FIVE ESTUARIES
OFFSHORE WIND FARM

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ENVIRONMENTAL STATEMENT

VOLUME 6, PART 3, CHAPTER 9: AIRBORNE NOISE AND VIBRATION

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DEFINITION OF ACRONYMS

Term	Definition
AAWT	Annual Average Weekday Traffic
AIS	Air Insulated Switchgear
BNL	Basic Noise Level
BPM	Best Practicable Means
CoPA	Control of Pollution Act 1974
CRTN	Calculation of Road Traffic Noise
DCO	Development Consent Order
DRMB	Design Manual for Roads and Bridges
EACN	East Anglia Connection Node
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EPA	The Environmental Protection Act 1990
ES	Environmental Statement
ETG	Expert Topic Group
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
IEMA	Institute of Environmental Management and Assessment
LSE	Likely Significant Effects
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
NPPF	The National Planning Policy Framework
NSPE	Noise Policy Statement for England
NSR	Noise Sensitive Receptor
OnSS	Onshore Sub-Station
PEIR	Preliminary Environmental Information Report
PINS	The Planning Inspectorate
SAC	Special Area of Conservation
SoS	Secretary of State

Term	Definition
SWL	Sound Power Level
TCC	Temporary Construction Compound
TDLP	Tendring District Local Plan
TJB	Transition Joint Bay
UKAS	United Kingdom Accreditation Service
VE	Five Estuaries Offshore Wind Farm
VE OWFL	Five Estuaries Offshore Wind Farm Limited
VSR	Vibration Sensitive Receptor
WTG	Wind Turbine Generator

GLOSSARY OF TERMS

Term	Definition
Array Areas	The areas where the WTGs will be located.
Cable Works TCC	TCC associated with cable works.
Code of Construction Practice	A guidance document setting out reasonable measures to reduce the impact of noise associated with the development.
DCO	An order made under the Planning Act 2008 granting development consent for a NSIP from the Secretary of State.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact in question with the sensitivity of the receptor in question, in accordance with defined significance criteria.
EIA	The process of predicting and evaluating the impact VE will have on the environment.
ES	The documents that collate the processes and results of the EIA.
European sites	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
The Environmental Protection Act 1990	The Environmental Protection Act 1990 is an Act of the Parliament, the fundamental structure and authority for waste management and control of emissions into the environment.
Evidence Plan	A voluntary consultation process with specialist stakeholders to agree the approach to the Environmental Impact Assessment.

Term	Definition
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial, resulting from the activities associated with the construction, operation and maintenance, or decommissioning of the project.
Landfall	The landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore cable circuits in TJBs.
Maximum Design Scenario	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to each impact assessed.
Mitigation	Mitigation measures are commitments made by the project to reduce and/or eliminate the potential for significant effects to arise as a result of the project. Mitigation measures can be part of the project design or secondarily added to reduce impacts through the assessment process.
Noise Policy Statement for England	The noise policy statement for England (NPSE) sets out the government's overall policy on noise.
Noise Sensitive Receptor	Noise Sensitive Receptors (NSRs) are defined as receptors which are potentially sensitive to noise and vibration
Onshore ECC	The onshore ECC is approximately 60 m wide where open trenching will be used. Where trenchless techniques such as HDD are used along the ECC, the width will need to increase to approximately 90 m, but slightly wider widths are required at the major crossings such as the railway and Tendring Brook.
OnSS	Where the power supplied from the wind farm is adjusted (including voltage, power quality and power factor as required) to meet the UK System-Operator Transmission-Owner Code for supply to the National Grid substation.

Term	Definition
	The area in which the final OnSS footprint will be located.
OnSS Access Zone	The area which will contain the final OnSS access route (both construction and operational)
OnSS TCC	The area in which the OnSS TCC footprint will be located.
OnSS Works Zone	Area within which temporary works may be undertaken to support the construction of the OnSS
Order Limits	The area within which development will be carried out including all works, access routes, TCCs, visibility splays and discharge points.
SSSI	A geological or biological conservation designation denoting a nationally protected area in the UK.
SAC	Area of protected habitats and species as defined in the European Union's Habitat Directive (92/43/EEC).
SPA	A designated area for birds under the European Union Directive on the Conservation of Wild Birds (2009/147/EC).
Sound Power Level	The Sound Power Level is a measure of the acoustic energy emitted from a source of noise independent of the acoustic environment it is in, expressed in decibels.
Sound Pressure Level	The Sound Pressure Level is the result of one or more sound sources that is transferred into a specific acoustic environment and measured at a specific location, expressed in decibels.
TJB	An underground unit where the offshore cable joins the onshore cable.
United Kingdom Accreditation Service	The United Kingdom Accreditation Service is national accreditation body recognised by the British government to assess the competence of organisations that provide certification, testing, inspection and calibration services.

9 AIRBORNE NOISE AND VIBRATION

9.1 INTRODUCTION

9.1.1 This Chapter of the Environmental Statement (ES) considers the potential for the construction and operation of the onshore elements of the proposed Five Estuaries Offshore Wind Farm (VE) to impact upon the airborne noise and vibration environment. Impacts are considered at the nearby sensitive receptors to the project, providing a worst case as noise and vibration impacts diminish with increasing distance. This Chapter describes the scope, relevant legislation, assessment methodology, and the baseline conditions existing at the site and its surroundings. It considers any potential significant environmental effects VE would have on this baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. Cumulative noise and/or vibration effects with other proposed developments that may also have an impact on the sensitive receptors close to the VE are also considered.

9.1.2 The Chapter is complemented with the following technical annexes:

- Volume 6, Part 6, Annex 9.1: Onshore Airborne Noise Baseline Noise Survey
- Volume 6, Part 6, Annex 9.2: Onshore Airborne Noise Construction Sound Power Details

9.1.3 This Chapter is reliant on the following ES chapters:

- Volume 6, Part 3, Chapter 1: Onshore Project Description; and
- Volume 6, Part 3, Chapter 8: Traffic and Transport.

9.2 STATUTORY AND POLICY CONTEXT

LEGISLATION

9.2.1 In England, there are two legislative instruments which address the effects of environmental noise with regard to construction noise and vibration and nuisance. The Environmental Protection Act 1990 (EPA) and the Control of Pollution Act 1974 (CoPA).

9.2.2 The EPA provides a requirement for Local Authorities to investigate noise from industrial, trade or business premises, or vehicles, machinery or equipment in the street, and to determine if the noise is detrimental to health or constitutes a statutory nuisance. If the Local Authority determines that noise is detrimental to health or constitutes a statutory nuisance, the EPA gives the Local Authority the power to issue an abatement notice that requires the person responsible for producing the noise to prevent the noise from occurring.

9.2.3 The CoPA provides two means of controlling construction noise and vibration. Section 60 provides the Local Authority with the power to impose, at any time, operating conditions on the development site. Section 61 allows the developer to negotiate a set of operating procedures with the Local Authority prior to commencement of site works.

NATIONAL POLICY

NATIONAL POLICY STATEMENTS

9.2.4 The assessment of the potential Airborne Noise and Vibration impacts of the onshore elements of VE has been made with reference to the UK Government's National Policy Statements (NPSs). Key policies for Airborne Noise and Vibration are listed in Table 9.3.

9.2.5 NPSs set out policies or circumstances that the UK Government considers should be taken into account in decisions on Nationally Significant Infrastructure Projects (NSIPs).

9.2.6 Those relevant to VE are:

- Overarching NPS for Energy (EN-1);
- NPS for Renewable Energy Infrastructure (EN-3); and
- NPS for Electricity Networks Infrastructure (EN-5).

9.2.7 The above NPSs were designated in January 2024. It is expected that the statements will be reviewed every five years, which will ensure that they reflect evolving policy and legislative changes.

NATIONAL PLANNING POLICY FRAMEWORK

9.2.8 The National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, updated December 2023) is the primary source of national planning guidance in England. Whilst the NPPF is not directly applicable to NSIPs, as Government policy it may be considered relevant and important.

9.2.9 The general aims for planning policy with regards to noise include:

- avoiding significant effects;
- minimising other impacts arising from new development and protecting identified areas of tranquillity; and
- recognising that this should be balanced against the need for business to operate without unreasonable restrictions being imposed.

NOISE POLICY STATEMENT FOR ENGLAND

9.2.10 The policies outlined in the NPPF are consistent with, and refer to, general Government policy on noise as set out in the Noise Policy Statement for England (NPSE).

9.2.11 The vision and aims of the NPSE are set out on pages 3 and 4 of that document. However, when considering these visions and aims it is important to note the specific advice of the NPSE that it should be interpreted *"within the context of Government policy on sustainable development"*.

9.2.12 The guiding principles of sustainable development are set out clearly in Paragraph 1.8 of the NPSE as relating not only to personal wellbeing but also to:

- ensuring a strong, healthy and just society in all respects by meeting the diverse needs of all;
- being guided by sound science;
- understanding the limits of the planet's resources;

- maintaining a sustainable economy; and
- promoting good governance.

9.2.13 In the Explanatory Note to the NPSE, Paragraph 2.4 states:

"By describing clear policy vision and aims the NPSE provides the necessary clarity and direction to enable decisions to be made regarding what is an acceptable noise burden to place on society."

9.2.14 The Explanatory Note therefore embodies a clear expectation that there will often be a 'noise burden' as a consequence of development. It is one of the underlying principles of the NPSE that any such noise effects should not be considered in isolation but should rather be evaluated alongside the overall planning merits of the development being considered. Therefore, any identified adverse effects of noise should not be allowed to preclude development in their own right, but only if deemed to be unacceptable when assessed within the wider planning context of the development.

9.2.15 The NPSE also advises that noise impacts should be assessed based on adverse and significant adverse effect. The NPSE does not provide any specific guidance on assessment methods or noise limits. However, the concepts summarised in Table 9.1 are introduced and can be applied when considering the significance of noise impacts.

Table 9.1: Observed Effect Level

EFFECT LEVEL	DESCRIPTION
No Observed Effect Level (NOEL)	This is the noise level below which no effect can be detected. In simple terms, below this level of noise, there is no detectable effect on health and quality of life due to the noise being assessed.
Lowest Observed Adverse Effect Level (LOAEL)	This is the level of noise above which adverse effects on health and quality of life can be detected.
Significant Observed Adverse Effect Level (SOAEL)	This is the level of noise above which significant adverse effects on health and quality of life occur.

PLANNING PRACTICE GUIDANCE

9.2.16 UK government online Planning Practice Guidance (PPG) provides greater details in relation to the relevance of noise to the planning process following the introduction of the NPPF and NPSE.

9.2.17 The PPG states that the following should be considered by local authorities:

"- whether or not a significant adverse effect is occurring or likely to occur;

- whether or not an adverse effect is occurring or likely to occur; and

- whether or not a good standard of amenity can be achieved.

In line with the Explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or

below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

9.2.18 The PPG provides further guidance on each of the various observed effect levels set out in the NPSE. This is summarised in Table 9.2 below.

Table 9.2: Observed Effects

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	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	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	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 the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigation and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	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.	Significant Observed Adverse Effect	Avoid

Response	Examples of outcomes	Increasing effect level	Action
Present and very disruptive	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	Unacceptable Adverse Effect	Prevent

9.2.19 It is important to note that no specific noise parameters are defined; and no target noise levels are provided in PPG, it is the role of the acoustic consultant, as Competent Expert, to define the specific thresholds for assessment.

9.2.20 When considering appropriate thresholds guidance can be taken from PPG under the heading 'What factors influence whether noise could be a Concern?'. PPG refers to the subjective nature of noise, stating that there is no simple relationship between noise levels and the impact on those affected. This depends on how various factors combine in particular situations, including:

"the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day - this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;…

for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise; …

the spectral content of the noise (i.e. whether or not the noise contained particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features)."

NATIONAL POLICY STATEMENTS

9.2.21 The Overarching NSP for Energy (EN-1) gives general policy guidance in relation to energy infrastructure projects. With specific regard to the assessment of noise impacts, EN-1 (current January 2024 version) gives the following recommendations:

"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 (Paragraph 5.12.9)."

9.2.22 EN-1 advises that operational noise should be assessed using the principles of the relevant British Standard, and Footnote 262 of EN-1 lists British Standard BS 4142, BS 6472 and BS 8233 as examples. Similarly, footnote 263 of EN-1 references British Standard BS 5228 as a relevant standard for the assessment of noise from construction and decommissioning noise. These British Standards are discussed in more detail in the following section.

9.2.23 As referenced in EN-1, the National Policy Statement for Electricity Networks Infrastructure (EN-5) provides planning policy advice specific to the development of electrical infrastructure projects. EN-5 sets out specialised assessment procedures that are applicable to overhead transmission lines. However, since the cable route that is to be considered as part of VE is entirely underground, this advice is not relevant to the assessment presented in this Chapter. EN-5 also makes reference to the assessment of operational noise from substation equipment (paragraph 2.9.37) and refers to BS 4142 as a standard method of assessment of noise (paragraph 2.9.39).

9.2.24 Details of the policies of relevance to this assessment are provided in Table 9.3 together with an indication of where each requirement is addressed.

9.2.25 Table 9.3 also presents key details of relevant saved local planning policy with regard to noise and vibration; however, the NPS remain the principal policy against which VE will be assessed.

TENDRING DISTRICT LOCAL PLAN

9.2.26 The Tendring District Local Plan (TDLP) 2013-2033 comprises two sections: Section 1 which was adopted 26 January 2021 and is shared with neighbouring authorities Braintree and Colchester; and Section 2 which was adopted 25 January 2022.

9.2.27 There are no specific noise policies set out in the TDLP; however, noise is referenced within Policy SP7 (Section 1): Place Shaping Principles and Policy SPL3 (Section 2): Sustainable Design.

9.2.28 Policy SP7 states:

"All new development must meet high standards of urban and architectural design. Development frameworks, masterplans, design codes, and other design guidance documents will be prepared in consultation with stakeholders where they are needed to support this objective.

All new development should reflect the following place shaping principles, where applicable:

….

Protect the amenity of existing and future residents and users with regard to noise, vibration, smell, loss of light, overbearing and overlooking."

9.2.29 Part C: Impacts and Compatibility of Policy SPL3 states:

"New development (including changes of use) should be compatible with surrounding uses and minimise any adverse environmental impacts. The following criteria must be met:

….

b. the development, including any additional road traffic arising, will not have unacceptable levels of pollution on: air, land, water (including ground water), amenity, health or safety through noise, smell, dust, light, heat, vibration, fumes or other forms of pollution or nuisance;…"

9.2.30 Relevant legislation and policy is outlined in Table 9.3.

Table 9.3: Summary of Policy Context

Legislation / policy	Key provisions	Section where comment addressed
EPA	Part III of the EPA provides powers for Local Authorities and affected persons to seek remedies where a statutory nuisance exists.	The risk of statutory nuisance arising is considered in Volume 5, Report 7: Environmental Protection Statement of Engagement. The control of significant effects would be expected to minimise the risk of nuisance.
CoPA	Sections 60 and 61 of Part III of the CoPA provide powers to Local Authorities for controlling noise from construction activities.	Construction noise impacts are considered in Section 9.10. Where approvals under COPA may be required, these have been included in Volume 5, Report 8: Details of other consents and licences.
NPSE, Overarching Noise Policy Vision	Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.	The significance of construction and operational noise has been assessed in Sections 9.10 and 9.11 and where appropriate mitigation specified to control the management of noise.
NPSE, Noise Policy Aims	Avoid noise having significant adverse impacts on health and quality of life and mitigate and minimise adverse impacts.	The assessment defines the relevant thresholds for SOAEL in Section 9.5 which are used to assess significance of effect in Sections 9.10 and 9.11.
EN-1 Paragraph 5.12.6	Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:	Noise generating plant is set out in Table 9.27, Table 9.30, Table 9.35, and Table 9.43. Noise impacts are assessed in Sections 9.10 and 9.11 at identified NSRs together with any mitigation required.

Legislation / policy	Key provisions	Section where comment addressed
	> 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	Section 9.7 provides a description of the existing noise environment.
EN-1 Paragraph 5.12.9	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	The assessment has been undertaken in accordance with the principles in the relevant British Standards as outlined in Paragraphs 9.4.27 to 9.4.47.

Legislation / policy	Key provisions	Section where comment addressed
	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 5.12.15	The project should demonstrate good design through the 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)	The siting of the OnSS and onshore ECC route has taken into account the locations of the nearest sensitive receptors. The measures adopted to avoid and mitigate effects are set out in Section 9.9, Table 9.26, Paragraphs 9.10.11, 9.10.43, and 9.10.46.
EN-1 Paragraph 5.12.17	The Secretary of State should not grant development consent unless they are satisfied that the proposals will meet the following aims, through the effective management and control of noise: > avoid significant adverse impacts on health and quality of life from noise > mitigate and minimise other adverse impacts on health and quality of life from noise > where possible, contribute to improvements to health and quality of life through the effective management and control of noise	The measures adopted to avoid and mitigate effects are set out in Section 9.9, Table 9.26, Paragraphs 9.10.11, 9.10.43 and 9.10.46.
Local Policy SP7	To protect the amenity of existing residents with regard to noise and vibration.	Construction and operational noise levels and the potential impact on existing properties as NSRs have been

Legislation / policy	Key provisions	Section where comment addressed
		assessed in Sections 9.10 and 9.11.
Local Policy SPL3	Any noise from a new development, including any additional road traffic, is to be acceptable.	Construction and operational noise levels have been assessed in Sections 9.10 and 9.11 against criteria representing best practice acceptable levels.

STANDARDS AND GUIDANCE

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

BRITISH STANDARDS 2558:2009 + A1:2014 PART 1: NOISE

9.2.32 BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

9.2.33 BS5228-1:2009+A1:2014 is the appropriate standard for assessing the impact of construction noise upon the existing noise environment at nearby sensitive receptors.

9.2.34 Noise levels generated by construction operations and experienced at local receptors will depend upon a number of variables, the most significant of which are likely to be:

- the amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the “on-time”;
- the distance between the noise source and the receptor;
- the attenuation due to ground absorption or barrier screening effects; and
- reflections of noise due to the presence of hard vertical faces such as walls.

9.2.35 BS5228-1:2009+A1:2014 gives several examples of acceptable noise thresholds for construction or demolition noise. For this assessment, as baseline noise data is available, it is proposed that the ABC method will be used to determine the threshold value at the receptor locations.

9.2.36 Under the ABC method, a threshold value noise level is determined by establishing the existing ambient noise level at each location. This measured ambient noise level is then rounded to the nearest whole 5 dB(A) and the threshold noise value for each receptor is then established from Table E.1 of BS5228-1:2009+A1:2014.

9.2.37 If the threshold value is exceeded, then the effect of construction noise upon nearby receptors may be significant. BS5228-1:2009+A1:2014 states that the significance of the effect will depend upon *"other project-specific factors, such as the number of receptors affected and the duration and character of the impact."* Professional judgement will be used to determine whether an effect is considered to be significant, and commentary explaining the reasons for this judgement will be provided. In accordance with this method, the threshold noise levels for a potentially significant effect are as detailed in Table 9.4.

Table 9.4: Construction Noise BS5228-1 Example Threshold Values

Assessment category and threshold value period	Threshold value, dB L_{Aeq}		
	Category A [A)]	Category B [B)]	Category C [C)]
Night-time (2300-0700)	45	50	55
Evening and weekends [D)]	55	60	65
Daytime (0700-1900) and Saturday (0700-1300)	65	70	75

9.2.38 The notes for Table 9.4Table 9.4 are as follows:

- NOTE 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.
- NOTE 2: If the ambient noise level exceeds the threshold values given in the Table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.
- NOTE 3: Applied to residential receptors only.
- A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
- B) Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
- C) Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
- D) 19.01-23.00 weekdays, 13.01-23.00 Saturdays and 07.01-23.00 Sundays.

9.2.39 Note that the thresholds in Table 9.4Table 9.4 above are external to an NSR and are not internal noise levels.

9.2.40 BS5228-1:2009+A1:2014 provides another example method for determining potential significant effects using a 5 dB change. In this method site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut off values equal to Category A listed in Table 9.4Table 9.4; and the duration of works is of one month or more, unless works of a shorter duration are likely to result in a significant effect.

9.2.41 If the contractor has applied all reasonable measures to reduce construction noise and the levels remain high, example thresholds are provided in BS5228-1:2009 +A1:2014 for the determination of eligibility for noise insulation and temporary housing.

9.2.42 Noise insulation and/or reasonable mitigation will be offered by the developer, where the construction noise level outside the dwelling exceeds the higher of:

- the noise insulation trigger levels presented in Table 9.5Table 9.5 for the corresponding times of day
- a noise level 5 dB or more above the existing pre-construction ambient noise level for the corresponding times of day;

and for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

9.2.43 Temporary rehousing will be offered by the developer, where the construction noise level outside the dwelling exceeds the higher of:

- A noise level 10 dB above any of the trigger levels presented in Table 9.5Table 9.5 for the corresponding times of day; or
- A noise level 10 dB above the existing pre-construction ambient noise level for the corresponding times of day;

and for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

Table 9.5: Construction Noise Insulation Trigger Levels

Time	Relevant time period	Averaging time, T	Noise insulation trigger level, dB $L_{Aeq,T}$
Monday to Friday	0700 – 0800	1 hour	70
	0800 – 1800	10 hours	75
	1800 – 1900	1 hour	70
	1900 – 2200	3 hours	65
	2200 – 0700	1 hour	55
Saturday	0700 – 0800	1 hour	70
	0800 – 1300	5 hours	75
	1300 – 1400	1 hour	70
	1400 – 2200	3 hours	65
	2200 – 0700	1 hour	55
Sundays and public holidays	0700 – 2100	1 hour	65
	2100 – 0700	1 hour	55

9.2.44 It is noted that all values presented in Table 9.5Table 9.5 are predicted or measured at a point 1 m in front of the most exposed of any windows and doors in any façade of any eligible dwelling.

9.2.45 The impact of construction noise, arising from VE, upon residential receptors will be determined with reference to BS5228:2009+A1:2014 Part 1.

BRITISH STANDARD 5228:2009 + A1:2014 PART 2: VIBRATION

9.2.46 BS5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/ operations generate significant vibration levels.

9.2.47 The majority of people are known to be very sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of between 0.14 mm/s and 0.30 mm/s. Vibration levels above these values can cause disturbance. BS5228-2:2009+A1:2014 provides guidance on the effects of vibration shown in Table 9.6.

Table 9.6: Risk of Complaint from Vibration Levels

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

9.2.48 High vibration levels generally arise from ‘heavy’ construction works such as piling, deep excavation, dynamic ground compaction or drilling.

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

9.2.50 The empirical equations for predicting construction-related vibration provide estimates in terms of PPV. Therefore, the consequences of predicted levels in terms of human perception and disturbance can be established through direct comparison with the BS 5228-2:2009+1A:2014 guidance vibration levels shown in Table 9.6.

BS4142:2014+A1:2019

9.2.51 BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound is intended to be used to assess the potential adverse impact of sound, of an industrial and/ or commercial nature, at nearby sensitive receptor locations within the context of the existing sound environment.

9.2.52 Where the specific sound contains tonality, impulsivity and/ or other sound characteristics, corrections should be applied depending on the perceptibility. For tonality, a correction of up to 6 dB should be added; for impulsivity, a correction of either 0, 3, 6 or 9 dB should be added and if the sound contains specific sound features which are neither tonal nor impulsive a penalty of 3 dB should be added.

9.2.53 In addition, if the specific sound contains characteristics that are neither tonal nor impulsive, nor intermittent, though are otherwise readily distinguishable against the existing sound environment, a further correction of 3 dB may be applied.

9.2.54 The assessment of impacts contained in BS4142:2014+A1:2019 is undertaken by comparing the sound rating level, i.e. the specific sound level of the source plus any character corrections, to the measured representative background sound level immediately outside the sensitive receptor location. Consideration is then given to the context of the existing sound environment at the sensitive receptor location to assess the potential impact.

9.2.55 Once an initial estimate of the impact is determined, by subtracting the measured background sound level from the rating sound level, BS4142:2014+A1:2019 states that the following should be considered:

- typically, the greater the difference, the greater the magnitude of the impact;
- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. It is an indication that the specific sound source has a low impact when the rating level does not exceed the background sound level, depending on the context.

9.2.56 BS4142:2014+A1:2019 outlines guidance for the consideration of the context of the potential impact, including consideration of the existing residual sound levels, location and/ or absolute sound levels. BS4142:2014+A1:2019 notes 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."

9.2.57 The impact of operational noise from the substation noise upon residential receptors will be determined with reference to BS4142:2014+A1:2019 and in combination of other guidance and standards.

ACOUSTICS AND NOISE CONSULTANTS TECHNICAL NOTE ON BS 4142

9.2.58 The Acoustics and Noise Consultants (ANC) technical note on BS4142:2014+A1:2019 was published in March 2020. The document reviews the British Standard and addresses the content regarded to be ambiguous.

9.2.59 Included in the technical note is guidance on areas of low background noise and the absence of any definition of low in BS4142:2014+A1:2019. It is noted that the note to the scope of the 1997 version of BS4142 defined very low background sound levels as being less than about 30 dB L_{A90} and low rating levels being less than about 35 dB $L_{Ar,Tr}$. The ANC technical note advises that similar values would not be unreasonable in the context of BS4142:2014:+A1:2019, subject to professional judgement.

WORLD HEALTH ORGANISATION

9.2.60 The World Health Organisation 2018 Environmental Noise Guidelines for the European Region, published in 2018, do not cover industrial noise. However, the previous 1999 Community Noise Guidelines (CNG) remain valid for industrial noise, i.e. *"… all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid"*.

9.2.61 The 1999 guidelines are therefore still valid when referring to external daytime (07:00 – 23:00 hours) ambient noise level limits. This document sets out guideline values for noise levels for different environments. For outdoor living areas during the daytime a value of 50 dB $L_{Aeq,\ 16hour}$ is described as 'moderate annoyance' and 55 dB $L_{Aeq,16hour}$ as 'serious annoyance'. During the night-time (23:00 – 07:00 hours) a level of 45 dB $L_{Aeq,8hour}$, as experienced outside an open bedroom window, is described as the guideline value when sleep disturbance starts to occur.

9.2.62 The 2009 Night Noise Guidelines are also still valid and define effect thresholds or 'lowest observed adverse health effect levels' for both immediate physiological reactions during sleep and long-term adverse health effects. The Guidelines state:

- An $L_{night,outside}$ level of less than 30 dB(A): No effects expected to occur, equivalent to NOEL for night noise.
- An $L_{night,outside}$ level of 40 dB(A): Adverse effects start to occur. $L_{night,outside}$ 40 dB is equivalent to the LOAEL for night noise.
- An $L_{night,outside}$ level of 55 dB(A): Adverse effects such as sleep disturbance are likely and occur frequently.

9.2.63 It should be noted that noise levels discussed in the two guidelines use different noise indexes. $L_{Aeq,T}$ is an equivalent sound pressure level over time T. Whilst an L_{night} is the annual average over the night-time period. If you assume a steady state noise, then an $L_{Aeq,T}$ should be close to or equal to an L_{night}. However, they are different metric and are not directly comparable.

GUIDELINES FOR ENVIRONMENTAL NOISE IMPACT ASSESSMENT

9.2.64 The Institute of Environmental Management and Assessment (IEMA) 'Guidelines for Environmental Noise Impact Assessment', Version 1.2 published in November 2014, addresses the key principles of a noise impact assessment and are applicable to *"all development proposals where noise effects are likely to occur"* and *"are relevant to all types of projects, regardless of size"*.

9.2.65 The guidelines provide specific support on how noise impact assessments fit within the Environmental Impact Assessment (EIA) process but can also apply to developments which do not require an EIA. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels.

9.2.66 Table 7-14 of the guidelines refers to impacts from change in sound levels, reproduced below in Table 9.7Table 9.7. This is discussed further in paragraph 9.5.17.

Table 9.7: IEMA Impact from Change in Sound Criteria

Long term impact classification	Short term impact classification	Sound level change, dB $L_{Aeq,T}$
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3 dB and < 5 dB
Moderate	Major	≥ 5 dB and < 10 dB
Major		≥ 10 dB

CALCULATION OF ROAD TRAFFIC NOISE

9.2.67 The former Department of Transport and Welsh Office memorandum Calculation of Road Traffic Noise (CRTN) published in 1988 sets out standard methods and procedures to predict and measure road traffic noise. These procedures were primarily intended to enable entitlement under the Noise Insulation Regulations to be determined, but they also provide guidance appropriate to the calculation of traffic noise for more general applications, for example the haul route under assessment in this Chapter.

9.2.68 Road traffic noise is predicted and measured in terms of a statistical measure, equivalent to the 10th percentile. Termed the L_{A10}, this measure of noise is equivalent to the noise level exceeded for 10 per cent of the measurement period. Most legislation that refers to road traffic noise uses this noise index over an 18-hour period, from 06:00 hours to 00:00 hours.

9.2.69 The CRTN prediction method applies a correction if the flow of traffic on a section of road is low, less than 4,000 vehicles per 18-hour period, and is not reliable if the flow is less than 1,000 vehicles per 18-hours.

9.2.70 The Design Manual for Roads and Bridges (DMRB) was originally published by the Department for Transport and sets out procedures for undertaking the design of road schemes. LA 111: 2019 sets out a methodology for assessing the impacts of noise and vibration. This methodology is generally applied to the assessment of new road schemes or schemes that result in changes in traffic flows on existing road links.

9.2.71 LA 111 advises that the study area limited to 300 m from construction activity is normally sufficient for assessing significant effects.

9.2.72 For construction traffic, LA 111 compares the Basic Noise Level (BNL) increases, as calculated using CRTN, for roads within the construction traffic study area. The magnitude of impact of construction traffic is set out in Table 3.17 of LA 111, reproduced in Table 9.8.

Table 9.8: LA 111 Magnitude of Impact for Construction Traffic Noise

Magnitude of impact	Increase in BNL of closest public road used for construction traffic (dB)
Major	Greater than or equal to 5
Moderate	Greater than or equal to 3 and less than 5
Minor	Greater than or equal to 1 and less than 3
Negligible	Less than 1

9.3 CONSULTATION

9.3.1 Consultation with regards to the scope of the Noise and Vibration assessment was outlined within the Scoping Report (GoBe, 2021) and has been undertaken through the VE Evidence Plan (Noise and Vibration Expert Topic Group (ETG)) process, comprising discussion with Essex County Council and Tendring District Council.

9.3.2 A Scoping Opinion for VE was sought from the Planning Inspectorate (PINS), which included responses to the proposed assessment methodology for further consideration.

9.3.3 In addition, Essex County Council and Tendring District Council were consulted over the general approach to the assessment and the baseline noise survey. The consultation took place through July 2022 to August 2022 and all points raised were agreed between all parties.

9.3.4 Consultation has also been undertaken through ETG meetings that took place on 3 November 2022 and 2 October 2023.

9.3.5 Given the changes in the project design between PEIR and ES, some areas of land will be affected differently by the proposals than consulted on at PEIR. Changes were made following feedback from the PEIR consultation, increased understanding of the local environment from dedicated surveys and coordination work with the North Falls project. To comply with the requirements of the Planning Act 2008, a targeted consultation was held with those affected by the changes from 5 December 2023 to Wednesday 31 January 2024.

9.3.6 Table 9.9 provides a summary of consultation comments received to date relating to Noise and Vibration, and associated responses.

