations (Document Reference: 3.3.62).

86. The DMRB LA111 states that “A study area of 100m from the closest construction activity with the potential to generate vibration is normally sufficient to encompass vibration sensitive receptors”. On this basis, and as agreed in consultation with the ETG, the assessment of vibration impacts only extends to NVSRs which are no further than 100m from the onshore project area. The closest identified NVSRs to the proposed landfall and onshore substation locations are further than 100m away; hence, assessment of vibration impacts due to construction of the landfall and onshore substation has been excluded from the assessment scope.

87. The DMRB LA111 states that “a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects”. On this basis, the assessment of vibration impacts due to construction traffic using public roads has been excluded from the assessment scope.

26.4.3.6 Magnitude of impact: operational noise

88. Operational noise from the proposed onshore substation has been assessed in accordance with BS 4142 which is the accepted UK standard for rating and assessing the impact of sound of an industrial and / or commercial nature and is referred to in NPS EN-1.

89. BS 4142 describes methods for rating and assessing sound of an industrial and / or commercial nature using outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a residential dwelling upon which sound is incident.

90. The basis of BS 4142 is a comparison between the *background sound level* in the vicinity of residential locations and the *rating level* of the noise source under consideration. The relevant parameters in this instance are as follows:

- *Background sound level* – $L_{A90,T}$ – defined in the standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F (Fast) and quoted to the nearest whole number of decibels;
- *Specific sound level* – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a reference time interval, T_r (1 hour during the daytime hours (07:00 to 23:00 hours) and 15 minutes during night-time hours (23:00 to 07:00 hours));
- *Residual Sound Level* – $L_{Aeq,T}$ – the equivalent continuous 'A' weighted sound pressure level at the assessment location in the absence of the specific sound source under consideration, over a given time interval, T; and
- *Rating level* – $L_{Ar,Tr}$ – the *specific sound level* plus a "character correction" if required for the acoustic features of the noise such as tonality, impulsivity and intermittency.

91. When comparing the *background sound* and the *rating* levels, the standard states that:

"*a) Typically, the greater the difference, the greater the magnitude of impact;*

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

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

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

92. When assessing the noise from a source, it is necessary to have regard to the acoustic features that may be present in the source noise at the receptors. Section 9.1 of BS 4142 states:

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

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

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

noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible;

- Impulsivity – a correction of up to +9dB can be applied for sound that is impulsive. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible;
- Intermittency – when the specific sound has identifiable on / off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied; and
- Other sound characteristics – where the specific sound feature characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

94. Noise levels from the operational fixed plant of the proposed onshore substation have been predicted using SoundPLAN v9.0 3-d modelling software and using the methods and guidance in ISO 9613. Noise modelling parameters are presented in ES Appendix 26.4 Operational Noise Calculations (Document Reference: 3.3.63). The model incorporates proposed buildings and noise sources located at the onshore substation. The model also includes nearby residential dwellings and other buildings in the study area, intervening ground cover and topographical information.

95. The magnitude of impact of the predicted onshore substation sound levels has been based on a quantitative assessment of noise impact using BS 4142, as shown in Table 26.13. Separate assessments have been undertaken of day and night-time impacts; the overall magnitude of impact is based on the worst case time period.

Table 26.13 Operational noise magnitude of impact criteria

Magnitude of Impact	Rating level dB $L_{Ar,Tr}$	NPSE/PPG category
Negligible	≤ Measured L_{A90}	-
Low	≤ Measured L_{A90} + 5dB	Upper end of range is LOAEL
Medium	< Measured L_{A90} + 10dB	-
High	≥ Measured L_{A90} + 10dB	Lower end of range is SOAEL

96. Impacts of medium or high magnitude according to Table 26.13 may be considered to result in significant effects; however, BS 4142 also requires that the context is considered. The effect significance depends on the magnitude of impact (the margin by which the *rating level* exceeds the *background sound level*) and the context in which the sound occurs.

97. BS 4142 Section 11 'Assessment of the impacts' identifies potential factors to be included when considering the context. Of particular relevance to this assessment is the absolute sound level; on this point of the standard states that "*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds*

the background. This is especially true at night." The standard offers no guidance about what *background* and *rating levels* are considered low; however, the 1997 version of the standard stated that *background sound levels* below around 30dB L_{A90}, and *rating levels* below around 35dB L_{ArTr}, were considered very low and therefore outside the scope of the assessment method. The Association of Noise Consultants produced guidance on the application of BS 4142 (BS 4142:2014+A1:2019 Technical Note, Association of Noise Consultants, March 2020) which states (Section 11 'Assessment of impacts' under subheading 'Context', 'Subclause 11(1)') that "*similar values* [i.e. *background sound levels* below around 30dB L_{A90}, and *rating levels* below around 35dB L_{ArTr}] *would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate."* Based on this, a level of 35dB L_{ArTr} is considered the LOAEL, where background sound levels are below 30dB L_{A90}.

98. Of additional relevance to the contextual analysis is the change in ambient sound levels; Table 7-14 of the Guidelines for Environmental Noise Impact Assessment (IEMA, 2014) refers to impacts from change in sound levels. The impact of operational noise from the Project will be present immediately when operation starts; hence, the criteria applied to impacts which occur in the short-term are relevant. Table 26.14 outlines these sound level change criteria.

Table 26.14 IEMA sound level change criteria

Short term impact classification	Sound level change dB $L_{Aeq,T}$ (positive or negative) T = either 16hr day or 8hr night
Negligible	≥ 0 and < 1
Minor	≥1 and <3
Moderate	≥3 and <5
Major	≥5

99. Guidance is not available regarding an appropriate study area for operational noise impacts. Thresholds for operational noise impact are more stringent than those applied to construction noise. A distance of 1km from operational plant that would produce noise has been adopted for this assessment, as beyond this distance operational noise from a typical substation is low and predictions would be unreliable due to the influence of meteorological effects.

26.4.3.7 Magnitude of impact: operational vibration

100. The onshore substation electrical plant is likely to be vibration sensitive; hence, to prevent damage, the onshore substation will be designed to achieve very low levels of ground-borne vibration within the onshore substation itself. This will be achieved using industry standard mitigation measures applied to items of plant with the potential to generate significant levels of vibration, such as vibration isolation pads / mounts for proposed super grid transformers.

101. In terms of the potential for impacts at receptors, these very low levels of vibration within the onshore substation will be further attenuated due to propagation with distance. The closest NVSR is more than 200m from the onshore substation. This further attenuation will ensure that the operation of the onshore substation will not result in perceptible levels of vibration at receptors

and therefore no further assessment of operational phase vibration impacts is required, as per the response to the Planning Inspectorate Scoping Opinion (Document Reference: 7.26) on this point provided in Table 26.1.

26.4.3.8 Significance of effect

102. The assessment of significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact (ES Chapter 6 EIA Methodology (Document Reference: 3.1.8)). The determination of significance is guided by the use of a significance of effect matrix, as shown in Table 26.15.

103. Definitions of each level of significance for noise disturbance are provided in Table 26.16, based on the NPPG and IEMA Guidelines.

104. Likely significant effects identified within the assessment as major or moderate are regarded within this chapter as significant. Appropriate additional mitigation has been identified, where appropriate, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall significance of effect to determine a residual effect upon a given receptor.

Table 26.15 Significance of effect matrix

		Impact magnitude			
		High	**Medium**	**Low**	**Negligible**
Sensitivity	**High**	*Major*	*Major*	*Moderate*	*Minor*
	Medium	*Major*	*Moderate*	*Minor*	*Negligible*
	Low	*Moderate*	*Minor*	*Negligible*	*Negligible*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*

Table 26.16 Definition of effect significance for noise

Significance	Definition
Major	Extensive and regular changes in behaviour, attitude or other physiological response and / or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation / awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.
Moderate	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area
Minor	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of

Significance	Definition
	the area such that there is a small actual or perceived change in the quality of life.
Negligible	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.

26.4.4 Cumulative effects assessment methodology

105. The CEA considers other plans, projects and activities that may result in cumulative effects with North Falls. ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) provides further details of the general framework and approach to the CEA.

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

26.4.5 Transboundary effects assessment methodology

107. The transboundary assessment considers the potential for transboundary effects to occur on NVSRs as a result of North Falls. ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) provides further details of the general framework and approach to the assessment of transboundary effects.

108. There are no transboundary effects with regard to onshore noise and vibration as the onshore project area would not be sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and are not considered further.

26.4.6 Assumptions and limitations

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

110. At this stage in the project design, the locations of some onshore infrastructure elements (e.g. jointing bays, trenchless compound entry pits) is not finalised. In addition, the final onshore cable route working width will be narrower than the onshore cable route following detailed design (to be undertaken post-consent). Hence, the assessments of construction noise and vibration have been based on the assumption that the onshore infrastructure will be at the closest potential location to each NVSR. Specifically:

- The onshore cable route will be located at the closest approach of the onshore project area;
- There will be a jointing bay at the worst case possible location on the cable route;
- Proposed trenchless crossing compound locations have been identified; however, the location of the entry and exit pits is not known. The trenchless crossing entry pit is assumed to be located within the worst case of the proposed compounds for each crossing; and
- Areas have been identified within which each TCC will be located, but the final TCC location within these areas is not known. It is assumed that, for each TCC area, the TCC will be as close as possible to each nearby NVSR.

111. It has been assumed that each trenchless crossing in the same section of the proposed onshore cable route will be constructed and drilled sequentially as a worst case.

112. Bunds will be constructed during the early construction phases of the Project. These bunds will store topsoil either side of the cable route and act as effective screening for plant and equipment operational along the cable route. These have been assumed to provide a worst case of 5dB screening to those activities which will be undertaken whilst the bund is in place. It is considered likely that the bunds would provide more effective screening than that assumed. No screening has been assumed for other activities; in many cases the remaining activities are likely to be partially screened from NVSRs during the formation or reinstatement of the topsoil bunds.

113. The above assumptions ensure that a realistic worst case assessment is presented, because the embedded mitigation requires that the project design process will be used to maximise the distance to the NVSRs at which significant effects are predicted, where practicable.

114. The construction road traffic noise assessment is reliant on the traffic data provided by the transport specialists working on the Project. Hence, any assumptions made in the generation of these data (as discussed in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29)) are also inherently assumed within this assessment.

115. For the road traffic noise calculations, all roads were assumed to be surfaced with standard hot rolled asphalt. Based on the advice in DMRB LA 111 Noise and vibration, a road surface correction of -1.0dB is applied at speeds below 75km/h and -0.5dB at and above 75km/h.

116. Calculations of likely construction vibration levels have been undertaken. In some instances, it has been necessary to calculate vibration levels at distances beyond their validated range; hence, the result should only be treated as an approximation. This is noted where relevant in Section 26.6.1.6.

117. 3-d operational noise predictions are based on an outline design and preliminary design metrics, including the likely plant type and quantities that will be used as well as their noise emissions (sound power levels). These assumptions have been provided by the Project's onshore substation design consultants. The assumptions are considered representative of a reasonably

foreseeable worst case. The plant and equipment for the onshore substation are detailed in ES Appendix 26.4 Operational Noise Calculations (Document Reference: 3.3.63).

26.5 Existing environment

26.5.1 Baseline noise environment

118. An understanding of the baseline noise environment is required to determine the significance of potential noise effects during both construction and operational phases of the Project.

119. Five NVSR locations at the landfall, labelled with the prefix Landfall Receptor (LFR), have been identified, 38 along the onshore cable route, labelled Cable Route Receptor (CRR), seven with the potential to be impacted by construction traffic, labelled Construction Traffic Receptor (CTR), three with the potential to be impacted by Bentley Road improvement works, labelled Bentley Road Receptor (BRR), and ten at the onshore substation, labelled Substation Receptor (SSR). These are presented in Table 26.17 and shown in Figure 26.1 (SSR), Figure 26.2 (LFR), Figure 26.3 (CRR) and Figure 26.4 (CTR) ((Document Reference: 3.2.22). So that the assessment is proportionate, not every potentially sensitive location is identified as a separate NVSR. Where appropriate, groups of residential dwellings have been assigned one NVSR identifier. Addresses are not provided for individual residential dwellings to ensure confidentiality but where a group of dwellings is represented, the location is provided.

Table 26.17 Onshore NVSRs included in the assessment

NVSR identifier	Coordinates		Classification and description	Sensitivity
	X	Y		
Landfall				
LFR1	623310	218604	Recreational – Frinton beach huts	Low
LFR2	623378	218912	Recreational – Frinton golf course club house	Low
LFR3	623230	219271	Residential cluster at western end of Holland Road	Medium
LFR4	621945	219290	Residential cluster on south side of Church Lane	Medium
LFR5	621687	217231	Residential – two dwellings at eastern end of Manor Way	Medium
Onshore Cable Route				
CRR1	621145	218761	Residential	Medium
CRR2	621083	219093	Residential cluster on south side of Little Clacton Road	Medium
CRR3	620358	218965	Residential	Medium
CRR4	620363	219007	Residential	Medium
CRR5	620623	219030	Residential cluster on south side of Little Clacton Road	Medium
CRR6	620542	219042	Residential	Medium
CRR7	620429	219055	Residential – two dwellings on north side of Little Clacton Road	Medium
CRR8	620615	219088	Residential	Medium
CRR9	620369	219336	Residential	Medium

NVSR identifier	Coordinates		Classification and description	Sensitivity
	X	Y		
CRR10	620490	220102	Residential	Medium
CRR11	620210	220557	Residential	Medium
CRR12	620174	221318	Residential – The Firs Care Home	Medium
CRR13	619702	221651	Residential cluster off B1033	Medium
CRR14	618660	222703	Residential cluster off Ronson Drive	Medium
CRR15	618583	222793	Residential – two dwellings off B1414	Medium
CRR16	618645	223038	Residential cluster on west side of B1414	Medium
CRR17	617621	223200	Residential cluster on south side of Golden Lane	Medium
CRR18	616752	223564	Residential	Medium
CRR19	616376	224060	Residential – two dwellings on north side of B1035	Medium
CRR20	616646	224242	Residential cluster on east side of Swan Road	Medium
CRR21	615871	224188	Residential	Medium
CRR22	614971	224893	Residential cluster on Lodge Lane	Medium
CRR23	615332	226306	Residential	Medium
CRR24	614753	226110	Residential	Medium
CRR25	614024	226070	Residential cluster on north side of Parsonage Lane	Medium
CRR26	614189	226597	Residential	Medium
CRR27	613505	226691	Residential	Medium
CRR28	613140	227115	Residential	Medium
CRR29	612465	227129	Residential	Medium
CRR30	613247	227639	Residential – two dwellings on Colchester Road	Medium
CRR31	612362	227483	Residential	Medium
CRR32	612565	228227	Residential	Medium
CRR33	612114	227623	Residential	Medium
CRR34	612099	228132	Residential cluster on west side of the B1035	Medium
CRR35	610396	227161	Residential	Medium
CRR36	610150	227442	Residential	Medium
CRR37	609026	227840	Residential	Medium
CRR38	608441	228484	Residential	Medium
Construction Traffic				
CTR1	611274	226570	Residential	Medium
CTR2	611220	226577	Residential	Medium
CTR3	611136	226669	Residential	Medium
CTR4	610919	226875	Residential	Medium
CTR5	610883	226905	Residential	Medium
CTR6	610697	227055	Residential	Medium
CTR7	610645	227079	Residential	Medium
Bentley Road improvement works				

NVSR identifier	Coordinates		Classification and description	Sensitivity
	X	Y		
BRR1	610401	227159	Residential	Medium
BRR2	611304	226522	Residential	Medium
BRR3	611242	226344	Residential	Medium
Onshore substation				
SSR1	607236	229625	Residential	Medium
SSR2	607135	229511	Residential	Medium
SSR3	607189	229356	Residential	Medium
SSR4	607173	228964	Residential	Medium
SSR5	607256	228374	Residential	Medium
SSR6	607731	227827	Residential	Medium
SSR7	608446	228492	Residential	Medium
SSR8	608753	228577	Residential	Medium
SSR9	609061	228932	Residential	Medium
SSR10	609483	229368	Residential	Medium
SSR11	608681	230164	Residential	Medium
SSR12	607379	229920	Residential	Medium

26.5.1.1 Survey procedures

120. The baseline noise survey comprised of unattended contiguous 15-minute measurements for a total of approximately 24-hours at the landfall location and 11 to 12 days at the onshore substation. Measurements were conducted in accordance with current guidance including BS 4142 and BS 7445.

