FIVE ESTUARIES OFFSHORE WIND FARM

PRELIMINARY ENVIRONMENT INFORMATION REPORT

VOLUME 3, CHAPTER 1: ONSHORE PROJECT DESCRIPTION

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Project	Five Estuaries Offshore Wind Farm
Sub-Project or Package	Preliminary Environment Information Report
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Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
A	Mar-23	Final for PEIR	SLR	GoBe	VE OWFL

CONTENTS

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FIGURES

DEFINITION OF ACRONYMS

Term	Definition
AIS	Air Insulated Switchgear
Array areas	The area where the WTGs will be located.
Cable works TCC	TCC associated with cable works
CBS	Cement bound sand
CfD	Contract for Difference
DCO	Development Consent Order
DOB	Depth of burial
DOE	Depth of excavation
EACN	East Anglia Connection Node
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
IEMA	Institute of Environmental Management & Assessment
LGV	Light goods vehicles
MDS	Maximum Design Scenario
MOT	Ministry of Transport
NF	North Falls
NGET	National Grid Electricity Transmission
NPS	National Policy Statement
O&M	Operation and maintenance
OnSS	Onshore Substation
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate

Term	Definition
PRoW	Public Right of Way
RLB	Red Line Boundary
TCCs	Temporary Construction Compound
TDC	Tendring District Council
TJB	Transition Joint Bay
VE	Five Estuaries Offshore Wind Farm
VE OWFL	Five Estuaries Offshore Wind Farm Limited
WTG	Wind Turbine Generators

GLOSSARY OF TERMS

Term	Definition
400 kV connection	400 kV cable connection between the proposed VE substation (OnSS) and the grid connection point
DCO	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) which would be approved by the relevant Secretary of State (SoS).
ES	Environmental Statement (the documents that collate the processes and results of the EIA).
Grid Connection Point	The point at which the Onshore ECC connects to the National Grid.
Jointing Pit	An underground structure where sections of cable are joined within cable ducts.
Landfall	The landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore cable circuits in TJBs.
MDS	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 embedded (part of the project design) or secondarily added to reduce impacts through the assessment process.
Onshore ECC	At PEIR, the Onshore ECC is the wider cable corridor within which the typically 60 m cable route is located. The Onshore ECC is typically approximately 200m to 250 m wide, however some areas require a wider corridor (such as where trenchless crossing may take place).
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 (STC) for supply to the National Grid substation.
OnSS access zone	The area which will contain the final OnSS access route (both construction and operational).

Term	Definition
OnSS construction zone	The area in which the final OnSS temporary construction compound (TCC) footprint will be located.
OnSS zone	The area in which the final OnSS footprint will be located.
Route section	A defined section of the route.
TJB	Transition Joint Bay is an underground unit where the offshore cable is jointed the onshore cable.

1 ONSHORE PROJECT DESCRIPTION

1.1 INTRODUCTION

1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) describes the onshore elements of the proposed Five Estuaries Offshore Wind Farm Limited (VE). It sets out the VE design and components for the onshore infrastructure associated with the construction, operation and maintenance (O&M) and decommissioning of the Project.

1.1.2 This chapter has been prepared by Five Estuaries Offshore Wind Farm Limited (VE OWFL) (hereafter, VE), and sets out:

- The design envelope approach. This Chapter includes the design envelope for the onshore project components and the techniques used to build, operate and decommission the onshore elements of VE;
- Consultation relating to the onshore project design undertaken to date;
- An overview of the project location and proposed onshore site boundaries; and
- The onshore project programme.

1.1.3 The Landfall for the purpose of this chapter means the point at which the offshore export cables (below Mean High Water Springs) meet the onshore export cables (above Mean Low Water Springs). Full details of the offshore elements of VE, including the description of the Landfall and associated works, is provided in Volume 2, Chapter 1: Offshore Project Description.

1.1.4 A detailed description of the site selection process that has resulted in the selection of the locations of project infrastructure and routes taken is also provided in Volume 1, Chapter 4: Site Selection and Alternatives.

CO-ORDINATION AND WORKING WITH NORTH FALLS OFFSHORE WIND FARM

1.1.5 VE have kept a wide RLB for PEIR to allow maximum flexibility for co-ordination with North Falls Offshore Wind Farm (OWF) on the most appropriate onshore ECC alignment for both projects to lay their cables whilst reducing the impact to the environment, communities and each other. For the OnSS, SSA West overlaps with the proposed search areas for both the onshore substation for the North Falls Offshore Windfarm project and the National Grid Electricity Transmission (NGET) East Anglia Connection Node substation. We are working with North Falls to ensure any proposals are coordinated. VE have also maintained the option to locate its OnSS on its own away from the proposed substations of NGET and North Falls within SSA East to provide flexibility for the project.

1.1.6 VE will continue to work with North Falls OWF to look at opportunities for co-ordination during construction to minimise the overall impact of the two projects. More information along with refined proposals will be provided with the Development Consent Order (DCO) application.

1.2 ONSHORE PROJECT OVERVIEW

1.2.1 This section provides a summary description of the area within which the onshore elements of VE will be constructed.

1.2.2 The onshore elements of VE are located entirely within the administrative boundary of Essex County Council and Tendring District Council (TDC) in south-east England.

1.2.3 The export cable configuration will include up to four cable circuits connecting the offshore substation to the proposed Onshore Substation (OnSS) and into the proposed NGET East Anglia Connection Node Substation (EACN). The location for this is still being considered by NGET at this stage and is subject to a separate consent process.

1.2.4 Figure 1.1 shows the onshore Export Cable Corridor (ECC), proposed substation search areas and the landfall location options.

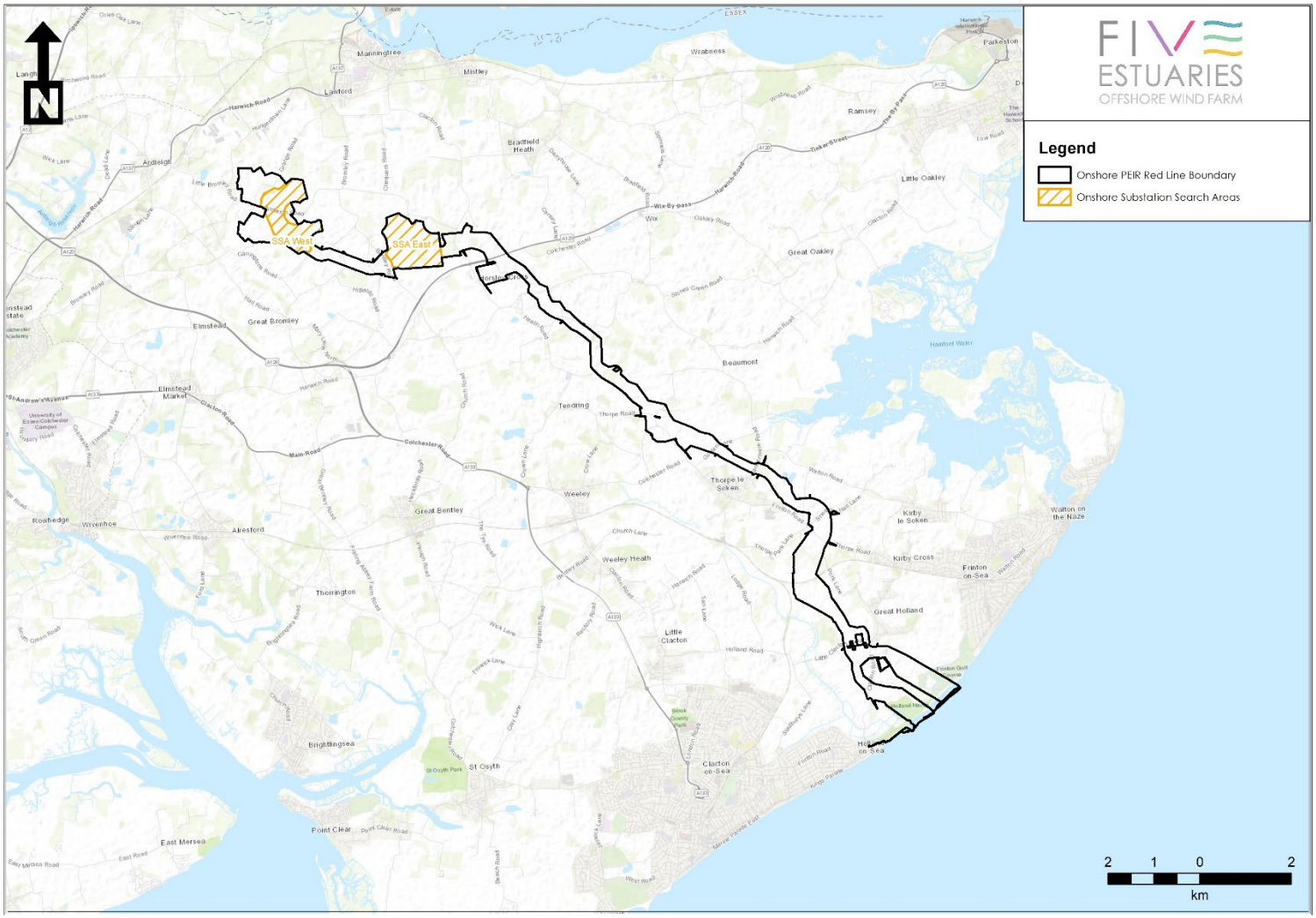


Figure 1.1: Onshore Export Cable Corridor (ECC), proposed OnSS search areas (SSAs) and Landfall location options

1.2.5 The onshore aspects of the project are:

- **Landfall:** the area from Mean Low Water to where the offshore export cables are connected to the onshore cable circuits within TJBs. There are currently two options being explored as part of the PEIR. A final option will be presented at DCO.
- **Onshore export cable corridor (ECC)**: where permanent infrastructure connects the cables at Landfall to the proposed OnSS and the onwards link to the proposed EACN Substation; and
- **Onshore substation (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 (STC) for supply to the EACN Substation. For the purposes of this PEIR, two substation search areas are considered (SSA East and SSA West), a final option will be presented at DCO.
- **Connection to the National Grid** will include 400kV underground circuit(s) running from the proposed VE OnSS (in either SSA East or SSA West) to the new NGET EACN Substation

1.2.6 Within these areas, VE will comprise cable circuits and associated infrastructure required to transmit the electricity generated to the National Grid network via a proposed grid connection. The transmission voltage will be up to 400 kV, with a maximum four circuits, and will use High Voltage Alternating Current (HVAC) technology.

1.2.7 The key permanent onshore components of VE will include:

- Infrastructure at landfall where the offshore cables are brought ashore;
- Up to four TJBs connecting the offshore cables to the onshore cables;
- Underground cable ducts, joint pits and cables;
- The construction of the proposed OnSS; and
- Underground cable ducts, joint pits and cables for the grid connection from the proposed OnSS to the proposed EACN.

1.2.8 The onshore cable corridor will be up to 27 km from landfall to the proposed EACN.

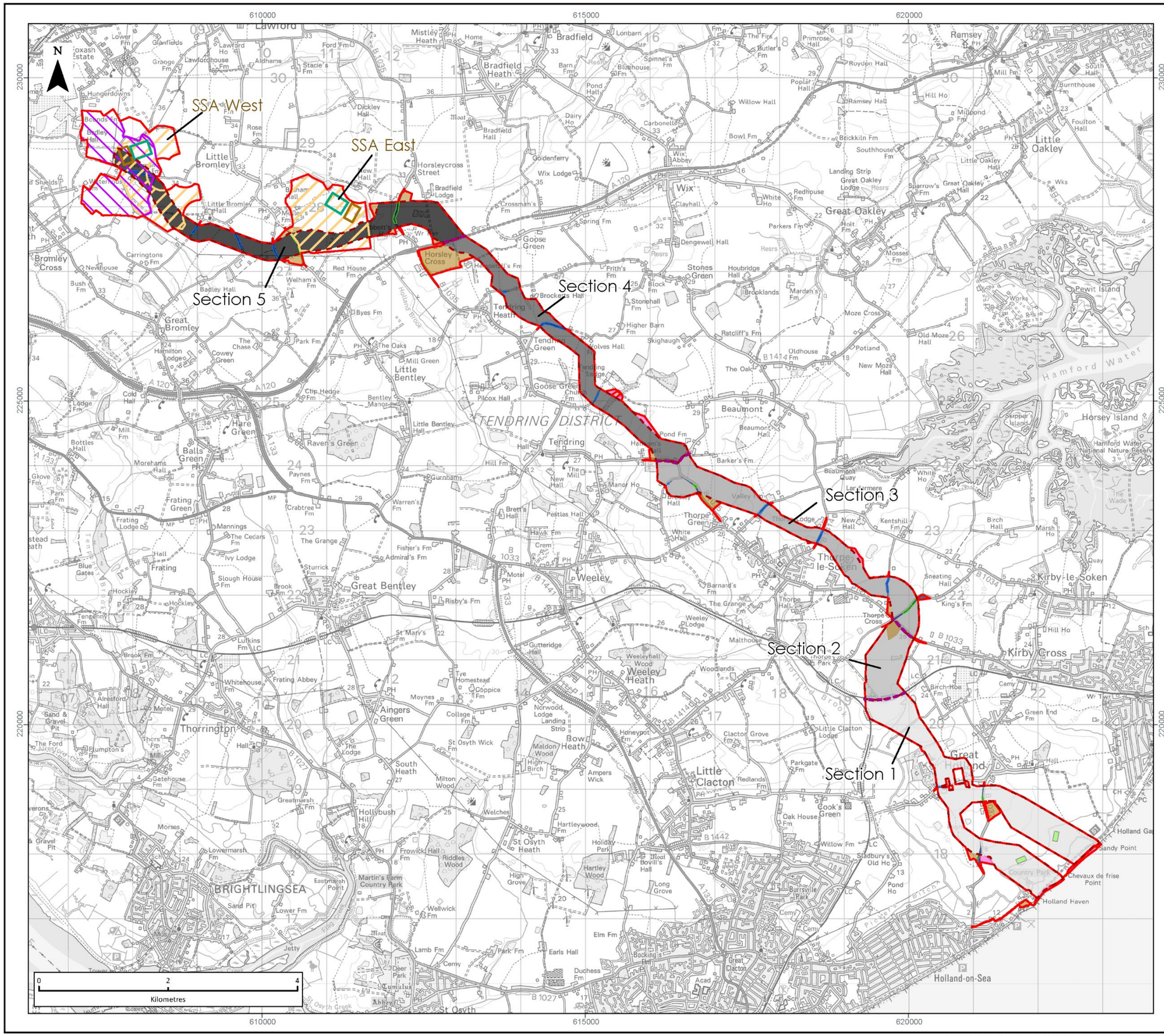
1.2.9 Table 1.1 summarises key onshore infrastructure information, with more detail on each component described in the subsequent sections of this Chapter.

