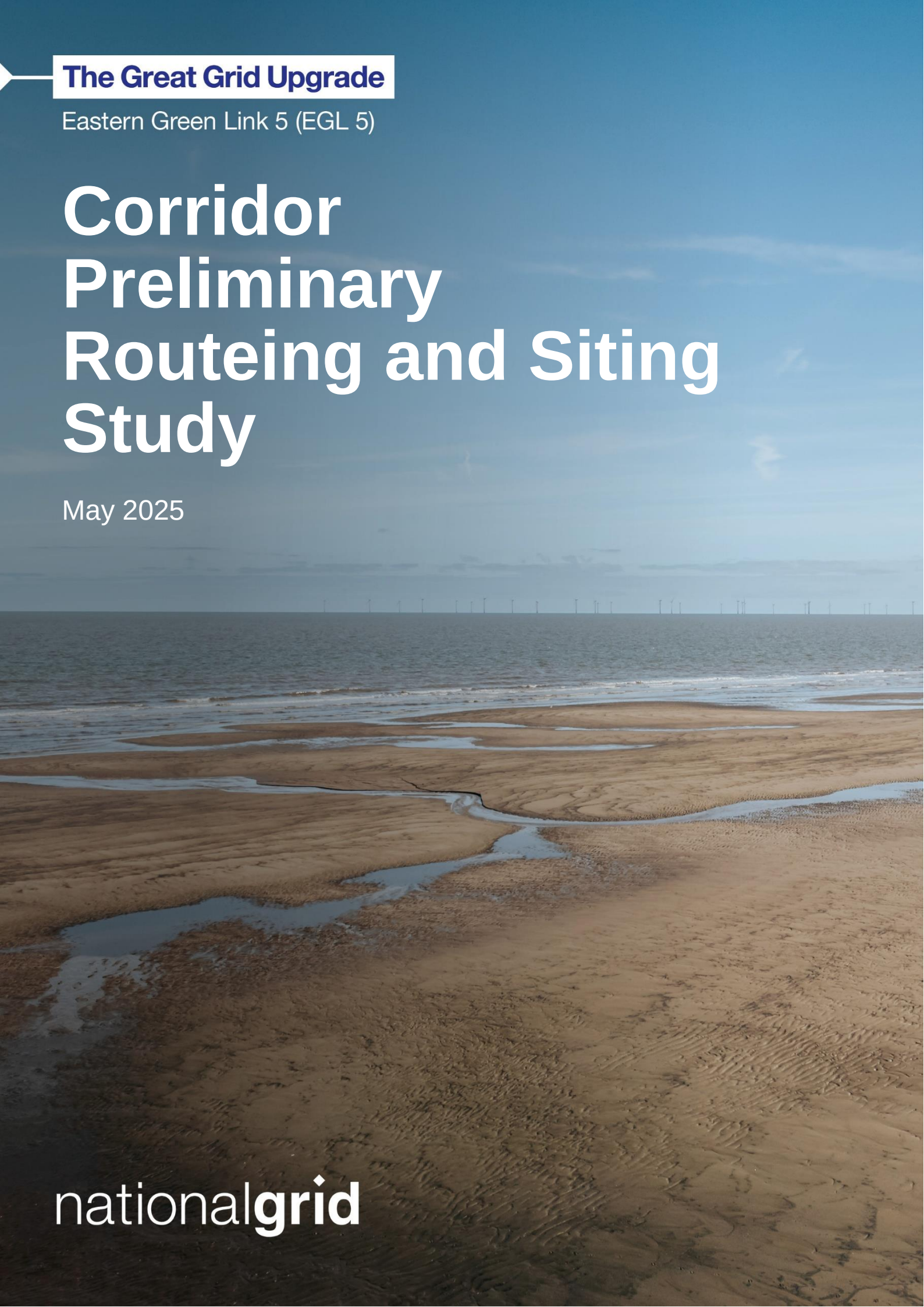
The Great Grid Upgrade

Eastern Green Link 5 (EGL 5)

Corridor Preliminary Routeing and Siting Study

May 2025



nationalgrid

Contents

Executive Summary 19

1. Introduction 24

1.1 Overview 24
1.2 Purpose 33
1.3 Structure of this Report 35

2. Aspects of the English Onshore Components of EGL 5 37

2.1 Introduction 37
2.2 Landfall 38
2.3 Underground Cables 39
2.4 Other Technical Considerations 44
2.5 Converter Stations 45

3. NGET's Approach to Routeing and Siting 47

3.1 Overview 47
3.2 NGET's Statutory Duties (Electricity Act 1989) 47
3.3 British Energy Security Strategy (2022) 48
3.4 Transmission Acceleration Action Plan 49
3.5 National Policy Statements (NPS) 50
3.6 The Holford and Horlock Rules 56
3.7 Clean Power 2030 Action Plan 58
3.8 National Planning Policy Framework (NPPF) (2024) 58
3.9 National Grid Electricity Transmission's Approach to Consenting 59

4. Options Identification and Selection Process (Stage 2) 62

4.2 Step 1: Define the Study Area 64
4.3 Step 2: Scope Environmental Topics and Baseline Data-gathering 65
4.4 Step 3: Ascribe a weight to, confirm and 'Heat Map' features 67
4.5 Step 4: Identifying and Defining Corridors, Siting Zones or Siting Areas 69
4.6 Step 5: Landfall Appraisal and Confirmation of Corridors, Siting Zones or Siting Areas for Appraisal 72
4.7 Step 6: Site Visits and Refinement of Corridors, Siting Zones or Siting Areas 72
4.8 Step 7: Options Appraisal of Corridors, Siting Zones or Siting Areas 73

4.9 Steps 8 and 9: Confirm Emerging Preferred Corridor(/s), Siting Zone(/s) or Siting Area(/s) and Develop Graduated Swathe for Consultation 74
4.10 Step 10: Undertake Non-Statutory Consultation 75

5. Study Area, Corridor, Siting Zone and Siting Area Definition 77
5.1 Introduction 77
5.2 Defining the Study Areas (Step 1) 77
5.3 Description of the Study Area 87
5.4 Scope of Environmental Topics and Data Gathering (Step 2) 88
5.5 Ascribe a weight to, confirm and 'Heat Map' Features (Step 3) 93
5.6 Identifying and Defining Corridors, Siting Zones or Siting Areas (Steps 4 to 6) and Landfall Appraisal (Step 5) 96
5.7 Mitigation of Impacts Through Avoidance 104
5.8 Introduction to the Cost and Programme Model 105
5.9 Next Step - Options Appraisal (Step 7) 106