121. No baseline noise measurements were obtained along the onshore cable route to inform the construction phase noise assessment. It was agreed during the EPP with Tendring District Council that a conservative approach would be to use the lowest threshold (for the BS 5228-1 'ABC method') at all identified NVSRs for the assessment of construction noise.

122. Measurement locations (representative of individual or groups of NVSRs) were identified and agreed with Tendring District Council, as provided in Table 26.18 and displayed in Figure 26.1 (Document Reference: 3.2.22) for the onshore substation and Figure 26.2 (Document Reference: 3.2.22) for the landfall. Also displayed is the NVSR represented by the measurement location.

Table 26.18 Baseline sound survey measurement locations

NVSR identifier	Coordinates		Represented receptors
	X	Y	
Landfall			
LFM1	623316	218954	LFR1, LFR2 and LFR5
LFM2	623253	219263	LFR3
LFM3	622002	219278	LFR4

NVSR identifier	Coordinates		Represented receptors
	X	Y	
Onshore substation			
SSM1	608736	230032	SSR11
SSM2	609218	230001	SSR10
SSM3	609148	229057	SSR9
SSM4	608433	228510	SSR6, 7 and 8
SSM5	607201	228946	SSR3, 4 and 5
SSM6	607511	229516	SSR1 and 2

123. Details of the baseline survey sound procedures are provided in ES Appendix 26.1 Baseline Noise Survey and Acoustic Terminology (Document Reference: 3.3.60).

26.5.1.2 Survey results

124. The purpose of the baseline noise measurement survey at the landfall was to enable the assessment of potential landfall construction noise impacts. To inform the assessment, the measured L_{Aeq} levels have been separated into the daytime, evening and weekends and night-time periods specified in BS 5228-1, as shown in Table 26.19.

Table 26.19 Measured baseline sound levels for construction assessment – landfall

Measurement location	Start date and time (dd/mm/yy, hh:mm)	End date and time (dd/mm/yy, hh:mm)	L_{Aeq} (dB)		
			Daytime	Evenings and weekends	Night-time
LFM1	07/07/22, 13:30	08/07/22, 13:15	50	41	35
LFM2	07/07/22, 13:45	08/07/22, 13:45	43	41	34
LFM3	07/07/22, 12:15	08/07/22, 12:30	48	41	28

125. The purpose of the baseline noise measurement survey at the onshore substation was to enable the assessment of potential onshore substation construction and operational noise impacts. To inform the construction assessment, the measured L_{Aeq} levels have been separated into the daytime, evening and weekends and night-time periods specified in BS 5228-1, as shown in Table 26.20. To inform the operational noise assessment, the measured L_{Aeq} and L_{A90} levels have been separated into the daytime and night-time periods specified in BS 4142, as shown in Table 26.21.

Table 26.20 Measured baseline sound levels for construction assessment – onshore substation

Measurement location	Start date and time (dd/mm/yy, hh:mm)	End date and time (dd/mm/yy, hh:mm)	L_{Aeq} (dB)		
			Daytime	Evenings and weekends	Night-time
SSM1	08/07/22, 16:00	20/07/22, 10:30	44	39	35
SSM2	08/07/22, 16:30	20/07/22, 10:30	46	43	34

Measurement location	Start date and time (dd/mm/yy, hh:mm)	End date and time (dd/mm/yy, hh:mm)	L_{Aeq} (dB)		
			Daytime	Evenings and weekends	Night-time
SSM3	07/07/22, 16:30	19/07/22, 08:00	41	38	32
SSM4	07/07/22, 16:45	18/07/22, 23:15	44	39	34
SSM5	07/07/22, 19:15	18/07/22, 21:30	47	44	35
SSM6	08/07/22, 17:45	20/07/22, 09:45	45	42	36

Table 26.21 Measured baseline sound levels for operation assessment – onshore substation

Measurement location	L_{Aeq} (dB)		L_{A90} (dB)	
	Daytime	Night-time	Daytime	Night-time
SSM1	42	35	30	22
SSM2	45	34	33	22
SSM3	40	32	29	21
SSM4	42	34	26	23
SSM5	46	35	32	25
SSM6	44	36	34	24

26.5.2 Baseline vibration environment

126. No significant sources of vibration have been identified in the vicinity of the Project; hence, baseline vibration levels are assumed to be negligible. The adopted construction vibration assessment criteria, described in Section 26.4.3.5, are independent of the baseline vibration levels; therefore, an understanding of the baseline vibration environment is not required.

26.5.3 Future trends in baseline conditions

127. In the event that North Falls is not developed, an assessment of the future baseline noise conditions has been carried out and is described within this section.

128. As discussed in Section 26.4.1.2, UK planning policy such as the NPPF (para. 185) requires that new development incorporates mitigation measures to reduce potential adverse noise impacts to a minimum; hence, in general, developments which significantly increase noise in the study area would not be expected to be granted consent. In addition to planning controls there is a clear trend for noise from vehicle, commercial and industrial sources to be driven down in compliance with stricter legislation and guidance as well as consumer expectations.

129. Future road traffic sound levels are unlikely to be significantly changed by the ongoing transition from combustion engine road vehicles to electric vehicles. Recent research has shown that electric vehicles are quieter than combustion engine vehicles at very low speeds (approximately <30km/h), but at higher

speeds (i.e. typical driving speeds) there is unlikely to be a significant change in road noise as the dominant source of sound is from the tyre-road interaction, not the engine.

130. The baseline noise monitoring survey identifies the existing soundscape within the study area and the sources which are contributing to it. In the absence of evidence to the contrary, it is reasonable to assume that the contributing noise sources will not change over time. Hence, changes in future baseline noise levels will depend on the change in noise emissions from the identified sources.

131. In general, the dominant sources contributing to the baseline sound climate were aircraft, road traffic and sounds typical of a rural environment, such as bird call and farm machinery. Road traffic and aircraft noise levels depend on road traffic flows and individual vehicle / plane noise levels. Traffic flows and aircraft movements are generally expected to increase in line with expectations for macro-economic expansion; however, as discussed above, vehicle and aircraft noise levels are expected to reduce over time. Farm machinery noise levels would also be expected to reduce as old equipment is replaced with newer, quieter versions.

132. It is reasonable to anticipate that the trend for increased economic activity to increase baseline noise levels would be balanced out by the effect of planning controls and reductions in source noise emissions. This would result in no change in overall baseline noise conditions in the study area.

26.6 Assessment of significance

26.6.1 Likely significant effects during construction

26.6.1.1 Impact 1: Noise of landfall and nearshore works

26.6.1.1.1 Magnitude of impact

133. The landfall and nearshore works have been divided into those which are onshore and offshore. Onshore works will be in the landfall compound and will comprise HDD, cable pull, transition joint bay installation and cable jointing. Offshore (nearshore) works comprise dredging of the landfall HDD exit pit.

134. The noisiest onshore works at the landfall compound will comprise site preparation, excavation of transition bays and the HDD works. The site preparation and excavation works will be undertaken during the standard working hours for the Project (07:00 to 19:00 hours, Monday to Saturday, with no activities on Sundays or bank holidays, with limitations on noisy working from 13:01 to 19:00 on Saturdays), and the HDD activities may involve 24-hour working for short periods of time during active drilling.

135. Based on the measured sound levels reported in Table 26.19, in accordance with the methodology specified in Table 26.7, all the landfall NVSRs are category A i.e. the Threshold Values for construction noise impacts are:

- Daytime: 65dB L_{Aeq};
- Evenings and weekends: 55dB $L_{Aeq;}$ and
- Night-time: 45dB $L_{Aeq.}$

136. Assumptions regarding construction plant for each activity are provided in ES Appendix 26.3 Construction Noise and Vibrations Calculations (Document Reference: 3.3.62) in addition to the predicted noise level at each NVSR.

137. Nearshore works associated with construction of the offshore cable corridor have the potential to impact the identified NVSRs at the landfall. The landfall HDD exit will be located within the offshore cable corridor and the closest NVSR is LFR1, at least 270m away. The maximum predicted daytime construction noise level at LFR1 due to the noise from the dredge is 54dB L_{Aeq}. This is below the daytime Threshold Value of 65dB L_{Aeq} and the evening and weekend Threshold Value of 55dB L_{Aeq}. According to the criteria in Table 26.8, this represents an impact of negligible magnitude during both reference time periods.

138. The landfall compound is at least 650m from any identified NVSR; hence, landfall construction works are not anticipated to have the potential to cause significant effects and are not assessed further.

26.6.1.1.2 Significance of effect

139. LFR1 is of low sensitivity; hence, the predicted impact of landfall and nearshore works noise results in an effect of negligible significance, i.e. not significant in EIA terms, during the daytime and 'evening and weekends' reference period. No additional mitigation is therefore required.

26.6.1.2 Impact 2: Noise of onshore cable route works

26.6.1.2.1 Magnitude of impact

140. Separate noise modelling scenarios have been created for the following onshore cable route construction activities. These activities may not occur in the stated sequence in all cases, but different activities from the list below are not anticipated to occur simultaneously in a way which would result in elevated noise levels at an NVSR:

1. TCC and site access establishment
2. Onshore cable route preparation, including fencing, haul road construction and topsoil strip
3. Onshore cable route trench excavation, duct installation, trench backfill and trenchless crossing works (daytime)
4. Trenchless crossing compound establishment
5. Trenchless crossing works (evening activities)
6. Trenchless crossing works (night-time activities)
7. Trenchless crossing compound re-instatement
8. Jointing bay excavation
9. Jointing bay base construction
10. Pulling and connection of cables
11. Backfill over jointing bays
12. Onshore cable route trench reinstatement, topsoil reinstatement, haul road removal, removal of fencing and reinstatement

13. TCC and site access reinstatement

141. The noise from the TCCs and HGVs using the haul road are included in calculation scenarios 2 to 13.

142. Activities at proposed TCCs, trenchless crossings, jointing bays and haul road operation are at fixed locations which will be present for at least 10-days in 15. The remaining activities will move along the onshore cable route. The realistic worst case rates at which they will progress have been calculated to be as follows:

- Route preparation – 34.3m/day;
- Trench excavation and backfill – 21.2m/day; and
- Re-instatement works – 38.3m/day.

143. Based on the above speeds, the modelling has been used to identify the maximum daytime noise level that will be exceeded for at least 10-days in any 15 from these works (the minimum duration for an impact to potentially cause a significant effect, as stated in Section 26.4.3.3). Each of these mobile activities will be separated by a gap of at least 15 days at any one location; hence, their impacts have been considered separately.

144. The onshore cable route works are currently planned to be undertaken during the standard working hours for the Project (07:00 to 19:00 hours, Monday to Saturday, with no activities on Sundays or bank holidays). The embedded mitigation in the OCoCP (Document Reference: 7.13) specifies that no high impact construction work will be carried out during Saturday afternoon, between the hours of 13:00 and 19:00. Therefore, all construction works have been assessed against daytime criteria with the exception of trenchless crossings.

145. Trenchless crossing works may continue through the evening (which includes Saturday afternoon) and potentially the night-time periods. Five crossings have been identified to potentially require regular 24-hour works, and are listed below and shown on Figure 26.3 (Document Reference: 3.2.22).

- TX-12 crossing the railway line;
- TX-23 crossing Swan Road north-west of Thorpe-le-Soken;
- TX-24 crossing B1035 Thorpe Road / Tendring Road north-west of Thorpe-le-Soken;
- TX-26 crossing Tendring Brook and Lodge Lane east of Goose Green; and
- TX-31 crossing the A120 east of Horsley Cross.

146. All other crossings may briefly and occasionally continue drilling into the night-time period to complete a drill or reach a safe point to stop for the day. These occasional over-runs could result in exceedances of the night-time construction noise threshold values, but would not occur regularly enough to exceed ten days in any 15 consecutive days. Hence, night-time works at all other trenchless crossings will not result in significant effects.

147. Ordnance Survey Address Base data has been used to identify the number of medium sensitivity NVSRs within the study area (there are no high sensitivity identified NVSRs within the study area) potentially exposed to impacts of

medium or high magnitude, as shown in Table 26.22 and illustrated in Figure 26.5 (daytime), 26.6 (evenings and weekends) and 26.7 (night) (Document Reference: 3.2.22). It should be noted that, where modelled activities are at the same location, (e.g. TCC establishment and reinstatement, or jointing bay excavation, base construction, cable pulls and backfill) the same receptors are identified multiple times as affected by each activity.

Table 26.22 Number of NVSRs at which impacts are predicted, grouped by magnitude of impact

Activity	Low	Medium	High
TCC and site access establishment	0	0	2
Onshore cable route preparation, including fencing, haul road construction and topsoil strip	0	0	0
Onshore cable route trench excavation, duct installation, trench backfill and trenchless crossing works (daytime)	11	3	2
Trenchless crossing compound establishment	1	0	0
Trenchless crossing works (evening)	9	7	6
Trenchless crossing works (night)	3	1	7
Trenchless crossing compound re-instatement	7	1	1
Jointing bay excavation	5	1	7
Jointing bay base construction	6	0	1
Pulling and connection of cables	6	0	1
Backfill over jointing bays	5	0	7
Onshore cable route trench reinstatement, topsoil reinstatement, haul road removal, removal of fencing and reinstatement	0	0	0
TCC and site access reinstatement	0	0	2

148. For each of the above activities, the NVSRs anticipated to experience the worst case impact have been identified, and the noise level which will be exceeded for the worst case ten days is provided in Table 26.23.

Table 26.23 Worst case predicted impacts for each activity

Activity	NVSR location	Maximum construction noise level predicted to be exceeded for at least 10-days in any 15 (dB $L_{Aeq,T}$)	Magnitude of impact
TCC and site access establishment	CRR29	79	High
Onshore cable route preparation, including fencing, haul road construction and topsoil strip	CRR7, CRR36 and CRR38	61	Negligible
Onshore cable route trench excavation, duct installation, trench backfill and trenchless crossing works (daytime)	CRR7	71	High
Trenchless crossing compound establishment	CRR36	66	Low
Trenchless crossing works (evening)	CRR36	66	High

Activity	NVSR location	Maximum construction noise level predicted to be exceeded for at least 10-days in any 15 (dB $L_{Aeq,T}$)	Magnitude of impact
Trenchless crossing works (night)	CRR19	57	High
Trenchless crossing compound re-instatement	CRR36	71	High
Jointing bay excavation	CRR7	81	High
Jointing bay base construction	CRR7	74	High
Pulling and connection of cables	CRR7	75	High
Backfill over jointing bays	CRR7	80	High
Onshore cable route trench reinstatement, topsoil reinstatement, haul road removal, removal of fencing and reinstatement	CRR36	64	Negligible
TCC and site access reinstatement	CRR29	78	High

26.6.1.2.2 Significance of effect

149. The modelling has accounted for the duration of the activities and all identified affected NVSRs are residential dwellings. None of the additional factors identified in BS 5228-1 (as discussed in Section 26.4.3.3) are considered relevant to the impacts of the onshore cable route construction works.