Table 9.9: Summary of Consultation Relating to Noise and Vibration

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
November 2021 PINS Scoping Opinion	The Inspectorate agrees that offshore airborne noise impacts during all phases of VE are unlikely to result in significant effects and can be scoped out of further assessment in the ES.	Offshore airborne construction, operational and decommissioning noise impacts have not been included within this Chapter.
November 2021 PINS Scoping Opinion	Due to the location of the substation not being known at the scoping stage the Inspectorate was not able to agree to scope out vibration impacts arising from its operation. The ES should include an assessment of these matters or the information demonstrating agreement with relevant stakeholders and the absence of Likely Significant Effects (LSE)	Further consultation was carried out on this matter with Essex County Council in a letter dated 28 July 2022. Their response (outlined further below in this table) supersedes PINS Scoping Opinion on this matter.
November 2021 PINS Scoping Opinion	The Inspectorate agrees that operational noise and vibration from the underground cable within the Onshore Export Cable Corridor (ECC) can be scoped out of further assessment, subject to agreement with the relevant Environmental Health Officer.	The letter dated 28 July 2022 to Essex County Council scopes out operational noise and vibration from the onshore ECC. Response received back 1 August 2022 agreed with this approach. Operational noise and vibration impacts from the onshore ECC have not been included within this Chapter.
November 2021 PINS Scoping Opinion	Construction, operation and decommissioning of the offshore extent of the export cable route (offshore ECC) and the array areas on the nearest onshore NSRs can be scoped out of further assessment in the ES.	Noise and vibration from the construction, operation and decommissioning of the offshore ECC and the array areas impacts have not been included within this Chapter.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
November 2021 PINS Scoping Opinion	The Inspectorate agrees that transboundary noise and vibration impacts can be scoped out of further assessment.	Transboundary noise and vibration impacts have not been included within this Chapter.
November 2021 PINS Scoping Opinion	The ES should explain any assumptions used in the construction noise assessment. This should include the types of vehicles and plant to be used during the construction phase. Where this is not known then the ES should explain how the noise levels have been derived. The ES should include an assessment based on the 'worst case' for receptors, i.e. that within the application boundary the vehicles and plant are at the closest possible point to a receptor.	Paragraphs 9.4.27 to 9.4.38 and Section 9.10 describe the construction noise and vibration assessment method and Volume 6, Part 6, Annex 9.2: Construction Noise Assessment sets out the assumptions for plant sound power levels which are summarised in Table 9.27, Table 9.30 and Table 9.35.
November 2021 PINS Scoping Opinion	The onshore search area for construction traffic noise does not encompass the full extent of the potential construction traffic routes. The final noise study area and identification of NSRs should be informed by the expected construction traffic routes.	Paragraphs 9.4.39 to 9.4.42 describes the construction traffic noise assessment method and area.
28 July 2022 Consultation letter to Essex County Council	Construction, operational and decommissioning noise from the array upon shoreline receptors can be scoped out.	Construction, operational and decommissioning noise impacts from the array have not been included within this Chapter.
28 July 2022 Consultation letter to Essex County Council	Operational noise and vibration of the underground cable situated within the onshore ECC can be scoped out.	Operational noise and vibration impacts of the cable within the onshore ECC have not been included within this Chapter.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
28 July 2022 Consultation letter to Essex County Council	Construction, operational and decommissioning noise from the offshore ECC upon shoreline receptors can be scoped out.	Construction, operational and decommissioning noise impacts from the offshore ECC have not been included within this Chapter.
28 July 2022 Consultation letter to Essex County Council	Transboundary noise impacts can be scoped out.	Transboundary noise impacts have not been included within this Chapter.
28 July 2022 Consultation letter to Essex County Council	There would be no LSE relating to noise and vibration arising from the operation of the Landfall[1]. The assessment is to consider construction and decommissioning impacts only.	Operational noise and vibration impacts of the Landfall have not been included within this Chapter. Paragraphs 9.10.4 to 9.10.19 assesses the construction noise and vibration impacts of the Landfall.
28 July 2022 Consultation letter to Essex County Council	No background noise surveys would typically be required along the onshore ECC route. Localised noise surveys may be appropriate to supplement the assessment as required.	Background noise surveys did not include locations along the onshore ECC route. Paragraphs 9.5.4 to 9.5.6 set out the criteria of the construction noise assessment.
28 July 2022 Consultation letter to Essex County Council	Vibration occurring during the operation of the OnSS would be of low magnitude and receptors would be sufficient distance that there would be no LSE. Operational vibration impacts can of the OnSS can be scoped out.	Operational vibration impacts of the OnSS have not been included within this Chapter.

[1] Landfall area of VE is where the offshore export cables are brought ashore and jointed to the onshore export cables in Transition Joint Bays (TJBs).

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
28 July 2022 Consultation letter to Essex County Council	Construction noise impacts are to be calculated in accordance with BS 5228-1 and where the distance exceeds the validity of BS 588-1, ISO 9613-2 is to be used. Predictions are to be made at fixed distances from construction activity.	Paragraphs 9.4.27 to 9.4.38 detail the prediction method for construction noise.
28 July 2022 Consultation letter to Essex County Council	Assessment of construction noise impacts is to be in accordance with BS 5228-1 ABC method. Where no background noise data is available to inform NSR category, the most stringent category A is to be assumed.	Paragraph 9.7.31 details the method for the assessment of construction noise in the absence of baseline noise data.
28 July 2022 Consultation letter to Essex County Council	Construction vibration impacts and assessment are to be in accordance with BS 5228-2. Construction vibration assessment will be limited to Horizontal Directional Drilling (HDD) and piling activities only.	Paragraphs 9.4.31 to 9.4.37, 9.10.13 to 9.10.19, 9.10.48 to 9.10.58, 9.10.64, and 9.10.74 to 9.10.79 detail the method for the assessment of construction vibration. Vibration of ground compaction works included also.
28 July 2022 Consultation letter to Essex County Council	Decommissioning noise and vibration will not be assessed separately and the results of the construction noise and vibration assessment will be used to provide as a worst case for the decommissioning phase.	Decommissioning noise and vibration impacts of VE have not been included within this Chapter.
28 July 2022 Consultation letter to Essex County Council	The only operational impacts that need to be assessed are those associated with the noise from the OnSS. BS4142 and baseline noise survey data are to be used to assess these impacts.	Paragraphs 9.4.43 to 9.4.47 and Section 9.11 details the method for the assessment of operational noise impact from the OnSS.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
4 August 2022 Consultation meeting with Essex County Council.	Essex County Council advised of North Falls Offshore Wind Farm (North Falls) baseline noise survey and consideration of using the data to inform VE baseline.	Paragraph 9.4.26 and Section 9.7 details the method for determining the baseline noise climate and how data has been acquired.
12 August 2022 Non-statutory consultation letter from Essex County Council.	Noise is raised in general terms. A detailed Construction Management Plan (CMP) in accordance with BS5228 is requested. The noise assessment is to consider operational and construction noise. As part of a Waste Infrastructure Impact Assessment noise impacts upon VE is to be considered.	A CMP not required for the EIA. Noise and vibration control measures are set out in the CoCP (Application Document 9.21), secured by the DCO. Sections 9.10 and 9.11 assess construction and operational noise impact from VE upon the existing environment. VE is not noise sensitive, so impacts upon it do not need to be assessed.
30 August 2022 Consultation letter to Essex County Council	North Falls noise survey data will be used to inform the baseline for VE. A further noise survey will be required to supplement these data.	Section 9.7 details the baseline noise survey and locations where measurements were taken.
3 November 2022 ETG meeting	Overview of assessment method, study area, assessment criteria and baseline conditions were provided.	Paragraphs 9.4.27 to 9.4.49 details the assessment method, Paragraphs 9.4.3 to 9.4.20 details the study area, Section 9.5 sets the assessment criteria and baseline conditions are summarised in Section 9.7.
12 May 2023 Section 42 response from Essex County Council	The Council request an operational and construction noise assessment is undertaken.	Section 9.11 details the operational noise assessment and Section 9.10 details the construction noise assessment.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
12 May 2023 Section 42 response from Tendring District Council	Concern over operational noise emanating from the substation.	Section 9.11 details the operational noise
Section 42 responses from Little Bromley Parish Council	Concern raised over operational noise from the substation. Would like to know the maximum noise increase in the village with mitigation measures in place. Concerns raised that construction noise will be disruptive and intrusive to the village and surrounding areas. Further explanation of the construction noise threshold requested. 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 mitigation measures could be included to reduce construction noise.	Section 9.11 details the operational noise assessment. Section 9.10 details the construction noise assessment and Volume 6, Part 6, Annex 9.2: Construction Noise Assessment. Construction noise threshold discussed in Paragraph 9.5.4 to 9.5.8. Further information addressing specific points raised are addressed in Paragraph 9.5.7 to 9.5.8.
2 October 2023 ETG meeting	Overview of assessment method, and consultation responses was provided.	Section 9.4 details the scope and assessment methodology, Section 9.5 sets the assessment criteria and baseline conditions are summarised in Section 9.7.

9.4 SCOPE AND METHODOLOGY

SCOPE OF THE ASSESSMENT

IMPACTS SCOPED IN FOR ASSESSMENT

9.4.1 The impacts that have been scoped into this assessment are summarised in Table 9.10.

Table 9.10: Impacts Scoped in for Assessment

Topic	Impact	Description of impact to be assessed
Construction	Impact 1	Noise and vibration during the construction of the Landfall
	Impact 2	Noise and vibration during the construction of the onshore ECC
	Impact 3	Noise and vibration during the construction of the OnSS
	Impact 4	Noise and vibration during the road improvements to the A120 junction and Bentley Road
	Impact 5	Noise from construction vehicles using the road network
Operation	Impact 6	Noise during the operation of the OnSS
Cumulative	Impact 7	Cumulative noise during the construction of the Landfall with other developments in the area
	Impact 8	Cumulative noise during the construction of the onshore ECC with other developments in the area
	Impact 9	Cumulative noise during the construction of the OnSS with other developments in the area
	Impact 10	Cumulative noise from construction vehicles using the road network with other developments in the area
	Impact 11	Cumulative noise during the operation of the OnSS with other developments in the area

IMPACTS SCOPED OUT OF ASSESSMENT

9.4.2 On the basis of the baseline environment and the project description outlined in Volume 6, Part 3, Chapter 1: Onshore Project Description and in accordance with the Scoping Opinion (PINS, 2021) and consultation summarised in Table 9.9Table 9.9, a number of impacts have been scoped out (see Table 9.9), as summarised in Table 9.11.

Table 9.11: Impacts Scoped out of Assessment

Topic	Impact	Description of impact to be assessed
Construction	Impact 1	Noise and vibration during the construction of the offshore wind farm array
	Impact 2	Noise and vibration during the construction of the offshore ECC
	Impact 3	Transboundary noise and vibration impact during construction of any part of VE
	Impact 4	Noise and vibration during the decommissioning of VE
	Impact 5	Vibration impacts from HGV and construction traffic
Operation	Impact 6	Noise and vibration impacts during the operation of the offshore wind farm array
	Impact 7	Noise and vibration impacts during the operation of the offshore ECC
	Impact 8	Noise and vibration impacts during the operation of the onshore ECC
	Impact 9	Noise and vibration impacts during the operation of the Landfall
	Impact 10	Vibration impacts during the operation of the OnSS
	Impact 11	Transboundary noise and vibration impact during the operation of any part of VE

STUDY AREA

9.4.3 DMRB LA111 identifies the need to define a construction noise study area and states that *"A study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive receptors."*. Whilst it is recognised that a study area based on 300 m is normally sufficient, construction works could take place during the evening and night periods, when the appropriate noise limits are lower, as set out in Table 9.4.

9.4.4 Further consideration has been given to the construction noise levels likely to be generated by VE, specifically during the evening and night periods, and at a distance of 650 m no LSE would be present under a worst case.

9.4.5 DMRB LA111 also advises 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"*.

9.4.6 Less guidance is available regarding an appropriate study area for operational noise impacts. Typically, thresholds for operational noise impact are more stringent than those applied to construction noise; however, the level of noise generated is often less. A distance of 1 km 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.

9.4.7 Based on the above, the study area is typically set to 650 m for construction noise, 100 m for construction vibration, and 1 km for operational noise.

9.4.8 The study area for the Noise and Vibration assessments has been divided into four separate areas as set out below and discussed in more detail in the subsequent sections:

- the Landfall;
- the onshore ECC;
- the OnSS; and
- the widening of Bentley Road and improvements to A120 junction with Bentley Road.

THE LANDFALL

9.4.9 The Landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore export cables in the Transition Joint Bays (TJBs). There is a clear overlap in the offshore and onshore study area at the intertidal area of the Landfall, as described in Volume 6, Part 2, Chapter 1: Offshore Project Description.

9.4.10 Landfall construction activities will predominantly take place in three potential locations, as highlighted on Figure 9.1, and are:

- Beach Works Temporary Construction Compound (TCC) at Manor Way;
- Landfall compound; and
- Beach and intertidal area.

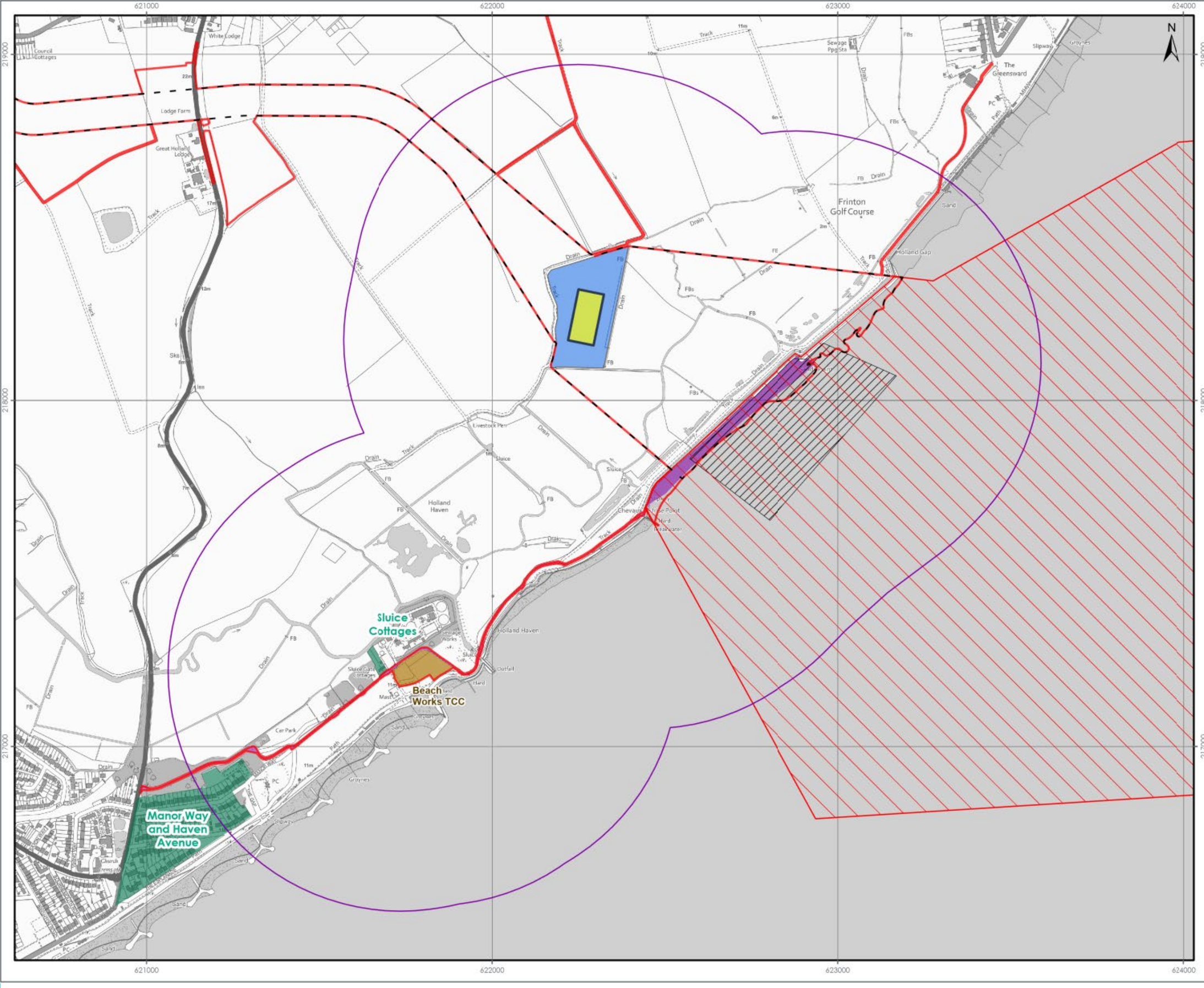
9.4.11 It is noted that there are no NSRs located within 650 m of the Landfall compound and the beach and intertidal area.

9.4.12 There are two dwellings located adjacent to the beach works TCC: Nos 1 and 2 Sluice Cottages, Manor Way, and the following dwellings located approximately 500 m to 650 m away:

- Manor Way, even numbers: 32 - 60 and odd numbers: 39 - 49;
- Haven Avenue, odd numbers: 39 - 47;

9.4.13 The assessment has considered Sluice Cottages and of the more distant receptors the closest to the beach works TCC: 60 Manor Way. Other dwellings listed above in Paragraph 9.4.11 would be exposed to lower levels of construction noise as they are either situated at a greater distance, behind other buildings that may act as a noise barrier, or both.

9.4.14 Figure 9.1 illustrates the study area for the Landfall.



LEGEND

- Onshore Order Limits
- Offshore Order Limits
- Onshore Export Cable Corridor
- Landfall Exit Pit Sheet Piling Zone
- Landfall Compound Zone
- Indicative Landfall Compound
- Temporary Beach Access Zone
- Temporary Construction Compound
- Landfall Study Area
- Noise Sensitive Receptor Location

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

LANDFALL STUDY AREA

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.1

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

THE ONSHORE ECC

9.4.15 The onshore ECC connects the Landfall to the OnSS at Little Bromley. The main cable route will have a length of approximately 22 km and will be installed using a standard trenching technique. In some areas the use of trenchless crossing techniques such as HDD will be required to cross obstacles, e.g. roads and rivers. References to HDD within this Chapter, also include other trenchless crossing techniques. Noise and vibration levels associated with HDD also cover other trenchless crossing techniques.

9.4.16 The onshore ECC is divided into seven sections that naturally fall between key obstacle crossings. These sections are discussed further in Paragraph 9.10.20.

9.4.17 The Noise and Vibration study area for the onshore ECC follows the route of the onshore ECC and extends a distance 650 m from the onshore ECC for the assessment of noise impacts and 100 m for the assessment of vibration impacts. This distance aligns with the guidance discussed in paragraphs 9.4.2 to 9.4.6. There are no operational noise impacts associated with the onshore ECC.

9.4.18 The study area for the onshore ECC also includes 650 m from any off-route areas, such as the TCCs and temporary haul roads and allows for trenchless installation compounds where required.

THE ONSS

9.4.19 The OnSS will be located north of Ardleigh Road and east of Grange Road, north east of the existing Lawford substation. As set out in in paragraphs 9.4.3 to 9.4.7, the study area for the OnSS will extend from its boundary by 650 m during construction and 1 km for the operational noise assessment.

9.4.20 Figure 9.2 illustrates the study area for the OnSS.

BENTLEY ROAD IMPROVEMENTS

9.4.21 A 1.4 km section of Bentley Road situated between the A120 and approximately 100 m north of the intersection with the onshore ECC will be widened, a Non-Motorised User path may be constructed, and a section of the A120 approximately 200 m long and centred around the junction with Bentley Road will be improved.

9.4.22 As set out in in paragraph 9.4.2, the study area defined in DMRB is 300 m, which is appropriate for standard construction work associated with road improvements. Some night working is anticipated to be likely for the Bentley Road widening and A120 junction improvement works; however, these specific parts of the works are less likely to be noise intensive, e.g. works to the central reservation barrier and road marking adjustments. Therefore, the assessment focuses on the daytime impacts. If night working involving the use of heavy plant is required, a more detailed assessment will be undertaken to determine if there would be any significant effects.

9.4.23 Figure 9.3 illustrates the study area for the Bentley Road Improvements.

607000
608000
609000
230000
229000
228000
N
SSR1
SSR2
SSR3
SSR4
SSR5
SSR6
SSR7
SSR8
SSR9
SSR10
SSR11
SSR12
Section 7
Home Farm
Badliss Hall
Badliss Hall Cottages
Charity Farm
Hungerdowns
Wormseywood Farm
Mayfields Farm
Airstrip
Bounds Farm
Lawfordhouse Farm
Grange Farm
Track
Path
Drain
Spinks's Farm
Hollylodge Cottages
Little Bromley
Jennings's Farm
Normans Farm
Cattsgreen Farm
Clover Cottage
Wind Turbine
Morrow Lane Farm
Morrowood Cottage
Moonraker
Waterhouse Farm
Waterhouse Cottages
Stable House
Tiley's Farm
Nicholls Corner
Burnt Heath
Field End
Mill House
Spinney House Farm
Clapper House
Walnut Tree
Bromley Cross
Bottle Cottage
Lilleys Farm
Warning Grove
The Old Rectory
Coach House
ESS
FB
PW
A12
A120
A133
COLCHESTER
Manningtree
Mistley

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor
- Substation Operational Boundary
- Indicative Substation Compound
- Substation Temporary Construction Compound
- Indicative Substation Access Route
- Substation Temporary Construction Haul Route
- North Falls Indicative Substation Operational Boundary
- North Falls Indicative Substation Access Route
- National Grid EACN Substation Zone
- Indicative Substation Compound and Substation Temporary Construction Compound 650 m Study Area
- Substation Operational Boundary 1 km Study Area
- Noise Sensitive Receptor Location

ID	Name
SSR1	Property South of Hungerdowns
SSR2	Mayfields Farm
SSR3	Bounds Farm
SSR4	Badley Hall
SSR5	Waterhouse Farm
SSR6	Lilleys Farm
SSR7	Normans Farm
SSR8	Mulberry Lodge
SSR9	Jubilee Villa
SSR10	Hollylodge Farm
SSR11	Grange Farm
SSR12	69 Hungerdown Lane

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ONSHORE SUBSTATION STUDY AREA

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.2

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

610000
611000
227000
N
BRR1
BRR2
BRR3
BRR4
BRR5
BRR6
BRR7
BRR8
BRR9
BRR10
BRR11
BRR12
BRR13
BRR14
BRR15
BRR16
TCC11
Section 5
Section 6
33m
32m
35m
38m
Track
Path
PAYNES LANE
MULBERRY CANE
Hawkins Farm Cottages
Orchard Cottage
Welham's Farm
Craigus
Red House Farm
Byesland Orchard
Jasmine Cottage
Pellens Cottage
Byes Farm
Spring Hall Cottage
Mast
COCK LANE
HARWICH ROAD
THE BROOKE ROAD
A120
Foxash Estate
Little Bromley
Bradfield Heath
Horsleycross Street
Horsley Cross
Great Bromley
Elmstead Market
Little Bentley
Tendring
B1035

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor
- Temporary Construction Compound
- Substation Temporary Construction Haul Road
- Bentley Road Improvement Works
- Bentley Road Improvement Works 300 m Study Area

ID	Name
BRR1	Crabtrees
BRR2	Richmond Cottage
BRR3	1 Hawkins Farm Cottages, Paynes Lane
BRR4	2 Hawkins Farm Cottages
BRR5	Oakwood Bentley Road
BRR6	Orchard Cottage
BRR7	Welhams Farm
BRR8	Craigus
BRR9	Jasmine Cottage
BRR10	The Nook
BRR11	Pellens Cottage
BRR12	Byeways
BRR13	Byes Farm
BRR14	Spring Hall
BRR15	Spring Hall Cottage
BRR16	Red House Farm, Harwich Road

0 100 200
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
BENTLEY ROAD WORKS STUDY AREA

VER	DATE	REMARKS	Drawn	Checked
1	05/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.3

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:6,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WINDFARM

DATA SOURCES

9.4.24 It was agreed with Essex County Council and Tendring District Council that data from the baseline noise surveys undertaken for North Falls offshore wind farm would be used to establish the existing noise environment, supplemented with further baseline noise surveys as required in areas not already covered. The complete set of survey data covers the areas around the Landfall and OnSS representative of nearest NSRs for the daytime and night-time periods. Further information on the baseline noise surveys is provided in Section 9.7.

9.4.25 Other sources that have been used to inform the assessment are listed in Table 9.12.

Table 9.12: Other Available Data and Information Sources

Data set	Details	Year
BS5228-1	Tables C.2 to C.6 sound level data for various construction plant and activities	2019
BS5228-2	Table D.6 historic empirical data of vibration levels	2019
Google Maps aerial photography	General information required when modelling noise propagation and location of features in the area	2023
Ordnance Survey Terrain 50	Ground contour data for noise modelling	2023
Ordnance Survey Master Mapping	Accurate determination of buildings within study area	2023
Tendring District Council local mapping	Used to identify names of dwellings	2023
Noise Impact Assessment, Proposed Battery Energy Storage Site – Land West of Lawford Sub-Station	Inform the cumulative impact assessment	2021

ASSESSMENT METHODOLOGY

9.4.26 The Noise and Vibration assessment methodologies were discussed with Essex County Council and Tendring District Council in correspondence and a meeting throughout July and August 2022, and in ETG meetings in November 2022 and October 2023, as set out in Section 9.3. The assessment methodologies, set out in the following sections, have been agreed.

9.4.27 On site construction noise and vibration assessments have been undertaken for the Landfall (Impact 1), the onshore ECC (Impact 2), the OnSS (Impact 3) and Bentley Road improvements (Impact 4). The assessments have been undertaken in conjunction with BS5228:2009+A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1 Noise and Part 2 Vibration.

9.4.28 Construction noise limits have been set at the identified NSRs in conjunction with the measured baseline levels, where present, and the ABC method contained in BS5228-1:2009+A1:2014.

9.4.29 Construction noise levels have been predicted at the identified NSRs using the BS5228:2009+A1:2014, Part 1 calculation method and assessed against the specified limits. 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:

- distance between the plant and the receptor location;
- percentage of time that the plant will be operating;
- type of ground between the plant and the receptor location;
- acoustic screening provided by barriers, buildings or topography.

9.4.30 Details of the construction activities and the plant and equipment that are likely to be used during these activities have been provided. A summary of these activities and the total sound power level of all plant are set out in the corresponding assessments listed in Section 9.10 and details of individual plant sound power levels can be found in Volume 6, Part 6, Annex 9.2: Onshore Airborne Construction Sound Power Details.

9.4.31 Vibration impacts from the majority of the construction plant and techniques would have no LSE due to the distance between the closest receptor and the activities and that ground level plant does not generate significant levels of vibration.

9.4.32 Vibration impacts from the following construction activities have been considered, as those that have the potential to generate higher levels of vibration:

- the HDD operations at various locations along the onshore ECC; and
- dynamic ground compaction works at the Landfall, along the onshore ECC and the OnSS.

9.4.33 In addition to the above, a temporary sheet pile wall may be installed at the HDD exit pits situated in the beach area of the Landfall, to reduce the flow of drilling fluid into the sea, should it be considered necessary. However, as there are no vibration sensitive receptors within 100 m of this location, there would be no LSE. See Paragraphs 9.4.5 and 9.4.7 for the explanation of the 100 m study area.

9.4.34 Similarly, there will be HDD operations at the Landfall; however, as there are no vibration sensitive receptors within 100 m of these works, there would be no LSE.

9.4.35 The potential vibration impacts of these working methods listed in paragraph 9.4.31 have been predicted at the closest vibration sensitive receptors (VSRs) to each construction activity using the BS5228:2009+A1:2014, Part 2 calculation method, as set out below, and assessed against the specified limits.

9.4.36 The operation of the HDD rigs is likely to generate similar level of vibration to rotary bored piling due to the similar mechanisms involved. Annex D of BS 5228-2:2009+A1:2014 contains historic measured levels from different construction activities, including Table D.6 for rotary bored piling. These data have been used to determine the likely level of PPV from HDD.

9.4.37 Annex E of BS 5228-2:2009+A1:2014 contains empirical formulae derived by Hiller and Crabb (2000) relating resultant PPV with other parameters for specific mechanised construction works. The use of these empirical formulae enables resultant PPV to be predicted at a distance. These have been used to calculate the level of vibration from HDD operations and ground compaction works.

9.4.38 Whilst the majority of construction activities will be carried out during daytime, five HDD crossings within the ECC onshore ECC have been identified to require 24-hour operation, as listed in paragraph 9.10.27. Therefore, noise associated with these crossings have been assessed against daytime, evening and night-time criteria. All other works will only occur between 07:00 and 19:00 hours Monday to Saturday, except in emergency situations. The period between 13:01 and 19:00 on a Saturday is classified as an evening, see Paragraph 9.2.38, and as such is subject to a more stringent construction noise limit than the daytime. The draft Code of Construction Practice (CoCP) 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. Therefore, with the exception of the identified 24-hour HDD crossings, all other construction works has been assessed against daytime criteria.

CONSTRUCTION TRAFFIC

9.4.39 Changes in road traffic noise resulting from construction vehicles using the local road network have been assessed (Impact 5) in accordance with the Design Manual for Roads and Bridges (DMRB). The assessment undertaken includes all roads where it is anticipated that at least a 10% change in the total number of vehicles will occur, which equates to approximately 0.5 dB(A).

9.4.40 For each link, the Basic Noise Level (BNL) has been established for the “With Construction Traffic” and “Without Construction Traffic” scenarios. The BNL is the $L_{A10,\,T}$ dB noise level at 10 m from the kerb of the road assessed, prior to any correction for road surface, gradient, percentage of Heavy Goods Vehicles (HGVs), screening and angle of view. With the exception of the correction for the percentage of HGVs, the other corrections would not alter between the two traffic flow scenarios. Therefore, when considering a change in noise level between two traffic flow scenarios on an unaltered section of road, only the BNL with HGV correction for the different scenarios needs to be compared.

9.4.41 The HGV corrected BNL results for each link have been tabulated and the impact and significance determined.

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

OPERATIONAL NOISE

9.4.43 Noise generated by the operation of equipment within OnSS has been predicted at the nearest NSRs using noise modelling software which employs the methodology in ISO 9613-2:1996. Predicted noise levels have been assessed in accordance with BS 4142:2014+A1:2019, whereby sound levels associated with the operation of the OnSS are compared to measured representative daytime and night-time background sound levels at the closest receptors.

9.4.44 It is noted that at the time of calculation, the 1996 version of ISO 9613-2 was current and that a revised version has been subsequently issued in January 2024. At the time of writing, noise modelling software are still implementing the 1996 version and the changes to the 2024 version are likely to alter the calculated results by a fraction of one decibel and as such will not affect the assessment.

9.4.45 All noise level predictions have been undertaken assuming soft ground (G=1) and an air absorption based on a temperature of 10°C and 70% relative humidity. A receiver height of 1.5 m has been used for the assessment of daytime noise and 4 m for the night-time. Existing buildings have been modelled at a height of 8 m with a façade that reflects 60 % of sound. The buildings within the OnSS have been modelled at their intended dimensions and heights. The calculations represent a free-field value outside of the receptor location.

9.4.46 In accordance with the method described in BS 4142:2014+A1:2019 a correction, based on subjective opinion, for the potential acoustic features has also been included. Corrections can be applied for tonal, impulsive and / or intermittent characteristics that have the potential to lead to increased awareness of a sound. +2 dB has been included for a tone that is just perceptible. An essential part of the BS4142:2014+A1:2019 assessment is to consider the context of the development in the surrounding area, which has been taken into account using the baseline noise survey data, guidance from the WHO and 2014 IEMA guidelines, which is discussed in more detail in Section 9.11.

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

9.4.48 The assessment indicates whether additional mitigation is required to reduce any identified impacts. As with construction noise, where adverse impacts have been identified, mitigation measures are detailed.

CUMULATIVE IMPACT ASSESSMENT

9.4.49 There are a number of potential developments that may contribute to a cumulative noise impact during the construction and operational phases. The timings and locations of construction works for all projects, including VE, will be dependent on many factors and may not coincide such that any one NSR is exposed to construction noise from more than one development at any one time.

9.4.50 The following developments have been considered in the cumulative impact assessment:

- Consented battery storage site west of Lawford substation (planning reference 21/02070/FUL);

- Proposed National Grid East Anglia Connection Node (EACN) substation;
- Proposed North Falls onshore substation;
- Proposed North Falls onshore export cable corridor; and
- Proposed North Falls Landfall.

9.5 ASSESSMENT CRITERIA AND ASSIGNMENT OF SIGNIFICANCE

9.5.1 The assessment criteria for the construction and operational noise and vibration impacts and the resulting effect significance is dependent on two main factors: the sensitivity of the receptor location and the impact magnitude. These are discussed in full below.

SENSITIVITY OF THE ENVIRONMENT

9.5.2 The sensitivity of the environment is defined in Table 9.13. These apply equally to the assessment of noise and vibration impacts and have been based on professional judgement.

Table 9.13: Sensitivity of the Environment

Receptor sensitivity/ importance	Definition / reason
High	Noise may be detrimental to vulnerable receptors, such as rooms within hospitals that require high level of focus (e.g. operating theatre) or care for vulnerable groups of people (e.g. high dependency unit); or The structural integrity of the building is unsound and exposure to vibration would result in permanent structural damage.
Medium	Noise may cause disturbance and a level of protection is required, but a level of tolerance is expected. Example receptors include at all times of the day: dwellings, hospital wards and care homes and daytime only receptors including education facilities. The structural integrity of the building is limited and sub-standard. Exposure to high levels of vibration may cause structural damage which would otherwise not in a standard building.
Low	Leisure and sports facilities including public parks and non-noise-producing employment such as offices. Noise and vibration may be heard or felt but are unlikely to result in any change in behaviour.
Negligible	All other areas including industrial and agricultural. Noise and vibration is unlikely to have any effect.