6. Options Appraisal – Underground Cable Corridors 110
6.1 Introduction 110
6.2 Options Appraisal 112
6.3 Environmental Factors 112
6.4 Engineering 127
6.5 Comparative Appraisal and Conclusion 133

7. Options Appraisal – EGL 5 Converter Station Siting Zones 135
7.1 Introduction 135
7.4 Engineering Factors 156
7.5 Horlock Rules 159
7.6 Comparative Appraisal and Conclusion 160

8. Option Selection 163
8.1 Introduction 163
8.2 Emerging Preferences 163

9. Cost and Programme Performance 167
9.1 Introduction 167
9.2 The Cost and Programme Estimate Options 167
9.3 National Grid's Cost and Programme Estimates 169
9.4 Conclusion 171

10. Development of the Graduated Swathe 172
10.1 Introduction 172
10.2 Developing the Graduated Swathe 173
10.3 Description of Graduated Swathe 173
10.4 Summary of the Graduated Swathe 179

11. Summary and Next Steps 182
11.1 Summary of Options Identification and Selection Process (Stage 2) 182
11.2 Non-statutory Consultation 183
11.3 Analysing Non-statutory Consultation Feedback 183
11.4 Defined Proposal and Statutory Consultation (Stage 3) 184

Tables

Table 0-1 – Abbreviations 7
Table 0-2 – Glossary of Terms 10
Table 4-1 – Description Associated with Sensitivity Weighting 67
Table 5-1 – Data Gathering Features (Underground Cables) 89
Table 5-2 – Data Gathering Features (Converter Station) 91
Table 5-3 – Major Features Representing Constraints within the Study Area 104
Table 5-4 – Options Appraisal Sub-Topics and Constraints 106
Table 6-1 – Landscape character and key visual receptors 116
Table 6-2 – Sites designated for Nature Conservation and Priority habitats 120
Table 6-3 – Identified Designated Heritage Assets identified within 1 km 121
Table 6-4 – Water environment features within and adjacent to Corridor 124
Table 6-5 – Socio-Economic features identified within the Corridors. 125
Table 6-6 – Access Constraints between the Landfall and LCS-B 130
Table 6-7 – Major Road and Utility Crossings between the Landfall and LCS-B 131
Table 6-8 – Number of Large & Moderate Watercourse Crossings within each Corridor 132
Table 7-1 – Landscape characteristics of the EGL 5 Converter Station Siting Zones 140
Table 7-2 – Relevant Sites Designated for Nature Conservation and Priority Habitat 146
Table 7-3 – Identified Designated Heritage Assets within 1 km 149
Table 7-4 - Identified socio-economic features within or immediately adjacent to Siting Zones 154
Table 9-1 – Cost estimates 170

Figures

Figure 1-1 – Example Images of NGET's Transmission System 25
Figure 1-2 – NGET's Approach to Project Development and Delivery 27
Figure 1-3 – Boundaries B6, B7a, B8 and B9 that EGL 5 is designed to transport electricity across from Scotland 29
Figure 1-4 – Option 1 Lincolnshire Connection Substation (LCS) potential strategic option 31
Figure 1-5 – EGL 5 Location – English Onshore Components 32
Figure 1-6 – Example annotated Graduated Swathe taken from a recent National Grid project, showing the key elements to aid interpretation 34
Figure 2-1 – Example TJB following reinstatement 39
Figure 2-2 – Example HVDC Cable Construction 41
Figure 2-3 – Example HVAC Cable Construction 43
Figure 4-1 – CPRSS Methodology 63
Figure 4-2 – Example of how Sensitivity Weighting is Incorporated into Heat Mapping 68
Figure 5-1 – Study Area 79
Figure 5-2 – Landfall Study Areas and Key Environment Features 81
Figure 5-3 – Landfall Study Areas and Key Water Features 82
Figure 5-4 – EGL 5 Converter Station Initial Search Area, Study Area, Siting Zones/Areas and Key Features 85
Figure 5-5 – Converter Station Heatmap 94
Figure 5-6 – Underground Cable Heatmap 95
Figure 5-7 – Landfalls, Siting Zones, Siting Areas and Corridors Identified for EGL 5 97
Figure 5-8 – Landfall, Siting Zones and Corridors Defined for EGL 5 103
Figure 6-1 – Corridors between the Anderby Creek Landfall Study Area and LCS-B 111
Figure 6-2 – Environment features between the Anderby Creek Landfall Study Area and LCS-B 115

Figure 6-3 – Water environment features between the Anderby Creek Landfall Study Area and LCS-B 123
Figure 6-4 – Engineering features between the Anderby Creek Landfall Study Area and LCS-B 128
Figure 7-1 – EGL 5 Converter Station Siting Zone locations 136
Figure 7-2 – Key landscape and visual features adjacent to EGL 5 Converter Station Siting Zones 139
Figure 7-3 – Key ecological features adjacent to EGL 5 Converter Station Siting Zones 145
Figure 7-4 – Key heritage features adjacent to EGL 5 Converter Station Siting Zones 148
Figure 7-5 – Key water features adjacent to EGL 5 Converter Station Siting Zones 152
Figure 7-6 – Key engineering features adjacent to EGL 5 Converter Station Siting Zones 158
Figure 8-1 – Emerging Preferred Landfall, Corridors and EGL 5 Converter Station Siting Zones 165
Figure 9-1 – Options used within the cost and programme estimate model 168
Figure 10-1 – Anderby Creek Landfall Graduated Swathe 174
Figure 10-2 – EGL 5 Converter Stations Graduated Swathe 176
Figure 10-3 – Landfall to LCS-B Graduated Swathe 178
Figure 10-4 – EGL 5 English Onshore Components Graduated Swathe 180

Appendices

Appendix A Landfall Options Appraisal

Table 0-1 – Abbreviations

Abbreviations	Definition
AC	Alternating Current
AIL	Abnormal Indivisible Load
BNG	Biodiversity Net Gain
BMV	Best and Most Versatile
CPRSS	Corridor Preliminary Routeing and Siting Study
CFPGM	Coastal and Floodplain Grazing Marsh
CROW	Countryside and Rights of Way
CS	Converter Station
DC	Direct Current
DNO	Distribution Network Operator
DTS	Distributed Temperature Sensing
EGL	Eastern Green Link
EPS	European Protected Species
NESO	National Energy System Operator (formerly Electricity System Operator (ESO))
FEED	Front-End Engineering Design
FES	Future Energy Scenarios
FRA	Flood Risk Assessment
GIS	Geographical Information Systems (or Gas Insulated Switchgear dependent upon context)
GtW	Grimsby to Walpole
GWDTE	Ground Water Dependent Terrestrial Ecosystem
GW	Gigawatt
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HND	Holistic Network Design
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
LCA	Landscape Character Assessment