150. Hence, without mitigation, the predicted construction noise impacts of medium and high magnitude result in effects of moderate and major significance respectively, which is considered significant in EIA terms. These effects are as a result of the following activities:

- TCC establishment and re-instatement – major adverse effects predicted at two NVSRs, these are specifically due to works at the proposed Section 1a and Section 4b TCCs.
- Onshore cable route trench excavation, duct installation, trench backfill and trenchless crossing works (daytime) – moderate adverse effects predicted at three NVSRs and major adverse at a further two NVSRs. These are due to the noise of daytime working at trenchless crossings. These NVSRs are a subset of those identified as affected by trenchless crossing works during the evening.
- Trenchless crossing works during the evening (all crossings) – moderate adverse effects predicted at seven NVSRs and major adverse at a further six NVSRs. The significant adverse effects are predicted due to the worst case assumption that an entry pit is located in the following compounds (for each trenchless crossing, the proposed compounds have been identified as north or south):
  - TX-03 North
  - TX-04 South
  - TX-20 North
  - TX-23 North
  - TX-32 North
  - TX-33 South

- TX-05 North
- TX-07 North
- TX-12 North
- TX-15 South
- TX-19 North
- TX-24 South
- TX-26 North
- TX-28 South
- TX-31 South
- TX-37 North
- TX-38 North
- TX-39 South
- TX-40 North

- Trenchless crossing works during the night – moderate adverse effects predicted at one NVSR and major adverse effects predicted at seven NVSRs. These NVSRs are a subset of those identified as affected by trenchless crossing works during the evening. These effects are due to the worst case assumption that an entry pit is located in the following compounds: TX-23 North, TX-24 South, TX-26 North and TX-31 South.
- Works at jointing bays – moderate adverse effects predicted at one NVSR and major adverse effects predicted at seven NVSRs. These are all associated with assumed worst case locations for the jointing bays.

26.6.1.2.3 Additional mitigation

151. Embedded mitigation includes refinement of the onshore cable route working width within the onshore cable route during the final design process, post-consent. This refinement will be used to minimise noise effects, primarily by maximising the distance from the onshore cable route construction works to the closest NVSRs where feasible. As discussed in Section 26.4.6, the assessment is based on locating the onshore cable route construction works at a worst case potential location for each NVSR inside the onshore cable route.

152. Where, in spite of the embedded mitigation, including the project design process and BPM, significant effects are anticipated to remain, the following further mitigation measures will be considered and included in the CoCP, where applicable and practicable:

- Limiting working hours to avoid the most noise-sensitive times such as weekends;
- Selection of quieter plant, equipment or working methods;
- Use of additional silencers and / or enclosures around noisy equipment;
- Reduced numbers of plant during sensitive periods;
- Reduced on-time of plant during sensitive periods;
- Interspersing of noisy works between quieter works to provide periods of respite;
- Phasing of the works to ensure that the noisiest operations are performed during the least sensitive times and vice-versa;
- Review of the construction programme to minimise the duration of the works at the closest approach to properties where practicable to give periods of respite; and
- Temporary screening. BS 5228-1 indicates that screening provides 5 to 10dB of attenuation, but the effectiveness is dependent on the position of

the barrier between the source and receiver and its height. The standard states: "*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*".

153. The OCoCP (Document Reference: 7.13), submitted as part of the DCO application, includes a range of appropriate mitigation options for the significant effects identified. The contractor appointed to construct the Project will select the mitigation measures from the options identified in the OCoCP (Document Reference: 7.13) to achieve the required overall noise level attenuation, following detailed design. These measures will be included in the final CoCP (preparation of which will be secured through a DCO Requirement) along with standard BPM.

26.6.1.2.4 Residual significance of effect

154. The proposed embedded mitigation to refine the onshore cable route design is anticipated to reduce the residual effect significance by increasing the distance from the works to the NVSRs where feasible. The noise model has been used to identify the potential for design refinement mitigation measures to reduce impacts, with and without additional mitigation, as discussed in the following paragraphs.

155. To mitigate the effects from works at TCCs, if feasible, the post-consent detailed design process will move the Section 1a and Section 4b TCCs as far as possible from the nearby NVSRs (within the identified potential TCC areas). Modelling has identified that this reduces the effects of activities within those compounds (and therefore the effects of all works in TCCs) during establishment, operation and reinstatement to negligible (noise levels below 65dB L_{Aeq}) without the need for additional mitigation.

156. To mitigate the effect of jointing bay construction noise, where feasible, jointing bays will be located at least 100m from the closest NVSR. This would reduce predicted noise levels to below 68dB L_{Aeq} without additional screening. Potential alternative jointing bay locations have not been identified; hence, no further modelling has been undertaken of this mitigation measure.

157. Locating trenchless crossing entry pits in the furthest compound from the worst affected NVSRs (i.e. not those identified in Section 26.6.1.2.2) reduces impacts at affected NVSRs. To be clear, where the "North" trenchless crossing compound has been identified, locating the entry pit in the "South" compound would reduce effects and vice versa. With this mitigation option applied, the worst case effect due to the formation, operation or reinstatement of trenchless crossings is reduced during normal daytime working hours to negligible. This option also reduces the effect of the combined onshore cable route trench excavation, duct installation, trench backfill and trenchless crossing works to negligible.

158. With the design refinement embedded mitigation in place, it has been shown that all residual effects have been reduced to no worse than minor adverse i.e. not significant, except for noise from the following activities which are considered potentially significant:

- Trenchless crossing works during the evening at the following locations:

- TX-05 South, causing a moderate adverse effect at CRR4 and a major adverse effect at CRR3, 5, 6 and 7;
- TX-20 South, causing a major adverse effect at CRR15;
- TX-37 South, causing a major adverse effect at CRR36; and
- TX-40 South, causing a major adverse effect at CRR38.

159. The worst affected NVSR from these residual effects during the evening is CRR36, with a predicted noise level of 64dB L_{Aeq}.

- Trenchless crossing works during the night at the following locations:
  - TX-12 South, causing a major adverse effect at CRR11;
  - TX-23 South, causing a major adverse effect at CRR20;
  - TX-24 North, causing a major adverse effect at CRR19;
  - TX-26 South, causing a moderate adverse effect at CRR22; and
  - TX-31 North, causing a major adverse effect at CRR30.

160. The worst affected NVSR is from these residual effects during the night is CRR19, with a predicted noise level of 58dB LAeq.

- Jointing bays within 60m of an NVSR.

161. An additional mitigation option is to introduce further screening, such that the already assumed insertion loss of 5dB is increased to 10dB, as per BS 5228-1 (quoted in Section 26.6.1.2.3).

162. With additional screening, the minimum distance from a jointing bay to an NVSR which avoids significant effects is reduced to 60m. It is reasonable to assume that the combination of embedded and additional mitigation can reduce the significance of effect of works at jointing bays to no worse than minor i.e. not significant in EIA terms.

163. Combined with the embedded mitigation, this additional screening reduces effects of trenchless crossing works during the weekend and evening periods to no worse than minor, except at CRR36 (TX-37 South), where the residual effects are moderate but the threshold for the onset of medium impacts (moderate effects) is only exceeded by 1dB. Effects at night are reduced to no worse than minor at the identified NVSRs, except CRRs 20 (TX-23 South) and 30 (TX-31 North), where the residual effects are moderate, and CRR19 (TX-24 North), where the residual effect is major.

164. Further specialist mitigation may be required to operate trenchless crossing compounds at night in these locations. It may also be needed where it is not practicable to use the embedded mitigation to eliminate significant effects, e.g. where other factors such as ground conditions mean that the entry pit must be in the worst case trenchless crossing compound location. Enclosures or the use of modern quiet equipment could provide further reductions of 5dB. Alternatively, high noise emitting equipment could be sunk below ground level such that the insertion loss of screening elements such as topsoil bunds and trenchless crossing entry pit walls could achieve 15dB. The implementation of either of these two options would reduce the worst case effect magnitude to minor at any time of day.

165. Significant effects have been predicted on the basis of draft construction plant lists and programme. The draft plant lists have been prepared on a conservative basis to represent a likely worst case over the duration of the construction programme and reflect the current understanding of the likely plant requirements. Actual selection of plant and plant on-times are subject to change once the Project is consented and a construction contractor is appointed. As such, it is considered that the predicted construction noise levels are representative of a worst case, and that actual construction noise levels would likely be lower than predicted, for most of the works' duration. The assessment is therefore representative of the envelope in which noise impacts may occur, whilst in practice the noise impacts may be lower than predicted.

166. The delivery of the mitigation outlined above would result in residual effects which are not significant. The final CoCP will identify the final mitigation measures to be implemented, which will be selected from the range of options identified in the CoCP. The final CoCP will include any required modelling or assessment to demonstrate that the final mitigation package ensures that residual construction noise effects due to the onshore cable route construction works are not significant in EIA terms.

26.6.1.3 Impact 3: Noise of onshore substation works

26.6.1.3.1 Magnitude of impact

167. The onshore substation works will comprise:

- Creation of a new construction access and onshore substation TCC;
- Onshore substation site grading earthworks;
- Laying of foundations, drainage and trenches;
- Platform formation;
- Building construction;
- Electrical plant installation; and
- 400kV cable route connection.

168. Based on the measured sound levels reported in Table 26.20 and in accordance with the methodology specified in Table 26.7, the category A Threshold Values are applicable to all the onshore substation NVSRs.

169. Assumptions regarding construction plant for each activity are provided in ES Appendix 26.3 Construction Noise and Vibrations Calculations (Document Reference: 3.3.62) in addition to the predicted noise level at each NVSR. The assessment has identified the impact of the worst case of the proposed works (site grading earthworks, laying of foundations and building fabrication works), other proposed works will result in lower impacts than identified.

170. The predicted onshore substation construction noise levels are all below the daytime Threshold Value, meaning that daytime impacts are of negligible magnitude.

26.6.1.3.2 Significance of effect

171. NVSRs surrounding the onshore substation location are identified to be of medium sensitivity; therefore, the predicted construction noise impacts result in effects of negligible significance, considered not significant in EIA terms. Hence, additional mitigation is not proposed.

26.6.1.4 Impact 4: Noise from road improvements to Bentley Road and the A120

26.6.1.4.1 Magnitude of impact

172. Assumptions regarding construction plant for each activity are provided in ES Appendix 26.3 Construction Noise and Vibrations Calculations (Document Reference: 3.3.62). This includes noise from the following activities:

- Improvements to the junction between Bentley Road and the A120, which will last around four weeks;
- Widening of Bentley Road (which includes addition of the non-motorised user route), anticipated to start once the junction improvements are complete and progress at a rate of around 12m per day; and
- Use of a crusher throughout the works which, if required, would be located in the closest TCC.

173. 3-d noise modelling has been undertaken to identify the noise level that will be exceeded during the worst case 10-days in any 15 during the works at the NVSRs identified as having the potential to be affected by these works (BRR1 to BRR3 and CTR1 to CTR7). Table 26.24 details the modelling results.

Table 26.24 Bentley Road improvement works noise modelling results

NVSR location	Maximum construction noise level predicted to be exceeded for at least 10-days in any 15 (dB $L_{Aeq,T}$)	Magnitude of impact
CTR1	72	High
CTR2	72	High
CTR3	76	High
CTR4	73	High
CTR5	75	High
CTR6	75	High
CTR7	69	Medium
BRR1	60	Negligible
BRR2	68	Low
BRR3	56	Negligible

174. The cause of the predicted worst case impacts at CTR2 to CTR7, BRR1 and BRR3 is the works widening Bentley Road. At CRT1 and BRR2, the cause of the impacts is the A120 junction improvements. The noise from the crusher is not a significant contributor to the overall predicted noise level except at BRR1.

26.6.1.4.2 Significance of effect

175. The identified NVSRs are all residential properties which are medium sensitivity receptors. None of the additional factors identified in BS 5228-1 are considered

relevant to the identified impacts. Hence, without mitigation, the predicted construction noise impacts of medium (CTR7) and high magnitude (CTR1 to 6) result in effects of moderate and major significance respectively, which is considered significant in EIA terms.

26.6.1.4.3 Additional mitigation

176. The additional measures identified in Section 26.6.1.2.3 may be required to mitigate construction noise impacts if, following any design refinement, significant noise effects are still predicted. These will be specified in the final CoCP.

26.6.1.4.4 Residual significance of effect

177. The calculations of impact magnitude have not accounted for any screening. Assuming temporary site hoarding is implemented, this can achieve 5 to 10dB of screening. 5dB of screening would reduce impacts to no worse than minor adverse at CTR1, CTR2, CTR4 and CTR7. To avoid significant effects at CTR3, CTR5 and CTR6, it would be necessary to mitigate construction noise levels by 6 to 8dB. It is reasonable to assume such mitigation could be implemented if required (e.g. through the screening outlined above), as will be identified in the final CoCP. Hence, residual effects are considered not significant in EIA terms.

26.6.1.5 Impact 5: Noise from off-site construction traffic

178. The Transport Assessment provided in ES Appendix 27.1 (Document Reference: 3.3.64) of ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29) details those roads links subject to increased vehicle movements during the Project's construction. These road links are presented in ES Figure 27.1 (Document Reference: 3.2.23).

179. Traffic data for these road links were provided for a baseline year (assumed first year of construction) ('without the Project' scenario) and baseline year plus development ('with the Project' scenario). The baseline data are provided based on the first year of construction (currently assumed to be 2027). It is anticipated that later years would have higher baseline traffic flows so the calculated change in flows due to the Project is maximised by assuming the earliest possible construction year.

180. The traffic noise assessment assesses the following situations:

- Baseline versus Baseline + Peak Construction; and
- Baseline versus Baseline + Average Construction.

181. For each situation (detailed above) and road link, a BNL was calculated to determine the short-term relative change from construction traffic associated with the Project. The road links assessed are provided in full detail in ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61).

182. The CRTN calculation method does not account for any potential changes in vehicle noise over time. Hence, the magnitude of impact is only dependent on the change in traffic flow, so assuming the earliest realistic construction year ensures a worst case effect has been determined.

26.6.1.5.1 Magnitude of impact

183. The construction road traffic noise assessment predicts changes in $L_{A10,18hr}$. A <1dB change in BNL (a negligible magnitude of impact according to Table 26.9)

is predicted at 43 of the road links during peak construction traffic flows. Changes of 1 to 2.9dB (low impact) are predicted on two road links and ≥ 5dB (high) at one link (link 4 (Bentley Road between the onshore route and the A120)). Separate BNL calculations using the forecast average construction traffic flows indicate 44 links experiencing negligible impacts, 1 experiencing a low impact and the impact on Bentley Road is reduced to moderate. These calculations are detailed in full in ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61).

26.6.1.5.2 Significance of effect

184. The seven NVSRs identified with the potential to be impacted by construction traffic noise (CTR1 to CTR7 listed in Table 26.17 and shown in ES Figure 26.4 (Document Reference: 3.2.22)) are all the residential properties within 50m of Bentley Road. These are all medium sensitivity receptors and no other NVSRs have been identified along this link.

185. As discussed in Section 26.4.3.4, to assess a potential worst case, there are assumed to be residential NVSRs along all the identified remaining road links i.e. receptors of medium sensitivity. The worst case effects on NVSRs due to the identified negligible and low magnitude impacts will be of negligible and minor significance respectively, not considered significant in EIA terms.