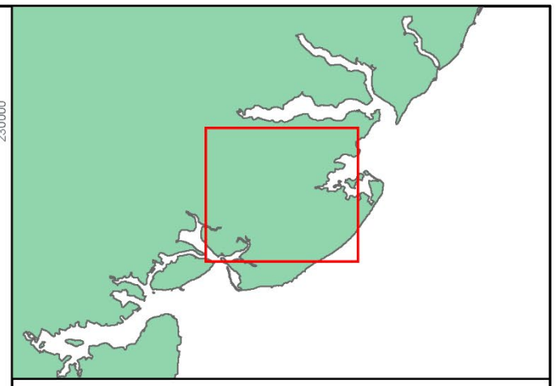
Table 1.1. VE onshore infrastructure information

Project Parameter	Maximum Design Scenario
TJB footprint area (area per TJB)	100 m²
Number of TJBs	Up to 4 (1 per export cable)
Total onshore ECC length	Up to 27 km
Number of onshore export cable circuits	Up to 4
Number of power cables per circuit	3
Number of ducts per circuit	7 (3 x power cables, 3 x comms. cables and 1 x earth)

DESCRIPTION OF ONSHORE RED LINE BOUNDARY ROUTE STAGES

1.2.10 Given that the length of the onshore ECC is up to 27 km running in a general east-west direction, it has been sub-divided into Route Sections (Figure 1.2). These have been used in describing the onshore elements of VE and reporting its potential environmental effects. Route Sections do not reflect any proposed phasing of works.





LEGEND

- Onshore Red Line Boundary
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- National Grid Area of Search
- Onshore Substation Areas of Search
- Temporary Construction Compounds
- Works Access Required
- Haul Road Crossings
- Haul Road Access
- Visibility Splays
- Indicative Landfall HDD Location
- Substation Construction Compound (Indicative)
- Substation Operational Boundary (Indicative)

Onshore Export Cable Corridor Sections

- Section 1
- Section 2
- Section 3
- Section 4
- Section 5

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Onshore Cable Route Sections

VER	DATE	REMARKS	Drawn	Checked
1	23/02/2023	PEIR Submission	JO	JS

DRAWING NUMBER:

FIGURE 1.2

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:60,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES OFFSHORE WIND FARM

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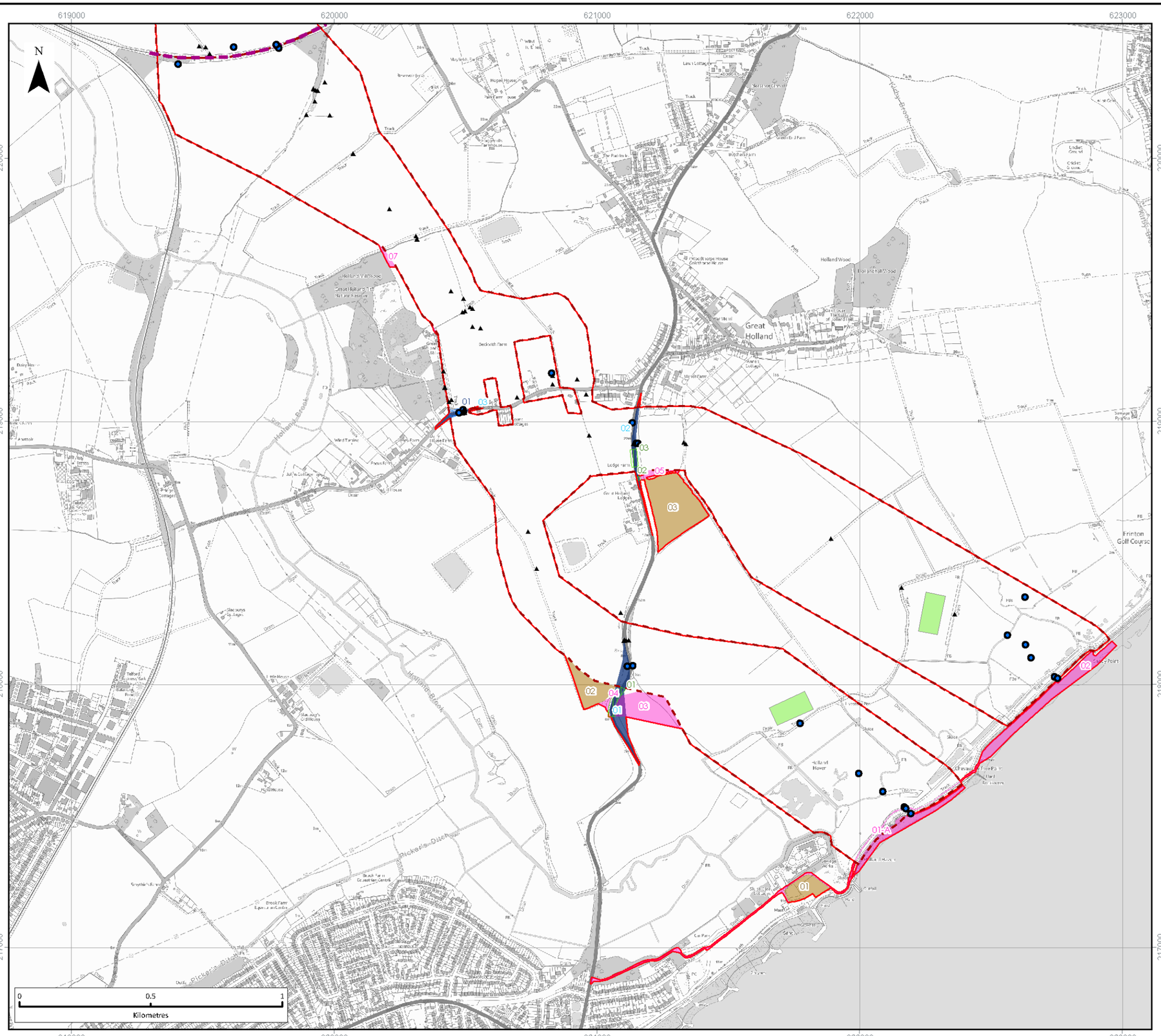
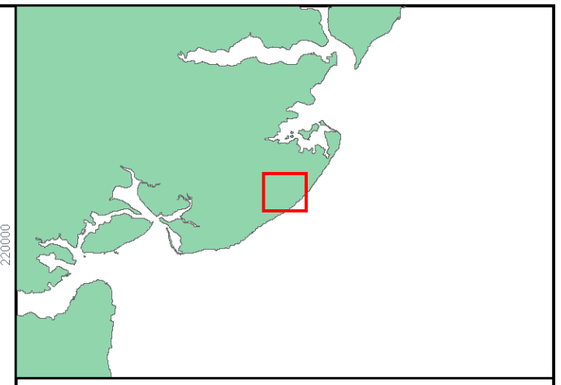
1.2.11 The following Cable Route Sections to be used in the project are identified as follows:

CABLE ROUTE SECTION 1 (INCL. LANDFALL)

1.2.12 Route Section 1 shown on Figure 1.3 encompasses the landfall options between Frinton-on-sea and Holland-on-sea. Currently two potential options are included, the northern and southern legs, within which indicative landfall Horizontal Directional Drilling (HDD) compounds are shown (only one location will be included in the DCO application). From the Landfall HDD compound, the onshore ECC continues northward to the East Coast Main Line spur between Holland Brook and Park Lane. The rail line will be crossed using a trenchless crossing technique, such as HDD at this point which would require a drilling compound to the south of the rail line. Within this section is the provision for three Temporary Construction Compounds (TCCs). The proposed TCC no.1 is located at Manor Way to support any works or access which may be required on the beach. Proposed TCC no.2 is located to the north of Clacton Road if the western route option is taken forward. Proposed TCC no.3 is located to the east of the B1032 (Clacton Road) to service the eastern route from landfall if that option is taken forward. Up to two TCCs will be selected depending on the final route and engineering design.





LEGEND

- Onshore Red Line Boundary
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Obstacles (Trenchless)
- Obstacles (Trenched, HDD or Other)
- Temporary Construction Compound (TCC)
- Works Access Required
- Haul Road Crossings
- Haul Road Access
- Visibility Splays
- Indicative Landfall HDD Location

Note:
Temporary Construction Compounds labelled in Brown.
Haul Road Crossings labelled in Dark Blue.
Haul Road Access labelled in Dark Green.
Visibility Splays are labelled in Light Blue.
Works Access Required are labelled in Pink.

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Onshore Cable Route Section 1

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	PEIR Submission	DB	JS

DRAWING NUMBER:

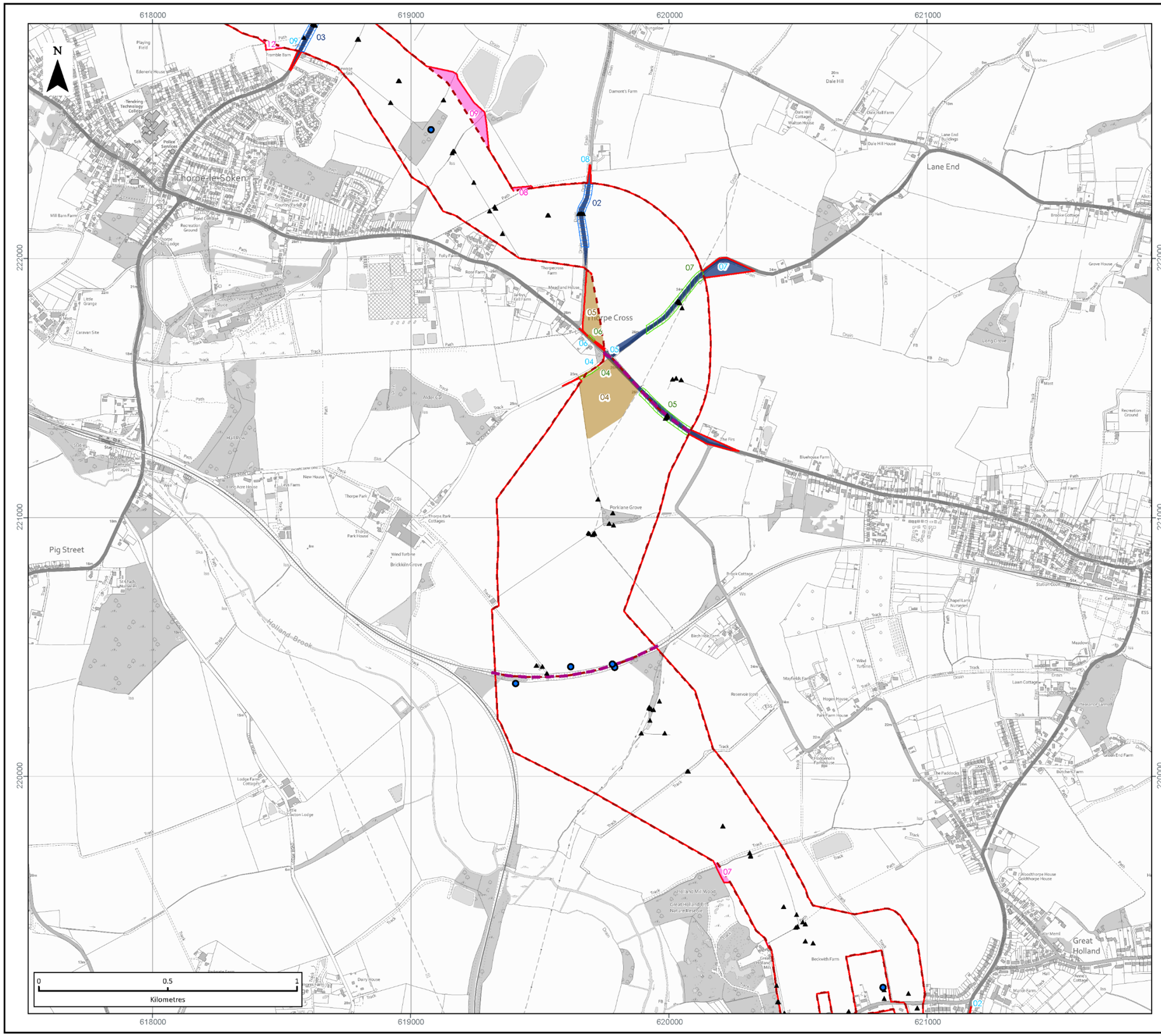
FIGURE 1.3

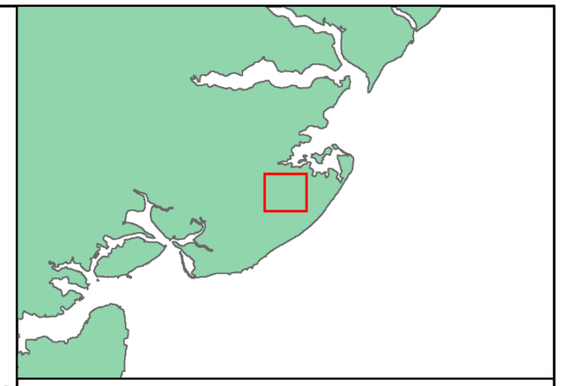
SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:15,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES
OFFSHORE WIND FARM

CABLE ROUTE SECTION 2

1.2.13 Route Section 2 shown on Figure 1.4 continues north from the East Coast Main Line spur between Holland Brook and Park Lane to the west of Kirby Cross across agricultural fields towards the B1033 (Thorpe Road). There will need to be a trenchless crossing technique, such as HDD, underneath the rail line for the cable. This will require a drilling compound to the north of the railway line. This section includes TCC (TCC no. 4) to service it.