Abbreviations	Definition
LCS	Lincolnshire Connection Substations
LCT	Landscape Character Type(s)
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MoD	Ministry of Defence
MPA	Mineral Planning Authority
MW	Megawatt
NCA	National Character Area
NCN	National Cycle Network
NETS	National Grid Electricity Transmission System
NGED	National Grid Electricity Distribution Plc
NGET	National Grid Electricity Transmission Plc
NL	National Landscape
NPS	National Policy Statement
Ofgem	Office of Gas and Electricity Markets
OS	Ordnance Survey
PRoW	Public Right of Way
RAG	Red, Amber, Green
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEC	Sealing End Compound
SINC	Site of Importance for Nature Conservation
SOR	Strategic Options Report
SPA	Special Protection Area
SPZ	Source Protection Zone
SQSS	Security and Quality of Supply Standard
SSEN-T	Scottish and Southern Electricity Networks Transmission
SSSI	Site of Special Scientific Interest
TCM	Trenchless Construction Method

Abbreviations	Definition
WFD	Water Framework Directive

Table 0-2 – Glossary of Terms

Term	Definition
High Voltage Alternating Current (HVAC)	Electric power transmission in which the voltage varies in a sinusoidal fashion. This is the most common form of electricity transmission and distribution.
Air Insulated Switchgear (AIS)	An AIS composing electrical disconnect switches or circuit breakers used to control, protect and isolate electrical equipment.
Converter Station (CS)	Facility containing specialist equipment (some indoors and some potentially outdoors) for the purposes of converting electricity from HVAC to HVDC or HVDC to HVAC.
Corridor	A broad preliminary area, which National Grid seeks to identify within the Study Area where new transmission infrastructure for the English Onshore Component of the Project's underground cables could be routed.
Corridor Preliminary Routeing and Siting Study (CPRSS)	The CPRSS reports the process undertaken as part of the Options Identification and Selection Stage (Stage 2) to identify an emerging preferred Corridor, Siting Zones and/or Siting Areas within which the required infrastructure for the English Onshore Component of the Project may be located.
Direct-buried	Direct burial of cables involves excavating trenches into which the cables are installed on a bed of selected sand or cement bound sand with the use of winches or power rollers. Sheet piling or timber is used to support the sides of the trenches.
High Voltage Direct Current (HVDC)	Electric power transmission in which the voltage is continuous. This is most commonly used for long distance point to point transmission
Distribution Network Operator (DNO)	A Distribution Network Operator is the company that owns and operates the overhead power lines and infrastructure that connects the National Grid electricity transmission system to properties and businesses. The DNOs in proximity to the Project are Northern Power Grid (NPG), National Grid Electricity Distribution Plc (NGED) and UK Power Networks (UKPN).
Department for Energy Security and Net Zero (DESNZ)	The ministerial department responsible for UK energy security, protecting billpayers and reaching net zero.
Easement	The right to use the land of another party for a specified purpose. In the context of electricity transmission, easements are often used to grant rights to install and retain equipment such as overhead lines or buried cables across the land of a third party.
Eastern Green Link 3 (EGL 3) Project	Located between Aberdeenshire in Scotland and Norfolk in England, the EGL 3 Project represents major reinforcement of the electricity transmission system to meet the requirements of generation connections in Scotland. The EGL 3 Project is expected to comprise

Term	Definition
	new converter stations, HVDC and HVAC underground cables and new substation.
Eastern Green Link 4 (EGL 4) Project	Located between Fife in Scotland and Norfolk in England, the EGL 4 Project represents major reinforcement of the electricity transmission system to meet the requirements of generation connections in Scotland. The EGL 4 Project is expected to comprise of new converter stations, HVDC and HVAC underground cables and new substation.
Eastern Green Link 5 (EGL 5)	Located between Scotland and England, the Project represents major reinforcement of the electricity transmission system to meet the requirements of generation connections in Scotland. EGL 5 is expected to comprise of the following component projects: Scottish Onshore, Scottish Offshore, English Offshore and English Onshore. EGL 5 is expected to comprise a new converter station, HVDC and HVAC underground cables.
Electricity Transmission System	In England and Wales, the electricity transmission system is made up largely of 400 kV and 275 kV assets connecting separately owned generators, interconnectors, large demands fed directly from the transmission system, and distribution systems. The electricity transmission system is designed to make sure there is sufficient transmission capacity to ensure that the system can be operated in an economic and efficient way by the NESO, ensuring power can be moved from where it is generated to demand centres across Britain. The planning and development of the electricity transmission system is governed by the Security and Quality of Supply Standard (SQSS) which ensures that the network is developed and operated securely and is resilient to any foreseeable network faults and disruption.
Emerging Preferred Corridor	An area within which the transmission infrastructure for the English Onshore Component of the Project may be located, based on the findings of the Options Identification and Selection Stage (Stage 2).
Emerging Preferred Siting Area	An area within which the converter station for the Project may be located, based on the findings of the Options Identification and Selection Stage (Stage 2).
Emerging Preferred Siting Zone	An area within which the Emerging Preferred Siting Area may be located, based on the findings of the Options Identification and Selection Stage (Stage 2).
The Project	The English Onshore Component and English Offshore Component of EGL 5 between the English/Scottish Offshore boundary and the electricity transmission connection point in England.
English Onshore Component	All components of EGL 5 between the electricity transmission connection point in England and the Mean Low Water Spring (MLWS) in England. The English Onshore Component of EGL 5 is expected to comprise a new converter station, HVDC and HVAC underground cables.

Term	Definition
English Offshore Component	All components of EGL 5 between the Mean High Water Spring (MHWS) in England and the English/Scottish Offshore boundary.
Frac-out	The unintentional return or inadvertent loss of drilling fluids from the borehole to the ground surface from points other than its entry and exit points, during a drilling operation.
Future Energy Scenarios (FES)	Published annually by the NESO to indicate possible future power requirements and where future connections may occur across the network.
Graduated Swathe	Shaded areas within the emerging preferred Corridors, Siting Zones and/or Siting Areas within which infrastructure forming part of the English Onshore Component of the Project is considered more or less likely to be located, shown by the varying levels of shading. Darker shaded areas represent where infrastructure is likely to be better located, in NGET's emerging view at this stage, within the Corridors, Siting Zones and/or Siting Areas.
Grimsby to Walpole Project	Located in the Humber and East Midlands region of England, the Grimsby to Walpole Project comprises major reinforcement of the electricity transmission system. This will allow increased north-south power flows and facilitate the connection of new sources of clean energy including power generated by offshore wind farms that will land on the East coast. The Grimsby to Walpole Project is expected to comprise a new overhead electricity transmission line, new 400 kV substations at Grimsby West and Walpole, together with new connection substations in Lincolnshire. There will be associated works to connect the new route into substations at either end, and to alter existing infrastructure crossed by the route, including crossings of existing 400 kV transmission lines.
Holford Rules	A series of guideline rules around overhead line routeing. The guidelines were initially developed in 1959 and have been reviewed on a number of occasions by NGET and by the other UK transmission licence holders. One of the reviews was against the Electricity Act 1989. The Guidelines provide a set of design criteria that have stood the test of time and become accepted industry best practice in overhead line routeing. The guidelines now form an important part of national planning policy relating to the development of electricity networks, as set out in National Policy Statement EN-5[1].
Horlock Rules	A series of guideline rules for the siting and design of new substations, or substation extensions, converter stations and includes consideration of line entries and sealing end compounds (SECs). The guidelines were initially developed in 2003 and have been reviewed on a number of occasions by NGET, with a revised version issued in 2009. The Horlock Rules provide a set of principles which avoid, or reduce the environmental impacts associated with the development of substation infrastructure.