IMPACT MAGNITUDE

9.5.3 The magnitude of impact will vary depending on the nature of the source of noise or vibration experienced. Each of the relevant different sources of noise and vibration, that would arise as a result of VE, are discussed below and the magnitude of impact quantified. The values specified for the various magnitudes of impact have been derived from guidance documentation or standards relevant to nature of the source, as discussed below.

CONSTRUCTION NOISE IMPACT MAGNITUDE

9.5.4 The impact of construction noise upon NSRs has been determined with reference to the BS5228-1:2009+A1:2014. The two example methods for acceptable noise limits of construction noise provided in BS5228-1, as discussed in Paragraphs 9.2.35 to 9.2.40, result in threshold values for Category A (see Table 9.4) for areas with a prevailing quiet environment.

9.5.5 BS5228-1 also provides advise on the likely impacts of construction noise with regard to the duration of exposure. For areas with a prevailing quiet environment, where the construction noise level outside a dwelling exceeds the trigger levels reproduced in Table 9.5Table 9.5 for a period of 10 or more days in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months, it is deemed to be significant and additional measures such as noise insulation or temporary rehousing may be appropriate.

9.5.6 The impact magnitude for construction noise is set out in Table 9.14Table 9.14, the threshold value is set at Category A (see Table 9.4).

Table 9.14: Construction Noise Impact Magnitude

Magnitude	Definition
High	Threshold value exceeded by more than 5 dB for a period of 10 or more days in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months
Medium	Threshold value exceeded by more than 3 dB and up to 5 dB for a period of 10 or more days in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months
Low	Threshold value exceeded by up to 3 dB, OR threshold value exceeded by more than 3 dB for a period of less than 10 days in any 15 consecutive days, or for a total number of days not exceeding 40 in any 6 consecutive months
Negligible	Threshold value not exceeded

9.5.7 Comments were raised by Little Bromley Parish Council in their Section 42 response requesting further explanation of the construction noise thresholds, and concern was raised over the character of some sources of noise being more discernible than others, such as vehicle reversing alarms.

9.5.8 Noise thresholds that are advised in relevant standards and guidance documents will differ based on a number of factors, including, but not limited to the time of day, character and type of noise experienced, duration of exposure and prevailing noise environment. BS 5228-1:2009+A1:2014 is the relevant British Standard when assessing construction noise and takes account of the factors relevant to the characteristics of construction noise when advising threshold values.

CONSTRUCTION TRAFFIC NOISE IMPACT MAGNITUDE

9.5.9 The impact of the change in road traffic noise level, as a result of construction vehicles, has been determined with reference to the classification of magnitude of impacts presented in the LA 111 and is shown in Table 9.15.

Table 9.15: Construction Traffic Noise Impact Magnitude

Magnitude	Definition
High	Change in HGV corrected BNL of 5 dB or greater
Medium	Change in HGV corrected BNL of at least 3 dB and less than 5 dB
Low	Change in HGV corrected BNL of at least 1 dB and less than 3 dB
Negligible	Change in HGV corrected BNL of less than 1 dB

CONSTRUCTION VIBRATION IMPACT MAGNITUDE

9.5.10 The impact of construction vibration has been determined with reference to BS5228-2:2009+A1:2014 using the values set out in Table 9.16 and should be applied equally during the daytime and night-time. Consideration of the likely duration of exposure, as discussed in Paragraph 9.5.5 for construction noise impacts, equally applies to construction vibration.

Table 9.16: Construction Vibration Impact Magnitude

Magnitude	Definition
High	Construction vibration levels of 10.0 mm/s PPV or greater
Medium	Construction vibration levels of at least 1.0 mm/s and less than 10.0 mm/s PPV for a period of 10 or more days in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months
Low	Construction vibration levels greater than 0.3 mm/s and less than 1.0 mm/s PPV. OR construction vibration levels of at least 1.0 mm/s and less than 10.0 mm/s PPV for a period of less than 10 days in any 15 consecutive days, or for a total number of days not exceeding 40 in any 6 consecutive months
Negligible	Construction vibration levels up to 0.3 mm/s PPV

OPERATIONAL NOISE IMPACT MAGNITUDE

9.5.11 The impact of operational noise from the substation upon existing NSRs has been determined with reference to BS4142:2014+A1:2019, by subtracting the measured background sound level from the rating sound level and considering the context in which the sound occurs. The margin by which the rating level exceeds the existing background sound provides an initial estimate of the impact, as described in paragraph 9.2.56, which then needs to be modified due to the context.

9.5.12 An important factor when considering the context is the absolute level of sound, where it is stated in BS4142:2014+A1:2019 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 30 dB L_{A90}, and rating levels below around 35 dB 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 that *"similar values"* [i.e. background sound levels below around 30 dB L_{A90}, and rating levels below around 35 dB 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."*.

9.5.13 When considering the absolute levels of sound and the likely impact it may have on people, many factors should be taken into account, such as the characteristics of the sound and the time of day it is experienced. As set out in paragraph 9.2.60, when considering industrial noise during the daytime, the 1999 WHO CNG can provide further advice. This guidance document is supplemented by the 2009 WHO NNG for the night-time period. These documents can be used to set appropriate values for the effect level categories defined in the NPSE and PPG.

9.5.14 In setting appropriate values for effect levels from operational noise the above has been considered. During the daytime, the threshold of LOAEL for a steady, anonymous noise, can be regarded as the guideline value for moderate annoyance of 50 dB $L_{Aeq,\ 16hour}$, set in the WHO CNG. This does, however, significantly exceed the low rating level of 35 dB L_{ArTr}, set out in paragraph 9.5.12, and therefore, should not simply be used as an acceptable threshold for industrial noise, even if the sound is steady and anonymous. Instead, consideration can be given to the value of the rating level in the context of the LOAEL and levels of existing ambient noise. This is discussed further in paragraph 9.5.16.

9.5.15 For the night-time period advice is available from the WHO NNG, where no observed effects on sleep were reported to be found when exposed to noise level of 30 dB $L_{night,\ outside}$, or below. Whilst these guidelines does state that there is no evidence that biological effects observed at levels below 40 dB $L_{night,\ outside}$ are harmful to health, it recognises that closer examination of the specific circumstances will be necessary for precise impacts within this range. Furthermore, Table 5.2 of the WHO NNG identifies the threshold for the wellbeing effect of complaints is 35 dB $L_{night,\ outside}$. At levels above 55 dB $L_{night,\ outside}$, the NNG detailed that adverse health effects occur frequently and there is limited evidence that the cardio-vascular system is coming under stress. Therefore, when considering the context of the absolute level of sound during the night-time the following effect levels can be used:

- 30 dB $L_{night,\ outside}$ – NOEL
- 35 dB $L_{night,\ outside}$ – LOAEL; and
- 55 dB $L_{night,\ outside}$ – SOAEL.

9.5.16 Another important factor, when considering the context, is the change in sound level that a proposed development would have upon the existing environment. If there is no or very little change in the long-term sound levels, then the IEMA 2014 guidelines advises there to be negligible impact. The sound generated by the OnSS using the L_{Aeq} noise parameter (specific sound level) at the NSR can be logarithmically added to the existing measured L_{Aeq} (residual sound level) to determine a revised absolute sound level.

9.5.17 It is noted in paragraph 9.2.65 that the impact criteria set out in the IEMA 2014 guidelines when considering a change in sound level should be relevant to the development and the nature of sound generated. When considering the context of noise from a proposed onshore substation for an offshore wind farm, in accordance with BS4142:2014+A1:2019, previous noise assessments[2] have applied the criteria as set out in Table 9.7.

9.5.18 Table 9.17 summarises factors considered when determining the operational noise impact magnitude.

Table 9.17: Operational Noise Impact Magnitude

Magnitude	Excess of rating level over background sound level	Rating level threshold Night-time (2300 to 0700)	Sound level change
High	≥10 dB	>55 dB	≥5 dB
Medium	>5 to <10 dB	>35 to ≤55 dB	≥3 to <5 dB
Low	>0 to ≤5 dB	>30 to ≤35 dB	≥1 to <3 dB
Negligible	≤0 dB	≤30 dB	<1 dB

SIGNIFICANCE OF EFFECT

9.5.19 Sensitivity of the receptor and magnitude of impact have then been considered collectively to determine the potential effect and its significance.

9.5.20 Table 9.18 is used as a guide to determine the level of effect. 'Major' and 'moderate' effects are considered to be 'significant' in terms of the EIA Regulations.

9.5.21 It is considered that the VE project would not lead to any beneficial noise and vibration effects; therefore, this has not been considered within Table 9.18.

9.5.22 Assessment of the level of effect is qualitative and reliant on professional experience, interpretation and judgement. The matrix should therefore be viewed as a framework to aid understanding of how a judgement has been reached, rather than as a prescriptive, formulaic tool.

[2] Chapter 23 – Noise and Vibration. Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects. Document no C282-RH-Z-GA-00061, dated August 2022. EN010109; and Volume 3, Chapter 10 – Noise and Vibration. Awel Y Mor Offshore Wind Farm. Dated April 2022. EN010112.

9.5.23 In addition, based on professional judgement, short-term is defined as less than one-month, medium-term is defined as one month to two years, and long-term is defined as greater than two years. Note: shaded cells are defined as significant with regards to the EIA Regulations 2017[3].

Table 9.18: Matrix to Determine Effect Significance

			Sensitivity			
			High	Medium	Low	Negligible
Magnitude	Adverse	High	Major	Major	Moderate	Minor
		Medium	Major	Moderate	Minor	Negligible
		Low	Moderate	Minor	Negligible	Negligible
	Neutral	Negligible	Minor	Negligible	Negligible	Negligible

9.6 UNCERTAINTY AND TECHNICAL DIFFICULTIES ENCOUNTERED

9.6.1 The main uncertainties and technical difficulties encountered during the completion of the Noise and Vibration assessment are outlined below. For the purposes of this Chapter, they have been divided into:

- Baseline Survey;
- Construction Noise and Vibration Assessment; and
- Operational Noise Assessment of the Substation.

BASELINE SURVEY

9.6.2 As advised in BS 4142:2014+A1:2019, areas of uncertainty associated with measurements of sound include:

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

[3] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

- the instrumentation used.

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

- baseline sound measurements were taken at positions representative of the NSRs near to the Landfall and OnSS;
- where reasonably practicable, the measurement positions were located away from reflecting surfaces, sources of environmental noise and mature leafy vegetation;
- longer-term measurements were undertaken that included daytime and night-time periods for typical midweek and weekend periods;
- a weather station was installed for the duration of the surveys so any unsuitable weather conditions could be identified and these periods excluded from the monitoring results; and
- the instrumentation was suitable according to BS EN 61672-1.

CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

9.6.4 Construction noise and vibration predictions are based on the anticipated programme and construction methods. It has been necessary to make assumptions with the advice of the design team regarding some aspects of the construction process. These are considered to be precautionary and reflect the level of information that is typically available. Further information on the anticipated construction programme is provided in Volume 6 Part 3, Chapter 1: Onshore Project Description.

OPERATIONAL NOISE FROM THE SUBSTATION

9.6.5 There is uncertainty associated with the calculation of sound from the onshore substation due to its layout and type of plant installed. An indicative substation layout has been modelled and the noise levels calculated at the relevant noise sensitive receptors.

9.7 EXISTING ENVIRONMENT

9.7.1 The existing environment has been determined with a combination of a baseline sound survey, which was undertaken in September 2022, and baseline sound data measured for North Falls during July 2022. A summary of the relevant information is set out below.

9.7.2 During all surveys undertaken, the sound level meters were calibrated prior to, and upon completion of, measurements being carried out. No significant drift in readings was observed. The calibration chain is traceable via the United Kingdom Accreditation Service (UKAS) to National Standards held at the National Physical Laboratory.

9.7.3 At all monitoring locations, the microphone was placed 1.5 m above the ground in free-field conditions, i.e., at least 3.5 m from the nearest vertical, reflecting surface, with the following noise level indices being recorded continuously every 15-minutes:

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period; and
- L_{A90}: The A-weighted noise level exceeded for 90 per cent of the measurement period. This parameter is often used to describe background noise; and

9.7.4 For the purposes of this Chapter, the baseline environment has been divided into two separate areas:

- the Landfall; and
- the OnSS.

LANDFALL

9.7.5 The local environment in the vicinity of the Landfall can be characterised as a rural environment between the towns of Frinton-on-Sea and Holland-on-Sea. The Landfall is located adjacent to Frinton Golf Club and agricultural land beyond. North east of the Landfall is Frinton Golf Clubhouse and dwelling of Frinton-on-Sea. To the south west of the Landfall is the water treatment works with two adjacent dwellings, numbers 1 and 2 Sluice Cottages, and the settlement of Holland-on-Sea beyond. A trenchless crossing technique, such as HDD will be required at the Landfall site.

9.7.6 The soundscape of the Landfall area can be characterised as one of natural sound, such as the sea breaking, birdsong and wind disturbed vegetation, other contributions came from distant road traffic and golfing activity. As one moves away from the shore toward Great Holland, contributions from the sea diminish and noise from agricultural activity becomes more prevalent.

MONITORING LOCATIONS

9.7.7 Baseline sound levels were measured at three representative locations around the Landfall area, as described in Table 9.19 and illustrated in Figure 9.4. Measurement commenced approximately midday Thursday 7 July 2022 and completed 24 hours later on Friday 8 July 2022.

Table 9.19: Landfall Noise Monitoring Locations

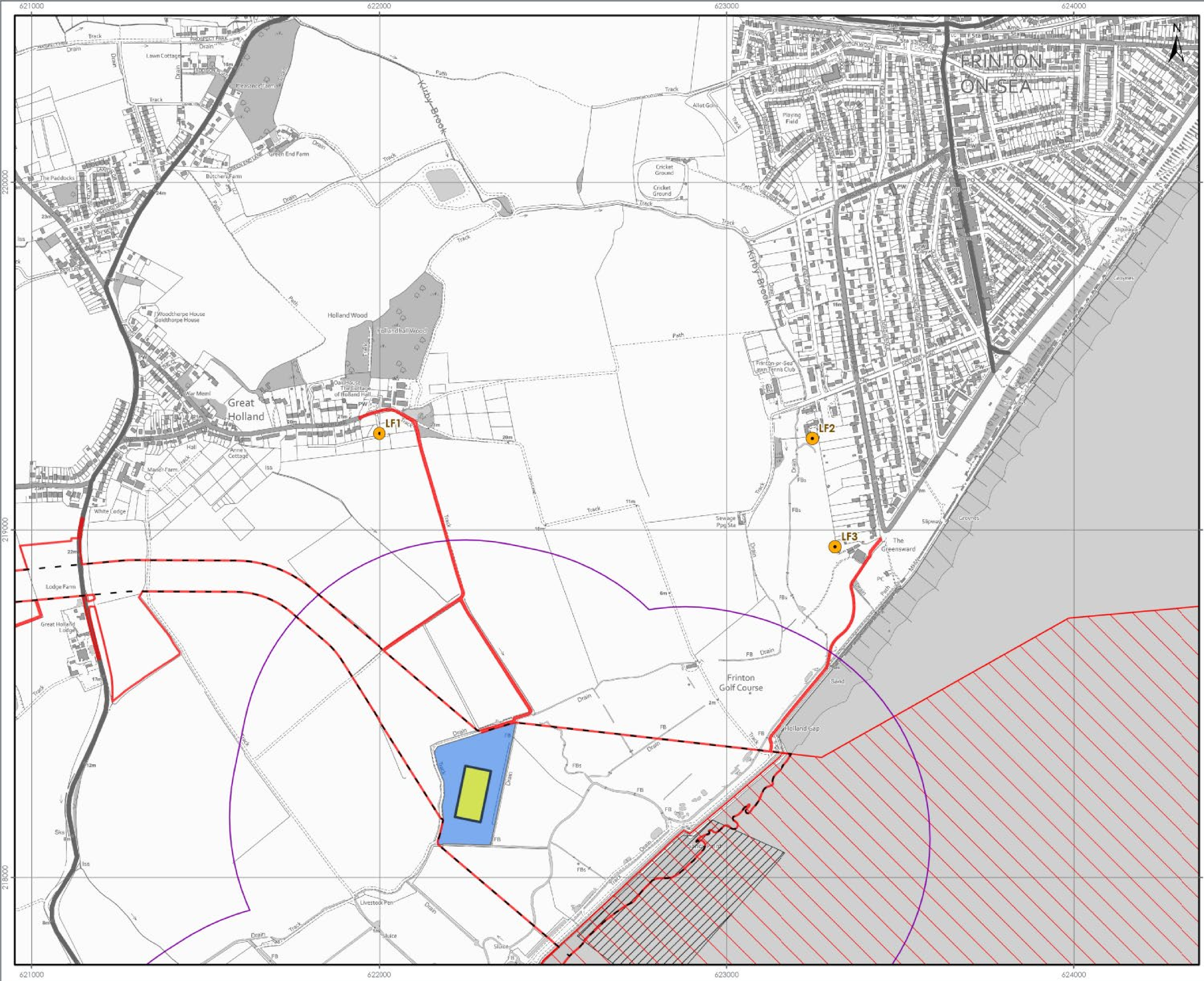
ID	Description	X (OSGB36)	Y (OSGB36)
LF1	To the east of dwellings off Church Lane, Great Holland, approximately 1.6 km north of Landfall.	622002	219278
LF2	Finton Golf Course, north east of number 1 green and south of dwellings on Linkside.	623253	219263
LF3	Frinton Golf Course, adjacent to the carpark and to the rear of the gardens of dwellings on Second Avenue.	623316	218954

9.7.8 Weather conditions during the survey were monitored using a Davis weather station and were dry with a light breeze of less than 3 m/s. The temperature was in the mid 20's Celsius during the daytime, dropping to 10 °C overnight. The weather conditions were suitable for measuring environmental sound.

9.7.9 The measurements were carried out utilising the equipment listed in Table 9.20. Field calibrations were undertaken using a Rion NC-75 1 kHz calibrator, serial number 35084983 that was laboratory calibrated on 31 May 2022.

Table 9.20: Noise Monitoring Equipment - Landfall

ID	Equipment	Serial Number	Calibrated	UKAS certificate no.
LF1	Rion NL-52 Class 1 sound level meter	864983	30/09/2020	UCRT/20/1940
LF2	Rion NL-52 Class 1 sound level meter	864982	30/09/2020	UCRT/20/1939
LF3	Rion NL-52 Class 1 sound level meter	898320	26/10/2021	UCRT/21/2320



LEGEND

- Onshore Order Limits
- Offshore Order Limits
- Onshore Export Cable Corridor
- Landfall Exit Pit Sheet Piling Zone
- Landfall Compound Zone
- Indicative Landfall Compound
- Landfall Study Area
- Landfall Baseline Noise Monitoring Location

LF1 To the east of dwellings off Church Lane, Great Holland, approximately 1.6 km north of Landfall.

LF2 Finton Golf Course, north east of number 1 green and south of dwellings on Linkside.

LF3 Frinton Golf Course, adjacent to the carpark and to the rear of the gardens of dwellings on Second Avenue.

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
LANDFALL NOISE MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.4

SCALE: 1:10,000 | PLOT SIZE: A3 | DATUM: OSGB 1936 | PROJECTION: British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

SURVEY SUMMARY

9.7.10 A summary of the overall survey results is included in Table 9.21 and are shown in full in Volume 6, Part 6, Annex 9.1: Onshore Airborne Noise Baseline Noise Survey.

9.7.11 The $L_{Aeq,T}$ levels presented are the logarithmic average for this parameter in each period. These data will be used to inform the construction noise assessment for the Landfall and as such, has been divided into day (07:00 to 19:00 hours), evening (19:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods to be consistent with BS5228:2009+A1:2014.

9.7.12 It was evident from the data that noise levels saw a sharp increase during the night-time period, around 04:00 hours. This is common in spring and early summer due to the dawn chorus (bird calls). As it would not be representative for the night-time of the year as a whole, the night-time data excluded any measurements between 04:00 and 07:00 hours.

Table 9.21: Summary of Baseline Sound Survey - Landfall, dB

Parameter	Period	LF1	LF2	LF3
L_{Aeq}	Day (07:00 to 19:00)	48	43	50
	Evening (19:00 to 23:00)	41	41	41
	Night (23:00 to 07:00)	28	34	35

9.7.13 To determine the BS5228-1:2009+A1:2014 assessment category using the example threshold values given in Table 9.4Table 9.4, the measured L_{Aeq} levels are rounded to the nearest 5 dB and compared to the values of Category A. During all periods the L_{Aeq}, when rounded to the nearest 5 dB, remains below the threshold values for Category A. Therefore, construction noise impacts at the NSRs nearest to the Landfall are to be assessed against Category A.

ONSHORE SUBSTATION

9.7.14 The local environment in the vicinity of the OnSS can be characterised as rural. The footprint of the OnSS boundary is approximately 5.88 ha and is surrounded by agricultural land with isolated farmhouses and dwellings in all directions. The nearest dwelling is Normans Farm, located just over 400 m from the OnSS boundary. The settlement of Little Bromley is approximately 1.3 km east of the OnSS boundary at the closest point. Situated to the south west of the OnSS is Lawford substation, located on the opposite side of Ardleigh Road.

9.7.15 The soundscape of the OnSS area can be characterised as one of a mix of natural sounds: birdsong and wind disturbed vegetation, and anthropogenic sounds: distant road traffic, aircraft and remote agricultural activity.

MONITORING LOCATIONS

9.7.16 Baseline sound levels were measured at a total of six representative locations around the OnSS operational boundary, as described in Table 9.22 and illustrated in Figure 9.5Figure 9.5. Measurements took place during two periods: between Thursday 7 July 2022 and Wednesday 20 July 2022 at five locations; and between Monday 26 September 2022 and Monday 3 October 2022 at one further location. A minimum of seven day's data was recorded at each location.

Table 9.22: OnSS Noise Monitoring Locations

ID	Description	Measurement dates	X (OSGB36)	Y (OSGB36)
SML1	Hollylodge Farm	7 – 19 July 2022	609148	229057
SML2	Badley Hall	7 – 19 July 2022	607190	228928
SML3	Mayfields Farm	8 – 20 July 2022	607494	229514
SML4	Grange Farm	8 – 20 July 2022	608736	230032
SML5	Normans Farm	7 – 19 July 2022	608423	228518
SML6	Fields between Lilleys Farm and Barlon House	26 Sept – 3 Oct 2022	608189	227712

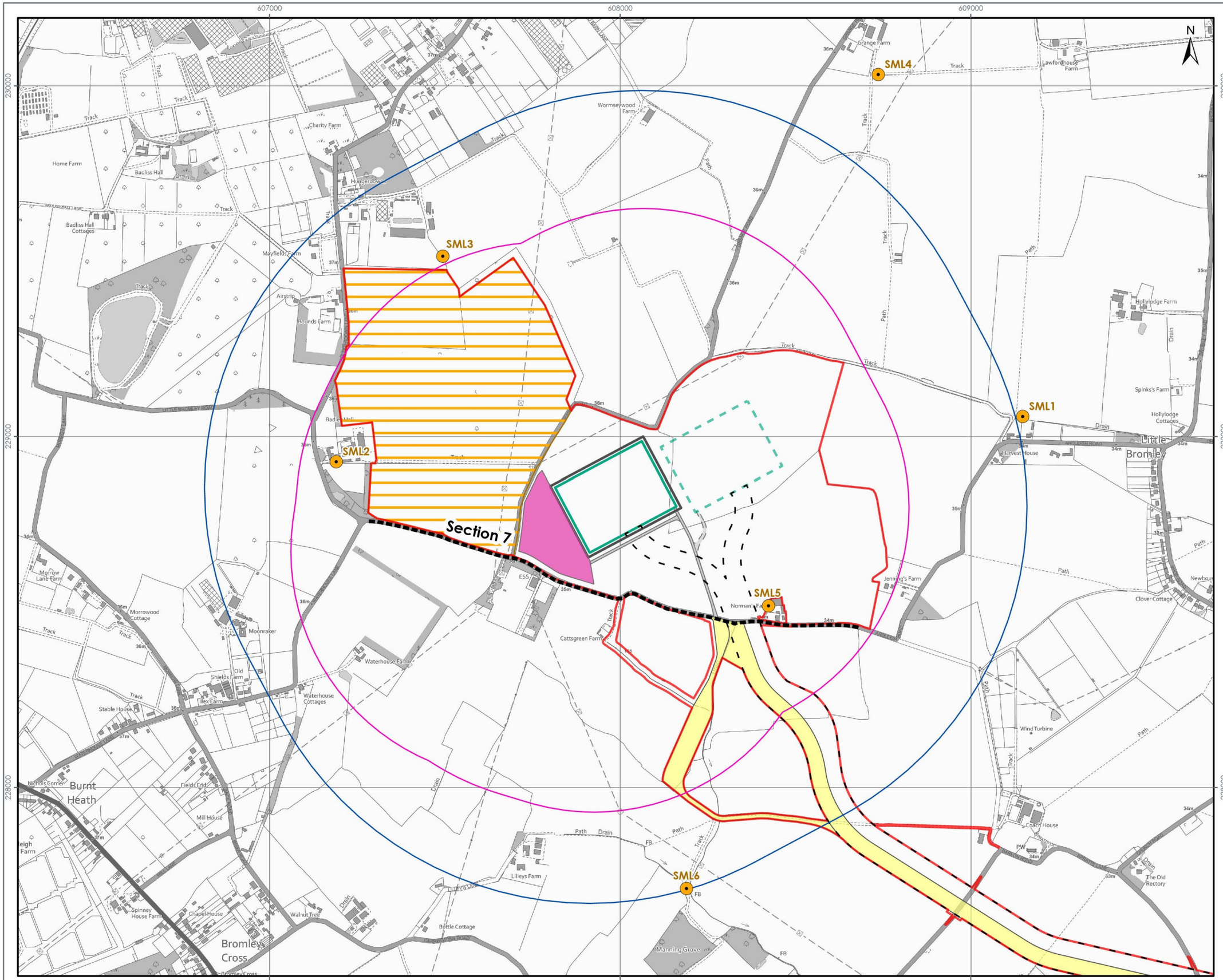
9.7.17 Weather conditions during both the OnSS surveys were monitored using a Davis weather station, situated at Normans Farm during July and nearby Branham Hall (610235, 228356) for the September measurements.

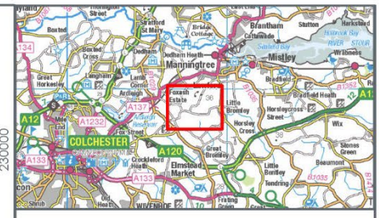
9.7.18 Weather conditions during July remained dry with wind speeds typically below 5 m/s and temperatures ranging between 10 °C and 37 °C.

9.7.19 Weather conditions during the second survey at the end of September included some spells of rain, wind speeds less than 5 m/s and temperatures ranging from 2 °C to 20 °C. Any periods where rainfall was noted, including a period of 30 minute after the rain stopped, have been excluded from the data as it is likely that noise levels would be elevated. Furthermore, the temperature remained at 3 °C or greater for the entire survey, with the exception of Thursday 29 September 2022 when it fell between 2.3 °C and 2.9 °C between 06:30 and 08:15 hours. This period was excluded from the data as environmental sound can increase due to the risk of a temperature inversion occurring.

9.7.20 The weather conditions for all included data were suitable for the measurement of environmental sound.

9.7.21 The measurements were carried out utilising the equipment listed in Table 9.23. Field calibrations during the first survey that took place in July 2022 were undertaken using a Rion NC-74 1 kHz calibrator, serial number 01020506 that was laboratory calibrated on 5 August 2021. Field calibrations during the second survey that took place in September and October 2022 were undertaken using a Rion NC-75 1 kHz calibrator, serial number 35292145 that was laboratory calibrated on 14 April 2022.





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor
- Substation Operational Boundary
- Indicative Substation Compound
- Substation Temporary Construction Compound
- Indicative Substation Access Route
- Substation Temporary Construction Haul Route
- North Falls Indicative Substation Operational Boundary
- North Falls Indicative Substation Access Route
- National Grid EACN Substation Zone
- Indicative Substation Compound and Substation Temporary Construction Compound 650 m Study Area
- Substation Operational Boundary 1 km Study Area
- Onshore Substation Noise Monitoring Location

ID	Name
SML1	Hollylodge Farm
SML2	Badley Hall
SML3	Mayfields Farm
SML4	Grange Farm
SML5	Normans Farm
SML6	Fields between Lilleys Farm and Barlon House

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ONSHORE SUBSTATION NOISE MONITORING LOCATIONS

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.5

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

Table 9.23: Noise Monitoring Equipment - OnSS

ID	Equipment	Serial Number	Calibrated	UKAS certificate no.
SML1	Norsonic 140 Class 1 sound level meter	1403342	01/07/2021	U38304
SML2	Norsonic 140 Class 1 sound level meter	1405219	06/07/2021	U38359
SML3	Rion NL-52 Class 1 sound level meter	864982	30/09/2020	UCRT20/1939
SML4	Rion NL-52 Class 1 sound level meter	864983	30/09/2020	UCRT20/1940
SML5	Norsonic 140 Class 1 sound level meter	1406177	23/07/2020	U35315
SML6	Rion NL-52 Class 1 sound level meter	586905	20/05/2022	UCRT22/1678

SURVEY RESULTS

9.7.22 A summary of the overall survey results is included in Table 9.24 and are shown in full in Volume 6 Part 6, Annex 9.1: Onshore Airborne Noise Baseline Noise Survey.

9.7.23 The $L_{Aeq,T}$ levels presented are the logarithmic average for this parameter in each period. These data will be used to inform the construction noise assessment for the OnSS and as such, has been divided into periods to be consistent with BS5228:2009+A1:2014:

- day and Saturday mornings – 07:00 to 19:00 hours weekdays and 07:00 to 13:00 hours Saturdays;
- evening and weekends - 19:00 to 23:00 hours weekdays, 13:00 to 23:00 hours Saturdays and 07:00 to 23:00 hours Sundays; and
- night-time - 23:00 to 07:00 hours.

9.7.24 The background noise levels, described by the L_{A90}, and residual sound level for the daytime (07:00 – 23:00 hours) and night (23:00 – 07:00), using the L_{Aeq} parameter, are used in the assessment of operational noise from the OnSS. The statistical distribution of the L_{A90} levels were reviewed and a representative value was selected for the overall daytime (07:00 to 23:00 hours) and the night-time (23:00 to 07:00 hours). This approach is consistent with the method described in BS4142:2014+A1:2019.

9.7.25 It was evident from the data measured in July that noise levels saw a sharp increase during the night-time period, around 04:00 hours. This is common in spring and early summer due to the dawn chorus. As it would not be representative for the night-time of the year as a whole, the night-time data excluded any measurements between 04:00 and 07:00 hours.

9.7.26 It is understood that the harvesting took place during the first survey in July. Local farmers have advised that harvesting activity, which includes combine harvesters and tractors with trailers active constantly on adjacent fields and roads, typically started around 11:00 hours and would not continue beyond 22:00 hours, 7-days a week. Data during these periods has been used with caution and is discussed further in Paragraph 9.7.30.

9.7.27 An increase in noise level within the early morning hours was also observed during the second survey to start around 05:00 to 06:00 hours, it was, however, not as pronounced as the dawn chorus in the July data. This increase observed in September / October, is considered to be typical of the diurnal pattern of noise and no time-specific exclusions were applied to these data.

Table 9.24: Summary of Baseline Sound Survey - OnSS, dB

Parameter	Period	SML1	SML2	SML3	SML4	SML5	SML6
L_{Aeq}	Daytime (07:00 – 23:00)	40	46	44	42	42	46
	Weekday day (07:00 – 19:00) & Sat morning	41	47	45	44	44	46
	Evenings and weekend	38	44	42	39	38	43
	Night (23:00 – 07:00)	32	35	36	35	34	37
L_{A90}	Daytime (07:00 – 23:00)	29	32	34	30	26	28
	Night (23:00 – 07:00)	21	25	24	22	23	24

9.7.28 To determine the BS5228-1:2009+A1:2014 assessment category using the example threshold values given in Table 9.4Table 9.4, the measured L_{Aeq} levels are rounded to the nearest 5 dB and compared to the values of Category A. During all periods at all locations the L_{Aeq}, when rounded to the nearest 5 dB, remains below the threshold values for Category A. Therefore, construction noise impacts at the NSRs nearest to the OnSS are to be assessed against Category A.