186. To further analyse the potential impacts associated with the traffic on Bentley Road, road traffic noise levels at the identified NVSRs have been calculated for comparison with the LOAEL and SOAEL criteria in Section 26.4.3.4, as shown in ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61). Table 26.25 provides the predicted impacts according to the criteria in Table 26.9 and comparison with the identified LOAEL and SOAELs.

Table 26.25 Predicted road traffic noise impacts

NVSR	Change in road traffic noise level due to construction traffic (dB $L_{A10,18h}$)	Magnitude of Impact	Difference between predicted traffic noise level and LOAEL (dB $L_{A10,18h}$)		Difference between predicted traffic noise level and SOAEL (dB $L_{A10,18h}$)	
			Baseline traffic	Baseline plus peak construction traffic	Baseline traffic	Baseline plus peak construction traffic
CTR1	3.2	Medium	12	15	-1	2
CTR2	2.1	Low	3	5	-10	-8
CTR3	6.1	High	6	13	-7	-1
CTR4	4.1	Medium	0	4	-13	-9
CTR5	4.3	Medium	0	4	-13	-9
CTR6	5.5	High	4	10	-9	-4
CTR7	4.8	Medium	-2	3	-15	-10

187. Table 26.25 shows that impacts of medium magnitude are predicted at four NVSRs and high magnitude at a further two NVSRs. According to the matrix in Table 26.15, these impacts equate to effects of moderate and major adverse significance respectively i.e. potentially significant in EIA terms.

188. The identified effects are due to the traffic generated during the 'worst case week' in the construction phase. As this is shorter than ten days, the predicted impact does not necessarily indicate a significant effect. The impact over the worst case ten-day period will be lower than predicted but these flows are not known.

189. The only alternative traffic data which could be used in the assessment are the average across the periods of the construction schedule when construction traffic is forecast to use the identified link. These would disregard shorter periods when flows could be much higher than the average, thereby underestimating the noise impact. Hence, average data has not been used and instead the 'worst case week' flows have been used to assess the potential worst case effect as the most relevant data available.

190. At all NVSRs except CTR1, the predicted 'with peak construction' road traffic noise levels are below the SOAEL; hence, the effects of construction traffic noise impacts are considered not significant, irrespective of the noise level change. At CTR1, the SOAEL is predicted to be exceeded and the change results in a medium impact, equating to a moderate adverse effect i.e. significant in EIA terms.

26.6.1.5.3 Additional mitigation

191. The off-site construction road traffic is predicted to result in large noise level changes at the majority of NSRs on Bentley Road, although these are only anticipated to result in significant effects at CTR1. To comply with the second aim of the NPSE (minimise effects above the LOAEL) as well as the first aim (avoid effects above the SOAEL), the following potential measures to mitigate all these road traffic noise effects have been identified:

- Temporary screening between the road and the NVSR. This is potentially feasible for the majority of the NVSRs, and, if line of sight from the road is blocked, this should reduce road traffic noise levels by around 10dB;
- A reduction in peak LV trips through the promotion of car-sharing or contractor provided minibuses, etc;
- A reduction in peak daily HGV trips through measures such as:
    - Stockpiling of materials to reduce peak daily HGV demand;
    - Backhauling, i.e. using laden vehicles to import stone and export excavated material;
    - Optimising the size of HGVs to reduce the total number;
    - Incentivising the appointed construction Contractor to seek engineering refinements to reduce material quantities and therefore HGV numbers; and
    - The reuse of materials onsite to reduce offsite HGV trips, e.g. using excavated materials to form bunds, etc.
- A temporary reduction in the speed limit along Bentley Road.

26.6.1.5.4 Residual significance of effect

192. Additional calculations of the 'with peak construction traffic' road traffic noise levels have been undertaken, including a temporary 40mph speed limit on

Bentley Road, as shown in ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61). Table 26.26 provides the predicted mitigated impacts according to the criteria in Table 26.9 and comparison with the identified LOAEL and SOAELs.

Table 26.26 Predicted road traffic noise impacts with 40mph speed limit on link 4

NVSR	Change in road traffic noise level due to construction traffic (dB $L_{A10,18h}$)	Magnitude of Impact	Difference between predicted traffic noise level and LOAEL (dB $L_{A10,18h}$)		Difference between predicted traffic noise level and SOAEL (dB $L_{A10,18h}$)	
			Baseline traffic	Baseline plus peak construction traffic	Baseline traf	Baseline plus peak construction traffic
CTR1	2.3	Low	12	14	-1	1
CTR2	1.5	Low	3	5	-10	-8
CTR3	4.7	Medium	6	11	-7	-2
CTR4	2.7	Low	0	3	-13	-10
CTR5	2.8	Low	0	3	-13	-10
CTR6	4.0	Medium	4	8	-9	-5
CTR7	3.4	Medium	-2	1	-15	-12

193. Table 26.26 shows that predicted residual impacts with this speed limit in place are low at four NVSRs and medium at three NVSRs. However, predicted noise levels at all NVSRs are below the SOAEL except at CTR1 (exceedance of 1dB). The impact due to noise level change at CTR1 is low, equating to an effect of minor adverse significance. Hence, residual effects with this mitigation measure in place are not significant in EIA terms.

194. The final package of mitigation measures to avoid significant noise effects will be identified in the final Construction Traffic Management Plan (CTMP) and CoCP, preparation of which will be secured by DCO Requirement. As demonstrated above, mitigation measures are available to reduce the currently identified effects to a non-significant level.

26.6.1.6 Impact 6: Construction vibration

195. As discussed in Section 26.4.3.5, the assessment of construction vibration impacts is confined to the onshore cable route. As discussed in Section 26.4.3.5, the closest identified NVSRs to the landfall and onshore substation works area are further than 100m away; hence, no vibration impacts are anticipated due to construction of the landfall or onshore substation.

196. The construction activities with the potential to emit significant vibration have been identified. A vibratory compacting roller would be used during a number of the construction activities that take place within the onhsore cable route, the construction and removal of the TCCs and the construction and removal of the off-route access roads. In addition to the vibration generated during the drilling of a trenchless crossing, a supporting pile may be installed at the entry and / or exit pit of the bore. If required, the pile would be installed using a vibratory piling rig.

197. Table 26.27 lists the minimum set-back distances at which the vibration level criteria relevant to the potential for human annoyance (see Table 26.12) and cosmetic building damage (for transient vibration at a frequency of 4Hz, see Table 26.11) may occur for the identified activities. Set back distances were derived using the calculation methods provided in BS 5228-2. There is a 5% probability that the predicted vibration levels are exceeded. Further detail on the assumptions made to undertake these calculations are provided in ES Appendix 26.3 Construction Noise and Vibrations Calculations (Document Reference: 3.3.62).

Table 26.27 Predicted distances at which vibration levels may occur

Activity	Set-back distance at which vibration level (PPV indoors, ground-floor) occurs			Set-back distance at which vibration level (PPV outdoors, free-field) occurs	
	0.3 $mm.s^{-1}$	1.0 $mm.s^{-1}$	10 $mm.s^{-1}$	6 $mm.s^{-1}$	15 $mm.s^{-1}$
Rotary Piling (HDD) based on Ref.103 Table D.6 BS 5228-2	39m	15.2m	1.7m	1.4m	Not anticipated
Vibratory piling (start up and run down)	467m	171m	25m	23m	11m
Vibratory piling (steady state)	194m	82m	16m	15m	7.8m
Vibratory compaction (start-up and run down)	123m	48m	7.2m	6.7m	2.8m
Vibratory compaction (steady state)	87m	38m	7.3m	6.9m	3.2m

26.6.1.6.1 Magnitude of impact – disturbance

198. The closest NVSR to any proposed trenchless drilling activity is CRR7, which is around 18m away from TX-05. The vibration level inside the property due to HDD drilling has been calculated to be around 0.81$mm.s^{-1}$; the criteria in Table 26.12 show this equates to a disturbance impact of low magnitude.

199. Vibration from piling will be generated at the trenchless crossing entry and / or exit pits. The closest NVSR to any proposed trenchless crossing compound is CRR36, which is around 43m away from a compound associated with TX-37. The vibration level inside the property due to vibratory piling has been calculated to be around 5.2$mm.s^{-1}$ (start up and run down) and 2.5$mm.s^{-1}$ (steady state running). The criteria in Table 26.12 show this equates to a disturbance impact of medium magnitude.

200. Construction activities where a vibratory compactor would be used are: site preparation, haul road construction and TCC construction, jointing bay construction, ground reinstatement, removal of TCCs and haul roads and Bentley Road improvement works. A worst case assumption has been made that ground compaction associated with these activities could be undertaken anywhere within the onshore project area. The only NVSRs within 7.3m of the onshore project area are CTR1, CTR3 and CTR6. NVSRs within 48m of the onshore project area could experience vibration levels equating to moderate impacts during compaction equipment start-up and run-down, and within 38m during steady-state running.

26.6.1.6.2 Magnitude of impact – structural damage

201. Table 26.27 identifies the distances at which structural damage impacts could occur. For the majority of identified vibration generating activities, works are not anticipated to be undertaken within the identified distance thresholds at which a low impact is anticipated (6mm.s^{-1}); hence, the associated structural damage impacts will be negligible. The only exception to this is vibratory compaction as part of the Bentley Road improvement works, which is anticipated to be undertaken within 6.9m of CTR1, CTR3 and CTR6; hence, impacts of low magnitude are predicted at these NVSRs, but works are not anticipated to be undertaken within the distance threshold for medium impacts.

26.6.1.6.3 Significance of effect – disturbance

202. The predicted worst case disturbance impacts of medium magnitude due to the trenchless crossing works are only anticipated be present whilst the drill head is within 15.2m of an NVSR. Typically, HDD (which is assumed to the worst case of potential trenchless crossing techniques) works progress at around 40m per day; hence, vibration levels are likely to exceed 1mm.s^{-1} for less than a day. Such a short duration of exposure means that vibration disturbance effects on identified NVSRs due to trenchless crossing works will be no greater than minor adverse significance, which is not significant in EIA terms.

203. The vibratory compaction works are predicted to cause medium magnitude impacts on human receptors when the compactor is started up or shut down within 48m of an NVSR. The transient nature of the activities requiring ground compaction is such that a nearby receptor would not be exposed to vibration for ten or more days in any 15 consecutive days, or for a total of more than 40 days in six consecutive months. Such a short duration of exposure means that these medium disturbance effects on human NVSRs due to ground compaction vibration will be no greater than minor adverse significance, therefore not significant in EIA terms.

204. The vibratory compaction works are predicted to cause high magnitude impacts on human receptors when the compactor is used within 7m of an NVSR (i.e. during the Bentley Road improvement works). The duration of these works within 7m of an NVSR is not known but is likely to be extremely short, nevertheless, whilst they are undertaken, vibration levels in the property are unlikely to be tolerable. Hence, without mitigation, these effects are considered to be of moderate adverse significance, therefore significant in EIA terms.

26.6.1.6.4 Significance of effect – structural damage

205. Building damage impacts due to vibration are predicted to be of no worse than low magnitude; hence, worst case effects will be of minor significance, which is considered not significant in EIA terms.

26.6.1.6.5 Additional mitigation

206. Additional vibration mitigation measures which could be implemented are the following:

- Choosing alternative, lower impact equipment (e.g. a roller with a single drum, a drum amplitude of less than 0.5mm and / or a wider drum, ideally at least 2m) or methods (e.g. non-vibratory ground compaction) if practicable;
- Scheduling the use of vibration-causing equipment at the least sensitive time of day;

- Routing, operating or locating high vibration sources as far away from sensitive areas as practicable;
- Sequencing operations so that vibration-causing activities do not occur simultaneously; and
- Keeping equipment well maintained.

207. If it is not practicable to apply any of the above mitigation, then a good working relationship with the occupants of the dwellings should be able to manage any disturbance, e.g. by providing prior notification of the works, evidence that building damage will not occur and / or undertaking the works at the closest approach to the property when the occupants are not present, where feasible.

208. The final CoCP will identify the final package of mitigation measures to be implemented as required.

26.6.1.6.6 Residual significance of effect

209. Following the implementation of BPM and any additional mitigation measures identified in the final CoCP, the construction vibration effects are expected to be no greater than minor adverse significance, which is considered not significant in EIA terms.

26.6.2 Likely significant effects during operation

210. During operation, it is expected that there will be no further requirement for land to be disturbed or excavated, except in the event that onshore cables require repair or maintenance or the onshore substation access works needing to be reinstated. However, these activities would not extend beyond the construction footprint assessed above, and for the former would be relatively rare and localised in occurrence. For the latter, the haul road required to access the onshore substation, required in the unlikely event of transformer failure, would potentially be in place for up to seven months, but its location would be over land already disturbed during construction. As such, effects on NVSRs from any activities other than those outlined under Impact 1 (onshore substation noise) during operation have been scoped out of further assessment, as impacts would be no worse than that assessed during the construction phase.

26.6.2.1 Impact 1: Onshore substation noise

211. As discussed in Section 26.4.3.6, an assessment has been undertaken in accordance with the guidance contained in BS4142:2014+A1:2019 to determine whether noise emissions associated with the operation of the proposed onshore substation is likely to give rise to adverse impacts at the closest residential receptors. 3-d noise modelling has been undertaken to determine the substation sound levels at the identified NVSRs within 1km of the substation (SSR3 to SSR10). Modelling details are provided in ES Appendix 26.4 Operational Noise Calculations (Document Reference: 3.3.63).

212. The magnitude of impact at each NVSR is determined based on the difference between the *background sound level* and predicted onshore substation sound *rating level.* The significance of effect is determined considering the context in which the sound occurs.

26.6.2.1.1 Magnitude of impact

213. The *background sound levels* at each NVSR are identified in Section 26.5.1.2 and the predicted *specific sound levels* are provided in ES Appendix 26.4 Operational Noise Calculations (Document Reference: 3.3.63).

214. As discussed in Section 26.4.3.6, the next stage of the BS 4142 assessment is to determine whether any acoustic penalties (for tonality, impulsivity, intermittency or other distinctive characteristics) are required.

215. Whilst the sound emitted by some of the onshore substation plant is likely to include tonal components, the embedded mitigation measures within the detailed design phase will minimise the tonality of the overall onshore substation sound emissions. With these measures implemented, based on professional experience of other similar substations, tonality is unlikely to be audible outside the onshore substation footprint. Any remaining tonality will be further attenuated by propagation with distance to NVSRs. It is therefore considered unlikely that tonality will be perceptible at the NVSRs. Nevertheless, to consider the potential worst case impact, a +2dB penalty has been added to the predicted *specific sound levels* to determine the *rating level* of the onshore substation sound.

216. The sound emissions from the onshore substation plant and equipment will be present 24 hours a day, 7 days a week and are relatively continuous; hence, no penalty corrections for intermittency or impulsivity are required. If a penalty is applicable for tonality, it would not be appropriate to apply the "other sound characteristics" penalty, as this is only applicable where no other penalty has been applied.

217. Table 26.28 presents the results of the initial BS 4142 assessment and the identified magnitude of impact at each NVSR, based on the criteria presented in Table 26.13. Daytime impacts are based on predicted *specific sound levels* at ground-floor and night-time impacts are based on first floor levels.