[1] National Policy Statement for Electricity Networks Infrastructure (EN-5).

Term	Definition
Indicative Study Area	The indicative area of the preferred strategic option identified at the Strategic Options Appraisal at the Strategic Proposal Stage (Stage 1).
Landfall	Where the submarine cables come ashore. It is the interface between the English Onshore Component and English Offshore Component of the Project.
Landfall Study Area	A search area of 1 km around each of the identified preliminary landfall areas and associated preliminary offshore subsea cable routes.
National Grid Group	Throughout this Report the term NGET is used to refer to National Grid Electricity Transmission Plc (see below). The wider National Grid Group comprises several businesses, including National Grid Ventures and National Grid Electricity Distribution. These businesses are not licenced Transmission Owners and do not develop the national transmission system.
National Energy System Operator (NESO)	NESO plans and operates the transmission for the whole of Great Britain. NESO ensures electricity is always where it is needed, and the network remains stable and secure in its operation. Generation and interconnector customers apply to NESO when they wish to connect to the network and NESO leads the work to consider how the network may need to evolve to deliver a cleaner, greener future. As of 1st October 2024, NESO became a public corporation owned by the Department for Energy Security and Net Zero (DESNZ). They were formerly part of National Grid PLC and were called the Electricity System Operator.
National Grid Electricity Distribution Plc (NGED)	A separate company from NGET, operating within the wider National Grid Group, NGED is a DNO operating in proximity to the Project.
National Grid Electricity Transmission Plc (NGET)	NGET operate the national electricity transmission network across Great Britain and own and maintain the network in England and Wales, providing electricity supplies from generating stations to local distribution companies. NGET does not distribute electricity to individual premises, but its role in the wholesale market is vital to ensuring a reliable, secure, and quality supply to all.
National Policy Statement (NPS)	Government planning policy relating to the development of Nationally Significant Infrastructure Projects (NSIPs) is set out in the relevant National Policy Statement (NPS). NSIPs should be developed in accordance with the relevant NPS. In the case of new transmission routes the relevant energy-related NPS are EN-1; Overarching NPS for Energy[2] and EN-5; Electricity Networks[1].
National Site Network (NSN)	Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in the UK no longer form part of the EU's Natura 2000 ecological network. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 have created a national site network (NSN) on

[2] Overarching National Policy Statement for Energy (EN-1).

Term	Definition
	land and at sea, including both the inshore and offshore marine areas in the UK. The NSN includes: • Existing SACs and SPAs; and • New SACs and SPAs designated under these Regulations. Designated Wetlands of International Importance (known as Ramsar sites) do not form part of the national site network. Many Ramsar sites overlap with SACs and SPAs and may be designated for the same or different species and habitats. All Ramsar sites remain protected in the same way as SACs and SPAs.
Non-statutory Consultation	An engagement process which will be undertaken to capture public, stakeholder and landowner feedback on the emerging preferred Corridors, Siting Zones and/or Siting Areas, and the graduated swathe. The feedback received will inform the onward development of the Project.
Northern Power Grid (NPG)	A power distribution company operating in northeast England and Yorkshire. NPG is a DNO operating in proximity to the Project.
Options Appraisal	A robust and transparent process used to compare options and to assess the potential impacts they may have across a wide range of criteria including environmental, socio-economic, technical and cost factors.
Options Identification and Selection	Work undertaken to determine the emerging preferred Corridor and preliminary routeing options for the English Onshore Component of the Project. It is intended to demonstrate how NGET's statutory duties, licence obligations, policy considerations, environmental, socio-economic, technical, cost, and programme issues have been considered and to provide information on the approach to the identification and appraisal of Corridors.
Overhead Line	An above ground electricity line that safely and securely transmits electricity through a series of conductors (wires). An overhead line comprises a series of components including: supporting structures, such as pylons; line fittings, such as electrical insulators and conductor spacers; an earthwire (to protect the line from electrical faults and carry control data) and; the conductors themselves.
Project Need Case	Sets out the reasons why the Project is required.
Pylon	Overhead line structure used to carry overhead electrical conductors, insulators and fittings.
Ramsar Site	An area of land designated under the Ramsar Convention to conserve wetlands, especially those providing waterfowl habitat.
Scottish Offshore Component	All components of EGL 5 between the Mean High Water Spring (MHWS) in Scotland and the English/Scottish Offshore boundary.
Scottish Onshore Component	All components of EGL 5 between the transmission connection point and MLWS in Scotland.

Term	Definition
Security and Quality of Supply Standard (SQSS)	The SQSS sets out a coordinated set of criteria and methodologies for planning, constructing and operating the National Grid Electricity Transmission System (NETS).
Site of Special Scientific Interest (SSSI)	An area of land designated by Natural England as of special interest by reason of its flora, fauna or geological or physiographical features.
Siting Area	An area of land, of sufficient size, within which a single converter station could be sited (with allowance for micrositing where relevant).
Siting Zone	An area of land within a study area, within which more than one configuration of converter station (Siting Area) could be located.
Special Area of Conservation (SAC)	An area of land designated under the under Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora to protect one or more special habitats and/or species.
Special Protection Area (SPA)	An area of land designated under the Directive 79/409 on the Conservation of Wild Birds to protect the habitats of migratory birds and certain particularly threatened birds.
Strategic Proposal	The outcome of the strategic options appraisal process; the Strategic Proposal is taken forward to the Options Identification and Selection Stage (Stage 2).
Study Area	The broad area within which infrastructure (Landfall, Corridors, Siting Zones and/or Siting Areas) required for the English Onshore Component of the Project could be located and within which detailed environmental and socio-economic data is gathered to inform the Options Identification and Selection Process.
Substation	A secure node on the electricity system where: switching may be undertaken to direct power flows; operating voltages may be altered through the use of electricity transformers and; sources of electricity import, generation and/or demand can be connected. Substations may be located either outdoors or within a building but will always be enclosed by a secure perimeter fence.
System Boundaries	A boundary splits the system into two parts, crossing critical circuit paths that carry power between areas and where power flow limitations may be encountered. Boundaries help identify regions where reinforcement is most needed by enabling analysis of power transfers between separated areas. They can be local boundaries, which are small areas of the Transmission System with a high concentration of generation, or wider boundaries, which are large areas containing significant amounts of both generation and demand.
Tee-Point	The point at which two electrical routes connect together.
Transition Joint Bay (TJB)	Buried concrete pad with joint connecting offshore and onshore cables located above MHWS.