9.7.29 The L_{A90} levels presented in Table 9.24 are the representative background sound levels against which an initial estimate of the operational noise impacts from the substation have been determined, as described in Paragraph 9.5.11. Further consideration is then given to the context of development in the surrounding area using the L_{Aeq} levels as discussed in Paragraphs 9.5.12 to 9.5.18.

9.7.30 When considering the potential impact harvesting or other a-typical daytime activities may have had on the measured levels, consideration is given to the assessment methods. For the case of construction noise, all receptor locations are within Category A during the BS5228-1:2009+A1:2014 daytime and Saturday; and evening and weekend periods. This is the most stringent category and therefore, a worst case will be assessed.

9.7.31 For any areas that were not covered by a baseline noise survey, such as NSRs along the onshore ECC, it is assumed that they fall within construction noise Category A as a worst case.

EVOLUTION OF THE BASELINE

9.7.32 The baseline noise conditions are not expected to change significantly between now and the point of impact over the project lifetime.

9.7.33 The other proposed developments in the area, as listed in Paragraph 9.4.48, which are considered within the cumulative assessment for operational noise, would have the potential to slightly elevate the existing baseline in the immediate locality of that development. None of these developments, would however, have a significant impact on the measured baseline sound levels due to their distance away.

9.8 KEY PARAMETERS FOR ASSESSMENT

9.8.1 The maximum design scenarios (MDS) identified in Table 9.25 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (Volume 6 Part 3, Chapter 1: Onshore Project Description). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project design envelope to that assessed here be taken forward in the final design scheme.

Table 9.25: Maximum Design Scenario for the Project Alone

Potential effect	Maximum design scenario assessed	Justification
Construction		
General: applies to Impact 1, Impact 2, Impact 3, and Impact 4.	Assumed all plant used in each construction activity to be operating in the same location at the same time. Resultant noise level for each activity compared and the noisiest selected.	Construction activities at the closest approach will result in greater noise impacts.
	Receptor height of 4 m adopted for all calculations and periods.	Representative of a first floor window height. Noise levels will be higher than ground floor.
	Evening and night-time assessment undertaken for construction operations that are continuous and unable to stop.	More stringent noise criteria applies during the evening and night periods.

Potential effect	Maximum design scenario assessed	Justification
	Scaling factors assumed for vibration calculations assume a 5% probability of the value being exceeded	Calculation permits 50%, 33.3% and 5% probability of exceedance. This represents a worst case
Impact 2: Noise and vibration impacts during the construction of the onshore ECC.	Noise assessment assumes that construction activity from noisiest phase is located at the extremity of the cable corridor or TCC.	Construction activities at the extremity of the cable corridor or TCC will result in greater noise impacts.
	Noise assessment assumes that VE will install ducting for four cable circuits within the onshore ECC.	Results in higher predicted construction noise levels.
Impact 5 and Impact 10: Noise impacts from construction vehicles using the road network.	Construction HGV and worker peak traffic are combined for the peak month of construction vehicular activity.	The values presented will result in the highest noise impact which would occur during the busiest month for each link.
Operation		
Impact 6: Noise impacts during the operation of the OnSS.	All the plant associated with the substation is operating 100% of the time.	Results in predictions of highest possible noise levels.
Cumulative		
Impact 7: Cumulative noise impacts during the construction of the Landfall	Qualitative consideration given to the cumulative construction activity of North Falls landfall together with VE Landfall.	North Falls EIA has not yet been submitted. Discussions with the North Falls noise consultants have taken place to understand likely cumulative impacts.
Impact 8: Cumulative noise impacts during the construction of the onshore ECC	Worst case construction noise scenario with North Falls between simultaneous and sequential construction programmes	

Potential effect	Maximum design scenario assessed	Justification
Impact 9: Cumulative noise impacts during the construction of the OnSS	It is assumed that construction of OnSS would coincide with the construction of the consented battery storage site, the proposed National Grid EACN substation and proposed North Falls substation.	Maximum possible construction activity assumed to be taking place at the same time. In reality fewer activities will be present and construction noise likely to be lower than assessed.
Impact 11: Cumulative noise impacts during the operation of the OnSS.	OnSS operating together with the consented battery storage site, proposed National Grid EACN substation and proposed North Falls substation.	Considers the highest cumulative level of operational noise from the proposed developments.

9.9 MITIGATION

9.9.1 The mitigation contained in Table 9.26 are mitigation measures or commitments that have been identified and adopted as part of the evolution of the project design of relevance to noise and vibration, these include project design measures, compliance with elements of good practice and use of standard protocols. General mitigation measures, which would apply to all parts of the project, are set out first. Thereafter mitigation measures that would apply specifically to noise and vibration issues associated with the Landfall, Onshore ECC and OnSS, are described separately. The subsequent assessment stage of the EIA is based on the 'mitigated' design with the mitigation incorporated.

Table 9.26: Mitigation Relating to Noise and Vibration

Project phase	Mitigation measures within the project design
General	
Project design	Careful routing of the onshore cable route and positioning of the landfall. OnSS and TCC to avoid key areas of sensitivity.
Construction	
All construction aspects	All construction work will be undertaken in accordance with the measures outlined in the CoCP.
Operation	
Operational noise from the substation	Substation sited at a location to avoid key areas of sensitivity. A minimum distance of 250 m between the OnSS and NSRs was applied during the identification of search areas.

9.10 ENVIRONMENTAL ASSESSMENT: CONSTRUCTION PHASE

9.10.1 A development of this nature has the potential to generate noise and vibration during the construction phases. However, disruption due to construction-related noise and vibration is a localised phenomenon and is both temporary and intermittent in nature. The techniques available to predict the likely noise and vibration effects from construction sites are necessarily based on detailed information on the type and number of plant being used, their location within the site and the length of time they are in operation.

9.10.2 During the construction of VE, noise from construction activities will inevitably be generated and can be audible at residential receptors in the vicinity of construction activities. The purpose of this section of the Chapter is therefore to:

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

9.10.3 Details of the construction works are described in Volume 6 Part 3, Chapter 1: Onshore Project Description. A detailed list of indicative construction plant, operational noise levels and associated on-times for all the construction activities/operations have been provided; the full list of plant and construction impacts are included within Volume 6, Part 6, Annex 9.2: Construction Noise Assessment.

IMPACT 1: NOISE AND VIBRATION IMPACTS DURING THE CONSTRUCTION OF THE LANDFALL

9.10.4 The three main areas of construction within the Landfall are the: Beach works TCC, Landfall compound and beach and intertidal area, as per Paragraph 9.4.10. It is noted that there are no NSRs within 650 m of the Landfall compound and the beach and intertidal area. Therefore, there would be no LSE of noise from construction activity taking place within these areas.

9.10.5 Beach and TCC access for construction vehicles will be via the existing access road north of Manor Way. This road is suitable for use without any significant upgrade works or widening. Therefore, no significant construction activity will take place in this area.

9.10.6 A beach works TCC may be required and located in an area of approximately 1 ha east of Sluice Cottages. The nearest and furthest points of the land available for the TCC to Sluice Cottages is 25 m and just over 200 m. The calculations have assumed all plant to be located 100 m from Sluice Cottages, which would allow for a spread of closer and more distant plant.

9.10.7 The construction activities associated with the beach works TCC are listed in Table 9.27 together with the total sound power levels, taking into account the number of plant and on-times, as detailed in Volume 6, Part 6, Annex 9.2: Construction Noise Assessment.

Table 9.27: Landfall TCC Construction Activities and Sound Power Levels

Activity	Combined Sound Power Level, dB L_{WA}
Construction of beach works TCC (if required).	122
TCC operations.	109
Removal of beach works TCC.	121

9.10.8 Calculations assume the MDS set out in Table 9.25 and include mitigation measures detailed in Table 9.26. The predicted noise levels from each of the Landfall construction operations are shown in Table 9.28 for 2 Sluice Cottages and 60 Manor Way as these dwellings represent the closest NSR to the beach works TCC of the groups of dwellings within the study area.

9.10.9 The NSRs around the Landfall are within BS5228-1:2009+A1:2014 Category A, as discussed in Paragraph 9.7.13, with the threshold values set out in Table 9.4. These values have been included in Table 9.28 for the daytime, which represents the time during which noise-generating construction works would take place, see Paragraph 9.4.37. The construction noise impact magnitude given in Table 9.14 has been applied to determine the significance of effect, together with Table 9.18 and Table 9.13, where residential receptors are of medium sensitivity.

Table 9.28: Landfall Construction Noise

Construction Activity	Receptor	Predicted noise level (dB L_{Aeq})	Threshold (dB L_{Aeq})	Difference (dB)	Impact magnitude	Effect
Construction of beach works TCC.	2 Sluice Cottages	73	65	+8	High	Major
	60 Manor Way	57		-8	Negligible	Negligible
TCC operations.	2 Sluice Cottages	66		+1	Low	Minor
	60 Manor Way	44		-21	Negligible	Negligible
Removal of beach works TCC.	2 Sluice Cottages	72		+7	High	Major
	60 Manor Way	56		-9	Negligible	Negligible

9.10.10 It can be seen from Table 9.28 that if a beach works TCC is required adjacent to the promenade at the eastern end of Manor Way, there would be a temporary high magnitude of impact during its construction and removal at Sluice Cottages. For medium sensitivity receptors, this would give rise to a **major adverse** level of effect at the two properties during the daytime. This effect is considered significant in terms of the 2017 EIA regulations.

9.10.11 A number of standard mitigation options can be employed, as appropriate, for the construction and removal of the beach works TCC. These include, but are not limited to, one or a combination of the following: the selection of quieter equipment, relocating noisier plant at greater distances from the NSRs, the use of a noise barrier around the perimeter of the works, localised acoustic screening around noisy plant and the use of an enclosure.

9.10.12 With the selection of an appropriate form of mitigation, discussed above, or suitable equivalent, BS5228-1:2009+A1:2014 advises that 5 dB attenuation would be provided by a barrier that results in the top of the plant being just visible at the NSR, and 10 dB attenuation if the barrier completely hides the plant. Reductions of at least 10 dB would be achieved if an enclosure or quieter plant or alternative techniques are employed. It is therefore achievable to apply a degree of mitigation commensurate to the reduction required. With such mitigation in place, it would ensure that there would be no greater than a low impact magnitude, which would be of **minor residual effect**.

9.10.13 A vibratory compacting roller would be used during the construction and removal of the TCC. Calculations of the distances at which vibration levels generated by this plant reach key thresholds have been carried out in accordance with BS5228-2:2009+A1:2014. Annex E of BS5228-2 details the method for predicting vibration levels from a number of different construction activities.

9.10.14 Calculations have been conducted using the vibratory compaction formulae provided in Table E.1 of BS5228-2, firstly for startup and rundown and, secondly for steady state compaction. It is assumed that a twin drum roller which is 1.2 m wide and has a drum vibration amplitude of 0.5 mm is used as a reasonable worst case.

9.10.15 The calculations provide a level of PPV outside of a building. A transfer function can be applied to determine the likely level of vibration inside a building. A factor of 1.8 has been applied as a frequency independent vibration transfer function, based upon measurements by D.J Martin (1980) described in the TRRL report 'Ground vibrations from impact pile driving during road construction'.

9.10.16 Table 9.29 sets out the predicted distances at which vibration levels from ground compaction activity would equal impact magnitudes.

Table 9.29: Landfall Construction Vibration Distances

Scenario	0.3 mm/s	1.0 mm/s	10 mm/s
Startup and run down	123 m	48 m	7.2 m
Steady state	87 m	38 m	7.3 m

9.10.17 The only receptors within the vibration study area of 100 m of the beach works TCC are Sluice Cottages. For steady state compaction occurring less than 38 m from Sluice Cottages the internal PPV would be at least 1.0 mm/s. Similarly, if the roller is started up or run down at a distance of less than 48 m from Sluice Cottages, the internal PPV would be at least 1.0 mm/s.

9.10.18 1 and 2 Sluice Cottages are located 30 m and 25 m respectively from the boundary of the beach works TCC. Compaction activities will not take place within 38 m of Sluice Cottages for a period of more than 10 days in any 15 consecutive days. Furthermore, startup and run down of the roller will not take place within 48 m of these dwellings, and if possible will be done at least 123 m away. This would be a low magnitude of impact upon a receptor of medium sensitivity which results in a **minor adverse** effect. This effect is considered not significant in terms of the 2017 EIA regulations.

9.10.19 Other construction activities that have the potential to generate vibration are HDD operations and piling of the HDD exit pit. The nearest receptor to these operations are over 1 km away; therefore, there would be no LSE. See Paragraphs 9.4.33 and 9.4.34 for further information and Paragraphs 9.4.5 and 9.4.7 for details of the study area.

IMPACT 2: NOISE AND VIBRATION IMPACTS DURING THE CONSTRUCTION OF THE ONSHORE ECC

9.10.20 The onshore ECC is divided into seven sections that naturally fall between key obstacle crossing, as set out below. The sections may not be constructed in sequence order.

- Section 1 extends from Landfall in the south to the East Coast Main Line spur railway crossing in the north with an approximate length of 4 km;
- Section 2 extends from the East Coast Line spur railway crossing in the south to the B1033 Thorpe Road in the north with an approximate length of 1 km;
- Section 3 extends from the B1033 Thorpe Road crossing in the south to the crossing of B1035 Thorpe Road or Swan Road in the north, with an approximate length of 5 km;
- Section 4 is subdivided into two:
  - Section 4A extends from the crossing of B1033 Thorpe Road crossing in the south to the crossing of Tendring Brook in the north and has an approximate length of 1.4 km;
  - Section 4B extends from the crossing of Tendring Brook in the south to the crossing of the A120 in the north and has an approximate length of 3.6 km;
- Section 5 extends from the crossing of the A120 in the east to the crossing of Bentley Road in the west and has an approximate length of 2.8 km;
- Section 6 extends from the crossing of Bentley Road in the southeast to the crossing of Ardleigh Road in the northwest and has an approximate length of 2.7 km; and
- Section 7 extends from the crossing of Ardleigh Road in the southeast to the OnSS location in the northwest and has an approximate length of just over 400 m. In addition this section includes the 400kV cable between the OnSS and the EACN substation.

9.10.21 For each of the onshore ECC sections a TCC will be constructed. A larger area within which each TCC will be located has been identified.

9.10.22 The onshore ECC will include sufficient number of trenches to accommodate ducting for four circuits and one haul road. Section 6 of the onshore ECC will include a second haul road to service the OnSS.

9.10.23 The construction activity taking place in the onshore ECC typically first involves the establishment of the TCCs and the early installation of the haul roads, followed by the installation of the cable ducting, and then the removal of the haul road and TCCs toward the end of the construction works.

9.10.24 In addition to the haul roads located within the onshore ECC, there are a number of off-route haul roads proposed that avoid sensitive areas or utilise existing gaps in hedgerows. For the majority of the onshore ECC, open trenching will be utilised to install cable ducting; however in the case of an obstacle to a trench, the ducting will be installed using a trenchless crossing technique. Also, as part of the duct installation, cable joint bays will be constructed along the onshore ECC as required.

9.10.25 Trenching comprises excavation, laying of ducting, backfilling and reinstatement. Trench excavation and backfilling may occur at a similar time within 100 m to 200 m of each other.

9.10.26 Trenchless crossings could occur anywhere along the onshore ECC route. For each trenchless crossing, a trenchless installation compound will be constructed, then a series of bores drilled to accommodate four circuits across the width of the onshore ECC and once complete, the compound will be removed. For each crossing, a total of up to 12 bores will be drilled sequentially and the drilling rig will be moved from bore to bore. Drilling may occur at the cable entry point, exit point or from both ends. It is assumed that two drilling rigs will be operational at any one time.

9.10.27 In addition, HDD works may continue through the evening and potentially the night-time. Five crossings within the onshore ECC have been identified to potentially require regular 24 hour works, which are listed below. All other crossings may briefly and occasionally continue drilling into the evening or night-time period to complete a drill or reach a safe point to stop for the day. These occasional over-runs would result in higher exceedances of the construction noise threshold values, as the thresholds for evening and night are lower than the day, but would not occur regularly enough to exceed 10 days in any 15 consecutive days which would be required to change the impact magnitude.

- 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.

9.10.28 Joint bays are used to connect cables and will be constructed at the end of a run of cable or at key locations to permit a continuous run of cable. Cable drum lengths of 500 m are assumed for the MDS. The works associated with joint bays comprise excavation, construction, cable jointing and backfilling.

9.10.29 The above construction activities are listed in Table 9.30 together with the total sound power levels, taking into account the number of plant and on-times, as detailed in Volume 6 Part 6, Annex 9.2: Construction Noise Assessment. This assessment assumes that all construction plant will be located at the closest point to any NSR, which will be the boundary of the ECC onshore ECC.

Table 9.30: Onshore ECC Construction Activities and Sound Power Levels

Task	Activity	Combined Sound Power Level, dB L_{WA}
Temporary haul road construction.	One haul road (Sections 1-5 & 7).	122
	Two haul roads together (Section 6 only).	125
	Off-route haul road.	122
TCC construction	TCC construction.	122
Onshore ECC duct installation works	Trench excavation.	121
	Trench backfilling.	121
	Trench reinstatement.	121
	Excavation of joint bays.	119
	Construction of joint bays.	114
	Cable pulling and jointing.	114
	Roof and backfill over joint bays.	121
	Trenchless installation compound construction.	121
	HDD rig mobilisation / demobilisation.	119
	HDD / trenchless duct installation (two rigs).	117
	Trenchless installation compound removal.	121
TCC removal	TCC compound removal.	121
Removal of haul roads.	Removal of haul roads, fencing and ground reinstatement.	121

9.10.30 The majority of the onshore ECC duct installation works will occur sequentially and not all activities listed in Table 9.31 for this task would occur at any one location. Therefore, this assessment assumes a realistic worst case with three duct installation work tasks occurring simultaneously, each separated 100 m from the next along the onshore ECC. It is assumed that all three works each have a combined sound power level of 121 dB L_{WA}, which would represent the situation of trench excavation, backfilling and a trenchless installation compound under construction. It is noted in Paragraph 9.10.25 that these works could be separated by 100 m to 200 m. A value of 100 m was found to be worst case when considering duration of exposure and increased noise level.

9.10.31 Calculations assume the MDS set out in Table 9.25 and include mitigation measures detailed in Table 9.26. The noise levels from each of the onshore ECC construction activities have been calculated and the minimum distances between each activity and a NSR have been determined such that the impact magnitude would be negligible, low, medium or high for a sustained noise with no respite. Table 9.31 summarises the minimum distances for each impact magnitude threshold from the activity taking place. It should be noted that this approach will be more conservative than other methods, such as detailed 3D modelling which can be considered at a later stage if required.

Table 9.31: Impact Magnitude Distances from Onshore ECC Construction Activities

Task	Negligible	Low	Medium	High
Haul road construction (excluding Section 6).	>210 m	156 – 210 m	127 – 155 m	≤126 m
2 x haul road construction (Section 6 only).	>287 m	212 – 287 m	173 – 211 m	≤172 m
TCC construction.	>210 m	156 – 210 m	127 – 155 m	≤126 m
Onshore ECC duct installation.	>310 m	199 – 310 m	151 – 198 m	≤150 m
HDD / trenchless duct installation (evening).	>350 m	260 – 350 m	210 – 259 m	≤209 m
HDD / trenchless duct installation (night).	>1000 m	720 – 1000 m	590 – 719 m	≤589 m

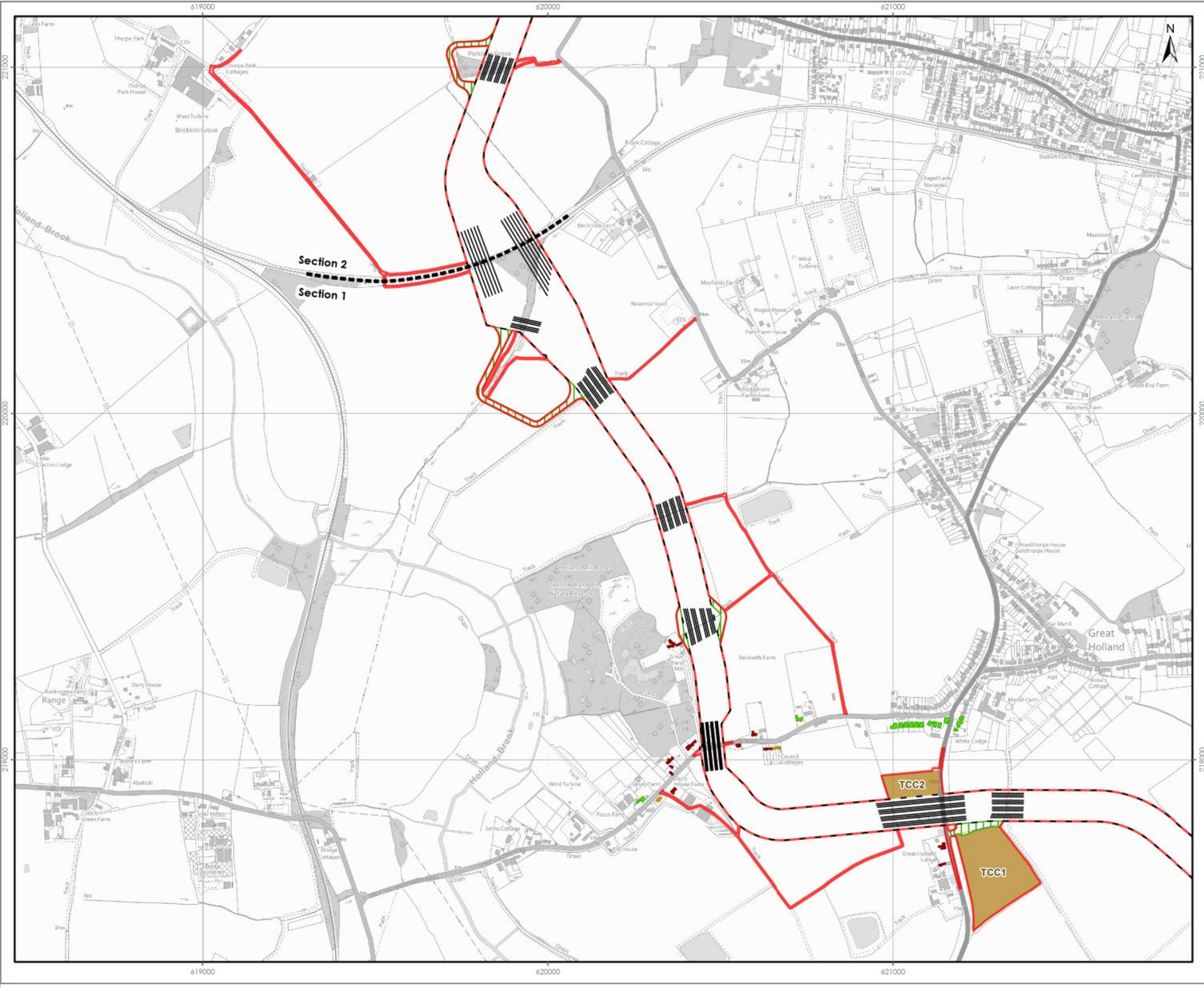
9.10.32 It is noted that the combined sound power level produced during the removal of TCCs and haul roads is less than during their construction. Therefore, impacts during removal of these items have been assessed to be the same as their construction.

9.10.33 The above distances have been applied to the relevant boundary where the corresponding construction activity would take place. For example, the distances associated with TCC construction have been applied from the boundary of all TCC areas, and onshore ECC duct installation works distances applied to the entire onshore ECC. The number of NSRs exposed to low, medium and high magnitudes of impact during the different construction activities are included in Table 9.32. Note the number of NSRs exposed to negligible impacts cannot be included as there is no lower threshold for this impact magnitude.

Table 9.32: Number of NSRs Within onshore ECC Construction Noise Impact Magnitudes

Task	Low	Medium	High
Haul road construction.	61	29	45
TCC construction.	27	13	16
onshore ECC duct installation.	204	37	59
HDD / trenchless duct installation (evening).	10	4	8
HDD / trenchless duct installation (night).	202	24	42

9.10.34 Figure 9.6 illustrates the location of the NSRs impacted by haul road construction works. NSRs impacted by TCC construction noise are illustrated in Figure 9.7. Figure 9.8 show onshore ECC duct installation impact assuming three simultaneous activities discussed in paragraph 9.10.30. Figure 9.10 and Figure 9.11 illustrate NSRs impacted during HDD works for the evening and night-time periods respectively. Note, that daytime HDD works is incorporated in the ECC duct installation impacts.



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - HAUL ROADS (WITHOUT MITIGATION)

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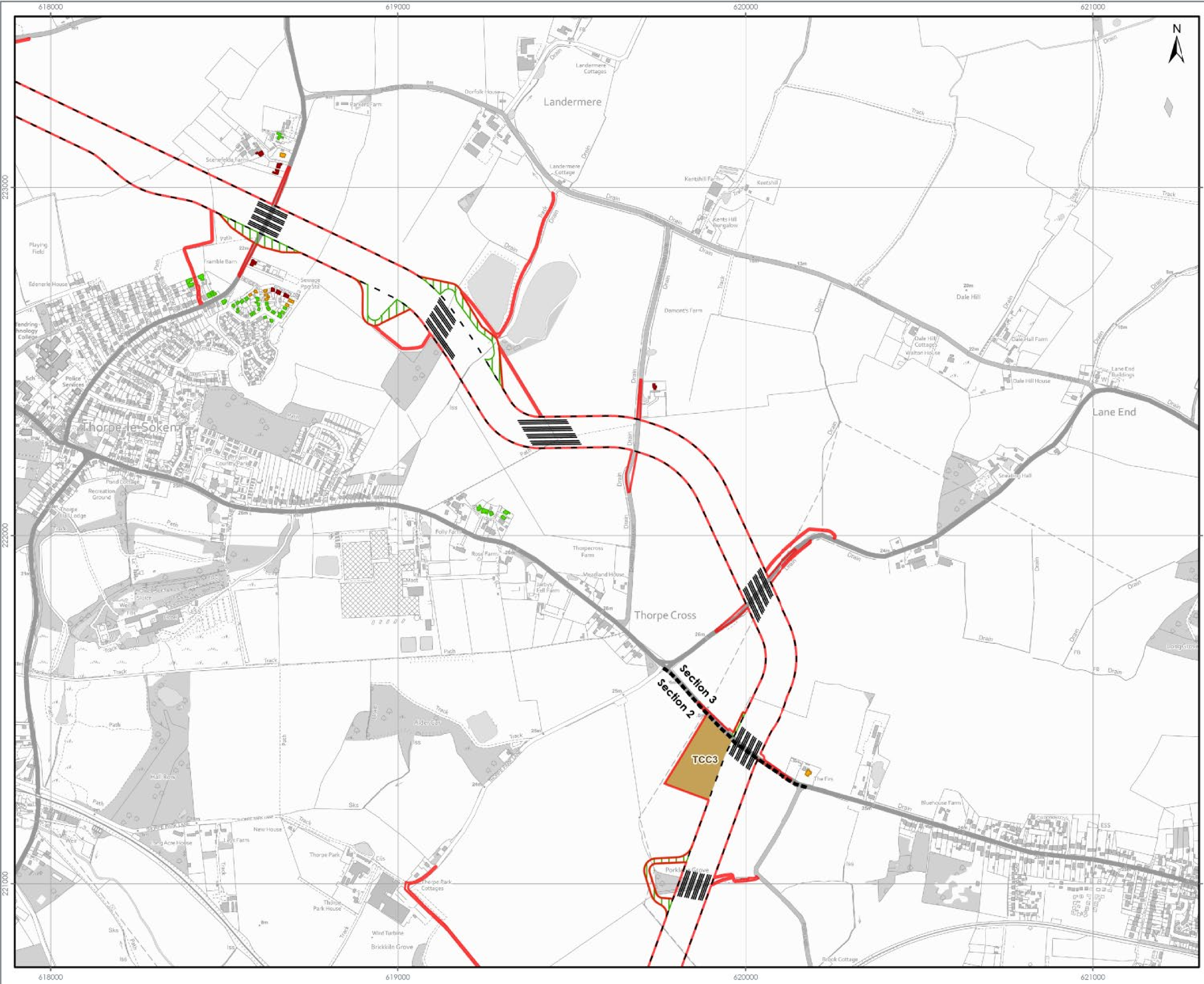
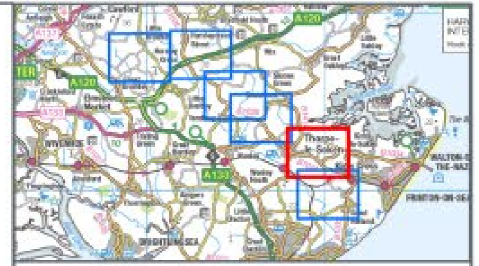
SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - HAUL ROADS (WITHOUT MITIGATION)

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FIVE ESTUARIES OFFSHORE WIND FARM

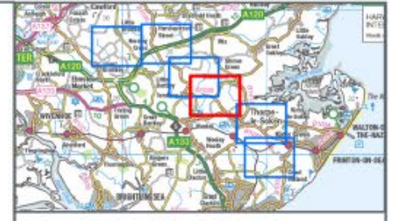
615000 616000 617000 618000

225000 224000 223000

N

Section 4b
Section 4a
Section 4a
Section 3
TCC5
TCC4

Tendring
Far Thorpe Green
Thorpe Green
Beaumont
Tendring Brook
Beaumonthall Wood
Homestead Lake Country Park



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - HAUL ROADS (WITHOUT MITIGATION)

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SCALE	PLOT SIZE	DATUM	PROJECTION
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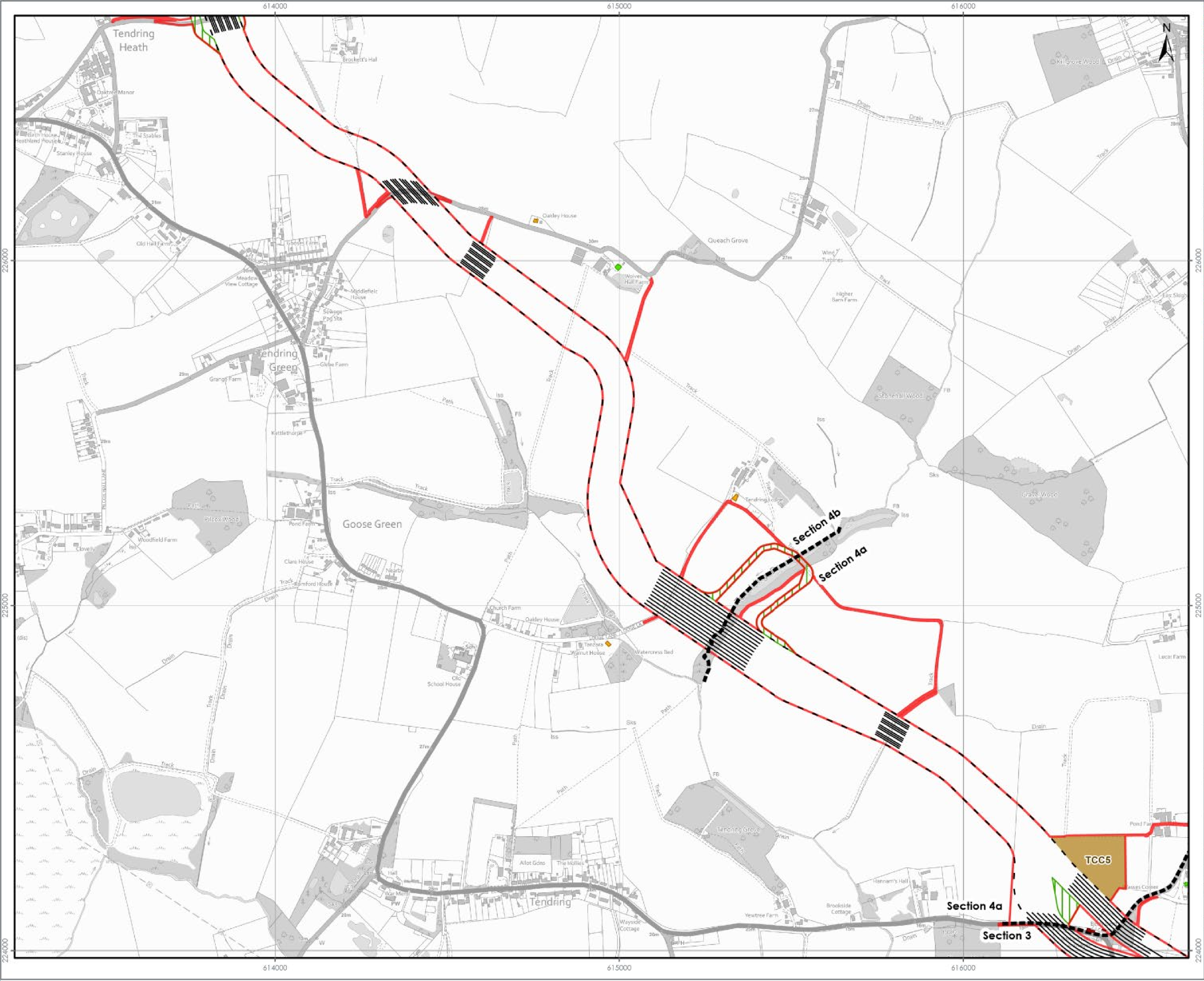
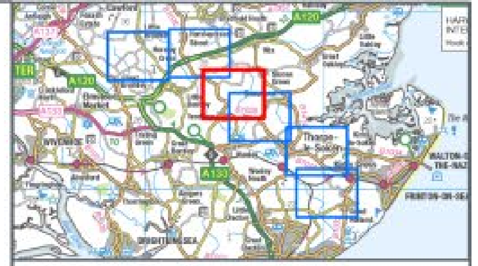
FIVE ESTUARIES
OFFSHORE WINDFARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - HAUL ROADS (WITHOUT MITIGATION)