Table 26.28 Operational Noise Assessment – Magnitude of impact

NVSR	Time period	Typical *background sound level* (dB $L_{A90,T}$)	*Rating Level* (dB $L_{Ar,T}$)	Excess of *rating level* over *background sound level* (dB)	Magnitude of impact
SSR3	Day	32	36	+4	Low
	Night	25	35	+10	High
SSR4	Day	32	34	+2	Low
	Night	25	36	+11	High
SSR5	Day	32	37	+5	Medium
	Night	25	35	+10	High
SSR6	Day	26	37	+11	High
	Night	23	36	+13	High
SSR7	Day	26	46	+20	High
	Night	23	44	+21	High
SSR8	Day	26	43	+17	High

NVSR	Time period	Typical *background sound level* (dB $L_{A90,T}$)	*Rating Level* (dB $L_{Ar,T}$)	Excess of *rating level* over *background sound level* (dB)	Magnitude of impact
	Night	23	44	+21	High
SSR9	Day	29	37	+8	Medium
	Night	21	38	+17	High
SSR10	Day	33	35	+2	Low
	Night	22	35	+13	High

218. It can be seen from Table 26.28 that, during the daytime, the initial estimate of impact is of high magnitude at SSR6, SSR7 and SSR8, medium at SSR5 and SSR9 and low at SSR3, SSR4 and SSR10.

219. During the night-time period, it can be seen from Table 26.28 that the initial estimate of impact would be high at all NVSRs. However, as discussed in Section 26.4.3.6, during the night-time the absolute levels can be more relevant than the difference between the *rating level* and *background sound level*.

26.6.2.1.2 Significance of effect

220. To determine the significance of the effect of the operational noise, it is necessary to consider the context. Of particular relevance to this assessment is the likely change in ambient sound levels and the very low (i.e. below 30dB L_{A90}) *background sound levels* during the night. Section 26.4.3.6 identifies a LOAEL for operational noise of 35dB $L_{Ar,Tr}$. Onshore substation sound levels equal to or below this level would not be anticipated to result in effects of effects of worse than minor adverse, irrespective of the difference to the *background sound level.*

221. Table 26.29 details the change in ambient sound level at all NSRs, which have been assessed according to the IEMA change in sound level guidance identified in Table 26.14.

Table 26.29 Predicted change in ambient sound levels with onshore substation sound

NVSR	Time period	*Specific sound level* (dB $L_{Aeq,T}$)	Change in sound level (dB $L_{Aeq,T}$)		
			Existing	With substation	Change
SSR3	Day	34	46	46.3	0.3
	Night	33	35	37.1	2.1
SSR4	Day	32	46	46.2	0.2
	Night	34	35	37.4	2.4
SSR5	Day	35	46	46.3	0.3
	Night	33	35	37.1	2.1
SSR6	Day	35	42	42.8	0.8
	Night	34	34	36.9	2.9
SSR7	Day	44	42	45.9	3.9
	Night	42	34	42.9	8.9

NVSR	Time period	*Specific sound level* (dB $L_{Aeq,T}$)	Change in sound level (dB $L_{Aeq,T}$)		
			Existing	With substation	Change
SSR8	Day	41	42	44.5	2.5
	Night	42	34	42.7	8.7
SSR9	Day	35	40	41.2	1.2
	Night	36	32	37.5	5.5
SSR10	Day	33	45	45.3	0.3
	Night	33	34	36.4	2.4

222. Comparison of the calculated change in ambient sound levels shown in Table 26.29 and the criteria in Table 26.14 shows that, during the daytime, the sound from the onshore substation would cause a negligible change in existing sound level at SSR3, 4, 5, 6 and 10. The daytime ambient sound level change would be minor at SSR8 and 9 and it would be moderate at SSR7. During the night, the sound from the onshore substation would cause a minor change in existing sound level at SSR3, 4, 5, 6 and 10. The night-time ambient sound level change would be major at SSR7, 8 and 9.

223. The *rating levels* presented in Table 26.28 do not exceed the identified LOAEL of 35dB $L_{Ar,Tr}$ at SSR3 (night-time only), SSR4 (daytime only), SSR5 and SSR10 (night-time only).

224. When considering the identified magnitude of impact, the medium sensitivity of the identified NVSRs, and the context discussed above, SSR7, SSR8 and SSR9 are anticipated to experience an effect of major adverse significance, and at SSR6 the effect would be of moderate adverse significance. Without mitigation, these effects are significant in EIA terms. Effects at the remaining NVSRs are anticipated to be minor adverse significance, which is not significant in EIA terms.

26.6.2.1.3 Additional mitigation

225. A number of mitigation options are available that can be applied as appropriate. These include, but are not limited to, one or a combination of the following: electrical components with reduced sound power levels, enclosures or localised screening around selected noisy components, a noise barrier around some or all of the onshore substation and using buildings and other structures within the onshore substation to form a noise barrier.

226. As discussed in Section 26.4.6, the operational noise predictions are reliant on the currently available onshore substation design and plant sound power level data. The sound emissions from the plant the original equipment manufacturer (OEM) installs may be different to those utilised in the predictions, and the onshore substation design is likely to change; this would alter the onshore substation sound emissions and mitigation requirements. It is therefore necessary to define operational noise level limits which will need to be complied with by the OEM, based on predictive noise modelling and assessment to be undertaken during the detailed design phase.

227. As discussed in the assessment of cumulative effects (Section 26.8.3), the onshore substation will be located in the same onshore substation works area

as the Five Estuaries onshore substation. The proposed substation area for the national grid Electricity Transmission Norwich to Tilbury project is also in close proximity to the proposed onshore substation works area. Discussions between the promoters and EIA specialists of each project identified a need to define operational noise level limits for each onshore substation, such that cumulative noise levels do not exceed the LOAEL (35dB $L_{Ar,Tr}$). The proposed limits for each project are provided in Table 26.37. Compliance with these limits will be secured by DCO Requirement. Comparison of the predicted *rating levels* in Table 26.28 with these limits shows that the worst case NVSR is SSR7, at which the *rating level* is 12dB above the proposed limit.

228. Detailed analysis of the predicted noise levels at the substation NVSRs has established that the power transformers, shunt reactors and their associated coolers are the dominant contributors to the onshore substation sound at SSR7. Potential mitigation measures would therefore focus on introducing noise attenuation at these items of onshore substation equipment. The noise model has been used firstly to identify the highest-contributing noise sources and then to reduce their sound emissions, until the limits are achieved. Table 26.30 identifies the mitigated onshore substation plant sound emissions included in the modelling. This analysis disregards the potential for larger reductions in certain noisy plant items and the potential mitigation from the other options identified in paragraph 223. Previous project experience indicates that the identified mitigated plant sound power levels are likely to be achievable.

Table 26.30 Potential mitigated plant sound power levels

Item of plant	Sound power level without mitigation (dB L_{WA})	Mitigated sound power level (dB L_{WA})	Difference (dB)
Power transformer	95	80	15
Power transformer cooler	93	81	12
Shunt Reactor (export)	95	80	15
Shunt Reactor (export) cooler	93	80	13
Shunt Reactor (400kV)	95	83	12
Shunt Reactor (400kV) cooler	93	83	10
Harmonic Filters	85	80	5
Statcom - Reactors	85	80	5
Statcom – Capacitors	80	75	5
Statcom Coolers	85	80	5

26.6.2.1.4 Residual significance of effect

229. The incorporation of noise mitigation measures at the onshore substation components identified in Table 26.30 would reduce the magnitude of impact at all substation NVSRs to no greater than low, except at SSR7 (impact of medium during the day and night) and SSR8 and 9 (impact of medium during the night only), as detailed in Table 26.31.

Table 26.31 Operational noise assessment – residual impact

NVSR	Time period	Predicted mitigated *rating level* (dB $L_{Ar,T}$)	Difference to *background sound level* (dB)	Magnitude of impact	Change in ambient sound level (dB L_{Aeq})		
					Existing	With onshore substation	Change
SSR3	Day	24	-8	Negligible	46	46	0.0
	Night	23	-2	Negligible	35	35.3	0.3
SSR4	Day	22	-10	Negligible	46	46	0.0
	Night	24	-1	Negligible	35	35.3	0.3
SSR5	Day	24	-8	Negligible	46	46	0.0
	Night	23	-2	Negligible	35	35.2	0.2
SSR6	Day	25	-1	Negligible	42	42.1	0.1
	Night	24	+1	Low	34	34.4	0.4
SSR7	Day	33	+7	Medium	42	42.5	0.5
	Night	32	+9	Medium	34	35.9	1.9
SSR8	Day	30	+4	Low	42	42.3	0.3
	Night	32	+9	Medium	34	36	2.0
SSR9	Day	25	-4	Negligible	40	40.1	0.1
	Night	26	+5	Medium	32	33	1.0
SSR10	Day	23	-10	Negligible	45	45	0.0
	Night	23	+1	Low	34	34.3	0.3

230. The mitigated modelling results in Table 26.31 show that the predicted change in ambient sound level at the NVSRs is no greater than 2dB L_{Aeq}; according to the criteria in Table 26.14, this is a minor change. In addition, the noise level does not exceed 35dB $L_{Ar,Tr}$ at any NVSR. Hence, the residual effects are no worse than minor significance, which is not significant in EIA terms.

26.6.3 Likely significant effects during decommissioning

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

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

- Dismantling and removal of electrical equipment;
- Removal of cabling from site;

- Removal of any building services equipment;
- Demolition of the buildings and removal of fences; and
- Landscaping and reinstatement of the sites.

233. Whilst details regarding the decommissioning are currently unknown, it is anticipated that the impacts would be no greater than those during construction, and any equivalent mitigation would be secured such that the conclusions on significance of effect will be no worse than those identified in Section 26.6.1.

234. The decommissioning methodology cannot be finalised until closer to the time of decommissioning but would be in line with relevant policy at that time.

26.7 Potential monitoring requirements

235. All predicted North Falls residual effects are identified to be not significant; hence, noise and vibration monitoring is not anticipated to be required. However, the assessment of cumulative road traffic noise effects (see Section 26.8.3.1.2) indicates the potential for significant effects at the receptors on Bentley Road. Noise monitoring may be required to determine the presence of a significant cumulative effect and further mitigation, as discussed in Section 26.8.3.1.2. Construction noise and vibration will be monitored in line with the final CoCP, which will detail the procedure for dealing with complaints and managing potential exceedances of relevant noise and vibration criteria.

236. The DCO would require a noise investigation protocol to be prepared and implemented. This would require a scheme for monitoring noise levels and assessment to be set out in the event of a complaint about noise from the onshore substation.

26.8 Cumulative effects

26.8.1 Identification of potential cumulative effects

237. The first step in the CEA process is the identification of which residual effects assessed for North Falls have the potential for a cumulative effect with other plans, projects and activities. This information is set out in Table 26.32.

Table 26.32 Potential cumulative effects

Impact	Potential for cumulative effect	Rationale
Construction		
Impact 1: Noise of landfall and nearshore works	Yes	Construction works associated with other projects in similar locations to the North Falls construction activities have the potential to result in cumulative effects, where there is a temporal overlap.
Impact 2: Noise of onshore cable route works	Yes	
Impact 3: Noise of	Yes	

Impact	Potential for cumulative effect	Rationale
onshore substation works		
Impact 4: Noise of Bentley Road improvement works	Yes	
Impact 5: Noise from off-site construction traffic	Yes	There is the potential for road traffic introduced by the construction of North Falls and traffic introduced by other nearby projects to result in cumulative road traffic noise impacts, where there is a temporal overlap.
Impact 6: Construction vibration	Yes	There is the potential for cumulative construction vibration impacts with projects that are introducing nearby sources of vibration to the onshore cable route, where there is a temporal overlap.
Operation		
Impact 6: Onshore substation noise	Yes	There is the potential for cumulative operational noise impacts with projects that are introducing industrial / commercial noise sources nearby to the onshore substation.

26.8.2 Other plans, projects and activities

238. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative effects for inclusion in the CEA (described as '*project screening*'). This information is set out in Table 26.33, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to North Falls, status of available data and rationale for including or excluding from the assessment.

239. The project screening has been informed by the development of a CEA project list which forms an exhaustive list of plans, projects and activities within the study area (Section 26.3.1) relevant to North Falls. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

Table 26.33 Summary of projects considered for the CEA in relation to noise and vibration (Project screening)

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
National Infrastructure Planning						
Five Estuaries Offshore Wind Farm EN010115	Pre-application	2028 - 2030	Five Estuaries onshore project area directly overlaps with North Falls onshore project area.	High	Yes	The onshore project area for Five Estuaries covers largely the same area as North Falls. There is also a possibility that both projects could be constructed at around the same time, therefore, cumulative effects may occur.
Norwich to Tilbury EN020027	Pre-application	2027 - 2031	Scoping area directly overlaps with North Falls onshore project area.	Low	Yes	The proposed substation area for Norwich to Tilbury is in close proximity to North Falls proposed onshore substation works area; and the proposed new substation operational access road overlaps with the Bentley Road improvement works. Therefore, cumulative impacts could occur.
Bradwell B new nuclear power station EN010111	Pre-application	Predicted 9-12 years	21	High	No	The projects are greater than 1km from North Falls, therefore there would be no potential for cumulative noise or vibration impacts. As detailed in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29), traffic and transport study area for these projects does not overlap with the North Falls onshore project area. These schemes have been screened out of the CEA for construction road traffic noise impacts.
East Anglia TWO Offshore Wind Farm EN010078	Approved (DCO Issued 2022)	Mid 2020s	47	High	No	
Sizewell C Project EN010012	Approved (DCO Issued 2022)	2022 – 2034	49	High	No	
Lake Lothing Third Crossing TR010023	Approved (DCO Issued 2020)	Over two years	76	High	No	
Manston Airport TR02002		Information unavailable.	53	High	No	

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Thanet Extension Offshore Wind Farm EN010084	Application refused	Application refused	52	High	No	
Sea Link EN020026	Pre-application	Information unavailable	20	High	No	
Ipswich Rail Chord TR040002	Approved (DCO Issued 2012)	Built	17	High	No	
Richborough Connection Project EN020017	Approved (DCO Issued 2017)	Built	55	High	No	
Kentish Flats Extension EN010036	Approved (DCO Issued 2013)	Built	46	High	No	
Galloper Offshore Wind Farm EN010003	Approved	Built	15	High	No	
Nautilus Interconnector EN020023	Pre-application	Pre-application	44	Low	No	The location of onshore infrastructure associated with this project is not known, however, it is highly unlikely to be within close proximity to the onshore project area so will not likely have a cumulative effect on noise and vibration.
A12 Chelmsford to A120 Widening Scheme EN010138	Pre-examination	Information unavailable.	27	Medium	No	As detailed in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29), no cumulative traffic effects are anticipated.
Rivenhall IWMF and Energy Centre EN010138	Pre-application	Information unavailable	27	Medium	No	The project is greater than 1km from North Falls, therefore there would be no potential for cumulative noise and vibration impacts.