Term	Definition
Transmission Owner (TO)	The owner of transmission assets such as underground cables, overhead lines and substations.
Underground Cable	An insulated conductor carrying electric current designed for underground installation.
Wirescape	Caused by multiple overhead lines running in different angles or the proximity of multiple overhead lines.

EGL 5
Document Control

Document Properties	
Organisation	National Grid Electricity Transmission
Author	National Grid Electricity Transmission, WSP, Mott MacDonald
Approved by	Stephen Mathers (Project Director)
Title	Corridor Preliminary Routeing and Siting Study (CPRSS)
Document Register ID	EGL 5-WSP-LAN-CON-010-A
Published Document Ref	EGL 5-WSP-LAN-CON-010-A-Corridor Preliminary Routeing and Siting Study
Data Classification	Public

Version History

Document	Version	Status	Description/Changes
February 2025	1.0	First draft for comment	-
March 2025	2.0	Work in progress	
April 2025	3.0	Comments addressed	
April 2025	4.0	Final	For non-statutory consultation

Executive Summary

nationalgrid

Executive Summary

National Grid Electricity Transmission Plc (NGET) owns, builds and maintains the high voltage electricity transmission system in England and Wales. Scottish and Southern Electricity Networks Transmission (SSEN-T) and Scottish Power Energy Networks (SPEN) own, build and maintain the high voltage electricity transmission system in Scotland. In each of their geographical areas, NGET, SSEN-T and SPEN are responsible for making sure electricity is transported safely and efficiently from where it is produced to where it is needed.

Eastern Green Link (EGL) 5 is a joint venture between NGET and SSEN-T. NGET is responsible for all onshore infrastructure in England including substations, converter stations, overhead lines and underground cables, and offshore infrastructure in English waters. SSEN-T are responsible for the onshore infrastructure in Scotland and offshore infrastructure in Scottish waters.

EGL 5 is a proposed new primarily offshore high voltage electricity link, with associated onshore infrastructure, between Scotland and England. EGL 5 would transport enough clean energy from Scotland to power up to two million homes in parts of the North, Midlands and South of England. By doing so, it would play an important role in building a more secure and resilient future energy system and decarbonising the UK.

EGL 5 will comprise Scottish Onshore, Scottish Offshore, English Offshore and English Onshore components. NGET is responsible for consenting the offshore works in English waters and all onshore works in England. This Report has been developed in tandem with the English Marine Options Appraisal undertaken for EGL 5 to ensure consistency. This Report is written with specific regard to the English Onshore Component of the Project.

Strategic Optioneering

The indicative location for this new transmission reinforcement was identified through a Strategic Options Appraisal undertaken at the Strategic Proposal Stage (Stage 1)[3]. This considered a range of options for providing the necessary north-south power flows identified as being needed to accommodate the amount of generation being proposed off the eastern coast of the UK.

Summary of the English Onshore Component of the Project

The English Onshore Component of the Project will establish a new transmission connection with up to approximately 9 km of High Voltage Direct Current (HVDC) underground cable and 3 km of High Voltage Alternating Current (HVAC) underground cable (up to approximately 12 km in total length) between a new landfall, a new converter station, and a new substation. The English Onshore Component of the Project will connect to a new 400 kV substation being promoted and consented by the NGET Grimsby to Walpole (GtW) Project. The GtW Project, being promoted and developed by NGET to reinforce the electricity transmission system to help deliver the UK Government's Net Zero targets, will establish a new (wholly or largely overhead line) 400 kV transmission connection between Grimsby and Walpole. As part of the GtW Project, two new substations are proposed in the Alford area, Lincolnshire Connection

[3] NGET's Approach to Consenting outlines the project development process, divided into six stages, for major infrastructure projects; Strategic Proposal, Options Identification & Selection, Defined Proposal & Statutory Consultation, Assessment & Land Rights, Application, Examination & Decision and Construction, with Strategic Proposal being Stage 1 and Construction being Stage 6. NGET's Approach to Consenting is detailed in Chapter 3 of this Report.

Substations (LCS) (-A and -B), which are required to provide new point on the network where connections for customers and other planned transmission connections can be made. It is proposed that the English Onshore Components of the Project would connect to the proposed 400 kV LCS-B.

This Report is the ***Corridor Preliminary Routeing and Siting Study (CPRSS)*** for the English Onshore component of the Project, which details the work undertaken at the Options Identification and Selection Stage (Stage 2). This includes development and refinement of preliminary Landfalls, preliminary Corridors for underground cables, preliminary Siting Zones and/or preliminary Siting Areas for the converter station, and the comparative assessment of these to identify NGET's preferred Landfall, preferred Corridors, and preferred Siting Zones which together comprise the broad location of the new infrastructure required to meet the Project need.

This CPRSS will be used to inform the non-statutory consultation and engagement with key stakeholders, including landowners. The non-statutory consultation will take place in Spring/Summer 2025.

In summary, the English Onshore Component of the Project comprises the following:

- A new landfall located on the Lincolnshire coast. The landfall is the interface between the EGL 5 English Offshore Component and English Onshore Component;
- A new underground HVDC cable route, from the landfall to a new converter station in the vicinity of the proposed 400 kV LCS-B, including A Transition Joint Bay (TJB) which will enable the connection of the offshore and onshore HVDC underground cable connections;
- The new EGL 5 converter station; and
- A new underground HVAC cable route, between the new EGL 5 converter station and the proposed 400 kV LCS-B.

The reasons for selecting emerging preferences for each of these components are as follows:

Landfalls

Two preliminary Landfall Study Areas were identified and taken forward in the options appraisal; these were:

- Theddlethorpe, located approximately 4.5 km north of the town of Mablethorpe on the Lincolnshire coast; and
- Anderby Creek, located both north and south of the village of Anderby Creek, on the Lincolnshire coast.