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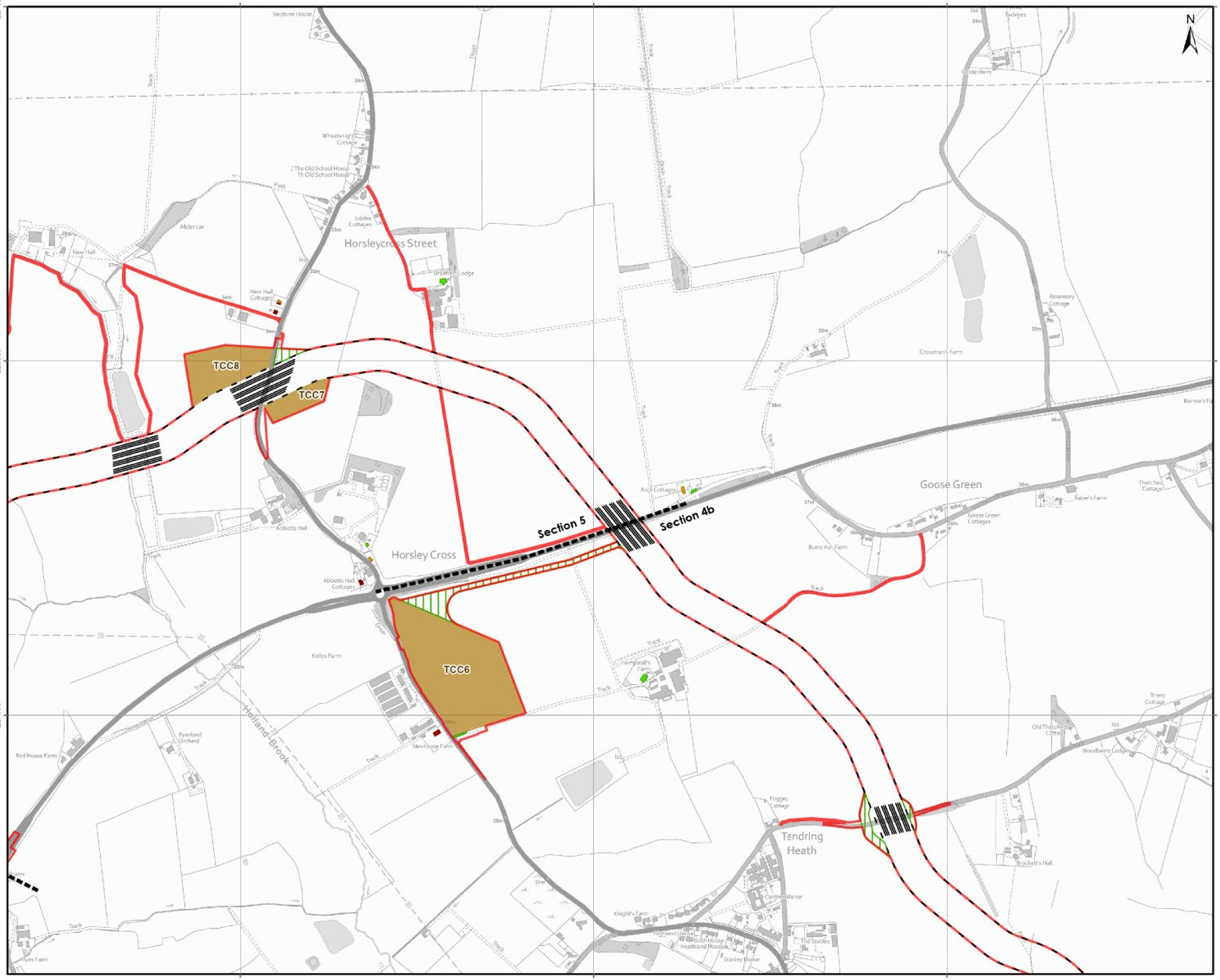
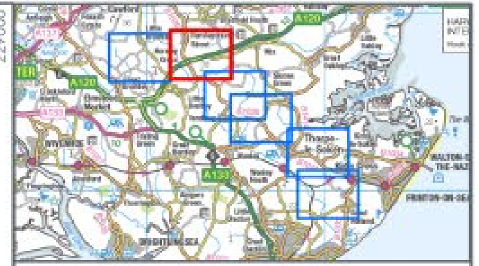
SCALE: 1:10,000	PLOT SIZE: A3	DATUM: OSGB 1936	PROJECTION: British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500

Metres

Data Source:

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - HAUL ROADS (WITHOUT MITIGATION)

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FIVE ESTUARIES
OFFSHORE WIND FARM

608000 609000 610000 611000

228000 227000

Section 7
Section 6
Section 5
Section 6

TCC9
TCC10
TCC11

N

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Indicative Substation Access Route
- Substation Operational Boundary
- Substation Temporary Construction Haul Road
- Substation Temporary Construction Compound
- Ardleigh Road Drainage Zone
- North Falls Indicative Substation Operational Boundary
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

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ECC CONSTRUCTION IMPACT - HAUL ROADS (WITHOUT MITIGATION)

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SCALE	PLOT SIZE	DATUM	PROJECTION
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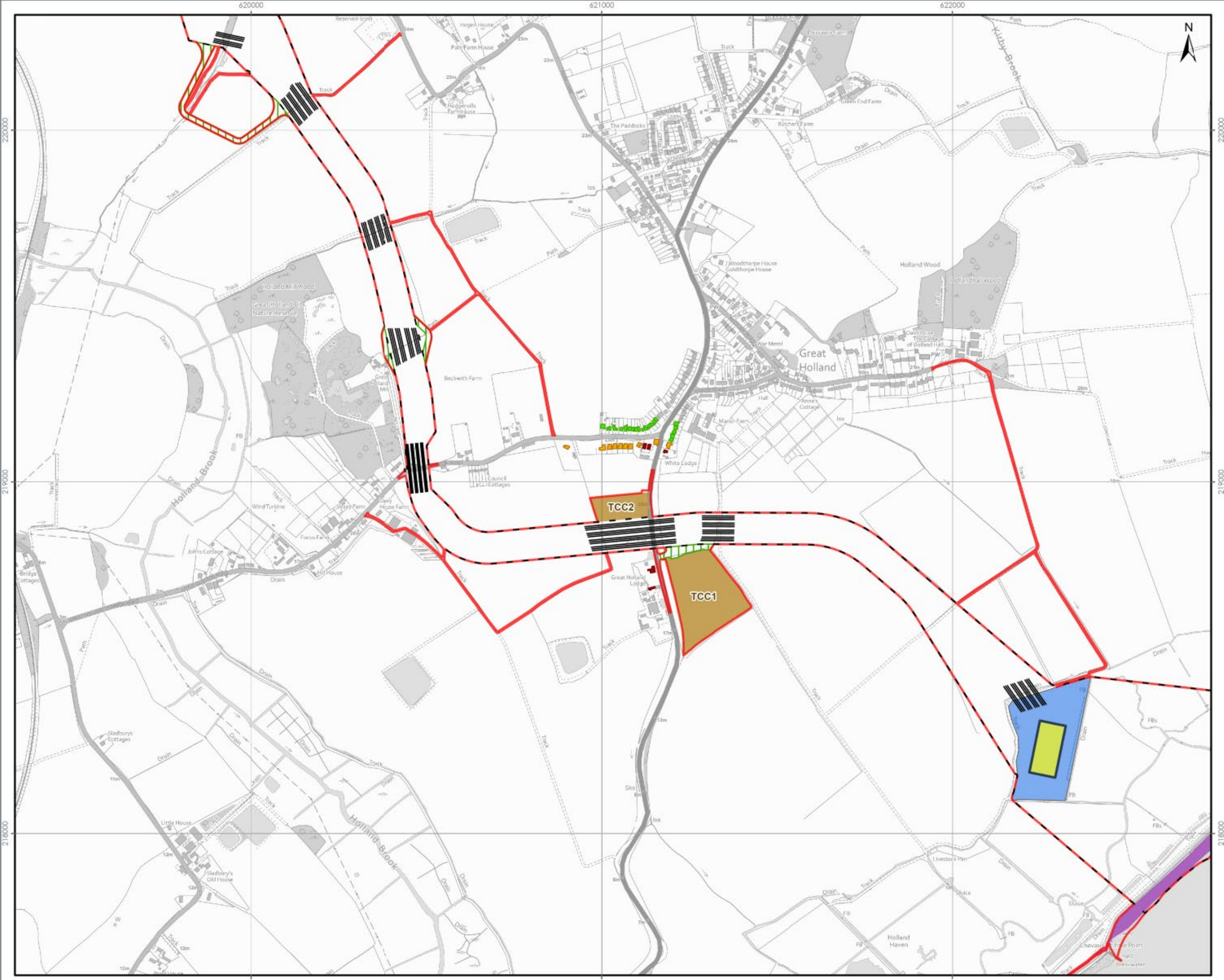
FIVE ESTUARIES OFFSHORE WINDFARM



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Landfall Compound Zone
- Indicative Landfall Compound
- Temporary Beach Access Zone
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - TCC CONSTRUCTION (WITHOUT MITIGATION)

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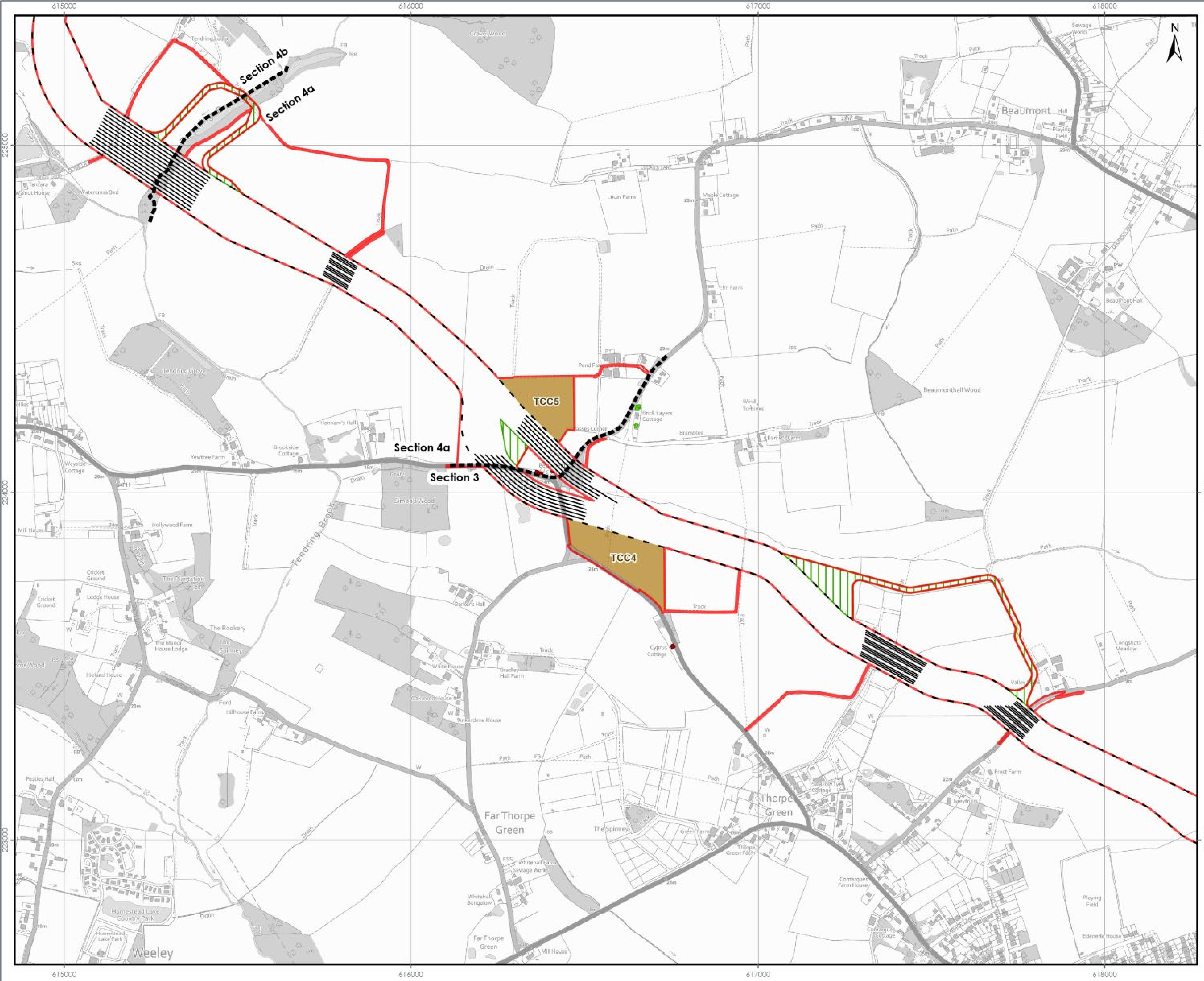
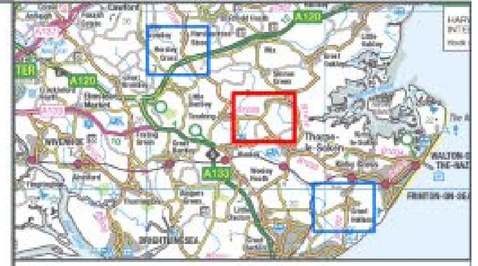
FIVE ESTUARIES
OFFSHORE WINDFARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Low

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - TCC CONSTRUCTION (WITHOUT MITIGATION)

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SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
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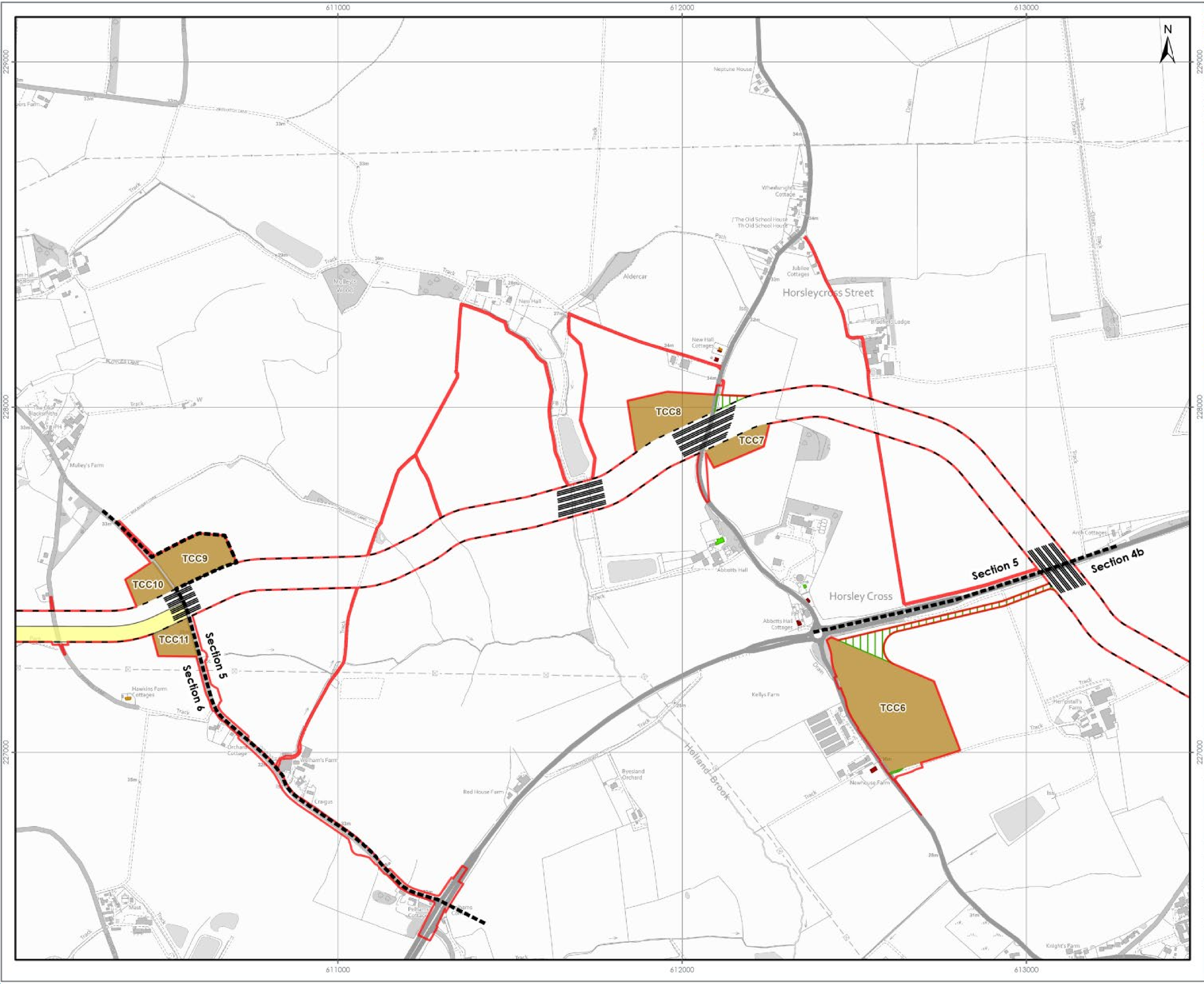
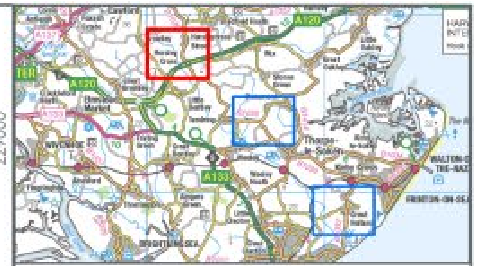
FIVE ESTUARIES OFFSHORE WIND FARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Substation Temporary Construction Haul Road
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - TCC CONSTRUCTION (WITHOUT MITIGATION)

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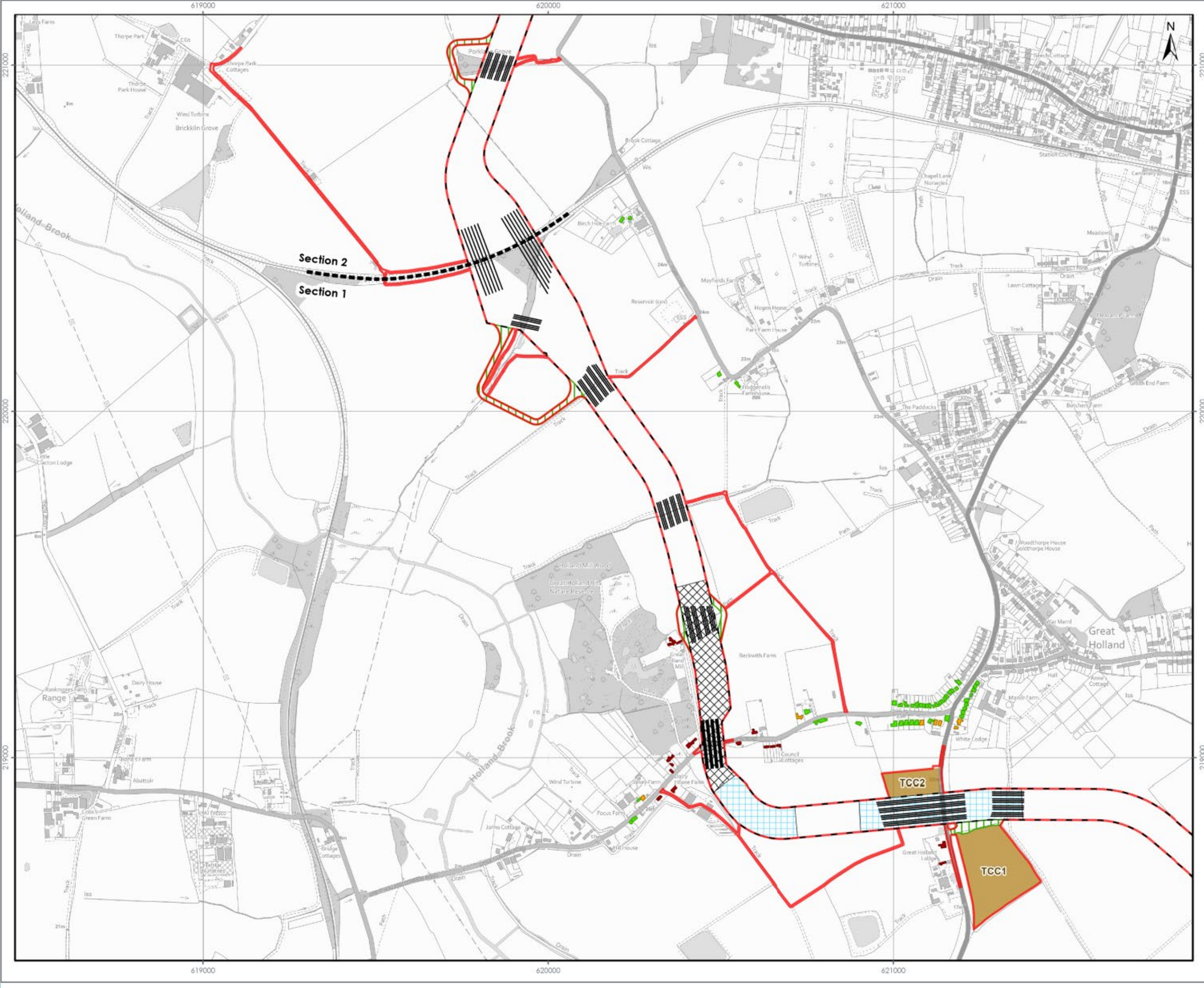
FIVE ESTUARIES
OFFSHORE WIND FARM



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road
- Enhanced Noise Mitigation Area
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - ECC (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
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SCALE	PLOT SIZE	DATUM	PROJECTION
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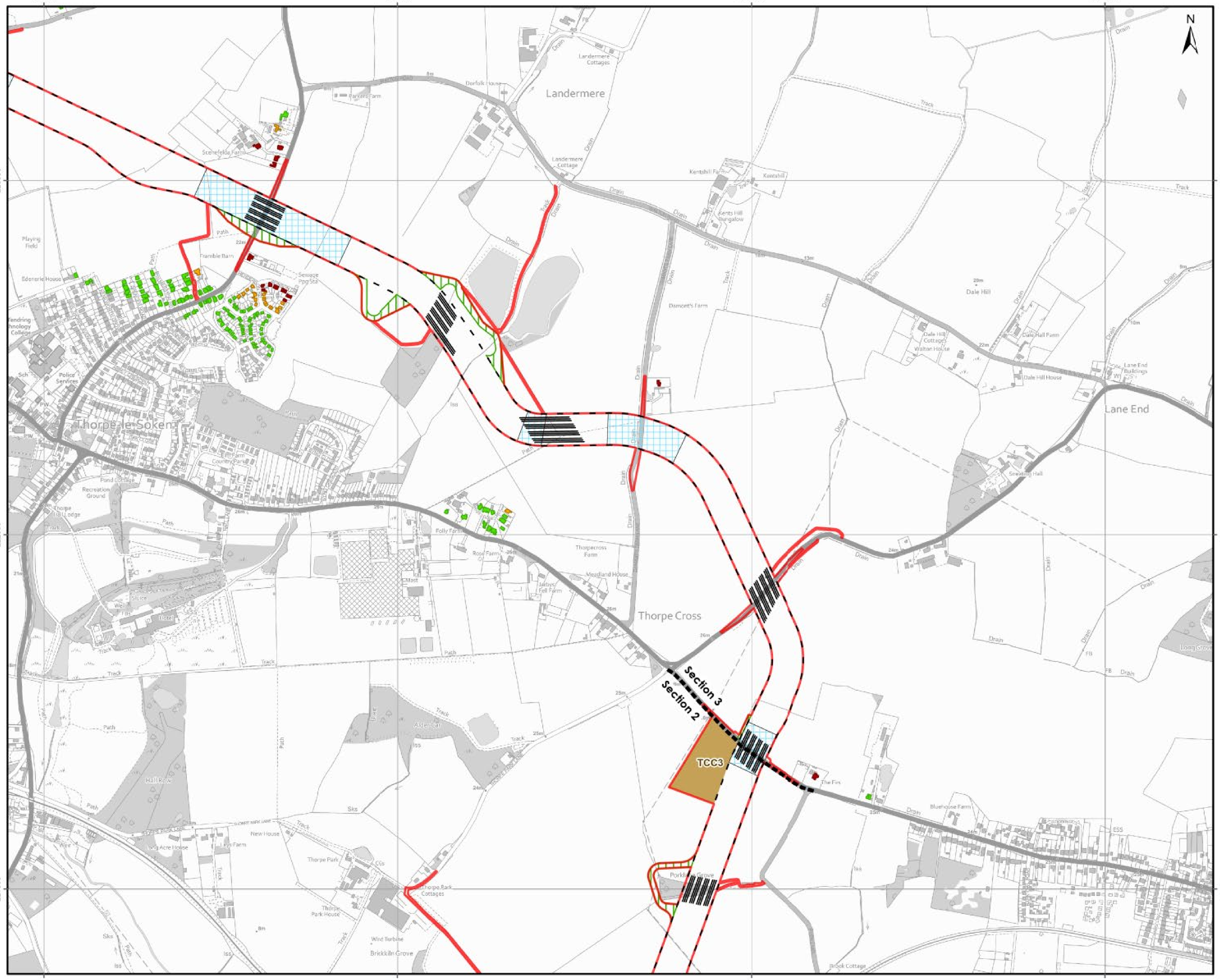
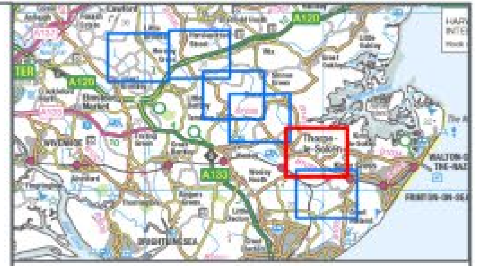
FIVE ESTUARIES
OFFSHORE WINDFARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

Data Source:
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PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - ECC (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.8

Sheet No: 2 of 6

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

615000 616000 617000 618000

225000 224000 223000

N

Section 4b
Section 4a
Section 4a
Section 3
TCC5
TCC4

Tendring
Beaumont
Far Thorpe Green
Thorpe Green
Beaumonthall Wood
Tendring Brook

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - ECC (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.8

Sheet No: 3 of 6

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

614000 615000 616000

226000 225000 224000

Tendring Heath
Brockett's Hall
Oaktree Manor
Heathland House
Stanley House
The Stables
Old Hall Farm
Meadow View Cottage
Middlefield House
Sewage Pmg Sta
Tendring Green
Glebe Farm
Grange Farm
Kettlethorpe
Goose Green
Woodfield Farm
Clovelly
Pond Farm
Clare House
Stamford House
Church Farm
Oakley House
Tenzara
Walnut House
Watercress Bed
Old School House
Allot Gdns
The Hollies
Tendring
Hall
War Mem
PW
Wayside Cottage
Oakley House
Queach Grove
Wolves Hall Farm
Wind Turbines
Higher Barn Farm
Killgrove Wood
Stonehall Wood
Tendring Grove
Hannam's Hall
Brookside Cottage
Yewtree Farm
Lucas Farms
Section 4b
Section 4a
Section 4a
Section 3
TCC5

N

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - ECC (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.8

Sheet No: 4 of 6

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WINDFARM

612000 613000 614000

229000 228000 227000

N

TCC8
TCC7
TCC6
Section 5
Section 4b

Horsley Cross
Horsleycross Street
Goose Green
Tendring Heath
Aldercar
Holland Brook

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - ECC (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.8

Sheet No: 5 of 6

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

608000 609000 610000 611000

228000 227000

N

Section 7

Section 6

TCC9

TCC10

TCC11

Section 5

Section 6

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Indicative Substation Access Route
- Substation Operational Boundary
- Substation Temporary Construction Haul Road
- Substation Temporary Construction Compound
- Ardleigh Road Drainage Zone
- North Falls Indicative Substation Operational Boundary
- Off Route Haul Road
- Enhanced Noise Mitigation Area
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500

Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - ECC (WITHOUT MITIGATION)

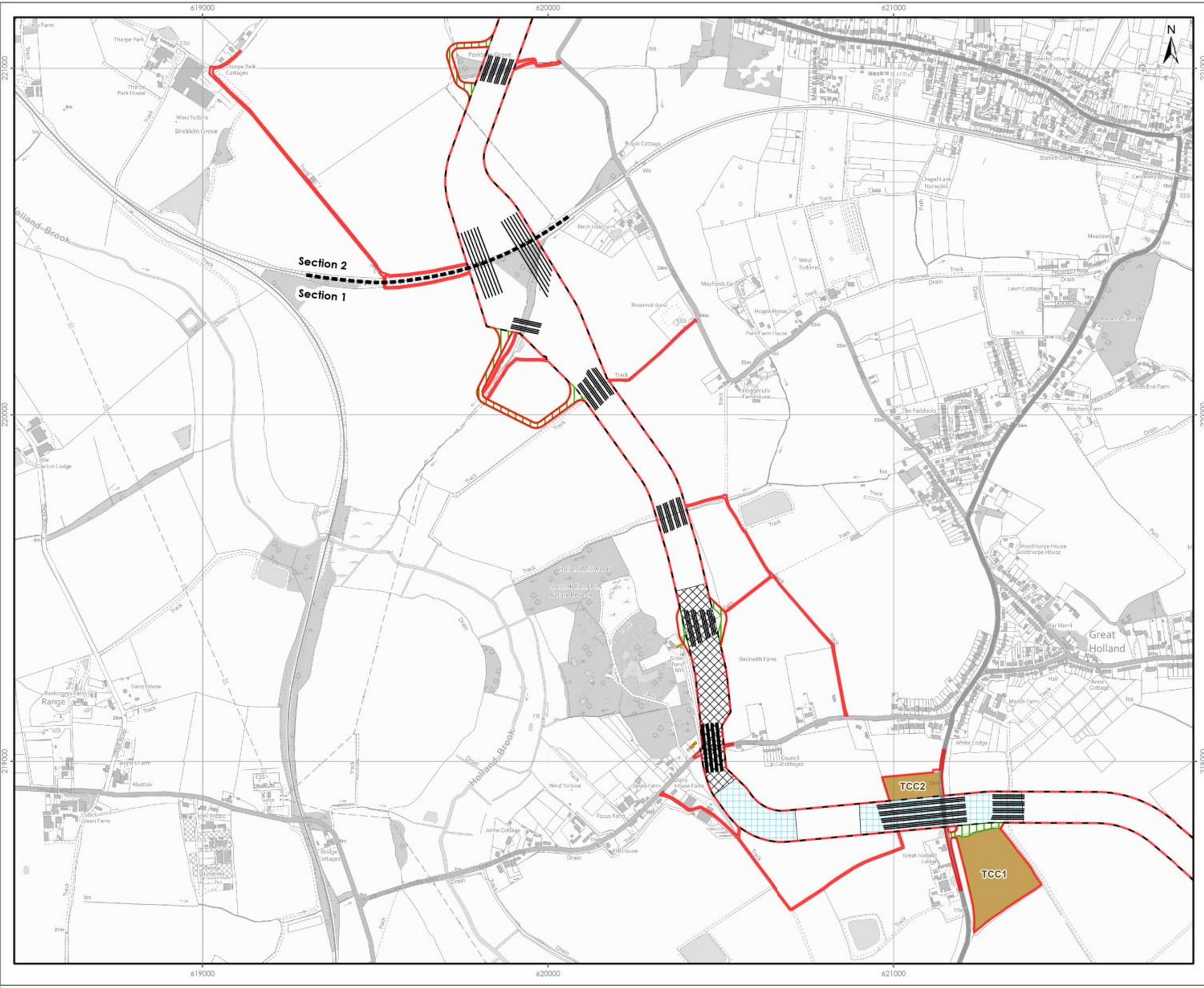
VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JQ	JRS