LEGEND

- Onshore Red Line Boundary
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Obstacles (Trenchless)
- Obstacles (Trenched, HDD or Other)
- Temporary Construction Compound (TCC)
- Works Access Required
- Haul Road Crossings
- Haul Road Access
- Visibility Splays

Note:
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Haul Road Access labelled in Dark Green.
Visibility Splays are labelled in Light Blue.
Works Access Required are labelled in Pink.

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Onshore Cable Route Section 2

VER	DATE	REMARKS	Drawn	Checked
1	23/02/2023	PEIR Submission	DB	JS

DRAWING NUMBER:

FIGURE 1.4

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

FIVE ESTUARIES
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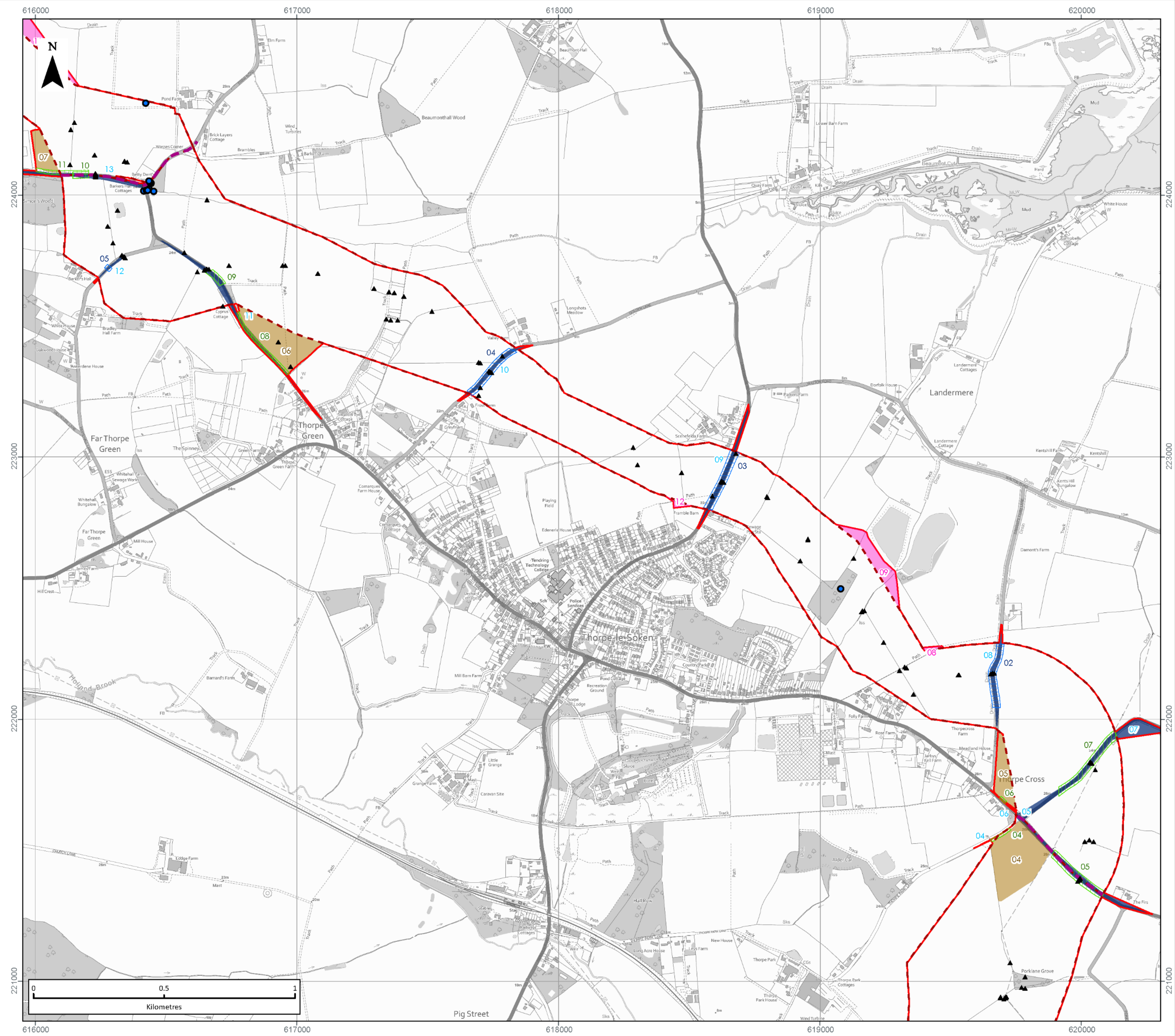
CABLE ROUTE SECTION 3

1.2.14 Route Section 3 shown on Figure 1.5 passes north of the B1033 (Thorpe Road) and the B1034 (Sneating Hall Lane) then continues north-west through agricultural land around Thorpe Le Soken, then crossing Landermere Road and Golden Lane towards the intersection of Thorpe Road/Swan Road. This section includes provision for two TCCs (TCC no.5 and 6).



LEGEND

- Onshore Red Line Boundary
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Obstacles (Trenchless)
- Obstacles (Trenched, HDD or Other)
- Temporary Construction Compound (TCC)
- Works Access Required
- Haul Road Crossings
- Haul Road Access
- Visibility Splays

Note:
Temporary Construction Compounds labelled in Brown.
Haul Road Crossings labelled in Dark Blue.
Haul Road Access labelled in Dark Green.
Visibility Splays are labelled in Light Blue.
Works Access Required are labelled in Pink.

Data Source:

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Onshore Cable Route Section 3

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1	23/02/2023	PEIR Submission	DB	JS

DRAWING NUMBER:

FIGURE 1.5

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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FIVE ESTUARIES
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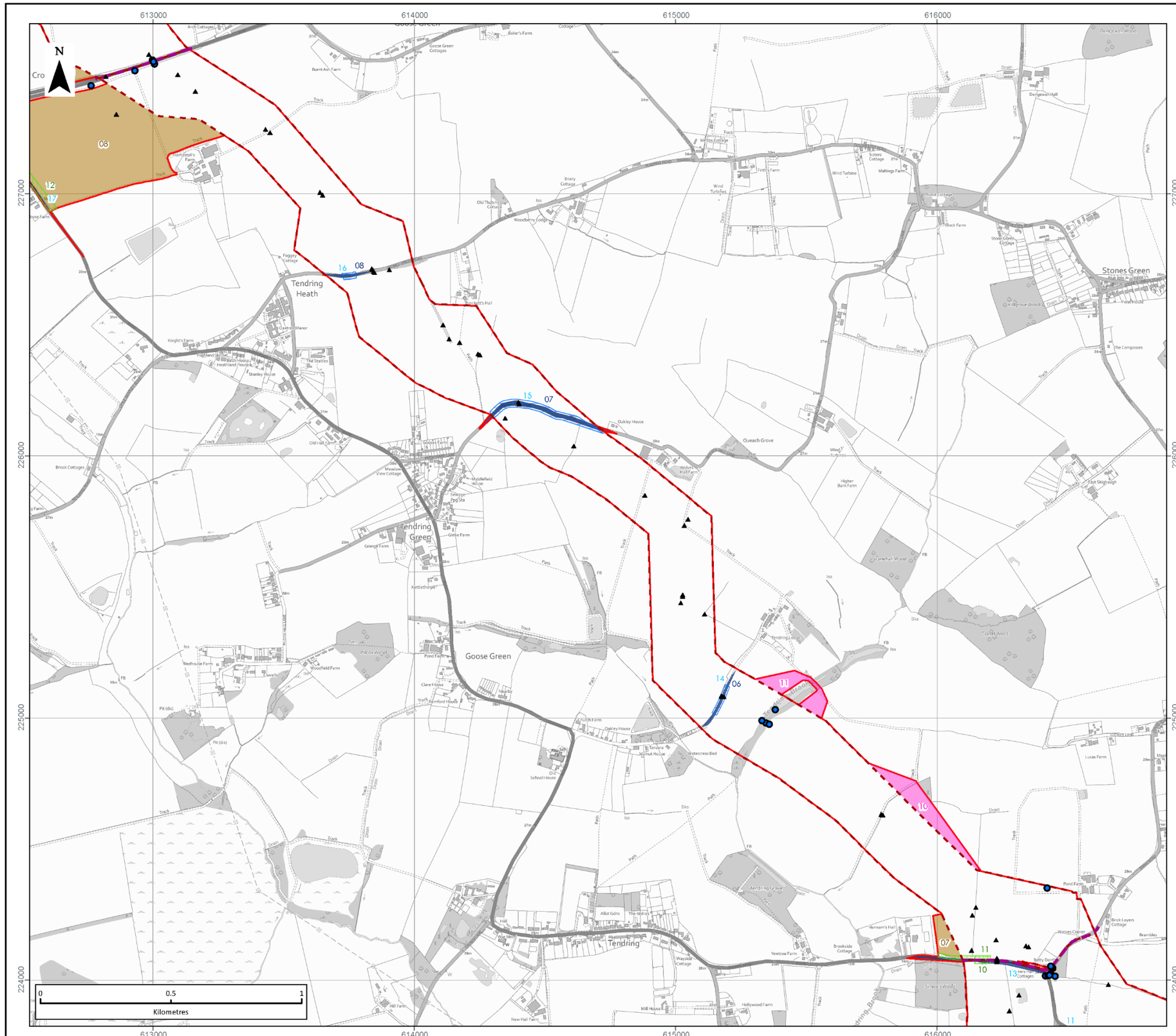
CABLE ROUTE SECTION 4

1.2.15 Route Section 4 shown on Figure 1.6 continues northwards through agricultural fields to the east of Tendring village, passing to the east of Tendring Heath towards the A120 (Harwich Road). This section abuts Horsley Cross where there is a planned TCC. The TCC will service the north of this section. A TCC (TCC no.7) is located to the south next to Thorpe Road to service the south of this section.

1.2.16 There are two defined off route haul roads, where works access will be required, the first will allow routing of vehicles through an existing gap in the hedgerow located due north of Swan Road. This will be further defined and assessed for the final DCO submission.

1.2.17 The second which is directly north is an off-route haul road to allow construction vehicles use of the existing bridge across Tendring Brook, space is also retained for bridge upgrade works if required.

1.2.18 Adjacent to the proposed TCC (TCC no.8) to the north and adjacent to the B1035/A120 is an indicative haul road access, this will be further refined for the final DCO submission.



LEGEND

- Onshore Red Line Boundary
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Obstacles (Trenchless)
- Obstacles (Trenched, HDD or Other)
- Temporary Construction Compound (TCC)
- Works Access Required
- Haul Road Crossings
- Haul Road Access
- Visibility Splays

Note:
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Haul Road Crossings labelled in Dark Blue.
Haul Road Access labelled in Dark Green.
Visibility Splays are labelled in Light Blue.
Works Access Required are labelled in Pink.

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Onshore Cable Route Section 4

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FIGURE 1.6

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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FIVE ESTUARIES OFFSHORE WIND FARM

CABLE ROUTE SECTION 5

1.2.19 Route Section 5 shown on Figure 1.7 and Figure 1.8 encompasses the area to the north of the A120 and includes the two search areas (SSA West and SSA East) for the proposed OnSS.

1.2.20 The onshore ECC continues westwards through agricultural fields passing Clacton Road, Bentley Road, Payne's Lane and Ardleigh Road ending at Grange Road, where this meets the NGET EACN Substation Area of Search. The NGET Substation Area of Search has been included here as there is some uncertainty regarding the exact proposed location. A further refinement will be available at DCO submission stage.