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Essex County Council						
Elmstead Hall, Elmstead, Colchester, Essex ESS/24/15/TEN	Approved	Information unavailable.	5	N/A	No	As detailed in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29), no cumulative traffic effects are anticipated for these projects. The projects are greater than 1km from North Falls, therefore there would be no potential for cumulative noise and vibration impacts.
St. George's Infant School and Nursery, Barrington Road, Colchester, Essex, CO2 7RW CC/COL/71/22	Approved	Information unavailable	9	N/A	No	
Wilson Marriage Centre, Barrack Street, Colchester, Essex, CO1 2LR CC/COL/85/22	Approved	Information unavailable	9	N/A	No	
Wivenhoe Quarry Alresford Road, Wivenhoe, Essex, CO7 9JU ESS/80/20/TEN/42/2	Report being prepared	Information unavailable	7	N/A	No	
Elmstead Hall, Elmstead, Colchester, Essex, CO7 7AT ESS/24/15/TEN/55/1/NMA	Approved	Information unavailable.	5	N/A	No	
Elmstead Hall, Elmstead, Colchester, Essex, CO7 7AT https://planning.essex.gov.uk/Planning/Display/ESS/24/15/TEN	Approved	Information unavailable.	5	N/A	No	

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
ESS/24/15/TEN/2/1/NMA						
Old Heath County Primary School, Old Heath Road, Colchester, Essex, CO2 8DD CC/COL/50/22	Approved	Information unavailable.	8	N/A	No	
Crown Quarry (Wick Farm), Old Ipswich Road, Ardleigh, CO7 7QR ESS/57/04/TENLA4	Approved	Information unavailable.	6	N/A	No	
Wivenhoe Quarry, Alresford Road Wivenhoe, Essex CO7 9JU ESS/80/20/TEN/42/2	Approved	Information unavailable.	7	N/A	No	
Martell's Quarry, Slough Lane, Ardleigh, Essex, CO7 7RU ESS/42/22/TEN	Out for consultation	Information unavailable	3	N/A	No	
Land at: Elmstead Hall, Elmstead, Colchester, Essex ESS/105/21/TEN	Approved	Information unavailable.	5	N/A	No	
Land at Martells Quarry, Slough Lane, Ardleigh, Essex, CO7 7RU ESS/39/22/TEN	Approved	Information unavailable.	3	N/A	No	
Land to the south of Colchester Main Road,	Report being prepared	Information unavailable	6	N/A	No	

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Alresford, Colchester, CO7 8DB ESS/17/18/TEN?NMA2						
Land at: Martells Quarry, Slough Lane, Ardleigh, Essex, CO7 7RU ESS/39/22/TEN/NMA/1	Approved	Information unavailable	3	N/A	No	
Tendring Education Centre, Jaywick Lane, Clacton on Sea, Essex, CO16 8BE CC/TEN/40/21/3/1	Approved	Information unavailable.	6	N/A	No	
Tendring Education Centre, Jaywick Lane, Clacton on Sea, Essex, CO16 8BE CC/TEN/40/21/4/1	Approved	Information unavailable.	6	N/A	No	
Land At Martells's Quarry, Slough Lane, Ardleigh, Essex CO7 7RU ESS/39/22/TEN	Approved	Information unavailable.	3	N/A	No	
Land At Martells's Quarry, Slough Lane, Ardleigh, Essex CO7 7RU ESS/39/22/TEN/NMA/1	Approved	Information unavailable.	3	N/A	No	
Crown Quarry (Ardleigh Reservoir Extension),	Approved	Information unavailable.	3	N/A	No	

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Wick Farm, Old Ipswich Road, Tendring, Colchester, CO7 7QR ESS/57/04/TENLA4						
Elmstead Hall, Elmstead, Colchester, Essex ESS/24/15/TEN	Approved	Information unavailable.	6	N/A	No	
Ardleigh Waste Transfer Station, A120, Ardleigh, Colchester, CO7 7SL ESS/04/17/TEN	Approved	Information unavailable.	5	N/A	No	
35 Roach Vale, Colchester, CO4 3YN CC/COL/07/22	Approved	Information unavailable.	4	N/A	No	
Boxted Bridge, Boxted, Essex, CO4 5TB CC/COL/106/21	Report being prepared	Information unavailable	9	N/A	No	
Elmstead Hall, Elmstead, Colchester, Essex ESS/24/15/TEN	Approved	Information unavailable.	6	N/A	No	
Lufkins Farm, Great Bentley Road, Frating CO7 7HN ESS/99/21/TEN/SO	EIA not required	Information unavailable.	6	N/A	No	
Elmstead Hall, Elmstead, Colchester ESS/24/15/TEN	Approved	Information unavailable.	5	N/A	No	

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Elmstead Hall, Elmstead, Colchester, CO7 7EX ESS/24/15/TEN	Approved	Information unavailable.	5	N/A	No	
Tendring District Council						
Land Between The A120 and A133, To The East of Colchester and of Elmstead Market 21/01502/CMTR	Awaiting decision	Information unavailable.	3	High	No	As detailed in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29), no cumulative traffic effects are anticipated for these projects. The projects are greater than 1km from North Falls, therefore there would be no potential for cumulative noise and vibration impacts.
Hamilton Lodge Parsons Hill Great Bromley Colchester Essex CO7 7JB 20/00547/OUT	Approval – Outline	Information unavailable.	2	N/A	No	
Land adjacent to Lawford Grid Substation Ardleigh Road Little Bromley Essex CO11 2QB 21/02070/FUL	Approved	Information unavailable.	0.3	High	Yes	As detailed in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29), no cumulative construction traffic effects are anticipated for this project. The proposed battery energy storage scheme (BESS) is located in close proximity to the onshore substation works area for North Falls. If the project construction overlaps with the construction of the North Falls substation, cumulative noise impacts could occur, depending on the eventual North Falls onshore substation location. Depending on the eventual North Falls onshore substation location,

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
						cumulative operational noise effects could also occur.

26.8.3 Assessment of cumulative effects

240. The Five Estuaries is also in its application phase, having submitted a DCO to the Planning Inspectorate for the project, which was accepted on 22nd April 2024. Although separate projects, the Five Estuaries shares the same landfall location and onshore cable route (including Bentley Road improvement works) as North Falls, with the two projects also having co-located onshore substations within the same onshore substation works area. The two projects also have the same national grid connection point.

241. Five Estuaries Offshore Wind Farm Limited (VEOWL) and North Falls Offshore Wind Farm Limited (NFOW) have sought to collaborate and coordinate where practicable, which has led to collaborative design of the projects' onshore infrastructure, and also to sharing of detailed project design information onshore. As a result, a detailed CEA for effects arising from the development of the Five Estuaries can be undertaken. The CEA section of this chapter is therefore split into two sections:

- the first describing a detailed CEA covering effects predicted to arise from development of Five Estuaries and North Falls;
- the second, detailing effects predicted to arise from the development of Five Estuaries, North Falls and other projects.

242. The latter section will be based on the project information available for each scheme in the public domain, and by definition is therefore less detailed than the Five Estuaries and North Falls CEA section.

243. Full details on the approach to CEA used within this chapter are set out in ES Chapter 6 EIA Methodology (Document Reference: 3.1.8).

26.8.3.1 Five Estuaries Offshore Wind Farm

26.8.3.1.1 Realistic worst case scenario

244. Using the design information provided by VEOWL and checked against the submission of the Five Estuaries ES, a realistic worst case cumulative scenario has been developed for the purpose of this chapter.

245. This realistic worst case cumulative scenario considers three potential cumulative build-out scenarios, as outlined in ES Chapter 5 Project Description (Document Reference: 3.1.7):

- **Scenario 1:** North Falls 'Option 2' build out is progressed, and VEOWL undertakes landfall, onshore substation construction and cable pull which overlaps with North Falls equivalent works. In this scenario, onshore cable route associated works, including TCCs, accesses and haul road, all remain in place and are used by the second project during its construction.
- **Scenario 2:** North Falls 'Option 1' build out is progressed, and VEOWL undertakes landfall, onshore substation and onshore cable route construction and cable pull, all of which does not overlap with North Falls' equivalent works. There would be a gap of between one and three years between each Projects' construction. In this scenario, onshore cable route associated works, including TCCs, accesses and haul road, all remain in place and are used by the second project during its construction.

- **Scenario 3:** North Falls 'Option 1' build out is progressed, and VEOWL undertakes a separate landfall, onshore substation and onshore cable route construction and cable pull with a multi-year (i.e. >3 year) gap between the two construction activities. In this scenario, there is no reuse in onshore temporary works between the two projects, and all onshore cable route associated works are rebuilt and reinstated in full by the second project.

246. Full details on the build out scenarios considered within this assessment are detailed in ES Chapter 5 Project Description (Document Reference: 3.1.7) ES Chapter 6 EIA Methodology (Document Reference: 3.1.8).

247. For cumulative scenarios 2 and 3, the gap between the end of the construction works for one project and the start of the next project's works at that location will be at least 12 months, except for the onshore substation. Onshore substation construction noise and vibration impacts are excluded from the assessment scope as there is no potential for significant effects to occur. The duration criteria specified in BS 5228-1 are taken to imply that, where periods of construction noise exposure at an NVSR are separated by a gap of at least six months (which is the case for cumulative scenarios 2 and 3), there is no potential for cumulative effects to occur. Hence, the assessment of cumulative construction effects with Five Estuaries is based on the Scenario 1 outlined above.

248. The realistic worst case scenario for likely cumulative effects scoped into the EIA for the onshore noise and vibration assessment are summarised in Table 26.34. These are based on project parameters for Five Estuaries described in ES Chapter 5 Project Description (Document Reference: 3.1.7), which provides further details regarding specific activities and their durations.

Table 26.34 Realistic worst case scenario of cumulative effects arising from development of North Falls and Five Estuaries – (Scenario 1) (simultaneous build).

Potential impact	Parameter	Notes
Construction		
Impacts relating to the landfall	<u>Landfall HDD (temporary works) physical parameters:</u> • Landfall construction compound dimensions = 150 x 300m • Individual TJB dimensions = 4 x 15m • No. of TJBs = four • Maximum HDD depth = 20m • Construction duration 13 months (of which HDD = six months) • Maximum indicative length of HDD = 1.1km • Drill exit location = subtidal exit below MHWS (up to 8m depth) • HDD to include 24 hour / 7 days working where required	
Impacts relating to the onshore cable route	<u>Onshore cable route construction physical parameters:</u> • Working width = 72m (open cut trenching), 90m (trenchless crossings), 130m (complex trenchless crossings) • Corridor length = Up to 24km • Cable trench dimensions = 3.75 – 1.2 x 2m (tapered top to bottom) • No. of trenches = four • Maximum cable trench depth = 2m • Minimum cable burial depth = 0.9m • Haul road width = 6m wide road, 10m wide total including verges, drainage and passing places. • Jointing bays = Up to 192 (approximately every 500m) buried below ground • Jointing bay construction footprint (per bay) = 15 x 4m • TCC footprint = 150 x 150m (main) to 100 x 100m (satellite). • No. of compounds (est.) = 11 • Trenchless crossing compound dimensions = 75 x 150m <u>Durations:</u> • Bentley Road improvement works = six – nine months • Cable route works = 18 – 27 months per project, with a 57 month gap in between i.e. 111 months start to finish	

Potential impact	Parameter	Notes
	• Cable installation = 12 months • Major trenchless crossings (each location) = eight months (of which HDD = four months) • Minor trenchless crossings = two months	
Impacts relating to the onshore substation and unlicensed works	<u>Onshore substation (temporary works) physical parameters:</u> • Permanent substation footprint = 280 x 210m (North Falls) + 280 x 210m (Five Estuaries) • Construction compound footprint = 150 x 250m (North Falls) + 150 x 250m (Five Estuaries) • Construction duration = 21 – 27 months	
	<u>Unlicensed works physical parameters (for two projects):</u> • All enabling worth / platform constructed by national grid. • Cable installation works as described above • Equipment may include: cable sealing ends, surge arrestors, earth switch, disconnectors, circuit breakers, current transformers, voltage transformers, busbars	
Operation		
Impacts relating to the onshore cable route	• None	
Impacts relating to the onshore substation	<u>Onshore substation physical parameters (North Falls):</u> • AIS • Permanent substation footprint (indicative building dimensions) = 280 x 210m <u>Onshore substation physical parameters (Five Estuaries)</u> • AIS or Gas Insulated Switchgear (GIS) • Permanent substation footprint (indicative building dimensions) = 280 x 210m	

Potential impact	Parameter	Notes
Decommissioning		
No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable route and onshore substation. It is also recognised that legislation and industry good practice change over time. However, it is likely that the onshore project equipment, including the cable, will be removed, reused, or recycled where possible and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the purposes of a worst case scenario, the impacts will be no greater than those identified for the construction phase.		

26.8.3.1.2 During construction

249. The assessment of construction noise from the Project includes a worst case scenario that the works required to install cable ducting for the Five Estuaries are undertaken as part of the construction of the Project. Hence, the works required to install cable ducting for the Five Estuaries are not incorporated into this CEA.

Impact 1: Noise of landfall and nearshore works

250. The only anticipated additive effect at the landfall and nearshore due to the introduction of Five Estuaries is noise from additional simultaneous HDD and a second cable pulling activity.

251. No NVSRs are within the study area for the landfall works, and the addition of a cable pull activity would not change the noise levels predicted from the nearshore works. Hence, cumulative effects with Five Estuaries are not anticipated in relation to noise from landfall and nearshore construction works.

Impact 2: Noise of onshore cable route construction works

252. As with the landfall and nearshore works, the only anticipated additive effect at the onshore cable route due to the introduction of Five Estuaries is the introduction of noise from a second cable pulling activity.

253. Noise impacts from cable pulling associated with North Falls have been predicted, as described in Section 26.6.1.2. An additional cable pull would increase either the duration of this activity (if cable pulling is undertaken sequentially for each project) or the associated noise levels (if simultaneous). The assessment of North Falls impacts made a worst case assumption that cable pulling would last at least 10-days; hence, an increase in duration would not change the conclusions of this assessment. Due to the distance between the cable routes of the two projects, the introduction of a second simultaneous cable pull would not significantly increase associated noise levels at NVSRs. Hence, cumulative effects with Five Estuaries are not anticipated in relation to noise from onshore cable construction works.

Impact 3: Noise of onshore substation construction works

254. The assessment of onshore substation construction noise associated with North Falls is summarised in Table 26.22, with further information, including predicted construction noise levels at each NVSR, provided in ES Appendix 26.3 Construction Noise and Vibrations Calculations (Document Reference: 3.3.62). Details of noise emissions from the construction of the Five Estuaries onshore substation were shared by VEOWL to enable cumulative effects to be assessed, these have been used in the following calculations.

255. This cumulative assessment scenario assumes simultaneous construction of the North Falls and Five Estuaries onshore substations. A significant cumulative effect would only occur during the daytime if the combined construction noise level exceeded 68dB L_{Aeq} (equating to a medium impact), for a period of ten or more days in any 15 consecutive days.

256. The highest predicted North Falls onshore construction noise level is 59dB L_{Aeq}, which is at SSR7 during ground works. The Five Estuaries proposed onshore substation is located a similar distance from this NVSR; hence, it is reasonable

to assume that the associated worst case onshore substation construction noise level would be similar, summing these noise levels results in a cumulative construction noise level of 62dB L_{Aeq}, which equates to an impact of negligible magnitude. Hence, cumulative effects with Five Estuaries are anticipated to be no worse than negligible significance (i.e. not significant in EIA terms) in relation to noise from onshore substation construction works.

Impact 4: Noise from Bentley Road improvement works

257. No additive effects are anticipated from the Bentley Road improvement works due to the Five Estuaries, as these works are only required once for both projects. Hence, cumulative effects are not anticipated.

Impact 5: Noise from off-site construction traffic

258. Cumulative traffic data for the road links anticipated to be used by both Five Estuaries and North Falls construction traffic were provided.

259. The traffic noise assessment comprises the following situations:

- Baseline versus Baseline + Peak Construction (Five Estuaries and North Falls mitigated); and
- Baseline versus Baseline + Average Construction (Five Estuaries and North Falls mitigated).

260. The results of the BNL calculations and short-term relative change from construction traffic associated with the Project and Five Estuaries are provided in full detail in ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61).