DRAWING NUMBER: 9.8

Sheet No: 6 of 6

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road
- Enhanced Noise Mitigation Area
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- Medium

0 250 500

Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - ECC (WITH MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.9

Sheet No: 1 of 2

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

608000 609000 610000 611000

228000 227000

N

Section 7

Section 6

TCC9

TCC10

TCC11

Section 5

Section 6

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Indicative Substation Access Route
- Substation Operational Boundary
- Substation Temporary Construction Haul Road
- Substation Temporary Construction Compound
- Ardleigh Road Drainage Zone
- North Falls Indicative Substation Operational Boundary
- Off Route Haul Road
- Enhanced Noise Mitigation Area
- Standard Noise Mitigation Area

ECC Noise Sensitive Receptor (NVSR) Impact

- Medium

0 250 500

Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - ECC (WITH MITIGATION)

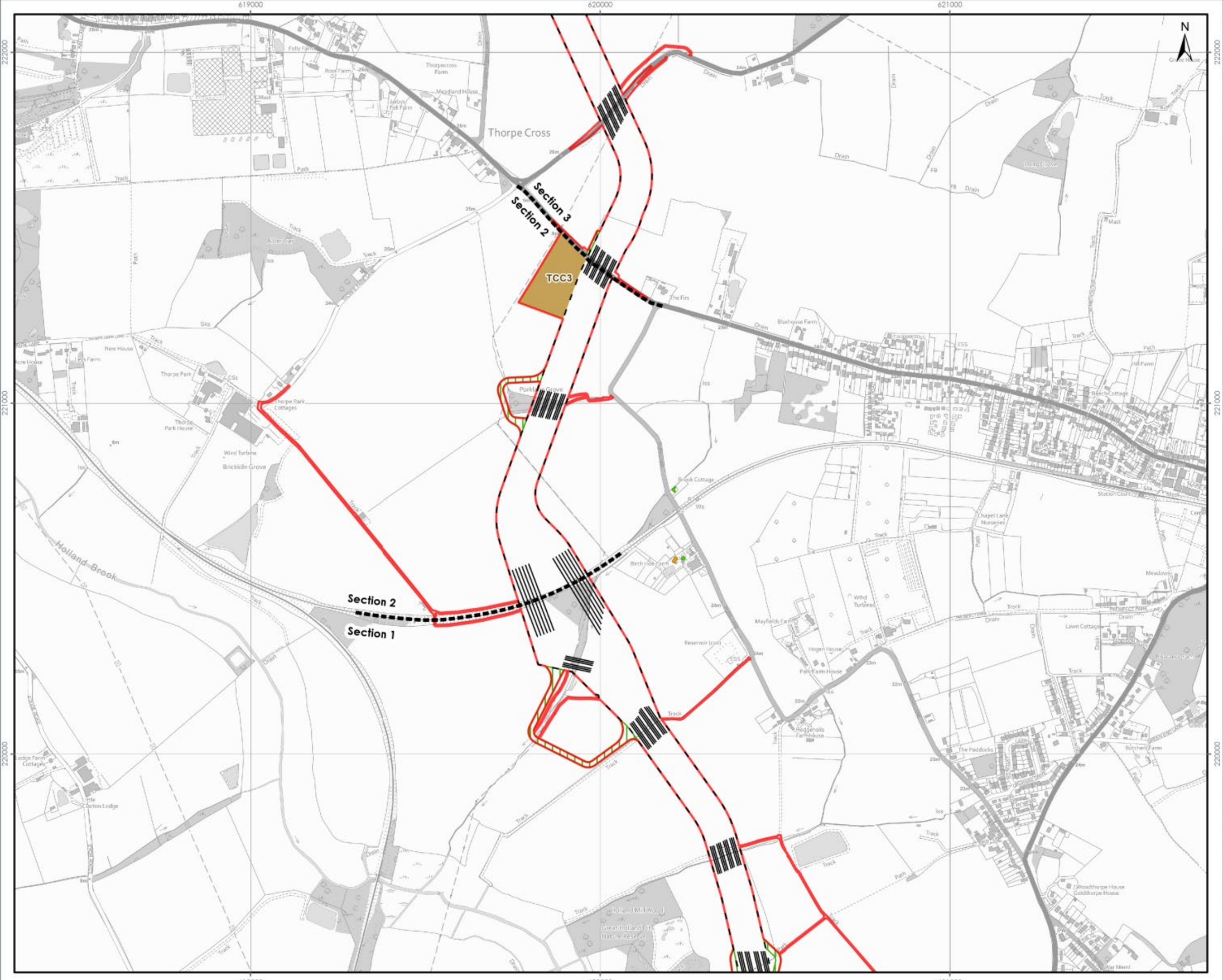
VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.9

Sheet No: 2 of 2

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES OFFSHORE WINDFARM



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - HDD EVENING (WITHOUT MITIGATION)

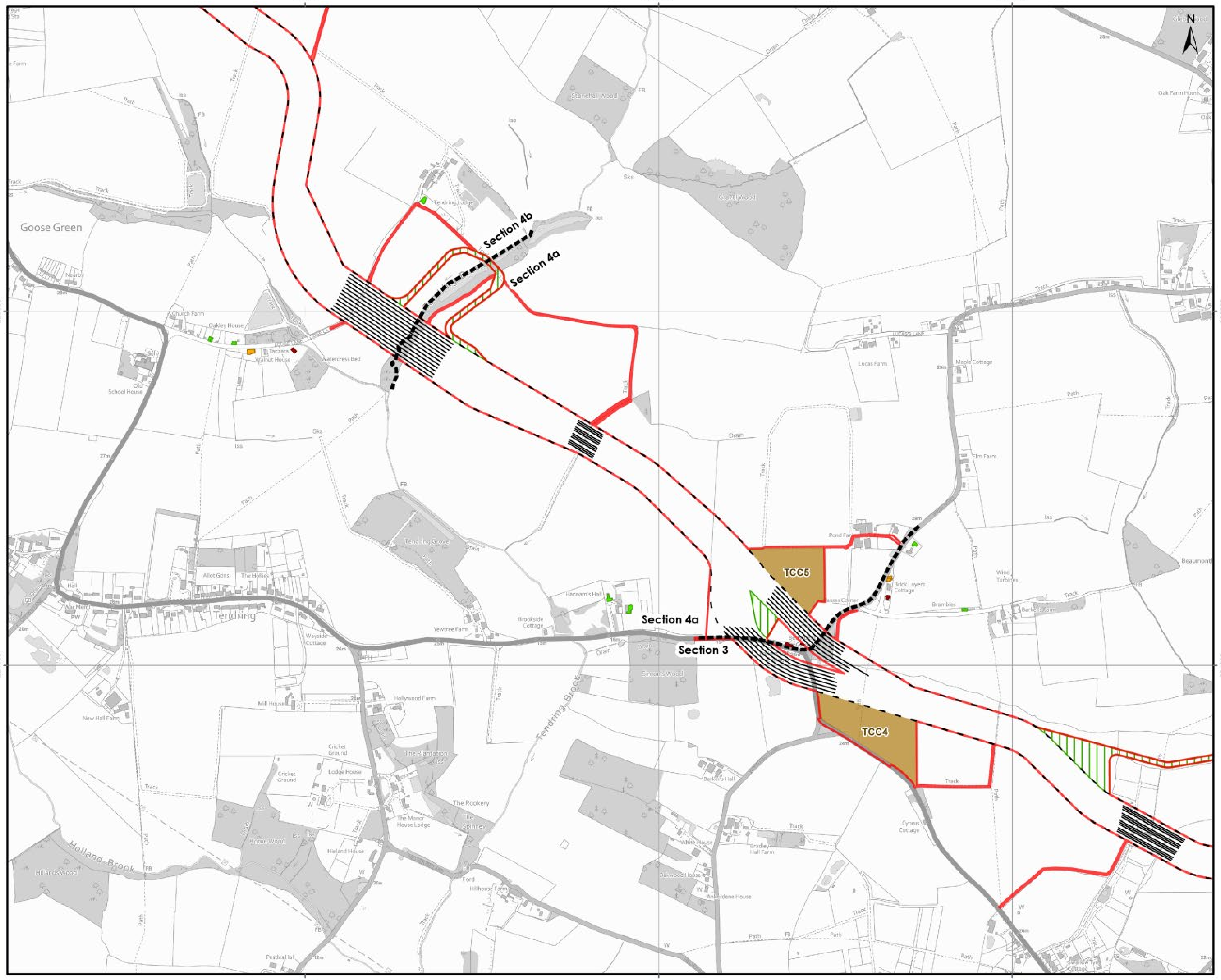
VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

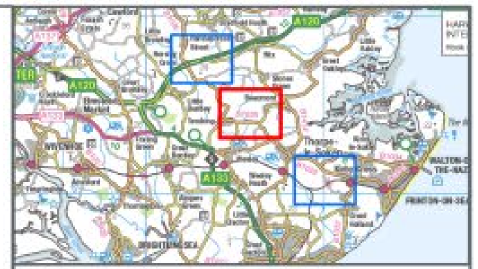
DRAWING NUMBER: 9.10

Sheet No: 1 of 3

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact
- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - HDD EVENING (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.10

Sheet No: 2 of 3

SCALE: 1:10,000	PLOT SIZE: A3	DATUM: OSGB 1936	PROJECTION: British National Grid

FIVE ESTUARIES
OFFSHORE WINDFARM

612000 613000 614000

228000 227000

N

TCC8
TCC7
TCC6
Section 5
Section 4b
Horsley Cross
Horsleycross Street
Goose Green
Tendring Heath
Holland Brook

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High

0 250 500

Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - HDD EVENING (WITHOUT MITIGATION)

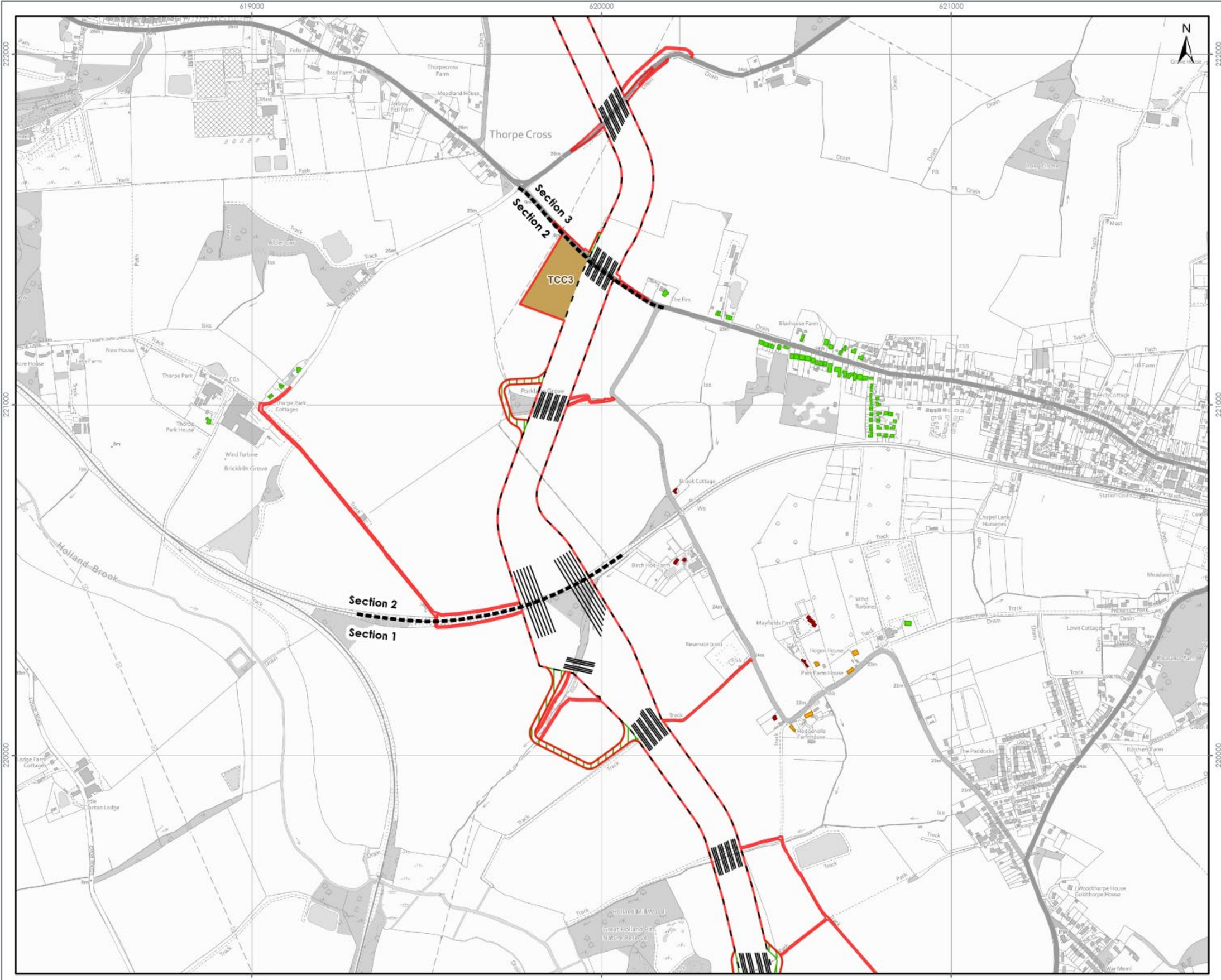
VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.10

Sheet No: 3 of 3

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES OFFSHORE WINDFARM



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - HDD NIGHT (WITHOUT MITIGATION)

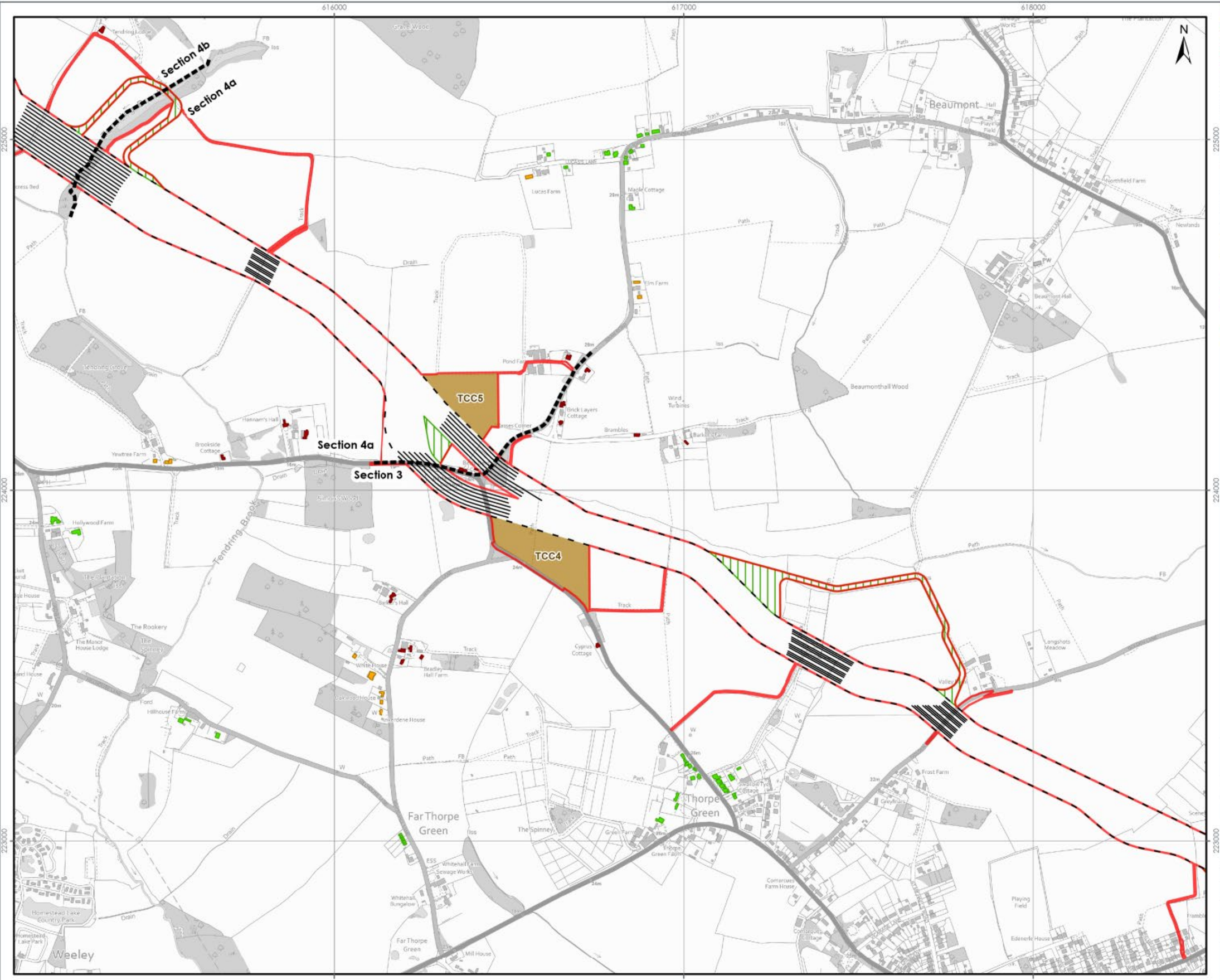
VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.11

Sheet No: 1 of 4

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WINDFARM



LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500

Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - HDD NIGHT (WITHOUT MITIGATION)

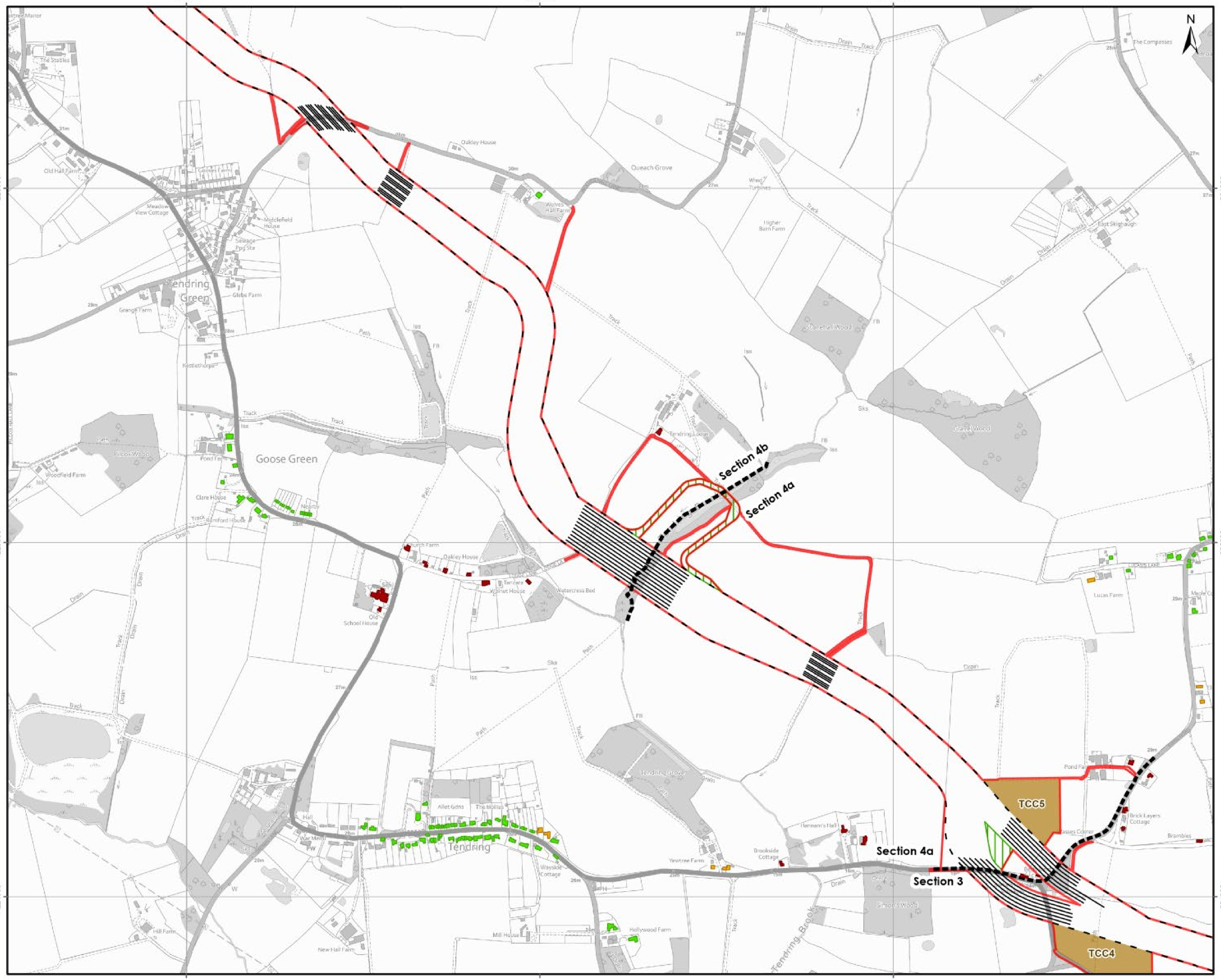
VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

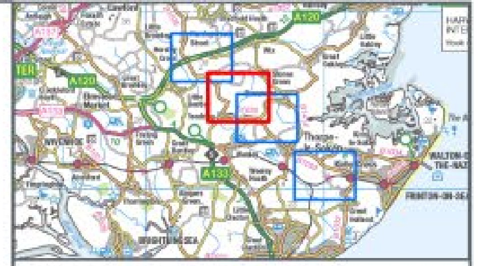
DRAWING NUMBER: 9.11

Sheet No: 2 of 4

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM





LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

ECC CONSTRUCTION IMPACT - HDD NIGHT (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.11

Sheet No: 3 of 4

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES OFFSHORE WINDFARM

612000 613000 614000

228000 227000

N

TCC8
TCC7
TCC6
Section 5
Section 4b
Horsley Cross
Horsleycross Street
Goose Green
Tendring Heath
Holland Brook
Aldercar
Wheelwrights Cottage
The Old School House
Jubilee Cottages
New Hall
New Hall Cottages
Abbotts Hall
Abbotts Hall Cottages
Kellys Farm
Newhouse Farm
Byesland Orchard
Crossmen's Farm
Rosemary Cottage
Burrow's Farm
Spring Farm
Thatched Cottage
Baker's Farm
Goose Green Cottages
Burnt Ash Farm
Arch Cottages
Hemptstall's Farm
Foggey Cottage
Briary Cottage
Old Thatched Cottage
Woodberry Lodge
Brickett's Hall
Oakley Manor
Knight's Farm
Highland House
Birch House
Heathland House
Stanley House
The Stables
Old Hall Farm
Oakley Ho

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor (ECC)
- Trenchless Crossing Indicative Alignment
- Temporary Construction Compound (TCC)
- Off Route Haul Road

ECC Noise Sensitive Receptor (NVSR) Impact

- High
- Medium
- Low

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ECC CONSTRUCTION IMPACT - HDD NIGHT (WITHOUT MITIGATION)

VER	DATE	REMARKS	Drawn	Checked
1	15/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.11

Sheet No: 4 of 4

SCALE	PLOT SIZE	DATUM	PROJECTION
1:10,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

9.10.35 It should be noted that for haul road construction, the number of NSRs in each construction noise impact magnitude in Table 9.32 and identified in Figure 9.6 do not take into account the duration of exposure set out in Table 9.14. This table assumes that NSRs would be exposed to the same level of construction noise for a period of 10 or more days in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months. Whereas the noise associated with the construction of temporary haul roads is transient and unlikely to be at the maximum predicted level for more than a few hours when works are at the closest point to the NSR.

9.10.36 Therefore, the construction noise experienced at NSRs from the construction and removal of haul roads would only be at its maximum for less than one day and would quickly diminish as plant progresses along the onshore ECC. As the period of exposure to high levels of construction noise would be less than 10 days, these activities would result in a low impact.

9.10.37 The distances specified in Table 9.31 for onshore ECC duct installation works considers three concurrent activities moving along the onshore ECC. Both the total construction noise and duration of exposure has been considered within the calculation model when determining these distances, therefore impacts reported in Table 9.32 are likely to be representative for this activity.

9.10.38 For the remaining construction tasks, TCC construction and removal and HDD evening and night-time works, the duration of exposure is likely to be at least 10 days in 15 consecutive days as works would take place within a fixed area. As such the impacts reported in Table 9.32 are likely to be representative for these activities.

9.10.39 For construction tasks that result in a medium and high impacts, a number of mitigation options can be employed, as set out in Paragraph 9.10.11. A reduction of 10 dB can be applied, as discussed in Paragraph 9.10.12, where necessary.

9.10.40 When considering the noise associated with the construction and removal of TCCs, Table 9.33 details where the above mitigation would be necessary.

Table 9.33: TCCs Identified for Construction Noise Mitigation

TCC reference	Onshore ECC Section	Number of NSR medium / high impact	General direction of NSRs	Mitigation required
TCC1	Section 1	2	West of TCC	Yes
TCC2	Section 1	14	North (13) and south (1) of TCC	Yes
TCC3	Section 2	0	n/a	No
TCC4	Section 3	4	North west (3) and south east (1) of TCC	Only if works take place on the boundary
TCC5	Section 4A	3	South of TCC	Yes

TCC reference	Onshore ECC Section	Number of NSR medium / high impact	General direction of NSRs	Mitigation required
TCC6	Section 4B	4	North west (3) and west (1) of TCC	Yes
TCC7	Section 5	0	n/a	No
TCC8	Section 5	4	North east of TCC	Yes
TCC9	Section 6	0	n/a	No
TCC10	Section 6	0	n/a	No
TCC11 (HGV marshalling)	Section 6	2	South west of TCC	Yes

9.10.41 It should be noted that some NSRs are exposed to medium or high impacts from the construction and / or removal of more than one TCC. This is relevant toTCC1 / TCC2, and TCC4 / TCC5 where they are proposed close together. Therefore, the total number of NSRs listed in Table 9.33 may not correspond to the total number in Table 9.32.

9.10.42 With the selection of an appropriate form of mitigation, discussed above, or suitable equivalent, the distance at which TCC construction noise would be a medium impact reduces to 55 m. Only three NSRs remain within this distance of the boundary of any TCC area:

- Great Holland Lodge opposite TCC1;
- Lodge Farm opposite TCC1; and
- New House Farm adjacent to TCC6.

9.10.43 The construction of the above two TCCs (TCC1 and TCC6) will require additional mitigation to control construction noise further. A combination of more than one of the mitigation options discussed in Paragraph 9.10.11 would be required, such as locating the TCCs as far from NSRs as practicable and installing a noise barrier around the perimeter of the TCC closest to the NSR and where possible using fewer or quieter plant.

9.10.44 With suitable mitigation applied to onshore ECC duct installation works, as discussed in paragraph 9.10.39, a 10 dB reduction can be achieved. Mitigation can be concentrated around areas shown in Figure 9.8, where medium and high impacts are present. After the above standard mitigation is accounted for, only three NSRs would now be exposed to a medium residual impact: Dankeer and Great Holland Mill, Great Holland near Section 1 (shown in Sheet 1 of Figure 9.9), and Paynes Cottage south of Little Bromley near Section 6 (shown in Sheet 2 of Figure 9.9).

9.10.45 It should be noted that the residual impacts reported at the above three NSRs assume that the noisiest three onshore ECC duct installation activities would be occurring concurrently at a location nearest to these properties. If more than one onshore ECC duct installation activity is taking place within 200 m of these properties, then additional mitigation would be necessary. This can be achieved with a combination of more than one of the mitigation options discussed in Paragraph 9.10.11, such as locating plant as far from NSRs as practicable and installing a noise barrier along the perimeter of the onshore ECC and where possible using fewer or quieter plant, this approach is defined as Enhanced Noise Mitigation. This is shown in Figure 9.8 as the Enhanced Noise Mitigation Areas. With Enhanced Noise Mitigation the three receptors shown in Figure 9.9 and discussed in Paragraph 9.10.44 to have a medium impact will further reduce to a low magnitude of impact.

9.10.46 Mitigation will also be required for the five onshore ECC crossings that may undertake regular evening and night-time drilling, as listed in Paragraph 9.10.27. As the calculations assume a worst case, the noise levels from plant used may not be as high as those presented, and any mitigation should be commensurate to the noise generated. An appropriate level of mitigation would be required to lower the noise level to a maximum of 48 dB at the nearest NSR. This would result in a low residual impact during the night-time. This mitigation can be achieved by the combination of more than one of the options discussed in Paragraph 9.10.11. It should be noted that the construction contractor is not selected at this stage; therefore, once appointed, there is likely to be a better understanding of the likely evening and night-time works, which may not include all five crossings listed in Paragraph 9.10.27.

9.10.47 With such mitigation in place, it would ensure that there would be no greater than a low impact magnitude, which would be of **minor residual effect**.

9.10.48 Predictions of ground-borne vibration have been completed in accordance with the empirical prediction method given in Table E.1 of BS5228-2:2009+A1:2014 Part 2 Vibration. These calculations provide a level of PPV outside of a building, to which a transfer function of 1.8 has been applied to give a likely level of vibration inside a building, as discussed in Paragraph 9.10.15.

9.10.49 A vibratory compacting roller would be used during a number of the construction activities that take place within the onshore ECC, the construction and removal of the TCCs and the construction and removal of the off-route access roads.

9.10.50 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.

9.10.51 The distances at which the above vibration-generating activities result in internal impact magnitudes discussed in Table 9.16 are set out in Table 9.34.

Table 9.34: ECC Onshore ECC Construction Vibration Distances

Scenario	0.3 mm/s	1.0 mm/s	10 mm/s
Vibration compaction startup and run down	123 m	48 m	7.2 m
Vibration compaction steady state	87 m	38 m	7.3 m

Scenario	0.3 mm/s	1.0 mm/s	10 mm/s
HDD bore / reaming	39 m	15 m	1.7 m
Vibratory piling HDD support startup / run down	427 m	171 m	25 m
Vibratory piling HDD support steady state	194 m	82 m	16 m

9.10.52 Construction activities where a vibration compactor would be used are either at the start of the construction works, such as site preparation, haul road construction and TCC construction; or at the end such as ground reinstatement and removal of TCCs and haul roads. Where jointing bays are required, a vibration compactor would be used also. These activities would be spread out over the entire construction programme and typically progress along the onshore ECC. Therefore, exposure to vibration would be limited to the time at which plant would be at its closest.

9.10.53 The transient nature of the above vibration-generating construction activities is such that a nearby receptor would not be exposed to vibration for 10 or more days in any 15 consecutive days, or for a total of more than 40 days in six consecutive months. Therefore, as set out in Paragraph 9.5.10 and Table 9.16, onshore ECC construction vibration would be of low impact magnitude if below 10 mm/s and high impact magnitude if it is 10 mm/s or greater inside a sensitive receptor. The distance at which 10 mm/s would occur is 7.2 m during startup and run down of the compactor.

9.10.54 HDD crossings typically comprise up to three days of vibration ground compaction at the start during the construction of the trenchless installation compound, followed by approximately an hour of vibratory piling for a HDD support for the first bore, if required, and then a day or two of HDD bore drilling and reaming, depending on the length of the bore. Drilling and reaming each typically progress at a rate of 100 m per day, depending on ground conditions. Vibration levels are generated at the cutting face during drilling. Once the first bore is complete, the drilling rig will be moved to the second bore, which may require a support to be piled, and then drilling and reaming will start again. This process is repeated until all (up to 12) bores are complete. Upon completion of the entire trenchless crossing the trenchless installation compound will be removed and ground reinstated, which could contain up to three days of vibration ground compaction.