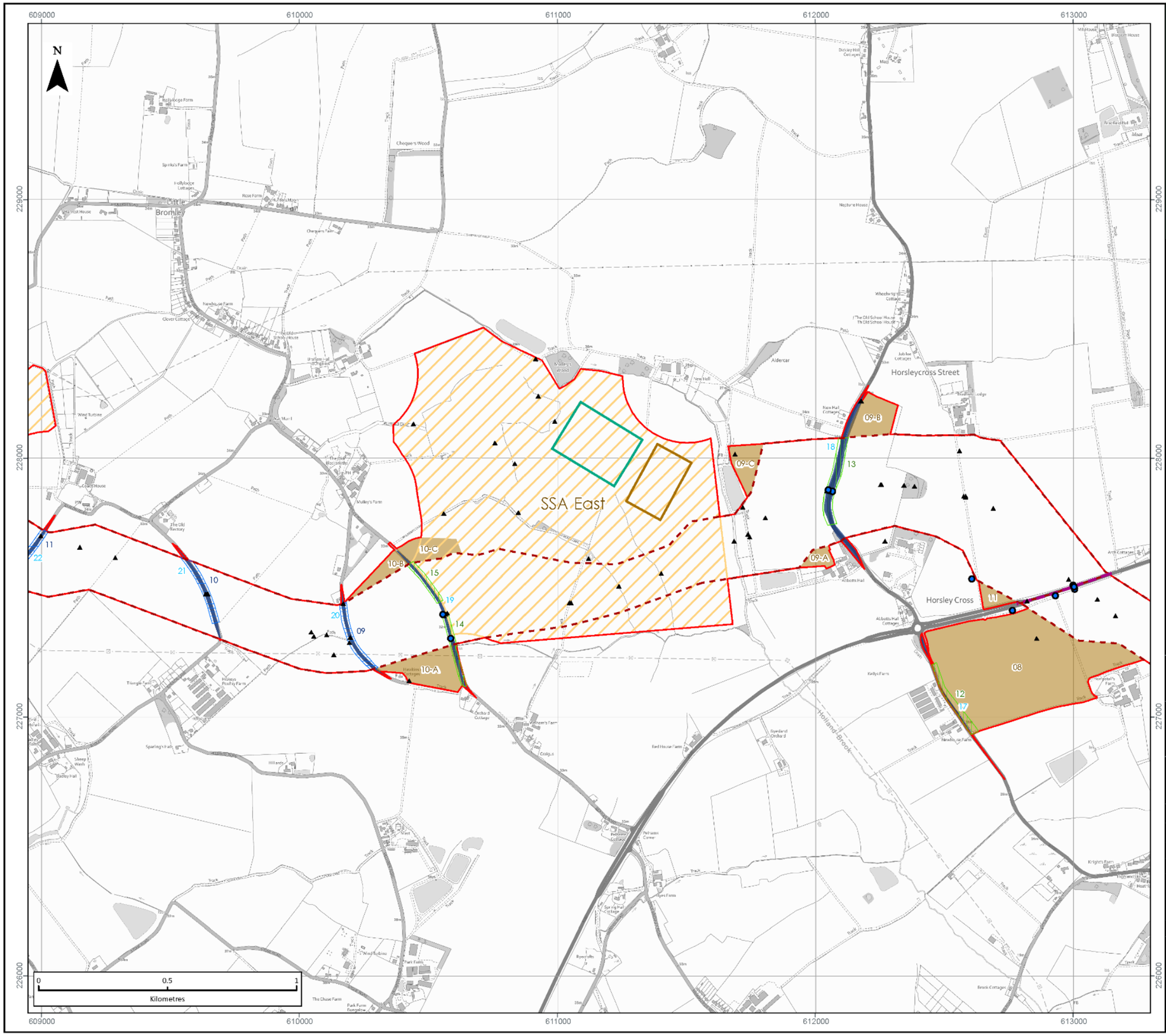
1.2.21 SSA East is located north of the A120 between Bentley Road and Clacton Road.

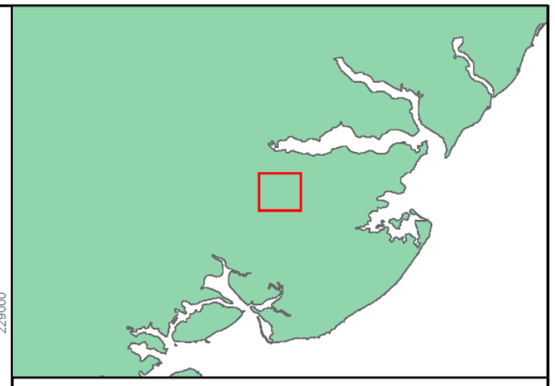
1.2.22 SSA West is location to the north and south of Ardleigh Road and overlaps the NGET EACN Substation Area of Search, and is where North Falls have their substation zone.

1.2.23 A single OnSS location for VE located within one of the SSA's will be included at DCO submission.

1.2.24 A number of TCC options have been identified within this section which could be used to support the works, areas within the SSA's will also be utilised for construction compounds. The approach will be further refined at DCO submission stage.

1.2.25 TCCs no. 09-A, 09-C, 09-N, 10-A, 10-B, 10-C and 11 are all potential TCC options in Section 5, indicative Substations TCC's have been shown within the SSA East and SSA West. These are shown on Figure 1.7 and Figure 1.8.





LEGEND

- Onshore Red Line Boundary
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Obstacles (Trenchless)
- Obstacles (Trenched, HDD or Other)
- Onshore Substation Areas of Search
- Temporary Construction Compound (TCC)
- Haul Road Crossings
- Haul Road Access
- Visibility Splays
- Substation Construction Compound (Indicative)
- Substation Operational Boundary (Indicative)

Note:
Temporary Construction Compounds labelled in Brown.
Haul Road Crossings labelled in Dark Blue.
Haul Road Access labelled in Dark Green.
Visibility Splays are labelled in Light Blue.
Works Access Required are labelled in Pink.

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Onshore Cable Route Section 5

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FIGURE 1.7

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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FIVE ESTUARIES
OFFSHORE WIND FARM

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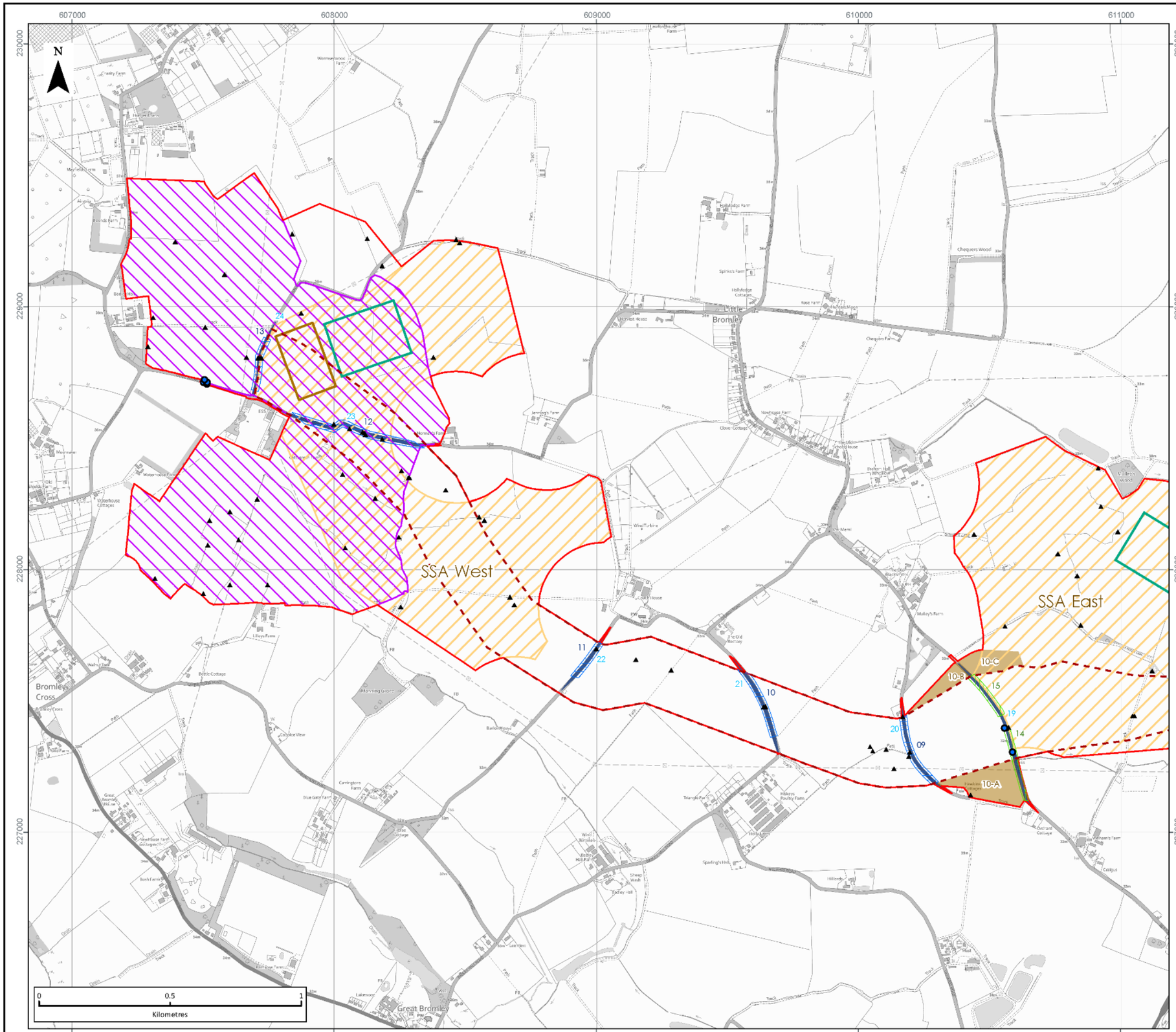

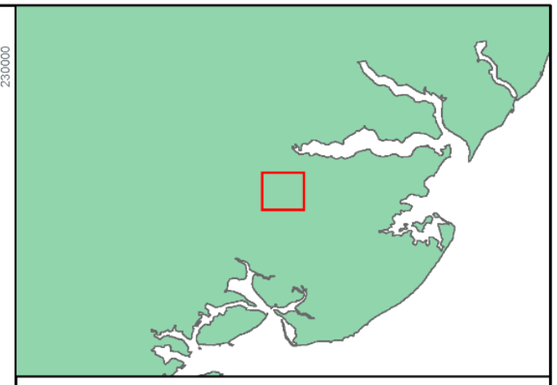

LEGEND

- Onshore Red Line Boundary
- Onshore Export Cable Corridor
- Obstacles (Trenchless)
- Obstacles (Trenched, HDD or Other)
- National Grid Area of Search
- Onshore Substation Areas of Search
- Temporary Construction Compound (TCC)
- Haul Road Crossings
- Haul Road Access
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- Substation Construction Compound (Indicative)
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FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Onshore Cable Route Section 5

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FIGURE 1.8

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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1.3 DESIGN ENVELOPE APPROACH

OVERVIEW

1.3.1 At this this stage in the VE development process, decisions on exact locations of infrastructure and the precise technologies and construction methods employed are still being made.

1.3.2 As detailed within the Environmental Impact Assessment (EIA) methodology chapter (Volume 1, Chapter 3: Environmental Impact Assessment Methodology), in some instances, the final design and or construction method cannot be defined at this stage. Where this is the case, a Maximum Design Scenario has been adopted.

1.3.3 The project description is therefore indicative and the design envelope approach (often referred to as the 'Rochdale Envelope') has been used to provide certainty that the final project as built will not exceed the identified parameters, whilst providing the flexibility to accommodate further project refinement during the detailed design phase post-consent.

1.3.4 For onshore aspects, this flexibility is required in for the number of export circuits, footprint requirements for the proposed Onshore Substation (OnSS), siting of onshore infrastructure and construction methods etc. This is to ensure that anticipated changes in available technologies between now and the detailed design phase can be accommodated within the design, whilst retaining an EIA that considers all options, with conclusions that are robust providing greater flexibility to co-ordinate with North Falls OWF.

1.3.5 The final project design will be influenced by ground and environmental conditions identified through detailed pre-construction surveys, project economics and the approach to procurement of resources.

1.3.6 This chapter sets out flexibility in the approach, which is encompassed within the overall design envelope.

RELATIONSHIP TO MAXIMUM DESIGN SCENARIO

1.3.7 The full onshore design envelope for VE is included in this Chapter. However, it is important to note that individual impact assessments do not consider all options. Instead, for each impact, the assessment is based on the scenario which results in the greatest potential for change, sometimes referred to as the 'worst-case' scenario. In the context of VE, this is referred to as the Maximum Design Scenario (MDS) approach.

1.3.8 The rationale for this approach is to ensure that the MDS for each impact is robustly considered, and therefore any other scenario as built would not result in impacts of greater significance of effect than those assessed in the EIA, whilst reducing the volume of assessment documentation required and avoiding dilution of outcomes in the interests of proportionality. The concept of proportionality is key in ensuring that the Environmental Statement (ES) is maintained at an accessible level for technical and non-technical stakeholders, and aligns with industry best practice as advised by the Institute of Environmental Management & Assessment (IEMA) Delivering Proportionate EIA guidance (IEMA, 2017).

1.3.9 To avoid excessive conservatism in the EIA, the parameters assessed throughout the EIA are not necessarily a combination of the MDS for each component, hence the MDS is chosen on an impact-receptor basis, on a range of eventual build-out scenarios. The details of the MDS for each impact assessed are described in detail within the topic-specific chapters of the PEIR.

1.3.10 Therefore, confidence can be had that resulting environmental effects will not exceed the worst-case assumptions of the EIA. Further detail on the MDS approach is included in Volume 1, Chapter 3: Environmental Impact Assessment Methodology.

1.4 ONSHORE CABLE ROUTE

1.4.1 For the assessment presented in this PEIR, 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 120 m. Currently for PEIR a RLB of around 250 m has been included to allow for potential co-ordination with North Falls OWF project and different options to be considered at obstacles i.e. micrositing / trenchless techniques. Approximations are necessary to account for the need to have a wider corridor at discrete locations for activities such as trenchless crossings or accommodation of temporary drainage arrangements. The more refined ECC will be included at DCO submission stage.

1.4.2 The full description of Landfall works and the associated parameters are included in the Offshore Project Description (Volume 2, Chapter 1, Offshore Project Description). For the purposes of this chapter, the following section outlines the location of the landfall and traffic associated with the landfall works.

1.4.3 The Landfall is the location where the offshore export cables are brought ashore and jointed to the onshore cable circuits in TJBs. There is an overlap in the offshore and onshore study area at the intertidal area of the Landfall, the full detail is within the Volume 2, Chapter 1, Offshore Project Description.

1.4.4 With regards to traffic generation estimates at landfall, these are provided in Table 1.2 with further information on traffic generation estimates provided within Volume 3, Chapter 8: Traffic and Transport.

Table 1.2 Traffic generation at landfall

Route Section	Total vehicles			HGVs			Employee vehicles		
	Min	Max	Av.	Min	Max	Av.	Min	Max	Av.
Route Section 1 - Landfall	97	258	187	18	82	63	53	187	124

1.4.5 The MDS associated with the onshore export cable is described in Table 1.3 below.

Table 1.3: Onshore export cable MDS

Onshore Cable Route	Max Design Scenario
Length	Up to 27 km
Max number of Export circuits	4 No. circuits
Number of power cables per circuit	3
Max number of comms cables per circuits	3
Max number of earth cables per circuit	1
Width of open trenched sections	Up to 60 m includes 10 m haul road swathe
HVAC cable technology	XLPE insultation
Indicative max export cable voltage	400 kV
Indicative external cable diameter	150 mm
Bedding Material	CBS
No. of ducts required per circuit	7 (three power and four for telecomms/earthing)
Construction period	18–24-month period.