261. A <1dB change in BNL (a negligible magnitude of impact) is predicted at 43 of the road links during peak construction traffic flows. Changes of 1 to 2.9dB (low impact) are predicted on two road links and ≥ 5dB (high) at one link (link 4 (Bentley Road between the onshore cable route and the A120)). Separate BNL calculations using the forecast average construction traffic flows indicate 44 links experiencing negligible impacts, one experiencing a low impact and the impact on Bentley Road is reduced to moderate.

262. The worst case cumulative effects on NVSRs due to the identified negligible and low magnitude impacts will be of negligible and minor significance respectively, not considered significant in EIA terms.

263. To further analyse the potential cumulative effects associated with the traffic on Bentley Road, road traffic noise levels at the identified NVSRs have been calculated, as summarised in Table 26.35 for peak flows and Table 26.36 for average traffic flows (detailed results are shown in ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61).

Table 26.35 Predicted peak construction road traffic noise cumulative effects

NVSR	Change in road traffic noise level due to construction traffic (dB $L_{A10,18h}$)	Magnitude of Impact	Difference between predicted traffic noise level and LOAEL (dB $L_{A10,18h}$)		Difference between predicted traffic noise level and SOAEL (dB $L_{A10,18h}$)	
			Baseline traffic	Baseline plus peak construction traffic	Baseline traffic	Baseline plus peak construction traffic
CTR1	3.6	Medium	12	16	-1	3
CTR2	2.3	Low	3	6	-10	-7
CTR3	6.7	High	6	13	-7	0
CTR4	4.1	Medium	0	4	-13	-9
CTR5	4.2	Medium	0	4	-13	-9
CTR6	5.7	High	4	10	-9	-3
CTR7	4.9	Medium	-2	3	-15	-10

Table 26.36 Predicted average construction road traffic noise cumulative effects

NVSR	Change in road traffic noise level due to construction traffic (dB $L_{A10,18h}$)	Magnitude of Impact	Difference between predicted traffic noise level and LOAEL (dB $L_{A10,18h}$)		Difference between predicted traffic noise level and SOAEL (dB $L_{A10,18h}$)	
			Baseline traffic	Baseline plus peak construction traffic	Baseline traffic	Baseline plus average construction traffic
CTR1	2.4	Low	12	14	-1	1
CTR2	1.5	Medium	3	5	-10	-8
CTR3	4.9	Medium	6	11	-7	-2
CTR4	2.8	Medium	0	3	-13	-10
CTR5	2.9	Low	0	3	-13	-10
CTR6	4.1	Low	4	8	-9	-5
CTR7	3.5	Low	-2	2	-15	-12

264. Table 26.36 shows that the peak construction traffic is anticipated to result in impacts of medium magnitude at four NVSRs and high magnitude at a further two NVSRs, all of which are medium sensitivity. These impacts equate to effects of moderate and major adverse significance respectively i.e. potentially significant. However, when considering average traffic flows, impacts of medium magnitude (moderate significance) are predicted at three NVSRs and the remaining impacts are of low magnitude i.e. minor significance.

265. At all NVSRs except CTR1, the predicted 'with peak construction' and 'with average construction' road traffic noise levels do not exceed the SOAEL; hence, the effects of construction traffic noise impacts are considered not significant, irrespective of the noise level change. At CTR1, the SOAEL is predicted to be exceeded in both the peak and average construction scenarios. The change due to peak construction traffic at CTR1 results in a medium impact, equating

to a moderate adverse effect i.e. potentially significant in EIA terms. The duration of the peak traffic flow is at least one month so the ten days in 15 criterion will be met. Hence, without mitigation, effects on CTR1 are considered moderate adverse i.e. significant in EIA terms.

266. The mitigation incorporated into the modelling only accounts for the proposed temporary 40mph speed limit on Bentley Road. Potential additional traffic-related mitigation measures that could be implemented if required, which go beyond those required to mitigate the effect of North Falls alone, are identified in the CTMP.

267. In addition, noise level monitoring is proposed to be undertaken at the worst affected property (CTR1). Should monitoring demonstrate that the property is potentially exposed to significant road traffic noise effects, additional mitigation will be implemented, including the additional measures identified in the CTMP. Further noise-related measures which could be implemented to mitigate these effects are offering improved glazing to the affected residential properties and / or temporary rehousing, these will be identified in the final CoCP.

268. The available range of potential traffic and mitigation measures are considered sufficient to ensure that cumulative residual effects will be not significant.

Impact 6: Construction vibration

269. The construction of Five Estuaries would introduce simultaneous landfall and onshore substation construction works and a simultaneous cable pull. Cable pulling works do not generate perceptible levels of vibration and the North Falls landfall compound and onshore substation are sufficiently far from NVSRs that vibration effects will be negligible. Hence, there are no anticipated cumulative effects in terms of construction vibration due to the simultaneous construction of Five Estuaries.

26.8.3.1.3 During operation

Impact 1: Onshore substation noise

270. The proposed Five Estuaries substation is in the same onshore substation works area as the North Falls onshore substation. As discussed in Section 26.6.2.1, the proposed Norwich to Tilbury substation is also nearby and the cumulative noise levels from all three substations have the potential to affect nearby NVSRs; hence, this substation has been included in the assessment of cumulative effects with Five Estuaries.

271. Onshore substation sound *rating level* limits have been agreed between North Falls, VEOWL and National Grid Electricity Transmission (NGET) (the promoter of Norwich to Tilbury), as detailed in Table 26.37, each of which will be secured by a DCO requirement. At all NVSRs, the combined sound from all three substations would not exceed the LOAEL of 35dB $L_{Ar,Tr}$. Hence, cumulative onshore substation noise effects would be not significant.

Table 26.37 Cumulative operational sound *rating level* limits

NVSR	Noise limit, dB $L_{Ar,Tr}$		
	North Falls	Five Estuaries	Norwich to Tilbury
SSR1	28	29	33

NVSR	Noise limit, dB $L_{Ar,Tr}$		
	North Falls	Five Estuaries	Norwich to Tilbury
SSR2	27	28	33
SSR3	24	26	34
SSR4	25	28	33
SSR5	28	32	31
SSR6	30	32	27
SSR7	33	31	23
SSR8	33	29	23
SSR9	33	30	26
SSR10	32	29	29
SSR11	31	30	28
SSR12	30	30	31

272. It should be noted that the division of the overall cumulative noise limit in this way assumes that the same acoustic character correction is applied to the *specific sound level* from the individual substations.

26.8.3.1.4 During decommissioning

273. As discussed in Section 26.6.3, whilst details regarding the decommissioning are currently unknown, it is anticipated that the impacts would be no greater than those during construction. Hence, as residual construction related cumulative effects are considered not significant, it is also anticipated that cumulative effects from decommissioning would be not significant. A full EIA will be carried out ahead of any decommissioning works.

26.8.3.1.5 Summary

274. Table 26.38 below provides a summary of the potential significant cumulative effects identified during the noise and vibration CEA in relation to Five Estuaries.

Table 26.38 Summary of cumulative effects with Five Estuaries

Potential impact	Cumulative effect	Additional mitigation
Construction		
Impact 1: Noise of landfall and nearshore works	Not anticipated	-
Impact 2: Noise of onshore cable route construction works	Minor adverse – no worse than North Falls effect	-
Impact 3: Noise of onshore substation construction works	Negligible – no worse than North Falls effect	-
Impact 4: Noise of Bentley Road improvement works	Not anticipated	-
Impact 5: Noise from off-site construction traffic	Moderate adverse temporary effect on receptors on Bentley Road	Traffic management measures identified in the CTMP, noise level monitoring and noise

Potential impact	Cumulative effect	Additional mitigation
		mitigation measures identified in the final CoCP
Impact 6: Construction vibration	Not anticipated	-
Operation		
Impact 1: Onshore substation noise	Minor adverse	

26.8.3.2 North Falls, Five Estuaries and other projects

275. Based on the project screening in Table 26.31, in addition to Five Estuaries, two of the other listed projects are included in the noise and vibration CEA for further assessment: Norwich to Tilbury and the Little Bromley BESS.

26.8.3.2.1 During construction

276. Cumulative effects from Five Estuaries and other projects during construction (impacts 1 to 4 and 6 only) are shown in Table 26.39. Cumulative effects from off-site construction road traffic (impact 5) cannot be isolated to specific other projects; hence, these are excluded from the table and are presented as follows.

277. Cumulative traffic data for the road links anticipated to be used by all other projects incorporated into the Traffic and Transport CEA were provided by the Transport Consultant. This includes additional projects beyond the two identified for the noise and vibration CEA, as identified in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29).

278. The traffic noise assessment comprises the following situations:

- Baseline versus Baseline + Peak Construction North Falls mitigated + Five Estuaries and other projects; and
- Baseline versus Baseline + Average Construction North Falls mitigated + Five Estuaries and other projects.

279. The results of the BNL calculations and short-term relative change from construction traffic associated with the Project and Five Estuaries are provided in full detail in ES Appendix 26.2 Road Traffic Noise Assessment (Document Reference: 3.3.61).

280. A <1dB change in BNL (a negligible magnitude of impact) is predicted at 34 of the road links during peak construction traffic flows. Changes of 1 to 2.9dB (low impact) are predicted on 11 road links and ≥ 5dB (high) at link 4. Separate BNL calculations using the forecast average construction traffic flows indicate 36 links experiencing negligible impacts, nine experiencing a low impact and a high impact on Bentley Road.

281. The worst case cumulative effects on NVSRs due to the identified negligible and low magnitude impacts will be of negligible and minor significance respectively, not considered significant in EIA terms. Cumulative effects of road traffic noise on Bentley Road are considered potentially significant in EIA terms. However, significant worst case assumptions have been made in the generation of the traffic flow information used within this assessment (see ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29) for details). It is considered

highly unlikely that the actual impacts will be as great as predicted, for example because peak traffic periods in the construction schedules of the cumulative schemes are unlikely to overlap with each other or with North Falls.

282. As discussed in Section 26.8.3.1.2, additional measures beyond the 40 mph temporary speed limit are proposed, which are likely to reduce the peak construction traffic flows and noise impacts on Bentley Road and thereby mitigate the impacts of North Falls, for inclusion in the CTMP. In addition, noise level monitoring is proposed to be undertaken at the worst affected property (CTR1). Should monitoring demonstrate that the property is potentially exposed to significant road traffic noise effects, additional mitigation will be implemented. Potential additional traffic-related mitigation measures that could be implemented if required are identified in the CTMP and those related to noise will be identified in the final CoCP. With these mitigation measures in place, cumulative residual effects are considered to be not significant.

Table 26.39 Cumulative effects from other projects on noise and vibration during construction

Project	Construction Impacts 1 to 4: Noise of landfall and nearshore, onshore route, onshore substation and Bentley Road improvement works	Construction Impact 6: Construction phase vibration
Norwich to Tilbury	A new substation is proposed to be built as part of the Norwich to Tilbury proposals by NGET, close to the North Falls onshore substation. North Falls is planned for construction at the earliest from 2027, compared to 2027 to 2031 for Norwich to Tilbury. If the construction of the two substations overlap temporally, there is the potential for cumulative construction noise effects. The remainder of the Norwich to Tilbury scheme is sufficiently far from the North Falls onshore cable route that cumulative effects will not arise. It is anticipated that a construction noise assessment would be undertaken and BPM will be recommended for the Norwich to Tilbury project. There are no NVSRs located between the proposed North Falls onshore substation and the Norwich to Tilbury substation. The worst affected NVSR from North Falls onshore construction noise is SSR7, which is over 800m from the proposed Norwich to Tilbury substation. At this distance, it is highly unlikely that the Norwich to Tilbury substation construction works could cause cumulative effects with the potential to be significant with those from North Falls, due to the need to avoid significant effects at other NVSRs which are much closer to the proposed substation site. Similarly, the NVSRs likely to be worst affected due to noise from Norwich to Tilbury substation construction works are over 800m from the proposed North Falls onshore substation, at this distance, the effect of North Falls construction noise will be negligible. Hence, cumulative construction noise effects are anticipated to be not significant in EIA terms.	There are no NVSRs with the potential to be affected by North Falls substation construction vibration. Hence, cumulative construction vibration effects are not anticipated.
Little Bromley BESS	A detailed construction noise assessment was not undertaken for the proposed Little Bromley BESS project. Nevertheless, the relevant construction contractor should implement BPM to comply with the requirements of CoPA. If the construction schedules for North Falls and Little Bromley BESS overlap temporally and spatially, the appointed North Falls construction contractor will be required to coordinate with the Little Bromley BESS contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final noise mitigation measures will be specified in the final CoCP. Based on the aim to coordinate between the North Falls works and Little Bromley BESS, no likely significant cumulative construction noise effects are predicted over and above the effects of North Falls. With these measures in place, cumulative construction noise effects are anticipated to be not significant in EIA terms.	A detailed construction vibration assessment was not undertaken for the proposed Little Bromley BESS project. Nevertheless, the relevant construction contractor should implement BPM to comply with the requirements of CoPA. If the construction schedules for North Falls and Little Bromley BESS overlap temporally and spatially, there is the potential for cumulative vibration effects to occur. Hence, the appointed North Falls construction contractor will be required to coordinate with the Little Bromley BESS contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final vibration mitigation measures will be specified in the final CoCP. Based on the aim to coordinate between the North Falls works and Little Bromley BESS, no likely significant cumulative

Project	Construction Impacts 1 to 4: Noise of landfall and nearshore, onshore route, onshore substation and Bentley Road improvement works	Construction Impact 6: Construction phase vibration
		construction vibration effects are predicted over and above the effects of North Falls. With these measures in place, cumulative construction vibration effects are anticipated to be not significant in EIA terms.
Overall cumulative effects with Five Estuaries and other projects	No significant cumulative effects are anticipated	No significant cumulative effects are anticipated

26.8.3.2.2 During operation

283. Cumulative effects from other projects during operation are shown in Table 26.40.

Table 26.40 Cumulative effects from other projects on noise and vibration during operation

Project	Operation Impact 1: Operational noise
Norwich to Tilbury	Proposed substation operational noise limits for the Norwich to Tilbury project are presented in Table 26.37. Assuming these are complied with, the cumulative operational noise effects with this project will be not significant.
Little Bromley BESS	The noise impact assessment submitted with the planning application for the Little Bromley BESS (Professional Consult (2017), Noise Impact Assessment, Proposed Battery Energy Storage Site – Land West of Lawford Sub-Station) has been reviewed. This includes an assessment of operational noise impacts at the closest NVSR to the proposed BESS, which is Waterhouse Farm (SSR5 as identified in Table 26.17). The predicted *rating level* from the proposed BESS was 35dB $L_{Ar,Tr}$ during the night when background levels were typically 32dB L_{A90}. The addition of onshore substation operational noise at 23dB $L_{Ar,\ Tr}$ results in a total rating level of 35dB $L_{Ar,Tr}$. Therefore, the North Falls onshore substation operational noise would not influence cumulative noise level at this NVSR, which will not exceed 35dB $L_{Ar,Tr}$. Hence, the cumulative effects are no worse than minor which is not significant in EIA terms.
Overall cumulative effects with Five Estuaries and other projects	No significant cumulative effects are anticipated.

26.8.3.2.3 During decommissioning

284. Decommissioning strategies have not yet been finalised for North Falls or Norwich to Tilbury; however, the cumulative impacts are expected to be the same as those of the initial construction phase.

26.9 Transboundary effects

285. There are no transboundary effects with regard to noise and vibration as the onshore infrastructure for North Falls is within the UK and is not located near to any international boundaries. Transboundary effects are therefore scoped out of the assessment and are not considered further.

26.10 Interactions

286. The ES chapters outlined in Section 26.1 were identified as having inter-relationships with noise and vibration and are shown in Table 26.41.