9.10.55 For the majority of time associated with a HDD crossing, vibration will be generated during drilling and reaming. Short periods during the construction and removal of the trenchless installation compound would see slightly higher levels of vibration and there could be very brief intermittent periods of higher vibration caused by the vibratory piling of supports, if required. Given the likely duration of exposure a high impact from HDD vibration would be present if the distance between a sensitive receptor and an entry or exit pit is 25 m or less and a low impact would be present if the distance is greater.

9.10.56 No dwellings would be exposed to a high vibration impact during construction activities that use a vibration ground compactor, as described in Paragraph 9.10.52. There are five dwellings identified to be within 25 m of the onshore ECC boundary and therefore, have the potential to be exposed to a high impact if a HDD entry or exit pit is situated at the closest point to them. These dwellings are:

- Dankeer, Great Holland;
- Great Holland Mill, Great Holland;
- 1 Barkers Hall Cottages, Beaumont;
- 2 Barkers Hall Cottages, Beaumont; and
- The static caravan at Barkers Hall Cottages, Beaumont.

9.10.57 For the above five locations, a HDD crossing has already been identified as likely to be required to cross Little Clacton Road, an established hedgerow and the interchange with Thorpe Road, Swan Road and Tendring Road. The entry and exit pits are more than 25 m from the listed dwellings and therefore vibration impacts would be of low magnitude.

9.10.58 A low magnitude of impact upon a receptor of medium sensitivity which results in a **minor adverse** effect. This effect is considered not significant in terms of the 2017 EIA regulations.

IMPACT 3: NOISE AND VIBRATION IMPACTS DURING THE CONSTRUCTION OF THE ONSS

9.10.59 The construction activities associated with the OnSS are listed in Table 9.35 together with the total sound power levels, taking into account the number of plant and on-times, as detailed in Volume 6 Part 6, Annex 9.2: Construction Noise Assessment.

Table 9.35: OnSS Construction Activities and Sound Power Levels

Activity	Combined Sound Power Level, dB L_{WA}
Site enabling works: site clearance, ground works and formation of site platform.	123
Access road construction.	116
Building foundation works.	119
Building fabrication and HV plant installation.	117
TCC construction.	122
TCC removal	121

9.10.60 Calculations assume the MDS set out in Table 9.25 and include mitigation measures detailed in Table 9.26. The predicted noise levels from each of the OnSS construction operations are shown in Table 9.37. The closest point to the substation and construction compound has been used in the calculations.

9.10.61 Construction noise levels have been predicted at the nearest NSRs to the OnSS and associated OnSS TCC in the various directions around these areas. A study area based on a distance of 650 m from construction works has been applied as per Paragraph 9.4.6. The NSRs are listed in Table 9.36.

Table 9.36: OnSS Construction Noise Receptors

ID	Name	X (OSGB36)	Y (OSGB36)
SSR4	Badley Hall	607173	228964
SSR5	Waterhouse Farm	607256	228374
SSR7	Normans Farm	608446	228492
SSR8	Mulberry Lodge	608753	228577

9.10.62 Table 9.37 also shows the BS5228-1:2009+A1:2014 construction noise threshold value for the daytime, as the majority of OnSS construction works will be carried out during this period. As discussed in Paragraph 9.4.37, some construction work can occur during the 'evenings and weekend' period; however, they would not generate the levels of noise during all other times and do not warrant assessment.

Table 9.37: OnSS Construction Noise Levels

NSR	Construction activity	Predicted noise level, dB L_{Aeq}	Threshold, dB L_{Aeq}	Difference dB
SSR4 Badley Hall	OnSS TCC construction	56	65	-9
	Site enabling	56	65	-9
	Building foundations	51	65	-14
	Access road and car park	49	65	-16
	Building fabrication	49	65	-16
	Removal of OnSS TCC	55	65	-10
SSR5 Waterhouse Farm	OnSS TCC construction	56	65	-9
	Site enabling	55	65	-10
	Building foundations	51	65	-14
	Access road and car park	48	65	-17
	Building fabrication	48	65	-17
	Removal of OnSS TCC	55	65	-10
SSR7 Normans Farm	OnSS TCC construction	57	65	-8
	Site enabling	60	65	-5
	Building foundations	56	65	-9

NSR	Construction activity	Predicted noise level, dB L_{Aeq}	Threshold, dB L_{Aeq}	Difference dB
	Access road and car park	53	65	-12
	Building fabrication	54	65	-11
	Removal of OnSS TCC	56	65	-9
SSR8 Mulberry Lodge	OnSS TCC construction	52	65	-13
	Site enabling	56	65	-9
	Building foundations	52	65	-13
	Access road and car park	49	65	-16
	Building fabrication	50	65	-15
	Removal of OnSS TCC	51	65	-14

9.10.63 It can be seen from Table 9.37 that construction noise would not exceed the day threshold at any of the NSRs. Therefore, this would result in a negligible impact on medium sensitivity receptors, giving a **negligible effect**, which is not significant in terms of the 2017 EIA regulations.

9.10.64 Ground compaction works involving a vibrating roller may take place during the construction of the OnSS. The closest receptor to the OnSS construction works is SSR7 Normans Farm which is over 420 m away. This is outside of the study area for vibration impacts and no LSE would be present in this regard.

IMPACT 4: NOISE AND VIBRATION IMPACTS FROM ROAD IMPROVEMENTS TO A120 JUCTION AND BENTLEY ROAD

9.10.65 A 1.4 km section of Bentley Road situated between the A120 and approximately 100 m north of the intersection with the onshore ECC will be widened as part of the proposals. In addition, a section of the A120 approximately 200 m long and centred around the junction with Bentley Road will be improved.

9.10.66 Details of the plant and equipment that would be used during these works are included in Volume 6 Part 6, Annex 9.2: Construction Noise Assessment. The total combined sound power level of all road improvement plant, taking account of the number of items as the percentage of time they would be operating, is 116 dB L_{WA}.

9.10.67 The widening of Bentley Road may require simultaneous working on up to three locations, each of which will require the plant discussed above. In addition to this plant which will be moving along the length of the area of work, a crusher may be required should aggregate be recycled on site. If a crusher is used, it would be located within TCC11, south of the onshore ECC at Bentley Road.

9.10.68 Areas of simultaneous working are likely to be spread along the length of Bentley Road between the A120 and where the onshore ECC crosses Bentley Road. A worst case of three simultaneous working parties, each with a sound power of 116 dB L_{WA} has been identified. The first area contains the section of Bentley Road that sits within the onshore ECC, the second area just south of this and the third area approximately 500 m further south down Bentley Road.

9.10.69 As work and plant pass closer to NSRs the contribution to the overall noise level experienced at the nearby NSR will change from a distant noise made up of all plant to the construction noise being dominated by the nearest item of plant. Noise from more distant plant, likely to be in operation 100 m to 200 m away, will contribute less to the overall total construction noise level. The noisiest item of mobile plant is the grader, which has a sound power level of 110 dB L_{WA}.

9.10.70 Two scenarios have been assessed:

- Simultaneous operation of the three areas discussed in Paragraph 9.10.68 plus a crusher within TCC11; and
- Grader passing at the closest point to an NSR plus a crusher within TCC11.

9.10.71 All NSRs within 300 m of these works have been identified, as discussed in Paragraph 9.4.21 and set out in Table 9.38, and the construction noise levels calculated for the above two scenarios. Table 9.39 details the results and include for a crusher within TCC11 for both scenarios.

Table 9.38: Bentley Road Construction Noise Receptors

ID	Name	X (OSGB36)	Y (OSGB36)
BRR1	Crabtrees	610228	227732
BRR2	Richmond Cottage	610160	227569
BRR3	1 Hawkins Farm Cottages, Paynes Lane	610388	227160
BRR4	2 Hawkins Farm Cottages	610401	227159
BRR5	Oakwood Bentley Road	610645	227079
BRR6	Orchard Cottage	610695	227056
BRR7	Welhams Farm	610882	226906
BRR8	Craigus	610915	226879
BRR9	Jasmine Cottage	611136	226669
BRR10	The Nook	611220	226577
BRR11	Pellens Cottage	611273	226569
BRR12	Byeways	611302	226511
BRR13	Byes Farm	611369	226355
BRR14	Spring Hall	611229	226303
BRR15	Spring Hall Cottage	611173	226284
BRR16	Red House Farm, Harwich Road	611498	226865

Table 9.39: Bentley Road Construction Noise Levels

ID	Name	Predicted noise level, dB L_{Aeq}	
		3 simultaneous activities	Activity at closest point
BRR1	Crabtrees	57	55
BRR2	Richmond Cottage	58	56
BRR3	1 Hawkins Farm Cottages, Paynes Lane	64	62
BRR4	2 Hawkins Farm Cottages	64	62
BRR5	Oakwood Bentley Road	64	75
BRR6	Orchard Cottage	65	82
BRR7	Welhams Farm	69	74
BRR8	Craigus	65	75
BRR9	Jasmine Cottage	55	82
BRR10	The Nook	53	82
BRR11	Pellens Cottage	53	82
BRR12	Byeways	52	82
BRR13	Byes Farm	50	58
BRR14	Spring Hall	51	57
BRR15	Spring Hall Cottage	51	55
BRR16	Red House Farm, Harwich Road	52	52

9.10.72 It can be seen from Table 9.39 that construction noise levels from these works would only exceed 65 dB L_{Aeq} at BRR5 to BRR12 inclusive. A construction noise impact of 65 dB L_{Aeq} or lower would be negligible, as discussed in Table 9.14 and Table 9.4. With the exception of BRR7, Welhams Farm, non-negligible impacts at BRR5 to BRR12 are caused when construction activities are at their closest. In the case of BRR7, Welhams Farm, noise from the three simultaneous activities discussed in Paragraph 9.10.67 and 9.10.68 also result in construction noise level greater than 65 dB L_{Aeq}, however, are dominated by noise from the third area which is assumed to be 80 m away.

9.10.73 Mitigation capable of providing 10 dB attenuation can be employed, as set out in Paragraph 9.10.11, if road improvement works are taking place within 100 m of a dwelling. At the distance of 100 m, unmitigated construction noise from road improvement works would be 67 dB L_{Aeq}, assuming all plant is located that minimum distance away. With such mitigation in place noise levels would be 68 dB L_{Aeq}, at a distance of 30 m, which is of low magnitude of impact. There would remain a brief period of up to one week when construction noise would exceed 68 dB L_{Aeq} for those NSRs situated within 30 m of the area where construction activity is taking place.

9.10.74 After mitigation there would remain a residual impact of over 68 dB L_{Aeq} for less than 10 days in any 15 consecutive days, which equates to a low impact magnitude, as per Table 9.14Table 9.14. A low magnitude of impact upon a receptor of medium sensitivity results in a **minor adverse** cumulative effect. This effect is considered not significant in terms of the 2017 EIA regulations.

9.10.75 In addition vibratory rollers would be used during the construction works associated with these road improvements. The same calculation method and assumptions used for Landfall construction vibration impact distances discussed in Paragraphs 9.10.13 to 9.10.16 and in Table 9.29 can be applied to these works.

9.10.76 Given the progressive nature of the ground compaction works, receptors will only be exposed to vibration for a short period of time, as the roller passes by. It is possible that three dwellings would be exposed to a high vibration impact, as they are situated within 7 m of the proposed road improvement works. These properties are:

- BRR6 Orchard Cottage;
- BRR9 Jasmine Cottage; and
- BRR11 Pellens Cottage.

9.10.77 All other receptors would be exposed to a low magnitude of impact due to ground-borne vibration.

9.10.78 For the receptors exposed to high vibration impacts, as listed in Paragraph 9.10.75, this can be mitigated by increasing the distance between the vibration compaction works and the receptor. Where this is not possible vibration levels can be reduced by using a compactor with one or more of the following:

- a single drum;
- a drum amplitude of less than 0.5 mm;
- a wider drum, ideally at least 2 m.

9.10.79 If it is not possible to apply any of the above mitigation, then an alternative form of ground compaction would need to be considered, or a good working relationship with the occupants of the dwellings to manage any disturbance. With suitable mitigation the magnitude of impact from all vibration work associated with the road improvements would be low.

9.10.80 A low magnitude of impact upon a receptor of medium sensitivity would result in a **minor adverse** effect. This effect is considered not significant in terms of the 2017 EIA regulations.

IMPACT 5: NOISE IMPACTS FROM CONSTRUCTION VEHICLES USING THE ROAD NETWORK

9.10.81 Construction traffic from the development proposals may temporarily alter noise levels near the affected local road network. A number of road links have been considered, as set out in Paragraph 9.4.39, using the method described in Paragraph 9.4.38 and Paragraph 9.4.41.

9.10.82 Table 9.40 presents a summary of the road links assessed, the traffic data and the HGV corrected basic noise level. The impact magnitude of the change in BNL has been determined using Table 9.15.

9.10.83 One road link provided was noted to have a level of flow that was below the validity of the calculation method; therefore, the haul route calculation method provided in BS5528-1:2009+A1:2014 has been used to determine the likely noise from construction vehicles. Table 9.41 summarises this link and the calculated total noise from construction HGV and LDVs at a reference distance of 10 m. The impact magnitude has been determined using Table 9.14.

9.10.84 Construction traffic noise is predicted to have a high magnitude of impact at Bentley Road and a negligible or low magnitude of impact at all other roads assessed. To mitigate the impact at Bentley Road a temporary 40 mph speed limit can be applied for the case with construction traffic. Reducing the speed of the traffic flow will also reduce the noise generated by the vehicles. With a speed reduction in place on Bentley Road, the change in BNL will be 1.9 dB, which is of low magnitude. Such impacts (negligible and low) upon medium sensitive receptors would result in a **minor effect** and not significant in terms of the 2017 EIA regulations.

Table 9.40: Construction Traffic Noise Assessment - Change in BNL

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
A12 (N)	70,060	9.50%	81.5	70,453	9.80%	81.6	0.1	Negligible	Negligible / not significant
A12 (S)	81,553	8.30%	82.0	81,939	8.60%	82.1	0.1	Negligible	Negligible / not significant
A12 (S) onslip at J29 Roundabout	14,474	9.80%	74.7	14,672	10.50%	74.9	0.2	Negligible	Negligible / not significant
A12 (N) offslip at J29 Roundabout	11,040	8.40%	73.3	11,177	8.80%	73.4	0.1	Negligible	Negligible / not significant
A12 (N) onslip at J29 Roundabout	10,674	12.10%	73.7	10,810	12.50%	73.8	0.1	Negligible	Negligible / not significant
A120 (E) offslip at J29 Roundabout	8,414	9.50%	72.3	8,648	10.20%	72.5	0.2	Negligible	Negligible / not significant
A120 (E) onslip at J29 Roundabout	9,857	9.90%	73.1	10,090	10.50%	73.3	0.2	Negligible	Negligible / not significant
A120 between J29 and A133	51,539	6.10%	79.6	52,513	7.20%	79.9	0.3	Negligible	Negligible / not significant
A120 between A133 and Harwich Road	14,257	11.40%	74.9	14,947	14.10%	75.5	0.6	Negligible	Negligible / not significant
A120 between Harwich Road and Bentley Road	14,439	12.10%	72.9	15,422	14.40%	73.5	0.7	Negligible	Negligible / not significant

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
A120 between Bentley Road and B1035	14,621	12.70%	73.0	15,572	15.00%	73.7	0.6	Negligible	Negligible / not significant
A120 East of B1035	17,868	11.90%	75.9	18,507	14.10%	76.4	0.4	Negligible	Negligible / not significant
A120 at Harwich	12,216	15.90%	74.8	12,854	18.80%	75.4	0.6	Negligible	Negligible / not significant
A133 between A120 and A133 Main Road	25,054	3.20%	76.0	25,447	3.90%	76.2	0.2	Negligible	Negligible / not significant
A133 between A133 Main Road and B1033	35,326	3.70%	77.6	35,616	4.20%	77.7	0.1	Negligible	Negligible / not significant
A133 between B1033 and B1027	23,629	2.70%	75.6	24,157	3.40%	75.9	0.2	Negligible	Negligible / not significant
A133 Clacton Road (Elmstead Market)	10,827	2.40%	69.6	10,917	2.40%	69.6	0.0	Negligible	Negligible / not significant
A133 Main Road	13,581	5.00%	69.4	13,722	5.00%	69.4	0.0	Negligible	Negligible / not significant
B1027 St John's Road (west of Clacton)	17,475	0.90%	69.1	17,575	0.90%	69.1	0.0	Negligible	Negligible / not significant
B1027 Colchester Road (St Osyth Park)	12,603	1.40%	72.6	12,632	1.40%	72.7	0.0	Negligible	Negligible / not significant
B1027 Valley Road (Clacton)	15,189	1.60%	68.8	15,422	2.20%	69.0	0.3	Negligible	Negligible / not significant

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
B1032 Frinton Road	7,822	1.90%	66.0	8,194	3.20%	66.6	0.7	Negligible	Negligible / not significant
B1032 Clacton Road	7,597	1.70%	70.5	7,973	3.00%	71.0	0.5	Negligible	Negligible / not significant
B1033 Colchester Road (west of B1441)	14,691	2.10%	73.5	15,059	3.10%	73.8	0.3	Negligible	Negligible / not significant
B1441 Clacton Road	6,255	2.60%	65.3	6,443	3.70%	65.8	0.5	Negligible	Negligible / not significant
B1414 Harwich Road	6,302	2.20%	65.2	6,491	3.30%	65.7	0.5	Negligible	Negligible / not significant
B1033 Frinton Road	12,344	1.80%	67.9	12,593	2.40%	68.2	0.3	Negligible	Negligible / not significant
B1033 Colchester Road (east of B1441)	9,890	2.40%	67.2	10,094	3.20%	67.5	0.4	Negligible	Negligible / not significant
B1035 Tendring Road	1,690	2.80%	63.1	2,008	6.40%	64.9	1.8	Low	Minor / not significant
B1035 Thorpe Road	2,458	2.30%	65.4	2,686	3.60%	66.1	0.8	Negligible	Negligible / not significant
B1035 south of A120	6,039	2.50%	69.7	6,317	3.50%	70.1	0.4	Negligible	Negligible / not significant
B1035 Clacton Road	8,910	2.50%	71.4	8,981	2.80%	71.5	0.1	Negligible	Negligible / not significant

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
B1029 Frating Road	2,343	2.24%	60.4	2,501	2.10%	60.8	0.3	Negligible	Negligible / not significant
Bentley Road	1,022	3.20%	59.3	1,624	15.20%	64.7	5.4	High	Major / significant
Bentley Road (40 mph limit applied)				1,624	15.20%	61.2	1.9	Low	Minor / not significant

Table 9.41: Construction Traffic Noise Assessment – BS5228 Haul Route

Road	Construction traffic		Predicted noise level (dB L_{Aeq})	Threshold	Difference	Impact magnitude	Effect	Significance
	HGVs	LDVs						
Waterhouse Lane	0	158	52	65	-13	Negligible	Minor	Not significant

9.11 ENVIRONMENTAL ASSESSMENT: OPERATIONAL PHASE

IMPACT 6: NOISE IMPACTS DURING THE OPERATION OF THE ONSS

9.11.1 An assessment has been made in accordance with the guidance contained in BS4142:2014+A1:2019 to determine whether noise emissions associated with the operation of the proposed OnSS is likely to give rise to adverse impacts at the closest residential receptors.

9.11.2 Noise levels from the OnSS have been predicted at the nearest residential receptors to the OnSS location within the study area, as set out in Table 9.42.

Table 9.42: OnSS Operational Noise Receptor Locations

ID	Name	X (OSGB36)	Y (OSGB36)
SSR1	Property South of Hungerdowns	607236	229625
SSR2	Mayfields Farm	607135	229511
SSR3	Bounds Farm	607189	229356
SSR4	Badley Hall	607173	228964
SSR5	Waterhouse Farm	607256	228374
SSR6	Lilleys Farm	607731	227827
SSR7	Normans Farm	608446	228492
SSR8	Mulberry Lodge	608753	228577
SSR9	Jubilee Villa	609061	228932

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

9.11.4 In conjunction with the MDS shown in Table 9.25, the modelling has assumed that the AIS substation would be chosen, as this has the potential to generate higher noise levels as the substation equipment is not housed within a building.

9.11.5 The operational noise levels of the plant associated with the OnSS have been provided by the Applicant and are shown in Table 9.43. Also included in the height that the source has been modelled at, which typically represents approximately 3/4 of the height of the plant.

Table 9.43: Operational Plant Associated with the OnSS

Item of plant	Sound power level, dB L_{WA}	Quantity	Source height, m
Power transformers	95	2	5
Shunt reactors (export)	92	6	5
Shunt reactors (33kV)	90	2	5
Statcom	85	2	3
Harmonic Filter	85	3	9
Transformer coolers	93	2	1.5
Shunt reactor coolers (export)	87	6	1.5
Shunt reactor coolers (33kV)	84	2	1.5
Statcom coolers	85	2	1.5

9.11.6 All sources have been modelled in their layout location based on AIS as point sources. The calculation follows the ISO 9613-2 methodology which accounts for the attenuation due to geometric spreading, atmospheric absorption, and barrier and ground effects. All attenuation calculations have been made on an octave band basis and therefore account for the sound frequency characteristics of the OnSS plant.

9.11.7 The calculated specific noise levels for the OnSS and all relevant factors to be considered when determining the operational noise impact, including the representative noise measurement location and survey data, are detailed in Table 9.44 and Table 9.45 for the daytime and night-time respectively. This approach is discussed further in Paragraph 9.5.11 to Paragraph 9.5.18 and summarised in Table 9.17.

9.11.8 It has been assumed that the specific noise from the operation of the OnSS contains a tone that is just perceptible at each receiver location as a worst case. BS4142:2014+A1:2019 applies a +2 dB correction for tone that is just perceptible.

Table 9.44: Daytime OnSS Operational Noise Assessment

NSR	NML	Specific noise level (dB L_{Aeq})	Character correction	Rating Level (dB $L_{Ar,Tr}$)	Day dB L_{A90}	Difference $L_{Ar,Tr}$ - L_{A90}	Change in day sound level, dB $L_{Aeq, 16hr}$		
							Existing	Revised	Change
SSR1	SML3	32	+2	34	34	0	44	44.3	+0.3
SSR2	SML3	32	+2	34	34	0	44	44.3	+0.3
SSR3	SML2	33	+2	35	32	+3	46	46.2	+0.2
SSR4	SML2	30	+2	32	32	0	46	46.1	+0.1
SSR5	SML2	33	+2	35	32	+3	46	46.2	+0.2
SSR6	SML6	33	+2	35	28	+7	46	46.2	+0.2
SSR7	SML5	38	+2	40	26	+14	42	43.4	+1.4
SSR8	SML5	34	+2	36	26	+10	42	42.7	+0.7
SSR9	SML1	31	+2	33	29	+4	40	40.5	+0.5

Table 9.45: Night-time OnSS Operational Noise Assessment

NSR	NML	Specific noise level (dB L_{Aeq})	Character correction	Rating Level (dB $L_{Ar,Tr}$)	Night dB L_{A90}	Difference $L_{Ar,Tr}$ - L_{A90}	Change in night sound level, dB $L_{Aeq, 8hr}$		
							Existing	Revised	Change
SSR1	SML3	32	+2	34	24	+10	36	37.5	+1.5
SSR2	SML3	32	+2	34	24	+10	36	37.5	+1.5
SSR3	SML2	33	+2	35	25	+10	35	37.2	+2.2
SSR4	SML2	31	+2	33	25	+8	35	36.3	+1.3
SSR5	SML2	33	+2	35	25	+10	35	37.2	+2.2
SSR6	SML6	33	+2	35	24	+11	37	38.5	+1.5
SSR7	SML5	38	+2	40	23	+17	34	39.5	+5.5
SSR8	SML5	35	+2	37	23	+14	34	37.3	+3.3
SSR9	SML1	31	+2	33	21	+12	32	34.5	+2.5

9.11.9 It can be seen from Table 9.44 that during the daytime the initial estimate of impact, obtained from subtracting the rating level from the background sound level, is of high magnitude at SSR7 and SSR8, medium at SSR6 and low at all other locations. When considering the context of the development, the rating level at all locations is below the threshold of LOAEL discussed in the WHO CNG of 50 dB $L_{Aeq,\ 16\ hour}$. The rating level is above the 'very low' level that is described in BS4142:1997 to be 'about 35 dB' at SSR7 and SSR8, but on or below this value at all other locations. The OnSS would have a negligible change on the existing sound level at all locations, except SSR7, where it would be a low impact.

9.11.10 During the night-time period, it can be seen from Table 9.45 that the initial estimate of impact would be high at all NSRs, except SSR4 where it would be of medium magnitude. However, as discussed in Paragraphs 9.5.12 and 9.5.15, during the night-time the absolute levels can be more relevant than the difference between the rating level and background sound level. Comparing the rating levels set out in Table 9.45 with the night-time rating level thresholds detailed in Table 9.17, a low impact is observed at all NSRs except for SSR7 and SSR8, which would be exposed to a medium impact. Considering this further, with the likely change in existing sound level, a high impact is predicted at SSR7, a medium impact at SSR8 and low impacts at all remaining receptors.

9.11.11 When considering all the above factors relevant to the determination of impacts, SSR7 and SSR8 would be exposed to a high magnitude of impact and all remaining receptors would be of low magnitude of impact. Low impacts upon a medium sensitive receptor results in a **minor effect**, which is not significant. High impacts upon a medium sensitive receptor results in a **major effect**, which is a significant effect without any mitigation.

9.11.12 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 OnSS and using buildings and other structures within the OnSS to form a noise barrier.

9.11.13 The exact reduction offered by the mitigation will depend on what is applied and where. A nominal 10 dB can be assumed as a realistically achievable value. The residual effects are summarised in Table 9.46 and Table 9.47 for the daytime and night-time respectively.

Table 9.46: Daytime OnSS Residual Operational Noise After Mitigation

NSR	NML	Specific noise level (dB L_{Aeq})	Character correction	Rating Level (dB $L_{Ar,Tr}$)	Day dB L_{A90}	Difference $L_{Ar,Tr}$ - L_{A90}	Change in evening sound level, dB $L_{Aeq, 4hr}$		
							Existing	Revised	Change
SSR1	SML3	22	+2	24	34	-10	44	44.0	0.0
SSR2	SML3	22	+2	24	34	-10	44	44.0	0.0
SSR3	SML2	23	+2	25	32	-7	46	46.0	0.0
SSR4	SML2	20	+2	22	32	-10	46	46.0	0.0
SSR5	SML2	23	+2	25	32	-7	46	46.0	0.0
SSR6	SML6	23	+2	25	28	-3	46	46.0	0.0
SSR7	SML5	28	+2	30	26	+4	42	42.2	+0.2
SSR8	SML5	24	+2	26	26	0	42	42.1	+0.1
SSR9	SML1	21	+2	23	29	-6	40	40.0	0.0

Table 9.47: Night-time OnSS Residual Operational Noise After Mitigation

NSR	NML	Specific noise level (dB L_{Aeq})	Character correction	Rating Level (dB $L_{Ar,Tr}$)	Night dB L_{A90}	Difference $L_{Ar,Tr}$ - L_{A90}	Change in night sound level, dB $L_{Aeq, 8hr}$		
							Existing	Revised	Change
SSR1	SML3	22	+2	24	24	0	36	36.2	+0.2
SSR2	SML3	22	+2	24	24	0	36	36.2	+0.2
SSR3	SML2	23	+2	25	25	0	35	35.3	+0.3
SSR4	SML2	21	+2	23	25	-2	35	35.2	+0.2
SSR5	SML2	23	+2	25	25	0	35	35.3	+0.3
SSR6	SML6	23	+2	25	24	+1	37	37.2	+0.2
SSR7	SML5	28	+2	30	23	+7	34	35.0	+1.0
SSR8	SML5	25	+2	27	23	+4	34	34.5	+0.5
SSR9	SML1	21	+2	23	21	+2	32	32.3	+0.3

9.11.14 It can be seen that the highest residual rating level would be 30 dB $L_{Ar, Tr}$, which is very low and would be of negligible impact magnitude during the night-time. Furthermore, the change in sound level at SSR7 would be low during the night-time and negligible during the day, and at all other locations there would be a negligible magnitude of impact during the day and the night. Therefore, in the context of the development and surrounding area, a negligible residual impact would result after mitigation. A negligible impact upon a medium sensitive receptor results in a **negligible residual effect**. This effect is considered not significant in terms of the 2017 EIA regulations.

9.11.15 It is noted that Little Bromley Parish Council raised concerns about substation noise and requested an understanding of what the likely increase in noise would be across the village after any mitigation. Figure 9.12 shows the calculated operational noise from the OnSS after mitigation, which is the specific sound level. Noise levels down to 15 dB L_{Aeq} have been shown include a wider area of Little Bromley village; however, in practice it would not be possible to measure levels below 20 dB L_{Aeq}. It should be noted that the rating level may be higher if an acoustic feature is audible at the receptor location.

9.11.16 It can be seen from Figure 9.12 that the OnSS would be situated to the east and just outside Little Bromley Parish Council boundary and that the specific noise level from the OnSS is in the region of 15 - 18 dB L_{Aeq} for the more populated area of the parish, Shop Road. Included in the parish are isolated dwellings, the closest to the OnSS being Normans Farm and Mulberry Lodge, that are assessed in detail above (SSR7 & SSR8). A small group of four dwellings are situated near to Jubilee Villa on Ardleigh Road which would be exposed to slightly lower (1 – 2 dB) sound levels from the OnSS than Jubilee Villa, which is assessed in detail above (SSR9).

606000
607000
608000
609000
610000
230000
229000
228000
227000

Dedham
Mistley
Lawford
Ardleigh
Little Bromley
Great Bromley
Elmstead

20 dB(A)Leq
25dB(A)Leq
30dB(A)Leq
35dB(A)Leq
40dB(A)Leq
30dB(A)Leq
25dB(A)Leq
20dB(A)Leq

Section 7
Section 6

N

LEGEND

- Onshore Order Limits
- Onshore Export Cable Corridor Section Division
- Onshore Export Cable Corridor
- Substation Operational Boundary
- Substation Operational Boundary 1 km Study Area
- Parish Boundary
- Specific Sound Level (5 dB LAeq Interval)

Sound Level (dB LAeq)

50

15

0 250 500
Metres

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
ONSHORE SUBSTATION OPERATIONAL NOISE LEVELS

VER	DATE	REMARKS	Drawn	Checked
1	05/02/2024	ES Submission	JO	JRS

DRAWING NUMBER: 9.12

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:15,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WINDFARM

9.12 ENVIRONMENTAL ASSESSMENT: CUMULATIVE EFFECTS

9.12.1 The cumulative impact assessments for noise and vibration has been undertaken in accordance with the methodology provided in Volume 6, Part 1, Chapter 3, Annex 3.1: Cumulative Effects Assessment Methodology.

9.12.2 The projects and plans selected as relevant to the assessment of impacts to noise and vibration are based upon an initial screening exercise undertaken on a long list. Each project, plan or activity has been considered and scoped in or out on the basis of effect–receptor pathway, data confidence and the temporal and spatial scales involved. For the purposes of assessing the impact of the VE on noise and vibration in the region, the cumulative effect assessment technical note submitted through the EIA Evidence Plan and forming Volume 6 Part 1, Chapter 3, Annex 3.1: Cumulative Effects Assessment screened in a number of projects and plans as presented in Table 9.49. The Tier structure is described in Volume 6 Part 1, Chapter 3, Annex 3.1: Cumulative Effects Assessment, and outlined here in Table 9.48Table 9.48. The Tiers are listed in descending order of detail likely to be available, and correspondingly, certainty of effects arising.

Table 9.48: Description of Tiers of Other Developments Considered for Cumulative Effect Assessment

Tiers	Development Stage
Tier 1	Projects under construction.
	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented.
	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted.
	Projects under the Planning Act 2008 where a PEIR has been submitted for consultation.
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted.
	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/ approvals, where such development is reasonably likely to come forward.

Table 9.49: Projects Considered Within the Noise and Vibration Cumulative Effect Assessment

Development type	Project	Status	Data confidence assessment/ phase	Tier
Battery storage	21/020270/FUL Battery storage facility	Consented	High – data presented in noise assessment	Tier 1
Substation	National Grid EACN substation	Not yet submitted	Low – no data available	Tier 3
Offshore wind farm	North Falls	PEIR submitted, EIA not yet submitted	Medium – PEIR data available	Tier 3

9.12.3 For the cumulative projects that are not yet constructed there is a potential that construction activities could occur concurrently. Table 9.50Table 9.50 sets out the scenarios considered in the cumulative assessment.