CABLE INSTALLATION

1.4.6 Site enabling works will be required before construction within each cable Route Section. These may include:

- Temporary fencing;
- Upgrade of existing, or installation of new, access from the public highways, only where required;
- Archaeological and ecological survey / mitigation works as necessary;
- Utility diversions and installation of temporary site drainage where required;
- Vegetation clearance; and
- Establishment of TCC site compounds, which could include site offices, welfare facilities, security, wheel wash, lighting and signage.

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

- Topsoil removal (to edge of working area);
- Temporary haul road installation along all sections of the route;
- Trenchless duct installation beneath complex obstacles (such as major roads, railways, rivers);
- Installation of header or interceptor drains at cable corridor boundaries;
- Trench excavation (up to four, one for each circuit);
- Duct and tile installation;

- Trench backfilling;
- Existing field drainage repairs (where disruption occurs); and
- Jointing pit installation (including French drains to prevent water pooling above jointing pit).

1.4.8 Once the ducts are installed cable installation will commence which includes:

- Cable installation (pulled through ducts from each joint pit);
- Cable jointing; and
- Cable testing and commissioning.

1.4.9 The main cable installation method will be through the use of open-cut trenching with High Density Polyethylene (HDPE) ducts installed, the trench backfilled and cables pulled through the pre-laid ducts.

1.4.10 The cable circuits will be installed within an onshore ECC generally up to 60 m wide during the construction phase, in some places it could be wider. This wider corridor includes space to store topsoil, subsoil and a temporary haul road, as well as any equipment required for that section of work during construction and to accommodate any Public Right of Way (PRoW) diversions required during the construction phase. An indicative cross section is shown in Figure 1.9

1.4.11 In some areas reinstatement can occur as soon as the cable ducts are installed. Activities are expected to consist of:

- Removal of haul road;
- Jointing pit ground re-instatement;
- Replacement of topsoil;
- Landscaping and hedge re-planting, where appropriate; and
- Demobilisation and fence removal.

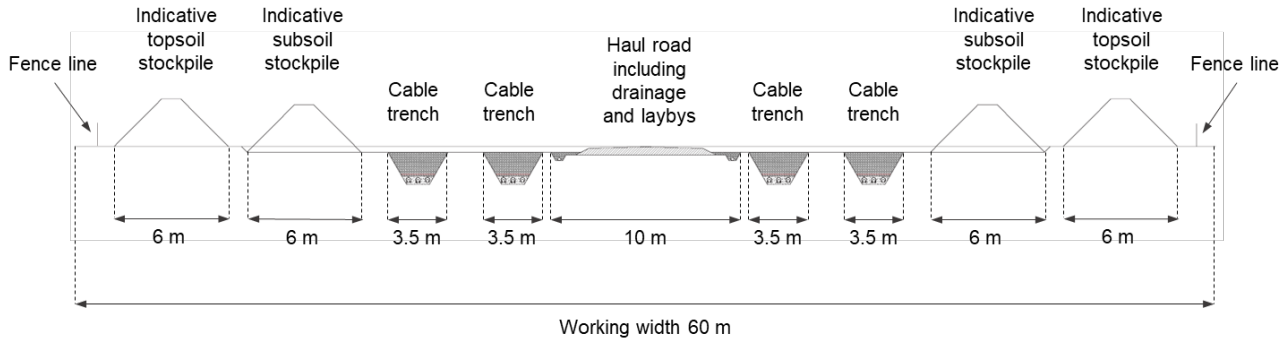

Figure 1.9: Indicative cross section through onshore ECC

1.4.12 The final VE cable corridor will be developed within the wider corridor. The typical width for the cable corridor would be up to 60 m for open trenching, although in places there would be exceptions where additional width would be added to give flexibility and to avoid repeated necking in and out of the corridor.

1.4.13 It is anticipated that where additional width for the cable corridor would be needed, (generally where HDD is required to cross constraints such as woodland, watercourses, roads, major utilities etc.) it would be approximately 180-280 m wide to allow for the HDD components.

1.4.14 The cables are typically installed in a flat (cables laid adjacently and horizontally) formation as seen in Figure 1.10, or a trefoil formation (cables bunded together in a triangular shape), depending on detailed cable system design, with separation between circuits to ensure thermal separation.

1.4.15 The cable trenches will be excavated, typically utilising tracked excavators. The excavated subsoil will be stored separately from the topsoil, with the profile of the soil maintained during the storage process, in accordance with best practice. Soil may be stored immediately adjacent to the trench or stored elsewhere within the development red line boundary (RLB) at temporary construction and laydown areas. The nominal width of topsoil affected is up to 60 m for open trenched sections.

1.4.16 The removal (or height reduction) of trees, hedgerows and ground vegetation will be kept to a minimum but where necessary will be completed in accordance with the prevailing best practice and controlled by the Code of Construction Practice (CoCP) and the Landscape Ecological Management Plan (LEMP), both of which will be secured within the DCO.

1.4.17 Drainage measures will be incorporated into the works design, the principles of these are set out in the draft CoCP (forming part of the DCO) to minimise water within the trench and ensure ongoing drainage of surrounding land. Where water enters the trenches during installation, this will be pumped via settling tanks or ponds to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains.

1.4.18 The base of the trench will be prepared by laying a base fill material of Cement Bound Sand (CBS). A duct for each cable and separate ducts for a fibre optic bundle will be laid on the base fill material and surrounded with further CBS material before being backfilled with stored subsoil. The stored topsoil will be replaced upon the backfilled subsoil to reinstate the trench to pre-construction condition, so far as reasonably possible.

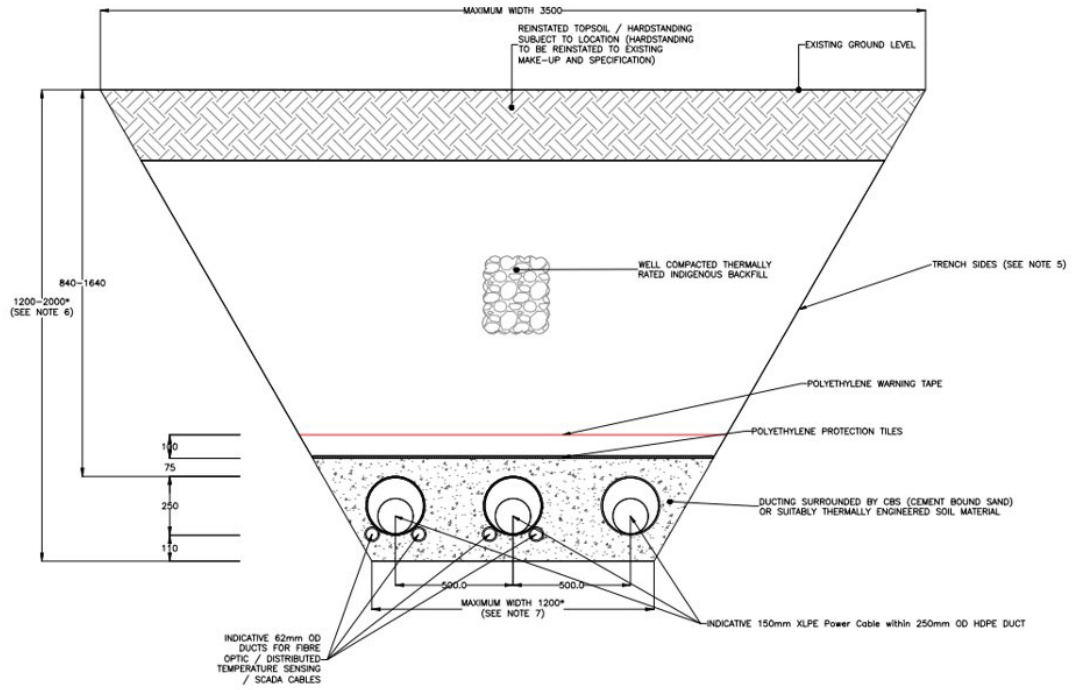

Figure 1.10: Indicative cross section of a direct burial trench

1.4.19 Cables will be pulled and installed through the buried ducts and will not require the trenches to be reopened, however access to and from the jointing bays will be required to facilitate the works. Cable pulling is likely to require temporary cable construction compounds alongside the cable route.

1.4.20 Cable drums will be delivered by Heavy Goods Vehicles (HGV) to the cable route TCC's for storage where necessary, then transported to the joint pit locations. The cable drum will be located adjacent to the joint pit on a temporary hard standing. A winch will be attached to the cable with a pilot wire, and the cable will be pulled off the drum through the buried ducts.

1.4.21 Figure 1.11 shows an example of a cable drum delivery to cable storage area.

Figure 1.11:Example of a cable drum delivery to cable storage area

1.4.22 Cranes will be used to transfer the cable drums from the delivery lorries either directly to the cable vehicles or to a storage point until they are required.

1.4.23 The cable trench will be closed and backfilled between cable joints, once conduit laying is completed. The soil will be reinstated at the end of the cable works however it should be noted that the haul road will remain in place for access to the joint pits until cable jointing and testing is complete. The soil will be reinstated with a warning tape buried approximately 100 mm above the polyethylene protection tiles to indicate the presence.

1.4.24 The MDS associated with the installation of the onshore export cable are described in Table 1.5 below.

Table 1.4: Onshore export cable construction MDS

Onshore Cable Route	Max Design Scenario
Indicative Maximum Depth of Burial (DOB) and Depth of Excavation (DOE) (excluding crossing points inc. utility crossings subject to depth of service line and clearance)	1.64 (DOB) 2.00 (DOE)
Indicative Minimum DOB and DOE	0.60 m (DOB) 0.96 m (DOE)
Open trench cable corridor construction swathe	Up to 60 m
Max no. of trenches for all cables	4
Indicative open trench dimensions [per trench]	3.5 m wide at surface
Typical Joint Pit dimensions	13 x 5 m
Number of HDDs bores per crossing	Up to 12
Indicative HDD / trenchless drives max depth (m below ground level)	Up to 20 m
Typical HDD compound dimensions	100 x 100 m
Haul road	Up to 6 m wide (10 m including verges and drainage)

JOINT PITS

1.4.25 Joint pits will be required along the cable route to allow cable pulling and jointing of two sections of cable. One joint pit will be required approximately every 500 m of cable (to be determined by detailed design), resulting in a maximum of 216 joint pits (this is 54 per circuit with a maximum of four cable circuits), in addition to the TJBs at Landfall and cable termination at the OnSS. The joint pits will be of a similar design and installed in a similar approach to the TJBs and will have a maximum footprint of 65 m^2 (indicatively up to 13 m long by 5 m wide by 1 m deep). While crossing agricultural land the highest point in the pit – including the cable circuit and associated protection – will be at a minimum depth of 900 mm below the top of the subsoil layer. In some areas the joint pits could be deeper, for example where there is extensive field drainage.

1.4.26 The jointing pits will require separate, smaller cable-testing pits (known as link boxes) to allow for fault testing. These will consist of a manhole set in a concrete plinth at ground level. The manhole covers will either be heavy duty to provide agricultural vehicle load-bearing capabilities or lightweight construction allowing access to personnel without need for additional lifting machinery. Each plinth is typically 1.7 m x 2.1 m.

1.4.27 Figure 1.12 shows a typical jointing pit under construction.

Figure 1.12: A typical jointing pit under construction.

CROSSING TECHNIQUES

1.4.28 Volume 7, Report 4: Crossing Register comprises a table noting the identified obstacles on the cable route that will be crossed by the onshore ECC. The list of obstacles where HDD (or other trenchless techniques) will be used to cross them is not exhaustive. The most suitable method for crossing obstructions will be determined during the construction stage of the project which may identify additional trenchless crossings and will be coordinated with North Falls as far as possible.

TRENCHLESS

1.4.29 The process for HDD has been described above. HDD (or other trenchless crossing techniques) will be used at a number of locations as an alternative methodology to open-cut trenching to cross significant environmental and physical features such as main rivers, major drains, roads, and railways. Figure 1.13 depicts a typical HDD layout.