Table 26.41 Noise and vibration interactions

Topic and description	Related chapter (Volume 3.1)	Where addressed in this chapter	Rationale
Construction			
Impact 1: Noise of landfall and nearshore works	ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25)	N/A	Potential noise impacts at ecological receptors addressed separately in ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25).
Impact 2: Noise of onshore cable route works	ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26)	N/A	Potential noise impacts at ecological receptors addressed separately in ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26).
Impact 3: Noise of onshore substation works Impact 5: Construction vibration	ES Chapter 32 Tourism and Recreation (Document Reference: 3.1.34)	N/A	Potential noise impacts addressed separately in ES Chapter 32 Tourism and Recreation (Document Reference: 3.1.34).
	ES Chapter 28 Human Health (Document Reference: 3.1.30)	Sections 26.6.1.1 - 26.6.1.5	Increase in noise or vibration levels at NVSRs associated with North Falls has the potential to result in human health effects, guidance used in this assessment accounts for these effects. Detailed assessment of potential Project health effects (which includes noise and vibration) are addressed in ES Chapter 28 Human Health (Document Reference: 3.1.30).
Impact 4: Noise from off-site construction traffic	ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29)	Section 26.6.1.5	Noise emissions from traffic movements associated with construction of North Falls have the potential to impact on local amenity.
	ES Chapter 28 Human Health (Document Reference: 3.1.30)	Section 26.6.1.5	Increase in noise levels at NVSRs associated with traffic generated by North Falls construction has the potential to result in human health effects, guidance used in this assessment accounts for these effects. Detailed assessment of potential Project health effects (which includes noise and vibration) are addressed in ES Chapter 28 Human Health (Document Reference: 3.1.30).
Operation			
Impact 6: Operational noise	ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25)	N/A	Potential noise impacts at ecological receptors addressed separately in ES Chapter 23 Onshore Ecology (Document Reference: 3.1.25).
	ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26)	N/A	Potential noise impacts at ecological receptors addressed separately in ES Chapter 24 Onshore Ornithology (Document Reference: 3.1.26).

Topic and description	Related chapter (Volume 3.1)	Where addressed in this chapter	Rationale
	ES Chapter 32 Tourism and Recreation (Document Reference: 3.1.34)	N/A	Potential noise impacts addressed separately in ES Chapter 32 Tourism and Recreation (Document Reference: 3.1.34).
	ES Chapter 28 Human Health (Document Reference: 3.1.20)	Section 26.6.2.1	Increase in noise or vibration levels at NVSRs associated with North Falls has the potential to result in human health effects, guidance used in this assessment accounts for these effects. Detailed assessment of potential Project health effects (which includes noise and vibration) are addressed in ES Chapter 28 Human Health (Document Reference: 3.1.20).
Decommissioning			
Interactions with the identified impacts associated with the decommissioning phase would be no greater than those identified for the construction phase.			

26.11 Inter-relationships

287. The impacts identified and assessed in this chapter have the potential to interrelate with each other. The areas of potential inter-relationships between impacts are presented in Table 26.42. This provides a screening tool for which impacts have the potential to interrelate. Table 26.43 provides an assessment for each receptor as related to these impacts. Decommissioning impacts are excluded from the scope of this assessment and therefore excluded from the screening exercise.

288. Within Table 26.43 the impacts are assessed relative to each development phase (i.e. construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the significance of effect upon that receptor. Following this, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across all development phases.

Table 26.42 Inter-relationships between impacts – screening

Potential interactions between impacts						
	Impact 1: Construction noise from landfall and nearshore works	Impact 2: Construction noise from onshore cable route works	Impact 3: Construction noise from onshore substation works	Impact 4: Noise from off-site construction traffic	Impact 5: Construction vibration	Impact 6: Operational noise
Impact 1: Construction noise from landfall and nearshore works		Y	N	Y	Y	N
Impact 2: Construction noise from onshore cable route works	Y		Y	Y	Y	Y
Impact 3: Construction noise from onshore substation works	N	Y		Y	Y	Y
Impact 4: Noise from off-site construction traffic	Y	Y	Y		Y	N
Impact 5: Construction vibration	Y	Y	Y	Y		N
Impact 6: Operational noise	N	Y	Y	N	N	

Table 26.43 Inter-relationship between impacts – phase and lifetime assessment

Receptor	Highest significance level	Phase assessment	Lifetime assessment
Human receptors	Impact 1: **Not significant**. Impact 2: **Not significant** with the implementation of mitigation measures detailed in Section 26.6.1.2.3. Impact 3: **Not significant**. Impact 4: **Not significant** with the implementation of mitigation measures detailed in Section 26.6.1.5.3. Impact 5: **Not significant** with the implementation of mitigation measures detailed in Section 26.6.1.6.5.	**Construction Phase** **No greater than individually assessed impact** Impacts 1-5 range from negligible to major adverse effect significance at residential receptors before mitigation measures. With the inclusion of mitigation the effects are considered to range from negligible to minor adverse impact significance. Given the predicated effect significance and that each impact will be managed with BPM it is considered that there would either be no interactions or that these would not result in greater impact than assessed individually.	**No greater than individually assessed impact** Noise and vibration impacts from the landfall and onshore cable route will only occur during the construction and decommissioning phases of the Project. These impacts will be temporally separated by the operational phase (approximately 30 years); therefore, these impacts will not combine to increase their significance level. The construction and operation of the onshore substation has the potential to result in inter-related noise effects as the most exposed NVSRs will be the same for both phases, essentially extending the duration of their exposure to noise associated with the Project. However, the adopted operational noise level criteria are sufficiently stringent to avoid significant effects over the lifetime of the Project, irrespective of their duration. Therefore, it is considered that these impacts would not combine to increase the significance level.
	Impact 6: **Not significant** assuming compliance with operational noise limits which will be secured by DCO Requirement, as discussed in Section 26.6.2.1.3.	**Operational Phase** **No greater than individually assessed impact** Only one impact is identified; hence, there is no potential for inter-relationships over the operational phase	

26.12 Summary

289. This chapter has assessed the potential noise and vibration effects of the construction and operation of North Falls on onshore NVSRs.

290. This chapter has been developed with regard to the legislative and policy framework outlined in Section 26.4.1 and further informed by consultation with Tendring District Council.

291. The existing noise and vibration environment at NVSRs has been characterised using a site-specific baseline noise survey and following current industry good practice and guidance.

292. Construction phase noise and vibration assessments were undertaken based on a preliminary understanding of the mobile / fixed construction plant and machinery required to build the Project at the landfall, onshore cable route, Bentley Road improvement works and onshore substation. With the application of BPM and additional mitigation measures to be specified in the final CoCP, the residual effect upon all receptors was assessed to be not significant in EIA terms.

293. Construction road traffic noise impacts were assessed based on a preliminary understanding of the traffic flows likely to be generated by the construction of the Project. Calculations of road traffic noise levels with and without the construction of the Project concluded that residual effects will be no greater than minor adverse i.e. not significant in EIA terms.

294. The assessment of operational phase noise identified appropriate noise level limits at nearby NVSRs, which will be secured by DCO Requirement. Compliance with these limits will ensure that operational noise effects are not significant in EIA terms.

295. Cumulative effects were assessed and found to be not significant without the need for additional mitigation, except for construction road traffic noise which are potentially significant. Hence, additional monitoring and mitigation measures have been proposed. Residual effects are considered no greater than minor adverse i.e. not significant in EIA terms.

296. An assessment summary is provided in Table 26.44. A summary of the conclusion of the CEA are provided in Table 26.45.

Table 26.44 Summary of potential likely significant effects on noise and vibration

Potential impact	Receptor	Sensitivity	Magnitude of impact	Pre-mitigation effect	Mitigation measures proposed	Residual effect
Construction						
Impact 1: Noise of landfall and nearshore works	Locations where noise and / or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools etc.	Medium	Negligible	Negligible	BPM	Negligible
Impact 2: Noise of onshore cable route works	Locations where noise and / or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools etc.	Medium	Negligible to high	Negligible to major adverse	Design refinement, BPM, additional mitigation and screening if required to be specified in final CoCP, as discussed in Section 26.6.1.2.3.	Negligible to minor adverse
Impact 3: Noise of onshore substation works	Locations where noise and / or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools etc.	Medium	Negligible	Negligible	BPM	Negligible
Impact 4: Noise of Bentley Road improvement works	Locations where noise and / or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools etc.	Medium	Negligible to high	Negligible to major adverse	Design refinement, BPM, additional mitigation and screening if required to be specified in final CoCP.	Negligible to minor adverse
Impact 5: Noise from off-site construction traffic	Locations where noise and / or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools etc.	Medium	Negligible to high	Negligible to major adverse	Screening and additional traffic management measures to be specified in final CTMP, potentially including a temporary speed limit on Bentley Road, as discussed in Section 26.6.1.5.3.	Negligible to minor adverse
Impact 6: Construction vibration	Locations where noise and / or vibration level changes may cause disturbance, e.g.	Medium	Negligible to medium	Negligible to moderate adverse	BPM and additional mitigation if required to be specified in final CoCP, as discussed in Section 26.6.1.2.3.	Negligible to minor adverse

Potential impact	Receptor	Sensitivity	Magnitude of impact	Pre-mitigation effect	Mitigation measures proposed	Residual effect
	residential properties, hospital wards, care homes, schools etc.					
	Vibration sensitive structures (potential for damage)	Medium	Negligible to low	Negligible to minor adverse	BPM	Negligible to minor adverse
Operation						
Impact 1: Operational noise	Locations where noise and / or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools etc.	Medium	Negligible to high	Negligible to major adverse	Screening and reduction in plant sound emissions as required. Compliance with operational noise limit specified in proposed DCO Requirement.	Negligible to minor adverse
Decommissioning						
The decommissioning strategy has not yet been finalised; however, the noise and vibration effects are expected to be no worse than those of the construction phase.						

Table 26.45 Summary of potential cumulative effects on Noise and Vibration

Potential impact	Cumulative effect	Additional mitigation
Construction		
Impacts 1-4: Construction noise	No significant cumulative effects are anticipated	None
Impact 5: Off-site construction traffic noise	Road traffic flows on Bentley Road have the potential to cause significant adverse cumulative effects.	Mitigation measures are proposed for inclusion in the CTMP and CoCP, and noise level monitoring is proposed at the worst affected property. With this mitigation and monitoring in place, significant cumulative effects are not anticipated.
Impact 6: Construction vibration	No significant cumulative effects are anticipated	None
Operation		
Impact 1: Onshore substation operational noise	No significant cumulative effects are anticipated	None

Potential impact	Cumulative effect	Additional mitigation
Decommissioning		
Decommissioning strategies have not yet been finalised for North Falls, Five Estuaries or Norwich to Tilbury; however, the cumulative effects are expected to be no worse than those of the construction phase.		

26.13 References

The Planning Inspectorate (2018). Planning Inspectorate Advice Note Nine: Rochdale Envelope. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/
BSI (2014). British Standards Institution [BS] 5228-1:2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 1: Noise”. Available at: https://www.warrington.gov.uk/sites/default/files/2020-08/cf53_bs_5228_pt1-2009a1-2014.pdf
BSI (2014). British Standards Institution [BS] 5228-2: 2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration”. Available at: [redacted]
BSI (2019). British Standards Institution [BS] 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, BSI, London. Available at: [redacted]
BSI (2003). British Standards Institution [BS] 7445-1:2003 – Description and measurement of environmental noise. Guide to quantities and procedures. BSI, London. Available at: [redacted]
BSI (2014). British Standards Institution [BS] 8233: Sound Insulation and Noise Reduction for Buildings. BSI, London. Available at: [redacted]
BSI (1993). BS 7385-2 – Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration. Available at: [redacted]
DEFRA (2010). Noise Policy Statement for England. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf
Department of Transport, Welsh Office (1988). Calculation of Road Traffic Noise. HMSO, London.
D.M. Hiller, and G.I. Crabb (2000). Ground borne vibrations caused by mechanised construction works. Highways Agency, Transport Research Laboratory, TRL report 429. Available at: [redacted]
D.J. Rockhill, M.D. Bolton and D.J. White (2014). Ground-borne vibrations due to press-in piling operations. Cambridge University Engineering Department. [redacted]

Department of Energy and Climate Change (2023a) Overarching NPS for Energy (EN-1) (Department of Energy Security and Net Zero. Available at: EN-1 Overarching National Policy Statement for Energy (publishing.service.gov.uk) (www.gov.uk)

Department of Energy and Climate Change (2023b) NPS for Renewable Energy Infrastructure (EN-3)Available at: National Policy Statement for Renewable Energy Infrastructure (EN-3) (publishing.service.gov.uk)

Department of Energy and Climate Change (2023c) NPS for Electricity Networks Infrastructure (EN-5) Available at: National Policy Statement for Electricity Networks Infrastructure (EN-5) (publishing.service.gov.uk)

Highways England (2020). Design Manual for Roads and Bridges, Sustainability & Environment Appraisal LA111 Noise and Vibration (formerly HD213/11, IAN 185/15) Revision 2. Highways England. Available at: [redacted]

HS2 (2022). High Speed Rail (Crewe – Manchester) Environmental Statement Volume 5: Appendix CT-001-00001_Part 1 Cross-topic Environmental Impact Assessment Scope and Methodology Report – Part 1 of 3. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1046854/M93.pdf

International Organization for Standardization (1996). ISO9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. ISO, Switzerland. Available at: [redacted]

International Organization for Standardization (2010). ISO 3744:2010 Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane. [redacted]

International Organization for Standardization (2020). ISO 717-1:2020 Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation. [redacted].

International Standards Organization (2010) ISO 4866:2010 – Mechanical Vibration and Shock – Vibration of Fixed Structures – Guidelines for the Measurement of Vibrations and Evaluation of Their Effects on Structures. Available at: [redacted]

Ministry of Housing, Communities & Local Government (2021). National Planning Policy Framework. Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf.
Ministry of Housing, Communities & Local Government (2019). National Planning Practice Guidance for Noise. Available at: https://www.gov.uk/guidance/noise--2
Martin D.J. (1980). Ground vibrations from impact pile driving during road construction. Transport and Road Research Laboratory, TRL Supplementary Report 544.
National Grid (April 2022). East Anglia Green Energy Enablement (GREEN), EIA Scoping Report. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN020027/EN020027-000012-EAGN%20-%20Scoping%20Report%20(including%20appendices%20B%20to%20K).pdf [Accessed November 2022].
Professional Consult (2017), Noise Impact Assessment, Proposed Battery Energy Storage Site – Land West of Lawford Sub-Station). Available at https://idox.tendringdc.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=R3UARTQB0PF00
UK Government (1990). Environmental Protection Act 1990. HMSO, London. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents
UK Government (1974). Control of Pollution Act 1974. HMSO, London. Available at: https://www.legislation.gov.uk/ukpga/1974/40
World Health Organization (1999). Guidelines for Community Noise. Available at: [redacted]
World Health Organization (2009). Night Noise Guidelines for Europe. Available at: [redacted]
World Health Organization (2009). Environmental Noise Guidelines for the European Region. Available at: [redacted]

NORTH FALLS

Offshore Wind Farm

sse Renewables | RWE

HARNESSING THE POWER OF NORTH SEA WIND

North Falls Offshore Wind Farm Limited

A joint venture company owned equally by SSE Renewables and RWE.

To contact please email contact@northfallsoffshore.com

North Falls Offshore Wind Farm Limited Registered Address: Windmill Hill Business Park, Whitehill Way, Swindon, Wiltshire, SN5 6PB, United Kingdom

Registered in England and Wales Company Number: 12435947