Overall, when considering all topics Anderby Creek was identified as the preferred landfall location over Theddlethorpe. Anderby Creek offers the best opportunity for landfall installation, particularly from an ecological perspective and it poses fewer onshore engineering constraints.

The identification of Anderby Creek as the preferred landfall subsequently informed the identification of the preferred underground HVDC cable routes.

EGL 5 Converter Station

Two emerging preferences for siting a new converter station near the proposed 400 kV LCS-B have been identified. The two emerging preferences are a Siting Zone (CS05, referred to as 'EGL 5 West Converter Station' at Stage 1 (non-statutory) consultation) located northeast of Bilsby, or a Siting Zone (CS06, referred to as 'EGL 5 East Converter Station' at Stage 1 (non-statutory) consultation) located northwest of Huttoft. These emerging preferences represent the best opportunity to limit potential landscape and visual effects between the Project and the GtW Project, help to reduce the potential for other environmental and socio-economic effects whilst minimising the length of connecting HVAC underground cables for the Project and the technical complexity during construction and operation. Few factors were identified to differentiate between the two Siting Zones and both options are taken forward at this stage to allow for further design flexibility at later stages and respond to external project factors such as electricity transmission projects being proposed in Lincolnshire. It will also allow further information to be gathered by National Grid on network capacity and for feedback from non-statutory public consultation to be considered before selecting a final preferred Siting Area.

Underground Cables (HVDC): Landfall to EGL 5 Converter Station

The emerging preference for the HVDC underground cable connection from the preferred Anderby Creek landfall to the EGL 5 converter station routes across Roman Bank before continuing west crossing the A52. From here, there are two routeing options for the underground cables. One corridor continues southwest past Asserby, Huttoft and Thurlby, before reaching an area northeast of Bilsby, terminating at the A1111 whilst the other crosses the A52 north of Huttoft. The emerging preference represents the best opportunity to limit environmental and socio-economic effects and technical complexity, whilst also representing the most direct and therefore, lower cost route (up to 9 km in total). Retaining route options at this stage also allows for further design flexibility at later stages of the Project.

Underground Cables (HVAC): EGL 5 Converter Station to Proposed 400 kV LCS-B

The emerging preference for the HVAC cable route from the EGL 5 converter station to the proposed 400 kV LCS-B varies according to which Siting Zone will be selected. Should Siting Zone CS06 be selected, HVAC cables will traverse west (south of Asserby, and north of Thurlby), and over Boy Grift Drain to connect with the proposed 400 kV LCS-B. HVAC cables from CS06 would be longer in length than for CS05 (up to 3 km in total), as the proposed 400 kV LCS-B will be located closer to CS05.

Graduated Swathe

A 'graduated swathe' has been identified within the emerging preferences. The graduated swathe is a way of showing the areas within the emerging preferences where the required permanent Project infrastructure is considered more or less likely to be located. The graduated swathes are shown with a colour shading, with the depth of shading indicating NGET's emerging view of where infrastructure would be best located based on the work undertaken to date. Darker shading indicates more likely locations, while lighter shading indicates less likely locations.

The use of the graduated swathe is intended to emphasise the preliminary nature of judgements made to date in respect of infrastructure locations within the emerging preferred Corridors 5 (north of Huttoft) and 6 (south of Huttoft) (for both HVDC and HVAC underground cables) and Siting Zones CS05 (EGL 5 West Converter Station) and CS06 (EGL 5 East Converter Station). The graduated swathe represents the current thinking on where the English Onshore Component of the Project infrastructure may be located. This will be informed by feedback received during non-statutory consultation and therefore there is the potential for the final design of the English Onshore Component of the Project to extend beyond the graduated swathe and emerging preferences. This will be fully considered through the development of the English Onshore Component of the Project, whilst maintaining the principles used to develop the current graduated swathe, for instance, the avoidance of areas of highest constraint such as settlements.

Next steps

During non-statutory consultation, NGET will be inviting feedback from landowners, local communities and stakeholders about our work to date, the emerging preferences and graduated swathe and matters that they would like us to consider as we develop our proposals in more detail. The feedback from non-statutory consultation, along with information from proposed surveys to supplement our baseline data and ongoing design studies will inform the further development of the English Onshore Component of the Project. The final proposed design will be subject to Environmental Impact Assessment, statutory public consultation, and design development prior to submission of the application to the Secretary of State for a Development Consent Order (assuming a section 35 is granted for the Project, as detailed further in paragraph 1.1.5).

1. Introduction

1. Introduction

1.1 Overview

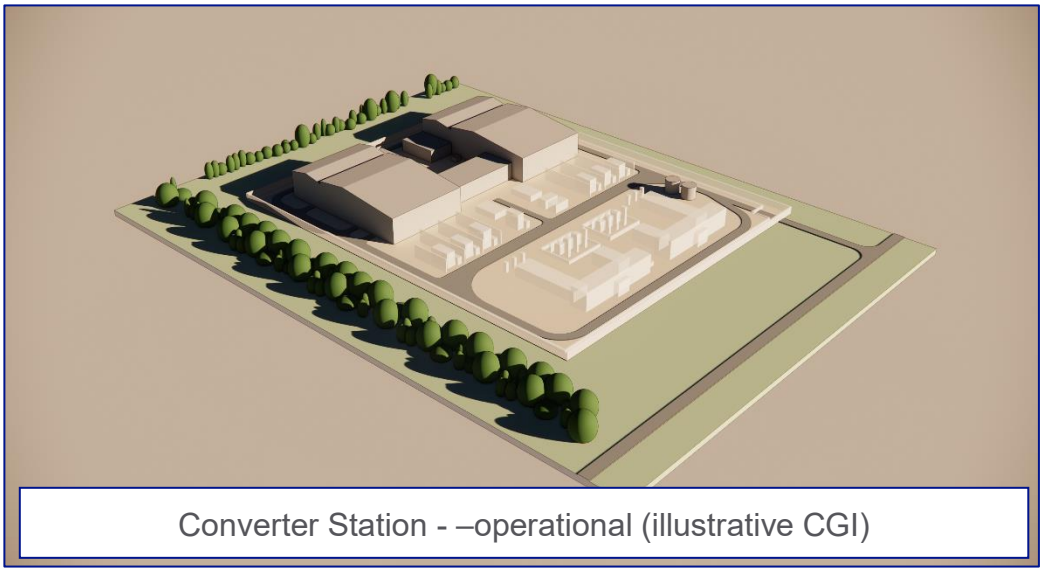
1.1.1 National Grid Electricity Transmission Plc (NGET) owns, builds and maintains the high voltage electricity transmission system in England and Wales. NGET is responsible for making sure electricity is transported safely and efficiently from where it is produced to where it is needed and for developing upgrades to the network as agreed with the industry regulator, the Office of Gas and Electricity Markets (Ofgem).