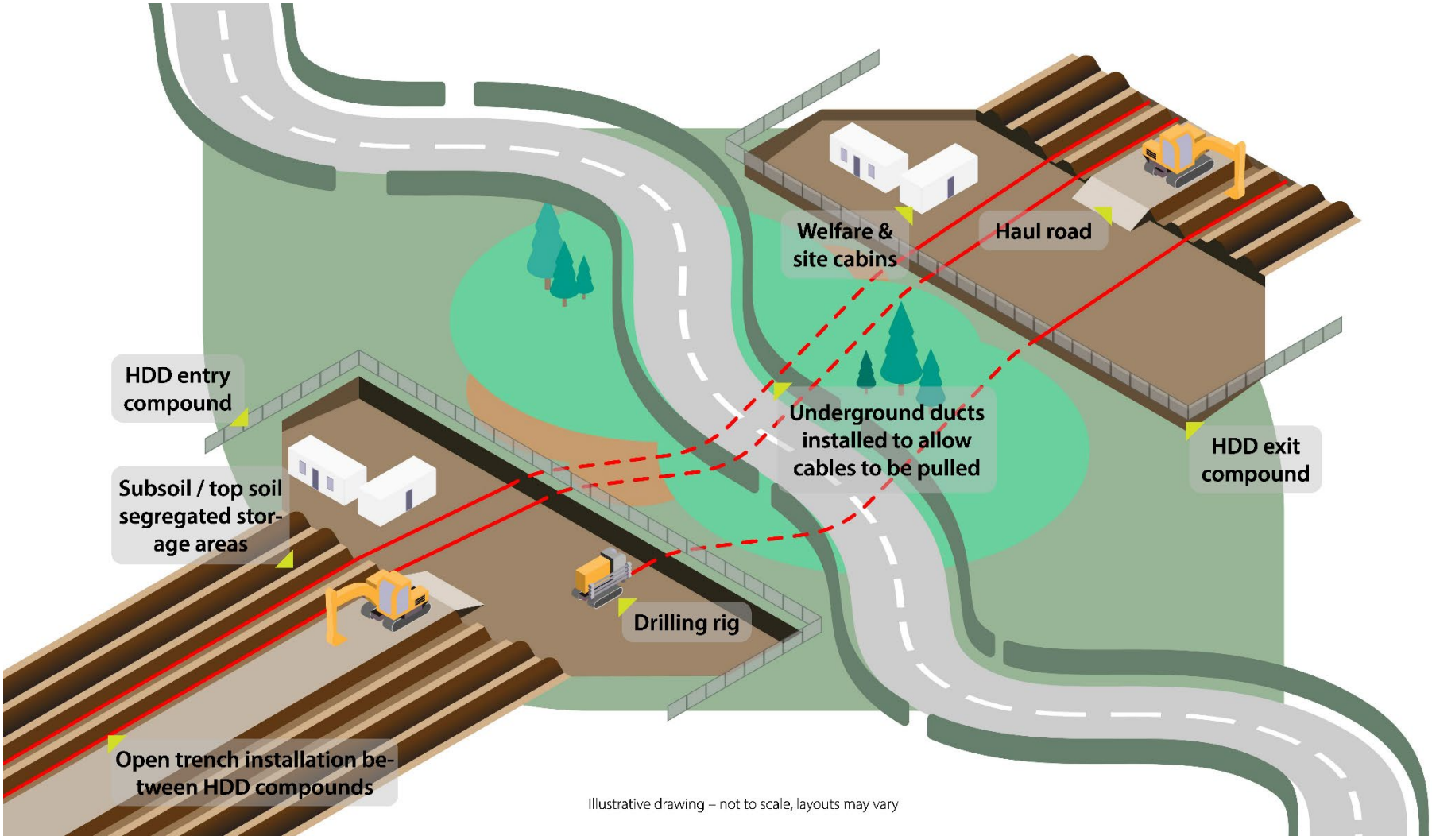

Figure 1.13 Typical HDD Layout

1.4.30 A number of minor obstacles are identified in the Obstacle Register as being crossed by trenchless techniques as they are adjacent to a major feature, such as a small ditch next to a main road and as a result will be crossed together as a group of obstacles.

1.4.31 Drilling compounds or launch and receptor pits (dependent on the technique chosen) will be set up within the cable corridor at suitable locations adjacent to each obstacle, or group of obstacles, to be crossed. The distance that each compound will be from the obstacles will be determined during the construction stage of the project and will depend on factors such as the length of the crossing, the height differential of the land either side of the obstacles, depth of the obstacle to be cleared, and the local ground conditions.

1.4.32 As the length of each crossing will not be finalized and known until the construction phase, the duration for each trenchless duct installation is not currently known.

TRAFFIC AND ACCESS

HAUL ROAD

1.4.33 A temporary haul road will be established along the onshore ECC to provide safe access for construction vehicles; from TCCs to cable installation sites and to reduce impact on the surrounding road network. The temporary haul road could be up to 6 m wide (up to 10 m wide, including verges and drainage channels) and extend the full length of the onshore ECC.

1.4.34 Depending upon ground conditions, it may not be necessary to undertake works to construct the designated haul road. Where the ground is sufficiently firm it may be acceptable to use significantly less granular sub-base material – this is to be confirmed once further information is available as part of the detailed design process.

1.4.35 Following topsoil stripping, the temporary haul road will be formed of protective matting, temporary metal road or permeable hardcore aggregate dependent on the ground conditions, vehicle requirements and any necessary protection for underground services.

1.4.36 Consideration will also be given to alternatives such as a specialist track-way if appropriate before the final ES. The final decision will depend upon ground conditions and the contractor's preferred construction strategy and will not be confirmed until the detailed design stage.

TRAFFIC ESTIMATES

1.4.37 Summary traffic generation estimates are provided in Table 1.5 with further information on traffic generation estimates provided within Volume 3, Chapter 8: Traffic and Transport.

Table 1.5: Minimum, maximum and average daily traffic generation (two way movement) estimates for cable installation

Route Section	Total vehicles			HGVs			Employee vehicles		
	Min	Max	Av.	Min	Max	Av.	Min	Max	Av.
Section 1 (incl. Landfall)	97	258	187	18	82	63	53	187	124
Section 2	0	142	91	0	62	26	0	97	65
Section 3	91	264	176	14	108	66	51	181	110
Section 4	98	224	165	16	107	63	51	159	102
Section 5	99	234	177	19	106	68	51	159	108

1.4.38 HGV traffic will only enter the onshore ECC from the highway at agreed access points, thus minimising the impact on the local minor road network.

1.4.39 Where the onshore ECC crosses the local road network, construction vehicles will need to cross the existing road to continue along the onshore ECC, no new junctions are proposed. As noted above, HGV construction traffic will not be permitted to access the onshore ECC from the public highway at these crossings, unless defined as an access point, and will be limited to directly crossing from one side of the road to the other to continue along the haul road. The temporary works required at each of these crossing points will therefore be significantly less than that required at TCC entrances, where HGV traffic will be exiting the public road network. Priority will be given to existing traffic on the local roads and, where necessary, the traffic entrance onto the roads will be managed. Barriers will be used, and access will be controlled, to prevent members of the public accessing the construction works.

TEMPORARY CONSTRUCTION COMPOUNDS

1.4.40 TCCs will be required along the onshore ECC for the duration of the enabling and installation works. The compounds will provide secure, fenced and potentially lit, storage locations for heavy duty plant equipment, local site management offices, welfare, local first aid points, refueling stations, and control of substances hazardous to health (CoSHH) storage as well as providing space for storage of cables, optical fibres, ducts and other supplies required to complete the installation works. Cranes will be used during establishment and decommissioning of each TCC.

1.4.41 TCCs will have sufficient space to ensure no vehicles are parked on the public highway.

1.4.42 Temporary site drainage will be installed during construction at each TCC, with the routing and discharging of water undertaken in accordance with principles set out in the draft CoCP.

1.4.43 The MDS associated with the TCCs are described in Table 1.6.

Table 1.6: Onshore TCC MDS

Onshore Cable Route	Max Design Scenario
Indicative no. of TCCs	8 (5 main TCCs & 3 minor TCCs)
Indicative max cable construction compound TCC area	22,500 m^2 (e.g., dimensions 150 m to 150 m)

1.4.44 TCCs may accommodate welfare facilities, car parking and storage areas for the purposes of enabling the construction works. Water, sewage, and electricity services will also be required at these sites.

1.4.45 The potential TCCs associated with each route section are outlined in section 1.2 and shown on Figure 1.3 to Figure 1.8.

SITE ACCESS AND CROSSING POINTS

1.4.46 HGV traffic will only be able to enter the onshore ECC from the highway at agreed access points, thus minimising the impact on the local minor road network. Personnel traffic and Light Good Vehicles (LGVs) may access the cable route from the public highway network at any point where they cross.

1.4.47 Where the ECC crosses the highway, construction vehicles will need to cross the existing road to continue along the ECC. As noted above, HGV construction traffic will not be permitted to access the ECC from the public highway at these crossings, unless defined as an access point, and will be limited to directly crossing from one side of the road to the other to continue along the haul road.

1.4.48 The temporary works required at each of these crossing points will therefore be significantly less than that required at TCC entrances, where HGV traffic will be exiting the public road network. Priority will be given to existing traffic on the local roads and, where necessary, the traffic entrance onto the roads will be managed.

1.4.49 Proposed access locations will mostly be via the TCCs, most construction traffic will enter the site through the TCCs. The precise access locations will be determined and finalised post consent and as part of detailed design. Table 1.7 below shows the construction access locations/TCCs.

Table 1.7: Construction access locations/TCCs

Access	TCC	Highway link	ECC Route Section
n/a	1	The Holland Haven Country Park car park access road	The beach for personnel to monitor Horizontal Directional Drilling (HDD) progress and excavate exit pit if required
1	2	B1032 Clacton Road	ECC Route Section 1 between Landfall and the SCL
2/ 3	3	B1032 Clacton Road	ECC Route Section 1 between Landfall and the SCL
4	4	Thorpe Park Lane	ECC Route Section 2 between the SCL and B1033 Thorpe Road
5	n/a	B1033 Thorpe Road	ECC Route Section 2 between the SCL and B1035 Tendring Road
6	5	B1033 Thorpe Road	ECC Route Section 3 between B1033 Thorpe Road and B1035 Tendring Road
7	n/a	B1034 Sneating Hall Lane	ECC Route Section 3 between B1033 Thorpe Road and B1035 Tendring Road
8	6	B1035 Tendring Road	ECC Route Section 3 between B1033 Thorpe Road and B1035 Tendring Road
9	n/a	B1035 Tendring Road	ECC Route Section 3 between B1033 Thorpe Road and B1035 Thorpe Road
10/ 11	7	B1035 Thorpe Road	ECC Route Section 4 between B1035 Tendring Road and A120
12	8	B1035 south of A120	ECC Route Section 4 between B1035 Tendring Road and A120
13	9 (a, b and c)	B1035 Clacton Road	ECC Route Section 5 between A120 and SSA West
14	10a	Bentley Road	SSA East and ECC Route Section 5 between B1035 Clacton Road and SSA West,
15	10b/ 10c	Bentley Road	SSA East and ECC Route Section 5 between B1035 Clacton Road and SSA West
16	11	Waterhouse Lane	SSA West

POST INSTALLATION ACTIVITIES

1.4.50 Following the installation of all cables and joint pits in a section, the construction working width will be cleared and reinstated. This reinstatement will include replanting of hedgerows where needed and where possible, replacement of fences, removal of temporary land drains and reinstatement of permanent land drains. Hedgerows will be replaced wherever possible although trees cannot be planted on top of any sections of underground cable that have been installed however there will be replacement tree planting within the project RLB, where practical.

1.4.51 Standard practice will be used for areas of temporary land take to be restored to agriculture, or other original use where practicable. Figure 1.14 shows an example of an area of cable corridor during restoration.

Figure 1.14: Cable corridor during restoration example (RWE renewables UK ltd)

ESTIMATED WASTE AND MATERIALS FOR ONSHORE ECC

1.4.52 Table 1.8 provides an estimate of the materials used in construction of the onshore ECC.

Table 1.8: Estimate of materials used in construction of the onshore ECC

Imported Materials / Permanent Equipment	Units	Indicative Maximum Value
MOT Type 1	Tonnes	337,175
Asphalt	Tonnes	7,866
HB2 External Radii Kerbs	No.	232
HB2 Straight Kerbs	No.	0
Concrete	m^3	3,901
Crusher Run Stone	Tonnes	0
20/40mm Drainage Stone	Tonnes	25,342
Length of perforated pipe	m	46,930
Geogrid	m^2	525,231
Geotextile	m^2	525,231
Fencing (including required posts)	m	47,530
Heras fencing panels	No.	4,986
Length of Onshore Export Cable	m	260,400
Length of Onshore Fibre Cable	m	261,400
Length of Onshore Earth Cable	m	86,800
Trench Tiles / cable protective covers	No.	325,402
Cement Bound Sand (CBS)	Tonnes	60,556
Selected Sand	Tonnes	9,266
Length of 250mm duct	m	223,800
Length of 62mm duct / pipe	m	300,400
Length of ducting for install in onshore HDD bores for cable circuits	m	36,600
Length of ducting for install in onshore HDD bores for FO and DTS	m	48,800

Imported Materials / Permanent Equipment	Units	Indicative Maximum Value
Bentonite	kg	1,314,500
Water	m^3	33,018
Steel Reinforcement	Tonnes	247
Link box lids	No.	368
Cable Joint Kits	No.	552
Transition bay pre-cast concrete slabs	No.	152
Length of 120mm duct	m	1,000
Length of 11kv Auxiliary Cable	m	1,000
Number of CG3 cable marker blocks	m	868

1.4.53 Table 1.9 provides an estimate of the waste generated from construction of the onshore ECC.

Table 1.9: Estimate of waste generated from construction of the onshore ECC

Waste Material Type	Units	Indicative Maximum Value
MOT Type 1	Tonnes	337,175
Asphalt	Tonnes	7,866
HB2 External Radii Kerbs	No.	232
HB2 Straight Kerbs	No.	0
Concrete	m^3	106
Crusher Run Stone	Tonnes	0
20/40mm Drainage Stone	Tonnes	25,342
Length of perforated pipe	m	46,930
Geogrid	m^2	525,231
Geotextile	m^2	525,231
Heras fencing panels	No.	4,986
Native Soil	Tonnes	143,232
Topsoil	Tonnes	734
Drill Fluid Removal	m^3	11,238
Fencing (including required posts)	m	47,530

1.5 ONSHORE SUBSTATION

1.5.1 One OnSS will be required for VE which will be sited North of the A120 on the east side of Colchester, this area has been chosen to facilitate ease of connection to the NGET EACN substation (subject to a separate DCO application).

1.5.2 Two search areas in the vicinity of the NGET EACN Substation are being considered for PEIR are shown on Figure 1.8 above and listed below:

- **SSA West**- north of Ardleigh road (which combines SSA1 and SSA2 from the consultation in summer 2022); and
- **SSA East** - north east of Bentley Road (SSA3 from the consultation in summer 2022).

1.5.3 These search areas each include an indicative OnSS substation location for this PEIR consultation to assist with assessments. A decision will be made following the statutory consultation, to identify a single location for the OnSS for the DCO application.