9.12.4 It should be noted that the following two projects are considered with greater certainty for the reasons described:

- North Falls OWF: In accordance with the provisions of NPS EN-5 to seek to develop co-ordination solutions for onshore grid connections, VE has been working with North Falls on a co-ordinated solution to reduce the overall environmental and community impacts of the proposals. The project includes almost fully overlapping, or combined onshore ECCs and a co-located site for the OnSS to the west of Little Bromley. It is proposed the two projects ducts will be installed adjacent to each other within the corridor. The level of co-ordination between the two projects has led to a higher degree of understanding and interactions with the North Falls proposals that can be used within the CEA than would be normal for other developments at a similar stage in the planning process.

  Due to the independent timescales for each project, three delivery scenarios have been developed (details of each scenario can be found within Volume 3, Chapter 1: Onshore Project Description). Each of these scenarios are discussed further from Paragraph 9.12.7 and have been considered in this noise impact assessment.

- Norwich to Tilbury Reinforcement Project: In order for VE to connect to the National Grid, the proposed National Grid Norwich to Tilbury Reinforcement Project and the associated EACN substation must be operational. National Grid has defined a construction and operational zone within which their EACN substation will be situated. This is adjacent to the VE OnSS zone.

  Despite its stage in the planning process, due to VE's reliance on this project for its connection to the National Grid, it has been given detailed consideration and treated with more certainty than other projects at similar stage in the planning process in the CEA. To assist with the assessment, it has been necessary to make assumptions as to the siting, scale, form and construction of the project, particularly the EACN substation. These assumptions have been checked and agreed to be appropriate and reasonable by National Grid. For the purposes of

the cumulative assessment of VE and National Grid Norwich to Tilbury Project, the worst case delivery scenario, with limited co-ordination has been assessed for the direct and indirect impacts.

Table 9.50: Cumulative MDS

Impact	Scenario	Justification
Impact 7: Cumulative construction noise with Landfall	North Falls Landfall is being constructed at the same time as VE in the same area.	This would result in the maximum possible cumulative construction noise impacts. If North Falls construction activity does not occur concurrently with VE then no cumulative impacts would occur.
Impact 8: Cumulative construction noise with onshore ECC	North Falls onshore ECC is being constructed at the same time as VE in the same area. Also North Falls onshore ECC is constructed shortly after VE onshore ECC in the same area.	This would result in the maximum possible cumulative construction noise impacts and also considers the maximum possible duration of exposure to construction noise
Impact 9: Cumulative construction noise with OnSS	The consented battery storage facility, proposed National Grid EACN substation and North Falls substation are all being constructed at the same time as VE OnSS.	Assumes maximum possible development consented and under construction concurrently. Consent applications have not yet been submitted for all cumulative developments, in which noise from VE should be assessed cumulatively.
Impact 10: Cumulative road traffic noise from construction vehicles	VE construction vehicles travelling on the road network at the same time as construction vehicles associated with North Falls and National Grid EACN substation infrastructure works.	Assesses maximum increase in road traffic noise associated with these developments. Consent applications have not yet been submitted for all cumulative developments, in which noise from VE should be assessed cumulatively.
Impact 11: Cumulative operational noise with OnSS	OnSS operating with battery storage facility, National Grid EACN substation and North Falls substation.	Assumes maximum possible development operating concurrently. Consent applications have not yet been submitted for all cumulative developments, in which noise from VE should be assessed cumulatively.

IMPACT 7: CUMULATIVE NOISE IMPACTS DURING CONSTRUCTION OF THE LANDFALL

9.12.5 It is noted in Paragraph 9.10.4 that the only Landfall construction works that has NSRs within the study area of 650 m from the activity taking place is a TCC at the end of Manor Way. Paragraph 9.10.12 confirms there would be a minor residual effect after mitigation at two properties, Sluice Cottages.

9.12.6 The only potential development listed in Table 9.49 near to the Landfall area is North Falls OWF. All Landfall construction activity associated with North Falls would take place at least 1 km from any NSR, including Sluice Cottages. At this distance, there would be no cumulative contribution of construction noise.

IMPACT 8: CUMULATIVE NOISE IMPACT DURING THE CONSTRUCTION OF THE ONSHORE ECC

9.12.7 Volume 6, Part 3, Chapter 1: Onshore Project Description describes three potential scenarios for the onshore delivery with cumulatively North Falls. In summary:

- Scenario 1 – VE proceeds to construction and undertakes the additional onshore cable trenching and ducting works for NF as part of a single programme of works (ducting for four electrical circuits). VE may also carry out some ground works (vegetation clearance, levelling, grading) in the wider substation zone where the North Falls substation will be located. VE would undertake the cable installation and OnSS build for its project only (two electrical circuits). The two projects would share accesses from the public highway for cable installation and substation construction. The projects would utilise and share the site accesses, haul roads and Temporary Construction Compounds (TCC) with North Falls for the cable installation works.
- Scenario 2 – Both VE and North Falls projects proceed to construction on different but overlapping timescales (between 1 and 3 years apart). Civil works would be undertaken independently but opportunities for reuse of enabling infrastructure e.g. haul roads, temporary construction compounds and site accesses are utilised with the other project reinstating.
- Scenario 3 – North Falls does not proceed to construction; or both VE and North Falls projects proceed to construction on significantly different programmes (over 3 years apart). In the latter case the significantly different programmes would mean that haul roads and TCC's are reinstated prior to the second project proceeding. In such case cumulative impacts are for a potential construction period of 6 years+. No reduction in overall impacts for the schemes from sharing of infrastructure. Paragraphs 9.10.20 to 9.10.58 set out the impacts for the construction of the ECC onshore ECC associated with VE assuming four sets of ducts all onshore cable trenching and ducting works are completed as part of a single civils campaign which result in a minor residual effect (Impact 2).

9.12.8 Scenario 1 equates to Impact 2 with the addition of some extra cable installation works for North Falls. Under Scenario 2 TCC and haul road impacts would be expected to be similar to Scenario 1 as this infrastructure is re-used by the second project. The other civils works (ducting, HDD works, joint bay installation) would be undertaken independently by VE and North Falls and could be carried out at the same time (which equates to Impact 2) or within three years. However, if done at overlapping times it is not expected that both projects would be undertaking civil works on the same sections of the route, but there is a potential for one project to be undertaking civil woks while the other installs cables on the same section. Similarly Scenario 3 also assumes the civil works is split between the two projects; however, over a much longer period of time such that infrastructure like haul roads and TCC are not retained and shared between projects.

9.12.9 Table 9.30 and Paragraph 9.10.30 confirm that Impact 2 considers three simultaneous duct installation work tasks taking place at any one time in close proximity to any NSR, each with a sound power level of 121 dB L_{WA}. This totals an equivalent sound power level of 126 dB L_{WA}. If, in addition to these tasks North Falls were installing their cables nearby, as per Scenario 1, a further sound power of 114 dB L_{WA} will be present (see Table 9.30). The revised total sound power level of the already assessed three duct installation works as part of Impact 2 and additional cable installation works would remain at 126 dB L_{WA}. Therefore, the magnitude of impact of construction noise associated with Scenario 1 and Scenario 2 with VE and North Falls civil works being carried out at the same time or within weeks of each other, would be no greater than those reported for Impact 2.

9.12.10 Scenario 2 with a gap of six months or greater between VE civils work and North Falls civils works, and Scenario 3 is likely to result in some reduction in the number of items of plant per project than assumed for Impact 2. Therefore, cumulative noise impacts for these Scenarios would be no greater and potentially less than those reported for Impact 2.

9.12.11 Therefore, cumulative construction of VE and North Falls onshore ECC would result in a low magnitude of impact, which upon a receptor of medium sensitivity is of **minor adverse** cumulative effect. This effect is considered not significant in terms of the 2017 EIA regulations.

IMPACT 9: CUMULATIVE NOISE IMPACT DURING THE CONSTRUCTION OF THE ONSS

9.12.12 All three proposed developments listed in Table 9.49 have the potential to add to the cumulative construction noise associated with the OnSS, including potential increase in the use, and duration of use, of the haul road in the CEA.

9.12.13 No construction noise assessment was carried out for the consented battery storage facility; presumably due to the scale of the development, amount of construction required and the distance to the nearest sensitive receptors. Notwithstanding this, worst case assumptions can be made to allow for noise from its construction contributing to the cumulative level.

9.12.14 Also, no construction noise assessment is available for the National Grid EACN substation as the planning application has not yet been submitted. The National Grid planning team has provided an approximate location of their EACN substation. It is reasonable to assume that similar construction operations will be required for the National Grid EACN substation as for VE OnSS.

9.12.15 A construction noise assessment was carried out for North Falls during the PEIR stage. During the PEIR stage, the location of the North Falls onshore substation was not finalised and a large search area was included. The North Falls PEIR construction noise assessment assumed a worst case by considering the impacts if construction activity took place at the closest point within their search area to the nearby receptors.

9.12.16 Further information has been provided by the North Falls project team regarding the location of their onshore substation. A more precise position adjacent to, and north east of, the VE OnSS has been confirmed. It is reasonable to assume that similar construction operations will be required for the North Falls substation as for VE OnSS.

9.12.17 In the absence of construction noise predictions for any of the cumulative developments, a simplified approach has been taken based on worst case assumptions of similar construction activity taking place at all sites.

9.12.18 The assessment of construction noise associated with VE (Impact 3) is summarised in Table 9.37. The reasonable maximum possible cumulative construction noise levels at each of the NSRs listed in the table are considered further.

9.12.19 The construction of VE OnSS would result in a negligible effect during the daytime, as detailed in Paragraph 9.10.63, because predicted noise levels do not exceed the threshold of 65 dB. A significant cumulative impact would only occur during the daytime if the total construction noise level exceeded 68 dB for a period of 10 or more days in any 15 consecutive days, which equates to a medium impact as set out in Table 9.14.

9.12.20 A simplified approach can be applied to Mulberry Lodge, Waterhouse Farm and Badley Hall for daytime cumulative construction noise. If all other construction works resulted in the maximum possible noise level without a significant effect, these receptors would be exposed to 68 dB. The highest level of noise during the construction of VE OnSS would be 56 dB, as given in Table 9.37. The cumulative effect of adding these two levels of noise, totals 68 dB and therefore construction noise associated with the VE OnSS would not increase the overall cumulative construction noise level. Therefore, the maximum possible cumulative noise impact during the daytime at these NSRs would be low which is of **minor effect** and is not significant in EIA terms.

9.12.21 At Normans Farm, the highest level of VE OnSS construction noise is 60 dB during site enabling works, as given in in Table 9.37. North Falls substation is proposed to be located at a comparable distance from Normans Farm as VE OnSS; therefore, similar construction noise levels are likely to occur. Both National Grid EACN substation and the battery storage facility are approximately twice the distance away from Normans Farm than VE OnSS. For individual point source noise levels that are in the far field of a receptor, which is the case here for all construction noise sources experienced at Normans Farm, the level of noise attenuates by 6 dB for a doubling of distance. It is therefore possible that if all cumulative developments carry out site enabling works at the same time, the levels of noise at Normans Farm would be 60 dB from VE and North Falls, and 56 dB from National Grid and the battery storage. The cumulative effect of adding these four levels of noise, totals 64 dB which is of negligible magnitude. Therefore, the maximum possible cumulative noise impact during the daytime at Normans Farm would be negligible which is of **negligible effect** and is not significant in EIA terms.

IMPACT 10: CUMULATIVE NOISE FROM CONSTRUCTION VEHICLES

9.12.22 In addition to the assessment carried out for the impacts of VE construction traffic noise, summarised in Table 9.40, a separate set of traffic flow data has been provided which accounts for the construction traffic associated with VE and:

- North Falls OWF;
- National Grid EACN substation;
- EN010078 East Anglia Two Offshore Wind Farm which could consist of up to 75 turbines, generators and associated infrastructure , with an installed capacity of up to 900MW, located 37km from Lowestoft and 32km from Southwold;
- EN010012 Sizewell C nuclear generating station located near the village of Sizewell, Suffolk;
- 19/00524/OUT, mixed development including 280 dwellings, a two form of entry primary school, 56 place early years nursery, up to 3000 sqm of office (B1) buildings on Land to The South of Thorpe Road Weeley Essex CO16 9AJ;
- 21/02070/FUL, 50MW battery energy storage system on land adjacent to Lawford Grid Substation, Ardleigh Road Little Bromley Essex CO11 2QB;
- 20/00179/FUL, residential development to provide 50 dwellings at land at Oakwood Park;
- 20/01130/FUL, residential development to provide 122 dwellings on land South of Centenary Way and west of Thorpe Road, Clacton on Sea Essex CO15 4QD; and
- 23/01594/FUL, reclamation of Bathside Bay and development to provide an operational container port, Bathside Bay Stour Road Harwich Essex CO12 3HF.

9.12.23 Table 9.51 presents a summary of the road links assessed, the cumulative traffic data and the HGV corrected basic noise level. The impact magnitude of the change in BNL as a result of cumulative construction traffic noise has been determined using Table 9.15.

9.12.24 One road link provided was noted to have a level of flow that was below the validity of the calculation method; therefore, as specified in Paragraph 9.4.41, the haul route calculation method provided in BS5528-1:2009+A1:2014 has been used to determine the likely noise from construction vehicles. Table 9.52 summarises this link and the calculated total noise from construction HGV and LDVs at a reference distance of 10 m. The impact magnitude has been determined using Table 9.14.

9.12.25 Cumulative construction traffic noise is predicted to have a high magnitude of impact on Bentley Road and a negligible or low magnitude of impact at all other roads assessed.

9.12.26 If a temporary speed limit of 40 mph is applied on Bentley Road during construction works, as discussed in Paragraph 9.10.84, the change in BNL reduces to 4.8 dB. The magnitude of this impact will have reduced to medium, which upon medium sensitivity receptors would be of moderate significant effect. Therefore, further mitigation would be necessary to reduce the magnitude of impact on Bentley Road. As calculations assume a worst case, the impacts may not be as high as those reported. It is therefore recommended that noise from road traffic using Bentley Road is monitored in accordance with CRTN, prior to, and during construction to monitor any increases. If an increase of 3 dB or greater is detected further mitigation will be required to control road traffic noise. This could include the use of temporary speed limits below 40 mph, re-routing of construction vehicles, particularly HGVs, sound insultation works to those properties affected, or other similar measures. With the noise levels monitored and appropriate mitigation in place a low residual magnitude of impact would be present.

9.12.27 Such impacts (negligible and low) upon medium sensitive receptors would result in a **minor effect** and not significant in terms of the 2017 EIA regulations.

Table 9.51: Cumulative Construction Traffic Noise Assessment - Change in BNL

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
A12 (N)	70,060	9.50%	81.5	71,686	1.80%	81.8	0.3	Negligible	Negligible / not significant
A12 (S)	81,553	8.30%	82.0	83,171	9.50%	82.3	0.3	Negligible	Negligible / not significant
A12 (S) onslip at J29 Roundabout	14,474	9.80%	74.7	14,720	10.60%	74.9	0.2	Negligible	Negligible / not significant
A12 (N) offslip at J29 Roundabout	11,040	8.40%	73.3	11,261	9.10%	73.5	0.2	Negligible	Negligible / not significant
A12 (N) onslip at J29 Roundabout	10,674	12.10%	73.7	10,891	12.90%	73.9	0.2	Negligible	Negligible / not significant
A120 (E) offslip at J29 Roundabout	8,414	9.50%	72.3	8,759	10.60%	72.7	0.3	Negligible	Negligible / not significant
A120 (E) onslip at J29 Roundabout	9,857	9.90%	73.1	10,191	10.80%	73.3	0.3	Negligible	Negligible / not significant
A120 between J29 and A133	51,539	6.10%	79.6	52,884	7.60%	80.0	0.4	Negligible	Negligible / not significant
A120 between A133 and Harwich Road	14,257	11.40%	74.9	15,333	15.30%	75.7	0.8	Negligible	Negligible / not significant
A120 between Harwich Road and Bentley Road	14,439	12.10%	72.9	15,946	15.40%	73.8	0.9	Negligible	Negligible / not significant

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
A120 between Bentley Road and B1035	14,621	12.70%	73.0	16,087	15.90%	73.9	0.9	Negligible	Negligible / not significant
A120 East of B1035	17,868	11.90%	75.9	18,664	14.50%	76.5	0.5	Negligible	Negligible / not significant
A120 at Harwich	12,216	15.90%	74.8	13,004	19.40%	75.5	0.7	Negligible	Negligible / not significant
A133 between A120 and A133 Main Road	25,054	3.20%	76.0	25,467	3.90%	76.2	0.2	Negligible	Negligible / not significant
A133 between A133 Main Road and B1033	35,326	3.70%	77.6	35,653	4.20%	77.7	0.1	Negligible	Negligible / not significant
A133 between B1033 and B1027	23,629	2.70%	75.6	24,212	3.40%	75.9	0.2	Negligible	Negligible / not significant
A133 Clacton Road (Elmstead Market)	10,827	2.40%	69.6	10,947	2.40%	69.6	0.0	Negligible	Negligible / not significant
A133 Main Road	13,581	5.00%	69.4	13,758	4.90%	69.4	0.0	Negligible	Negligible / not significant
B1027 St John's Road (west of Clacton)	17,475	0.90%	69.1	17,591	0.90%	69.1	0.0	Negligible	Negligible / not significant
B1027 Colchester Road (St Osyth Park)	12,603	1.40%	72.6	12,633	1.40%	72.7	0.0	Negligible	Negligible / not significant
B1027 Valley Road (Clacton)	15,189	1.60%	68.8	15,442	2.20%	69.1	0.3	Negligible	Negligible / not significant

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
B1032 Frinton Road	7,822	1.90%	66.0	8,216	3.20%	66.7	0.7	Negligible	Negligible / not significant
B1032 Clacton Road	7,597	1.70%	70.5	7,980	3.10%	71.0	0.5	Negligible	Negligible / not significant
B1033 Colchester Road (west of B1441)	14,691	2.10%	73.5	15,063	3.10%	73.8	0.3	Negligible	Negligible / not significant
B1441 Clacton Road	6,255	2.60%	65.3	6,444	3.70%	65.8	0.5	Negligible	Negligible / not significant
B1414 Harwich Road	6,302	2.20%	65.2	6,493	3.30%	65.7	0.5	Negligible	Negligible / not significant
B1033 Frinton Road	12,344	1.80%	67.9	12,609	2.40%	68.2	0.3	Negligible	Negligible / not significant
B1033 Colchester Road (east of B1441)	9,890	2.40%	67.2	10,097	3.20%	67.5	0.4	Negligible	Negligible / not significant
B1035 Tendring Road	1,690	2.80%	63.1	2,038	6.30%	65.0	1.9	Low	Minor / not significant
B1035 Thorpe Road	2,458	2.30%	65.4	2,714	3.60%	66.2	0.8	Negligible	Negligible / not significant
B1035 south of A120	6,039	2.50%	69.7	6,353	3.50%	70.1	0.4	Negligible	Negligible / not significant
B1035 Clacton Road	8,910	2.50%	71.4	8,984	2.80%	71.5	0.1	Negligible	Negligible / not significant

Road	Without construction traffic			With construction traffic			Change in BNL	Impact magnitude	Effect / Significance
	AAWT	% HGV	BNL	AAWT	% HGV	BNL			
B1029 Frating Road	2,343	2.24%	60.4	2,658	1.97%	61.1	0.6	Negligible	Negligible / not significant
Bentley Road	1,022	3.20%	59.3	2,134	22.10%	67.3	8.0	High	Major / significant

Table 9.52: Cumulative Construction Traffic Noise Assessment – BS5228 Haul Route

Road	Construction traffic		Predicted noise level (dB L_{Aeq})	Threshold	Difference	Impact magnitude	Effect	Significance
	HGVs	LDVs						
Waterhouse Lane	0	316	53	65	-12	Negligible	Minor	Not significant

IMPACT 11: CUMULATIVE NOISE IMPACT DURING THE OPERATION OF THE ONSS

9.12.28 If all developments listed in Table 9.49 are consented, the operational noise associated with each development has the potential to produce a cumulative impact at nearby NSRs.

9.12.29 For the three proposed substations associated with VE, North Falls and National Grid EACN, a reduced noise limit can be considered, such that the cumulative noise would not be significant. The magnitude of impact of operational noise is discussed in Paragraph 9.5.11 to Paragraph 9.5.18. A rating level of 35 dB $L_{Ar,Tr}$ would be of low magnitude of impact.

9.12.30 If 35 dB L_{ArTr} is apportioned at an NSR based on the likely noise levels produced by each of the substations. This affords more of the noise level to the development that is closest to the NSR. Table 9.53 sets out suggested noise limits that when added together result in a cumulative noise impact of a low magnitude.

Table 9.53: Cumulative Operational Noise Limits

Noise Sensitive Receptor Details				Noise Limit, dB L_{ArTr}		
ID	Name	X	Y	VE	North Falls	National Grid EACN
SSR1	Property South of Hungerdowns	607236	229625	29	28	33
SSR2	Mayfields Farm	607135	229511	28	27	33
SSR3	Bounds Farm	607189	229356	26	24	34
SSR4	Badley Hall	607173	228964	28	25	33
SSR5	Waterhouse Farm	607256	228374	32	28	31
SSR6	Lilleys Farm	607731	227827	32	30	27
SSR7	Normans Farm	608446	228492	31	33	23
SSR8	Mulberry Lodge	608753	228577	29	33	23
SSR9	Jubilee Villa	609061	228932	30	33	26
SSR10	Hollylodge Farm	609483	229368	29	32	29
SSR11	Grange Farm	608681	230164	30	31	28
SSR12	69 Hungerdown Lane	607379	229920	30	30	31

9.12.31 It should be noted this approach assumes that the same acoustic character correction is applied to the specific noise level from the individual substations.

9.12.32 Table 9.47 sets out the night-time residual operational noise from VE OnSS after mitigation for receptors SSR1 to SSR9. For completeness, Table 9.54 contains the residual night-time rating level at all receptors in Table 9.53, including those more distant to VE OnSS.

Table 9.54: Night-time Cumulative Operational Noise Assessment

ID	VE Rating Level, dB L_{ArTr}	Limit, dB L_{ArTr} (Table 9.53)	Difference, dB L_{ArTr} - Limit
SSR1	24	29	-5
SSR2	24	28	-4
SSR3	25	26	-1
SSR4	23	28	-5
SSR5	25	32	-7
SSR6	25	32	-7
SSR7	30	31	-1
SSR8	27	29	-2
SSR9	23	30	-7
SSR10	17	29	-12
SSR11	20	30	-10
SSR12	23	30	-7

9.12.33 It can be seen from Table 9.54 that the operational noise rating level from OnSS would not exceed the apportioned noise limits at any NSR. Therefore, the highest cumulative impact would be of low magnitude upon medium sensitive receptors. This would be of **minor effect** and is not significant in EIA terms. Furthermore, the DCO will include a requirement for a noise investigation protocol which will enable the three developments to efficiently review any valid complaint and for remedial actions to be taken at the appropriate development.

9.12.34 Further consideration can be given to the battery storage facility which already has planning consent. The planning consent does not contain any conditions controlling the operational noise and it would not be possible to set noise limits that would be controlled through planning.

9.12.35 The noise assessment for the battery storage facility reported a rating level of 35 dB $L_{Ar,\ Tr}$ at Waterhouse Farm (SSR5) during the night when background levels were typically 32 dB L_{A90}. The addition of OnSS operational noise at 25 dB $L_{Ar,\ Tr}$ results in a total rating level of 35 dB $L_{Ar,\ Tr}$. Therefore, the VE OnSS operational noise would not influence cumulative noise level at this NSR, which do not exceed 35 dB L_{ArTr} and therefore, are of low magnitude upon medium sensitive receptors. This would be of **minor effect** and is not significant in EIA terms.

9.13 CLIMATE CHANGE

9.13.1 The information provided in this section will be drawn upon and summarised in Volume 6, Part 4, Chapter 1: Climate change. As outlined in Volume 6, Part 4, Chapter 1: Climate Change, the operational phase of VE would enable the use of renewable electricity which would result in a positive greenhouse gas impact, resulting in a significant beneficial effect.

EFFECT OF CLIMATE CHANGE ON THE LOCAL ENVIRONMENT

9.13.2 Meteorological conditions influence the propagation of sound. Noise levels experienced at a receptor, from the same source, can differ slightly on different days. For example, a dwelling 500 m from a busy road may experience more road traffic noise on a cold day than on a hot summer's day with no change in the number or speed of vehicles on the road. This same noise source would also increase when it is raining as the level of noise from vehicle tyres would be greater. Similarly, the strength and direction of wind influences sound propagation, with greatest noise levels experienced when the receiver is down wind of the noise source.

9.13.3 The variability of sound propagation is recognised in the relevant standards and guidance documents that sets limits. When predicting a level of noise from a proposed source, set meteorological parameters are used which represent a worst case, usually the highest level of noise from the proposed source. When assessing the impacts of a proposed source of sound against an existing noise climate, pre-development noise measurements are taken over a sufficient period of time to account for the inherent variability of environmental sound. A statistical approach is then applied to arrive at a single noise level representative of the overall noise level.

9.13.4 The alterations in meteorological conditions highlighted to be introduced by climate change will not result in a change in the range of environmental noise level experienced. There is potential for the number of quieter or noisier days to change with the different weather patterns brought about by climate change.

EFFECT OF CLIMATE CHANGE AND THE PROJECT ON THE LOCAL ENVIRONMENT

9.13.5 Operational noise from VE is limited to the OnSS. Climate change will not alter the level of sound produced by the plant within the substation. The calculations assume worst case meteorological conditions that favour sound propagation, which will not increase as a result of climate change. Therefore, climate change is not considered likely to alter the impacts of the Airborne Noise and Vibration assessment.

9.14 INTER-RELATIONSHIPS

9.14.1 The inter-related effects assessment considers likely significant effects from multiple impacts and activities from the construction, operation and decommissioning of VE on the same receptor, or group of receptors. Such inter-related effects include both:

- **project lifetime effects:** i.e. those arising throughout more than one phase of the project (construction, operation, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation; and
- **receptor led effects:** Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

9.14.2 No project lifetime effects would occur at a receptor, as noise would dissipate once a phase of the project, e.g. construction, passes.

9.14.3 Receptor let effects concern the accumulation of impacts on a single receptor between Noise and Vibration and other environmental disciplines. It is considered likely that during the construction phase, human receptors impacted by noise and vibration are also likely to be affected by traffic and air quality impacts, which is considered in in Volume 6 Part 3, Chapter 9: Traffic and Transport and in Volume 6 Part 3, Chapter 10: Air Quality respectively. It is not anticipated that these inter-relationships will lead to any significant effects greater than the assessments presented for each discipline.

9.15 TRANSBOUNDARY EFFECTS

9.15.1 Transboundary noise and vibration effects from the construction, operation and decommissioning of VE have been scoped out as there are no likely significant effects. There are no noise and vibration transboundary effects.

9.16 SUMMARY OF EFFECTS

9.16.1 This assessment has considered the potential noise and vibration effects arising from onshore activities associated with VE. Consideration has been given to potential worst-case effects arising from onshore construction activities and the operation of the substation based upon available information. Worst-case parameters have been adopted to provide a robust assessment.

9.16.2 The approach undertaken was based upon the PINS Scoping Opinion (PINS, 2021), consultation carried out with Tendring District Council and Essex County Council and during the ETG meetings on 3 November 2022 and 2 October 2023.

9.16.3 A summary of all significant effects is presented in Table 9.55. There are no significant residual effects after additional mitigation detailed in Section 9.10, Section 9.11 and summarised below in Table 9.55, and the embedded mitigation set out in Section 9.9 and Table 9.26.

Table 9.55: Summary of Effects for Noise and Vibration

Description of impact	Effect	Additional mitigation measures	Residual impact
Construction			
Landfall construction noise – construction and removal of Beach Works TCC only	Major adverse	Examples include: quieter equipment, relocation of plant, and the use of barriers or enclosures.	No significant adverse residual effects
Landfall construction vibration	Minor	Not Applicable – no additional mitigation required	No significant adverse residual effects
Onshore ECC construction noise	Major adverse	Careful positioning of route / drilling of crossings. Use of	No significant adverse residual effects

Description of impact	Effect	Additional mitigation measures	Residual impact
		barriers, enclosures or quieter techniques where necessary.	
Onshore ECC construction vibration	Minor	Not Applicable – no additional mitigation required	No significant adverse residual effects
OnSS construction noise	Negligible	Not Applicable – no additional mitigation required	No significant adverse residual effects
OnSS construction vibration	Negligible	Not Applicable – no additional mitigation required	No significant adverse residual effects
Bentley Road widening construction noise	Major adverse	Examples include: quieter equipment, relocation of plant, and the use of barriers.	No significant adverse residual effects
Bentley Road widening construction vibration	Major adverse	Careful selection of compactor roller to reduce vibration source.	No significant adverse residual effects
Construction vehicular noise	Major adverse	Reduction of speed limit to 40 mph along Bentley Road.	No significant adverse residual effects
Operation			
OnSS operational noise	Major adverse	Examples include: quieter electrical components, enclosures, silencers sound proofing grilles for fans. localised screening, noise barriers, or repositioning.	No significant adverse residual effects
Cumulative			
Cumulative Landfall construction noise	Minor	Not Applicable – no additional mitigation required	No significant adverse residual effects

Description of impact	Effect	Additional mitigation measures	Residual impact
Cumulative onshore ECC construction noise	Minor	Not Applicable – no additional mitigation required	No significant adverse residual effects
Cumulative OnSS construction noise	Minor	Not Applicable – no additional mitigation required	No significant adverse residual effects
Cumulative construction vehicular noise	Major adverse	Reduction of speed limits along Bentley Road. Monitoring of noise from vehicles using Bentley Road prior to and during construction.	No significant adverse residual effects
Cumulative OnSS operational noise	Minor	Not Applicable – no additional mitigation required. Complaint investigation protocol to be included in the DCO to protect residents.	No significant adverse residual effects

9.17 REFERENCES

Acoustics and Noise Consultants (2020). 'BS 4142:2014+A1:2019 Technical Note'. ANC

BSI (2014). 'BS5228:2009+A1:2014 Parts 1 & 2 – Code of Practice for Noise and Vibration Control on Construction and Open Sites'. British Standards Institute

BSI (2019). 'BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound'. British Standards Institute.

Department of Transport (1988). 'Calculation of Road Traffic Noise'. HMSO

Highways England (2020). 'Design Manual for Roads and Bridges - LA 111 Noise and Vibration' available online from: https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true [accessed November 2022]

Institute of Environmental Management and Assessment (2014). 'Guidelines for Environmental Noise Impact Assessment'. Ruddocks.

Martin D.J. (1980). 'Ground vibrations from impact pile driving during road construction'. Transport and Road Research Laboratory, TRL Supplementary Report 544.

Tendring District Council (2021). 'Tendring District Local Plan 2013-2033 and Beyond: North Essex Authorities Shared Strategic Section 1'. Available online from: https://www.tendringdc.gov.uk/localplan [accessed November 2022]

Tendring District Council (2022). 'Tendring District Local Plan 2013-2033 and Beyond: Section 2'. Available online from: https://www.tendringdc.gov.uk/localplan [accessed November 2022]

The Department for Energy Security & Net Zero (2023). National Policy Statement for Energy (EN-1)' available online from: https://assets.publishing.service.gov.uk/media/65a7864e96a5ec0013731a93/overarching-nps-for-energy-en1.pdf [accessed January 2024]

The Department for Energy Security & Net Zero (2023). National Policy Statement for Renewable Energy Infrastructure (EN-3)' available online from: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf [accessed January 2024]

The Department for Energy Security & Net Zero (2023). 'National Policy Statement for Networks Infrastructure (EN-5)' available online from: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf [accessed January 2024)

The Department for Environment, Food and Rural Affairs (2010). 'Noise Policy Statement for England. Available online from: https://www.gov.uk/government/publications/noise-policy-statement-for-england [accessed November 2022]

The Department for Levelling Up, Housing and Communities (2012). 'National Planning Policy Framework'. Available online from: https://www.gov.uk/guidance/national-planning-policy-framework [accessed November 2022]

The Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (2016). 'Planning Practice Guidance' available online from: https://www.gov.uk/government/collections/planning-practice-guidance [accessed November 2022]

The UK Government (1974), 'Control of Pollution Act Part III'. HMSO

The UK Government (1990), 'Environmental Protection Act, Part III'. HMSO

The World Health Organisation (1999). 'Community Noise Guidelines'. WHO

The World Health Organisation (2009). 'Night Noise Guidelines'. WHO

The World Health Organisation (2018). ‘Environmental Noise Guidelines for the European Region’. WHO

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