1.1.2 The National Energy System Operator (NESO) controls and operates the high voltage electricity transmission system in England and Wales. The NESO facilitates several roles on behalf of the electricity industry, including making formal offers to connection applicants to the National Electricity Transmission System (NETS). NESO also manages shortfalls in capacity by reducing power flows and constraining generation, as well as making investment recommendations to Transmission Owners (TOs), including NGET, through an annual network planning cycle and other periodic reviews. This indicates which areas of the transmission system require reinforcement.

1.1.3 NGET's transmission system in England and Wales consists of approximately 7,250 km of overhead lines and a further 1,450 km of underground cable, operating at 400 kilo volts (kV) and 275 kV. The 275 kV grid was developed in the 1950s to provide a national electricity transmission system, and then developed further from the mid-1960s, at 400 kV to increase its power carrying capacity. The overhead lines and underground cables connect around 300 substations to form a highly interconnected network. The substations provide points of connection to the local distribution networks, which operate at voltages from 132 kV down to 240 V (the voltage at which electrical power is distributed to domestic consumers). The distribution networks are owned by Distribution Network Operators (DNOs), including Northern Power Grid (NPG) and National Grid Electricity Distribution (NGED) in the East Midlands region of England.

1.1.4 Example images of NGET's transmission system are shown in **Figure 1-1**.

Figure 1-1 – Example Images of NGET's Transmission System



Converter Station - –operational (illustrative CGI)

Substation – operational

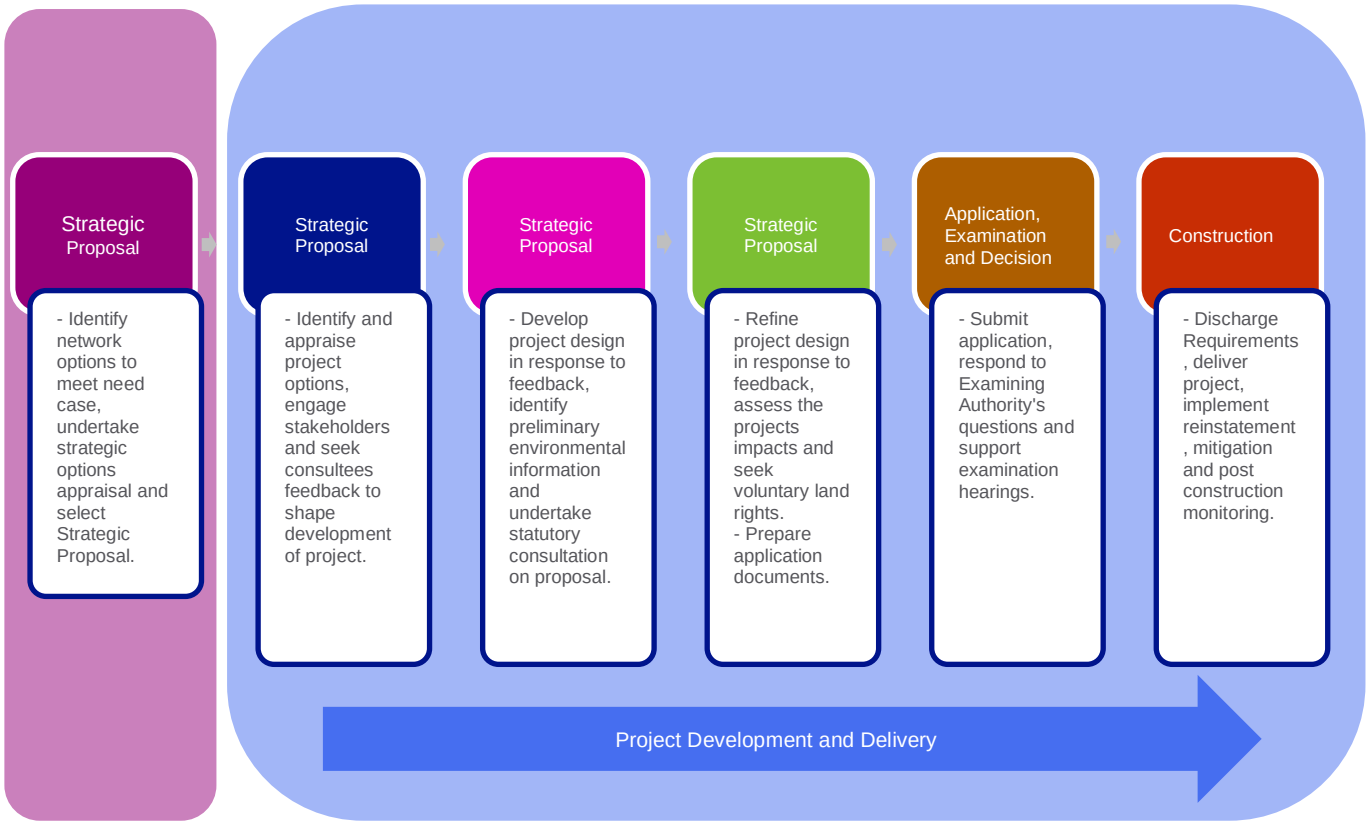
Overhead Line – operational

High Voltage Direct Current (HVDC) Underground Cables – in construction

1.1.5 NGET's Approach to Consenting[4] sets out how NGET seeks to develop, consent, and ultimately deliver its major electricity transmission reinforcement projects in an economic, efficient and co-ordinated manner. The approach is based on a section 35 direction being issued by the Secretary of State, and the Project following the Development Consent Order (DCO) consenting process, under the Planning Act 2008. The approach comprises six distinct stages, as shown in **Figure 1-2** which presents an overview of NGET's staged Approach to Consenting. The Approach to Consenting is explained in more detail in **Chapter 3** of this Report.

[4] NGET develops projects through a six-stage process set out in the Approach to Consenting (April 2022) guidance available at https://www.nationalgrid.com/electricity-transmission/network-and-infrastructure/planning-and-development. Accessed 02 August 2024. The process is detailed further in Chapter 3 of this Report.

Figure 1-2 – NGET's Approach to Project Development and Delivery



Background and Summary of Need

1.1.6 The electricity industry in Great Britain is undergoing unprecedented change. The Climate Change Act 2008 (as amended) now commits the UK Government by law to reducing greenhouse gas emissions by at least 100% from the 1990 baseline by 2050. This 2050 target is commonly known as 'Net Zero'. The Scottish Government's target is to become Net Zero by 2045, five years ahead of the rest of the UK.