1.5.4 As part of this specific footprints or zones for the various infrastructure elements will be identified. The zones are defined as follows:

- **Onshore substation area (OnSS)** The area in which the final OnSS footprint will be located. The footprint, which will be required to allow for either Air-Insulated Switchgear (AIS) or Gas-Insulated Switchgear (GIS) technology.
- **Onshore substation construction zone (OnSS construction zone**) The area in which the final OnSS Temporary Construction Compound (TCC) will be located. The final OnSS TCC footprint will be confirmed between PEIR and ES.
- **Onshore substation access zone (OnSS access zone)** The area which will contain the final OnSS access route(s) (both construction and operational) – The route(s) of the construction and operational access will be confirmed between PEIR and ES.

1.5.5 The SSA West search area partially overlaps with the proposed indicative search areas for the onshore substation for the proposed North Falls OWF project and the proposed National Grid's East Anglia Connection Node (EACN) substation, both of which are currently underway with their consenting programme. This has the potential for an increase in localised effects, however this does provide greater opportunities for co-ordination on items such as site access, drainage, construction compounds. As the project design develops, VE will continue engagement with the neighbouring projects on coordination.

1.5.6 The OnSS will contain a number of elements including switchgear, busbars, transformers, capacitors, reactors, reactive power compensation equipment, filters, cooling equipment, control and welfare buildings, lightning protection rods (if required) and internal road access. A security fence will surround the OnSS compound, full design details will be provided at detailed design

1.5.7 The OnSS will use either AIS or GIS. The choice of switchgear affects both the total land area required and the size and type of buildings which will be needed. GIS substations are generally smaller than their AIS counterparts, typically taking up an approximately 35% smaller footprint than an equivalent AIS substation, although they are likely to require a greater number of taller buildings. GIS substations typically require less maintenance as the interior elements are sealed and insulated. GIS systems do, however, have a higher upfront cost, but may have a lower lifetime cost than equivalent AIS systems. The choice of AIS or GIS will be part of the detailed design process and a decision will be made post-consent prior to construction commencing.

1.5.8 Figure 1.15 and Figure 1.16 provide indicative substations views for AIS and GIS technologies.

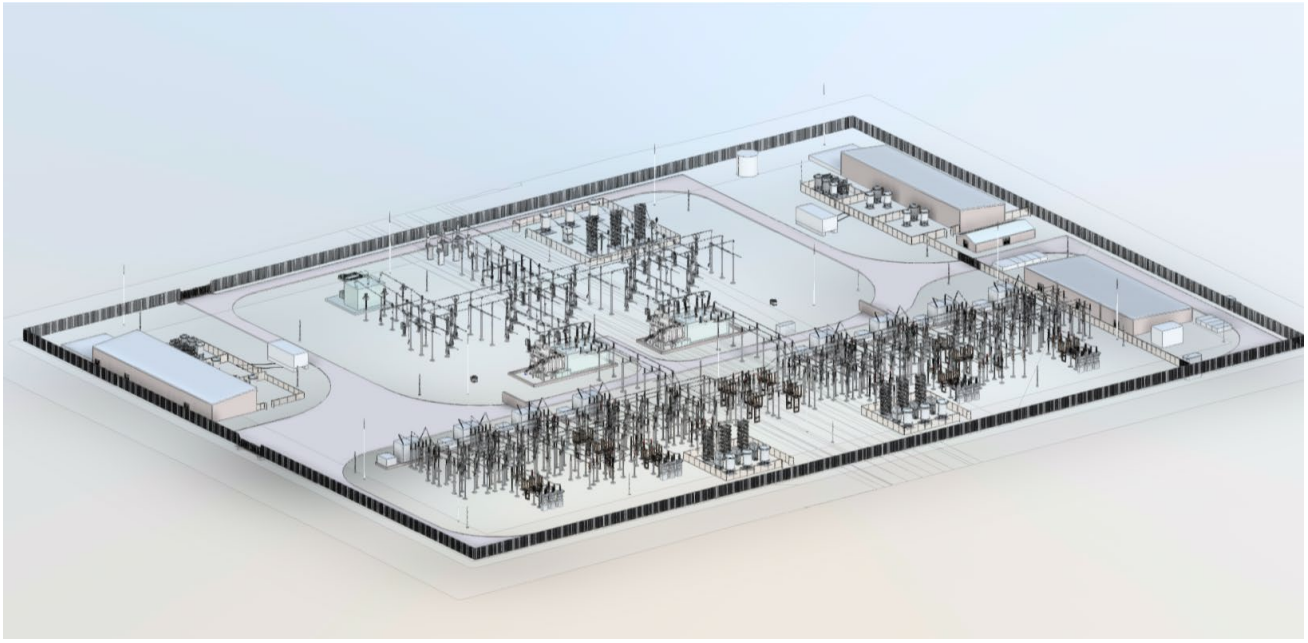

Figure 1.15: Indicative view of an AIS Substation

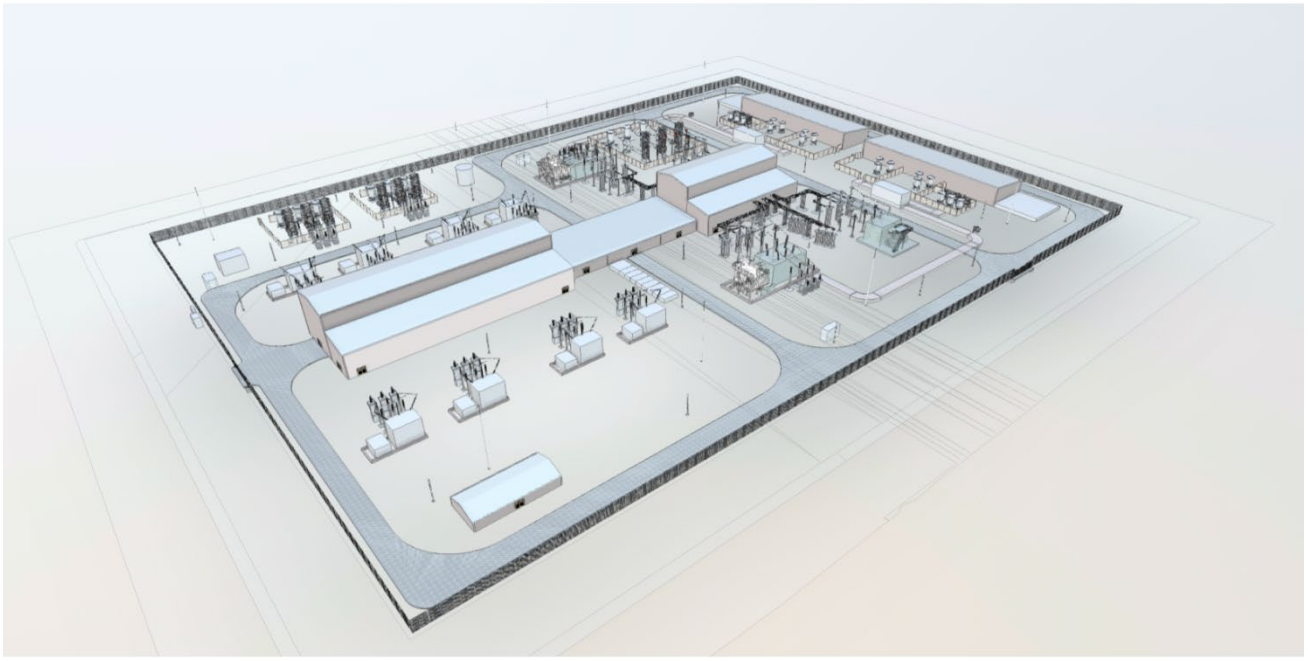

Figure 1.16: Indicative view of a GIS Substation

1.5.9 The largest structure within the OnSS will be the OnSS building, with a maximum height of 15 m above existing ground level (assuming a GIS design). All other equipment (e.g., transformers, switchgear) is designed not to exceed a height of 15 m above existing ground level with the exception of slender lightning masts which would be 18 m in height. While there would be lighting associated with the OnSS during the operational phase, this would be limited in extent and usage.

1.5.10 The total land requirement for the OnSS (assuming AIS layout) to the perimeter fence is 58,800 m^2, as well as additional land required for the TCC, roads, drainage and cut/fill.

1.5.11 The MDS associated with the OnSS are described in Table 1.10.

Table 1.10: Substation site MDS

Substation	Max Design Scenario
Indicative dimensions of AIS site	280 m x 210 m
Max area of AIS site	58,800 m²
Indicative dimensions of GIS site	250 m x 180 m
Max area of GIS site	45,000 m²
Indicative number of buildings	6
Indicative building dimensions	1 x 400 kV GIS building: 40 x 25 x 15 m high (only required for GIS substation, not for AIS) 1 x 132 kV GIS building: 65 x 25 x 12 m high (only required for GIS substation, not for AIS) 2 x STATCOM (Control & Valve) buildings: 55 x 15 x 7 m 1 x Control building (possibly several adjacent containerised buildings): 50 x 20 x 5 m 1 x Storage/Amenity building: 20 x 9 x 4 m
Max external equipment height	15 m
Max area of TCC	37,500 m²

ONSHORE SUBSTATION TEMPORARY CONSTRUCTION COMPOUND (OnSS TCC)

1.5.12 During construction of the OnSS, a TCC will be established to support the works. The area will be formed of hard standing with appropriate access to allow the delivery and storage of large and heavy materials and assets, such as power transformers.

1.5.13 The area will be approximately 37,500 m^2 and will accommodate construction management offices, welfare facilities, car parking, workshops and storage areas. Water, sewerage and electricity services will be required at the site and supplied either via mains connection or mobile supplies such as bowsers, septic tanks and generators. This area may also support the ECC works.

1.5.14 The OnSS TCC will not necessarily be a regular shape and may be split between several smaller areas to avoid constraints such as utilities or ecology receptors which are to be defined at ES stage.

1.5.15 The location of the OnSS TCC will be sited next to the OnSS in close proximity to the cable route with due consideration for avoiding existing utilities, ponds, watercourses, hedgerows and other known infrastructure/ constraints, where practicable, to minimise any potential impacts.

SUBSTATION CONSTRUCTION METHODS

1.5.16 The main OnSS construction works are anticipated to take place over an approximately 24-month period. Preliminary / enabling works may extend this period.

1.5.17 Site enabling works for the OnSS include site initial site clearance. The soil will be stripped and graded as required with material being reused on site where possible. Further information on soil management is in Volume 3, Chapter 5: Ground Conditions and Land Use. Any excess material will be disposed of at a licenced disposal site. Excavations and laying of foundations, trenches and drainage will commence after grading is complete.

1.5.18 Upon completion of the enabling works and installation of drainage and foundations, the substation platform will be finalised with a layer of stone combined with concrete pour. The exact thickness of the platform will be determined at detailed design stage following the ground investigation.

1.5.19 Foundations for the OnSS may require piling, however, confirmation of the foundation design, including the type and amount of piling is dependent on the ground investigations.

1.5.20 Specialist electrical equipment will be delivered to site, installed and commissioned. Due to the size and weight of the transformers' tanks, these deliveries will be classed as Abnormal Indivisible Loads (AILs). Such loads may require specialist delivery methods to be employed and, when on site, offloaded and skidded into position with the use of a mobile gantry crane.

1.5.21 Temporary perimeter fencing will enclose the OnSS for the duration of the construction period, and then during operation a permanent fence will be installed once constriction works are complete.

SEQUENCE OF CONSTRUCTION ACITIVITIES AT THE SUBSTATION

1.5.22 The likely sequence of activities at the OnSS are:

- Detailed site investigation works, pre-construction archaeological and ecological surveys and mitigation;
- Site enabling works will include the following:
  - Site clearance,
  - Site mobilisation, temporary security fencing and the establishment of the OnSS TCC;
  - The construction of temporary accesses and any local road improvements;
  - Ground works including cable ducting and new site drainage; and
  - Reprofiling (ground raising), establishment of the stoned site platform.

1.5.23 Installation of the OnSS including:

- Permanent security fencing and operational access road
- Construction of buildings (e.g. control and welfare) and other structures;

- Installation of electrical equipment such as switchgear, busbars, capacitors, reactors, reactive power compensation equipment, filters and cooling equipment;
- Commissioning of the electrical equipment; and
- Demobilisation, removal of the TCC and;
- Landscaping.

SUBSTATION LANDSCAPING, SCREENING AND PLANTING

1.5.24 Proposals for mitigation planting and screening will be developed once the location of the OnSS is confirmed. At this stage information on proposed planting mixes and approaches to mitigation planting is contained within the LEDPP. This may include proposals for advanced planting.

1.5.25 Currently, some PRoWs cross the substation search areas. Any requirement to permanently reroute any PRoWs will be identified when the location of the OnSS is confirmed and permanent diversions proposed.

SUBSTATION CONSTRUCTION TRAFFIC

1.5.26 Summary traffic generation estimates (two-way traffic) for the OnSS construction are provided in Table 1.11 with further information on traffic generation estimates for each parameter provided within the Traffic and Transport Chapter (Volume 3, Chapter 8).

Table 1.11: Daily two-way traffic generation estimates for OnSS construction

OnSS Parameter	TOTAL VEHICLES
Civil main works	71
Mechanical and Electrical equipment deliveries	1.33
Abnormal load deliveries	Approximately 8 two-way movements for transformers on 20 Axle frame trailers or similar Approximately 16 - 24 two-way movements oversized indivisible plant
Light vehicles/cars	30
Hazardous waste	0.7
Non-hazardous waste	0.4

ESTIMATED WASTE AND MATERIALS FOR OnSS

1.5.27 Table 1.12 provides an estimate of the materials used in the construction of the OnSS.

Table 1.12 Estimate of materials used in construction of the OnSS

Parameter	Base Value
Concrete (m^3)	6,975
Imported Engineered Fill (m^3)	70,606
Fencing (m)	1,030
Reinforcement (tonnes)	700
Chippings (m^3)	5,520
Drainage (m)	6,012
Structural Steel (tonnes)	450
Cladding (m^2)	5,700
Bituminous road (m^3)	8,750

1.5.28 Table 1.13 provides an estimate of waste generated from the construction of the OnSS.

Table 1.13: Estimate of waste generated from construction of the OnSS

Parameter	Base Value	Classification	Waste Management Option
Vegetation (m^3)	20	Non-hazardous	Exemption on site or disposal for controlled plants
Soil and stones (m^3)	23,640 (Substation Topsoil) 9,490 (Earthworks, assumed 50% reuse and 50% waste – figure shown is 50%)	Non-hazardous	Reuse on site where possible

Parameter	Base Value	Classification	Waste Management Option
Hardstanding, road surfaces (m^3)	3,750 (Bituminous surface from Construction Compound)	Non-hazardous	Reuse on site
Mixed construction waste (m^3)	150	Non-hazardous	Disposal
Wood (m^3)	3000	Non-hazardous	Segregation and recycling or recovery
Metal (m^3)	100	Non-hazardous	Segregation and recycling
Hard core (m^3)	1000	Non-hazardous	Reuse on site
Mixed Packaging (m^3)	120	Non-hazardous	Segregation and re-use or recycling
Contaminated packaging (m^3)	10	Hazardous	Treatment and disposal
Office general waste (m^3)	20	Non-hazardous	Treatment
Office paper (m^3)	3	Non-hazardous	Recycling
Canteen waste (m^3)	15	Non-hazardous	Composting and treatment
Waste hydraulic oil (m^3)	5	Hazardous	Disposal
Wiping cloths (m^3)	2	Non-hazardous	Disposal

1.6 EAST ANGLIA CONNECTION NODE SUBSTATION AND CONNECTION TO NATIONAL GRID

1.6.1 The 400 kV onshore ECC connection will be underground circuit(s) running from the proposed VE OnSS (within either SSA East or SSA West) to the new NGET EACN 400kV Substation.

1.6.2 The new National Grid EACN 400kV Substation facilitates the connection of the offshore generation to the main National Electricity Transmission System and will include HV transformers, reactors and other typical HV Plant and equipment.

1.6.3 The EACN Substation construction works will be consented separately by National Grid as part of their DCO for the EA GREEN Project.

1.6.4 The construction of infrastructure within the EACN substation compound will be co-ordinated with the main construction works being undertaken by NGET

1.6.5 The following is expected to be part of the new NGET EACN Substation construction works and consented by National Grid separately:

- Construction of a 400kV substation including but not limited to the construction of the main compound, access roads, cable troughs, buildings, HV electrical primary plant / switchgear and including all associated civils works ; and
- Provision of a construction access suitable for HGVs to enter the EACN substation construction site and a temporary construction / welfare compound that can be used by the Contractor undertaking the cable connection works to connect the new VE OnSS to the new NGET substation.

GRID CONNECTION POINT

1.6.6 The VE DCO application will include works for the cable connection between the new VE OnSS to the NGET substation and some specific works to facilitate the connection within the NGET substation as follows:

- Installation of switchgear bays in the NGET EACN substation;
- Installation of troughs / ducts to facilitate the 400kV circuits, Protection & Control cables from the VE onshore substation into the switchgear bays.
- Installation and termination of the 400kV circuits and Protection & Control cables between the VE substation and the switchgear in the National Grid substation;
- Installation of protection and control equipment (if required) within the National Grid relay building; and
- Temporary infrastructure such as haul roads and construction compounds to facilitate access, egress, laydown, storage and welfare containers which would be placed within close proximity of the work area.

1.6.7 The configuration of the VE switchgear within the footprint of the NGET EACN Substation station will depend on a number of factors including the detailed design of the equipment required and the final layout of the new NGET EACN Substation.

STATUS OF NATIONAL GRID PROPOSALS

1.6.8 NGET have identified a search area within which they anticipate their EACN substation will be located. This is the purple hatched highlighted area illustrated on Figure 1.8 above. At this stage NGET have not confirmed the exact location of the EACN substation within this search area. NGET have provided outline parameters for the EACN substation.

1.6.9 The whole search area has therefore been included within the VE PEIR RLB to ensure that the works required to connect the new VE OnSS to the NGET EACN substation (as set out above) are encapsulated and appropriately assessed. The VE RLB will be refined, as required, as further information is provided by NGET prior to the submission of the VE DCO application.

1.6.10 In light of the current uncertainty regarding the proposed location of the NGET EACN substation, it has only been practicable to consider any likely significant effects relating to the works between the VE OnSS and the NGET EACN substation at a very high level in the PEIR. These cumulative assessments are based on publicly available data and expert judgment from analogous projects. A full assessment, including a cumulative effects assessment, will be contained in the Environmental Statement that accompanies the DCO Application.

1.7 CONSTRUCTION HOURS

1.7.1 Core working hours for construction of the onshore components will be 07:00 – 19:00 Monday to Saturday, further information is included in the Draft CoCP.

1.7.2 No activity where noise is audible beyond the project boundary will take place outside of these hours including Sundays, public holidays, or bank holidays apart from under the following circumstances:

- where continuous periods of construction work are required, such as concrete pouring or directional drilling.
- for the delivery of abnormal loads to the connection works, which may cause congestion on the local road network, where the relevant highway authority has been notified prior to such works 72 hours in advance;
- where works are being carried out in the marine environment and may be tidally restricted; and
- as otherwise agreed in writing with the Relevant Authorities.

1.7.3 HDD (or other trenchless crossing techniques) at the landfall and other major crossing points may require works to take place for continuous periods. This has been assessed in Volume 3, Chapter 9: Airborne noise and vibration.

1.8 CONSTRUCTION PLANT AND EQUIPMENT

1.8.1 The types of construction plant and equipment that could be used during the onshore construction of VE are listed below. This list is not an exhaustive list of equipment, but an indication of the types of plant and equipment that could be used during standard construction:

- Vibrating compactor;
- Tarmac roller;
- Concrete mixer;
- Cable-pulling winch;
- Angle grinder;
- Pneumatic breaker;
- Tarmac production plant;
- Dump truck;
- Tracked excavator; and
- Lorries.

1.9 OPERATIONS AND MAINTENANCE

1.9.1 For the purposes of assessment, the operational lifetime of the project is assumed to be up to 40 years.

1.9.2 Onshore operations and maintenance activities can be categorised as preventative and corrective. Preventative maintenance is according to scheduled services whereas corrective maintenance covers unexpected repairs, component replacements, retrofit campaigns and breakdowns.

1.9.3 Onshore, the O&M requirements will be largely preventative, accompanied by infrequent on-site inspections of the onshore transmission infrastructure. However, the onshore infrastructure will be consistently monitored remotely, and there may be O&M staff visiting the OnSS to undertake works on a regular basis (expected to be once per week). The OnSS will not be manned, and lighting will only be required during O&M activities.

1.9.4 Link boxes will need to be serviced approximately once a year to ensure correct operation. Occasional access may also be required to the cable in the event of a fault and for repair purposes.

1.9.5 As the haul road will not be in place during the operational phase, VE will seek to agree appropriate access routes with the relevant landowner, as required.

1.9.6 Planned maintenance associated with the onshore ECC would involve approximately one visit to each cable joint pit per year by two maintenance personnel.

1.9.7 Unplanned maintenance may involve the repair of onshore cable faults. This is extremely rare (indicatively one to two events per lifetime). Typically, this involves excavating the two adjacent pits, pulling the cable back through the ducting and pulling a new cable through. Alternatively, the area of the fault may be excavated (with an additional up to 40 m in both directions) and two new joints installed within this area. Methods for excavation and reburial will be similar to the original installation.

1.10 DECOMMISSIONING

1.10.1 No decision has yet been made regarding the final approach to decommissioning for the Project as it is recognised that industry best practice, rules and legislation change over time. The detail and scope of decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator with decommissioning plan provided.

1.10.2 Closer to the time of decommissioning, it may be decided that removal of infrastructure, such as the cable circuits, would lead to a greater environmental impact than leaving some components in situ. In this case it may be proposed that cable circuits, cable ducts and Landfall infrastructure are to remain in situ where appropriate and any requirements for decommissioning at the Landfall will follow the appropriate regulatory regime.

1.10.3 A decommissioning plan would be required to be submitted prior to decommissioning as part of the suite of post-consent documentation for VE and will be secured in the DCO. The activities and methodology for decommissioning are likely to include:

- Dismantling and removal of electrical equipment;

- Removal of cabling, and where required leaving in situ as with the ducting;
- Removal and demolition of buildings, fences, and services equipment; and
- Reinstatement and landscaping works.

1.10.4 The decommissioning plan will follow the appropriate regulatory regime at the time.

1.11 PROJECT PROGRAMME

OVERVIEW

1.11.1 Following formal consultation on the PEIR, Five Estuaries Offshore Windfarm Limited (VE OWFL) is aiming to make final applications for the DCO by the end of 2023, and would expect consent determinations between Q4 2024 and Q1 2025. The aim is for VE to be operational and commissioned by 2030 in order to meet UK Government renewable energy targets.

1.11.2 The construction programme for VE is dependent on a number of factors which may be subject to change, including:

- Grid connection and proposed substation construction dates specified in agreements with the National Grid;
- The date that the necessary consents are granted;
- Should it be required, obtaining a Contract for Difference (CfD) from the UK Government within the anticipated programme; and
- The availability and lead in times associated with procurement and installation of project components.

ONSHORE PROGRAMME

1.11.3 Onshore preliminary works are anticipated to commence 2027. VE is anticipated to be operational in 2030.

1.11.4 Figure 1.17 illustrates the indicative durations and windows for each activity across the proposed project, and the order in which they may occur in the construction campaign. The overall full construction and commissioning for the project would be expected to take around 5 years to complete.

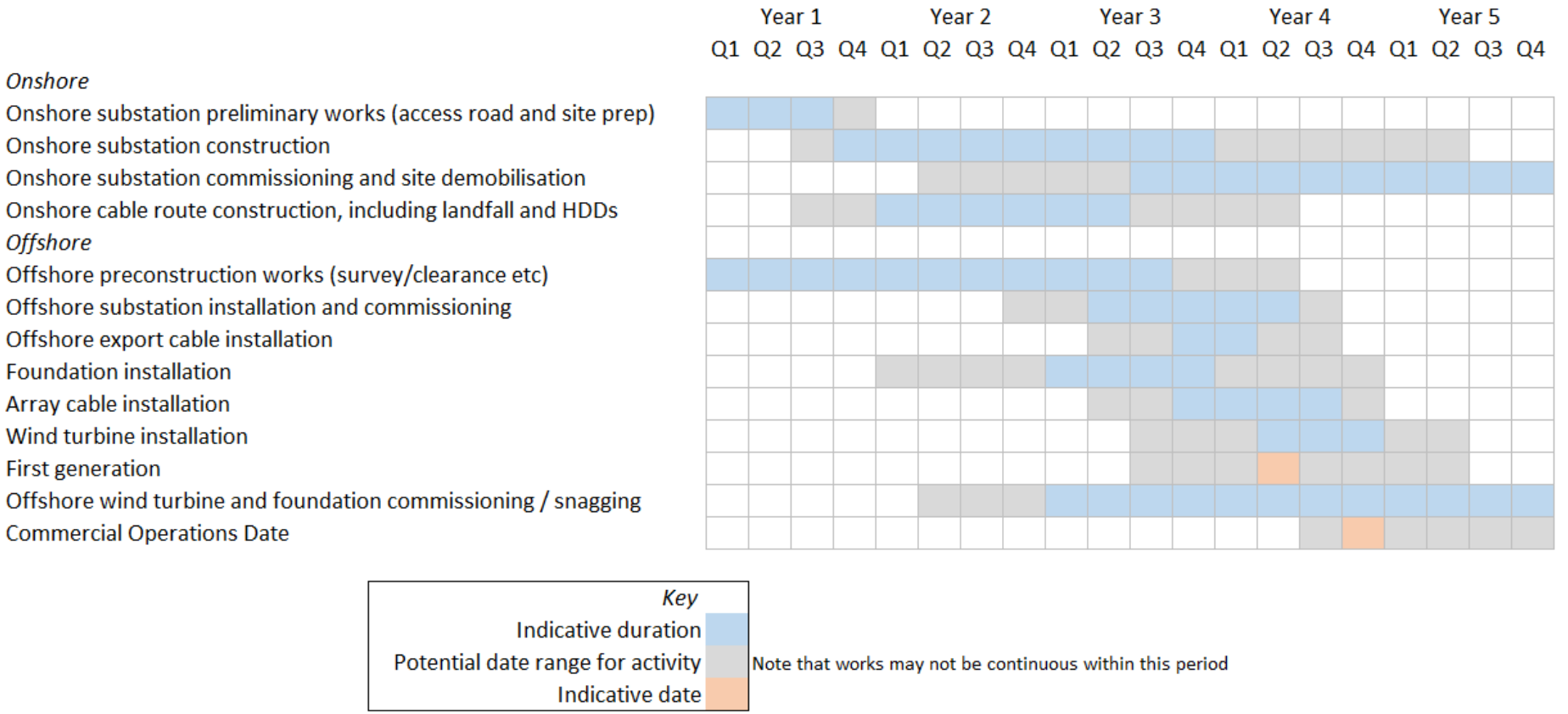

Figure 1.17: Indicative construction programme

FIVE ESTUARIES
OFFSHORE WIND FARM

PHONE 0333 880 5306
EMAIL fiveestuaries@rwe.com
WEBSITE www.fiveestuaries.co.uk
ADDRESS Five Estuaries Offshore Wind Farm Ltd
Windmill Hill Business Park
Whitehill Way, Swindon, SN5 6PB
COMPANY NO Registered in England and Wales
company number 12292474