1.1.7 To achieve Net Zero, there will need to be a substantial shift away from the use of fossil fuel burning generation and towards new generating and interconnection capacity. The UK Government has set clear targets of 50 Gigawatt (GW) of offshore wind generation by 2030[5] and up to 140[6] GW by 2050. There is particular growth forecast in offshore wind capacity in Scotland[7] and the northeast of England, as well as subsea 'onshore' transmission or 'bootstraps' to and from Scotland and to and from European power grids. This will put pressure on the existing network such that reinforcement of the network in the East Midlands area has been identified as necessary to ensure optimal operation of the transmission system and reliable economic long-term supply.

1.1.8 The existing electricity transmission and distribution networks in Great Britain both operate using predominantly High Voltage Alternating Current (HVAC) systems. However, High Voltage Direct Current (HVDC) technology allows electricity to be transmitted from point to point in much larger volumes, over greater distances, with fewer transmission losses compared to an equivalent HVAC system. This flexibility brings operational benefits; however, to transmit electricity in Direct Current (DC) form, specialist electrical equipment contained within converter stations is required at either end of the transmission line to convert the power from Alternating Current (AC) to DC, or vice versa.

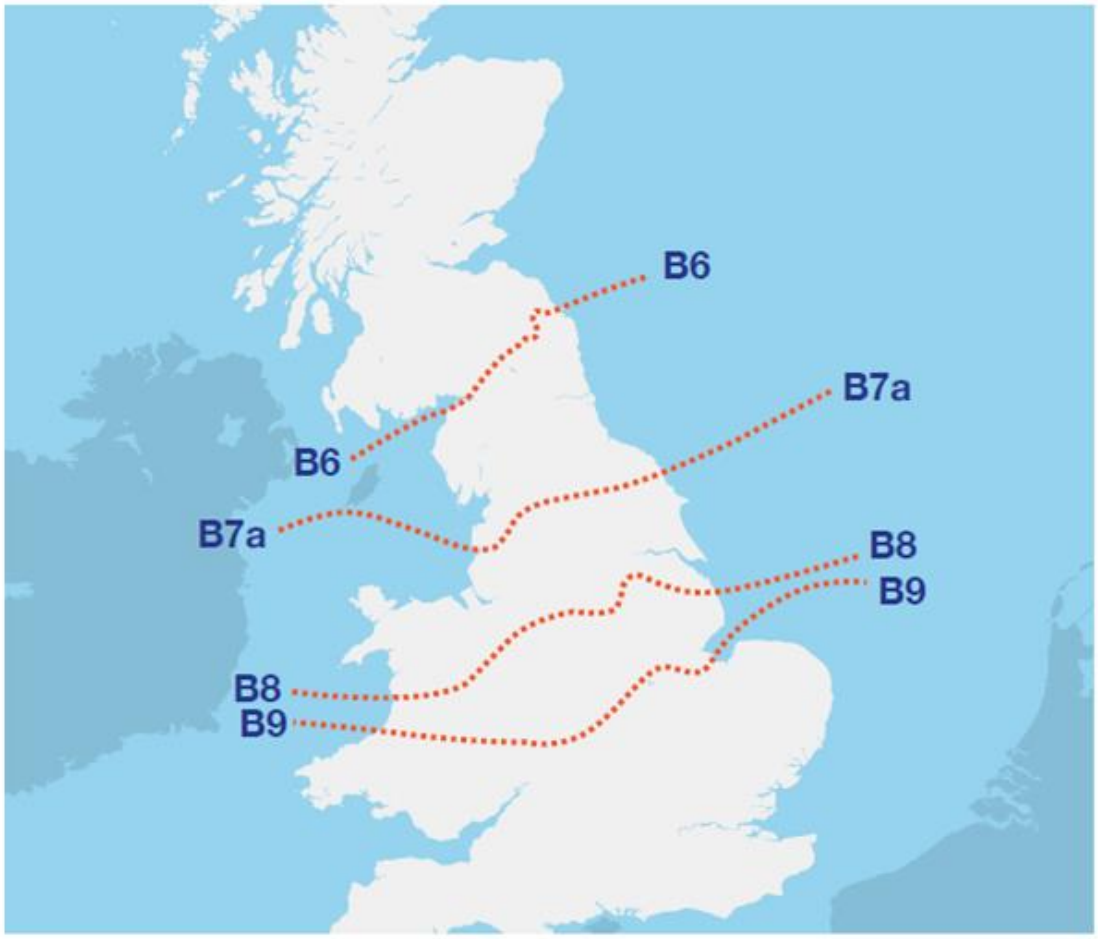
1.1.9 The electricity network system in Britain is split into boundaries. Each boundary has a limit to the amount of electricity that can flow through it. As more electricity is needed and is being generated in Britain, we can assess where the power flows between these boundaries will need to increase. The boundaries shown in **Figure 1-3** - through the north and the midlands - are where we need to increase the capacity of the Grid for this increased amount of electricity. EGL 5 is one of the projects needed to help achieve this.

[5] UK Government, (2022), British Energy Security Strategy. Available at https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy. Accessed 02 August 2024.

[6] Committee on Climate Change, (2020), The Sixth Carbon Budget. Available at https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf. Accessed 02 August 2024.

[7] The Crown Estate Scotland states that the offshore wind leasing round in Scottish waters (ScotWind) could result in as much as 27.6GW of new generating capacity being built over the next decade. Available at https://www.crownestatescotland.com/scotlands-property/offshore-wind/scotwind-leasing-round. Accessed 02 August 2024.

Figure 1-3 – Boundaries B6, B7a, B8 and B9 that EGL 5 is designed to transport electricity across from Scotland



1.1.10 Potential strategic options were identified to meet the need case for EGL 5, provide the best economic solution and meet NGET's transmission licence obligations (including to provide an efficient, economic and co-ordinated transmission system in England and Wales). The SOR evaluated each of the identified strategic options in respect of environmental constraints, socio-economic effects, technology alternatives, capital and lifetime costs. The SOR concluded that EGL 5 could be connected south of the B8 transmission boundary to or near to a Main Interconnected Transmission System substation (identified as one of the two proposed new LCS). This is relayed as Option 1 (LCS) in the SOR, the 'Indicative Study Area' in this Report, and is shown below in **Figure 1-4**.

1.1.11 The new LCS are proposed to be consented and developed pursuant to the NGET Grimsby to Walpole Project[8] (described in this Report as the 'GtW Project'). The GtW Project is being developed by NGET to reinforce the electricity transmission system to help deliver the UK Government's Net Zero targets. It forms part of a major programme of reinforcement of the electricity transmission system to accommodate substantial increases in north-south power flows. It will establish a new (wholly or largely overhead line) 400 kV transmission connection. As part of the GtW Project, two new 400 kV substations are proposed in the Alford area, LCS-A and LCS-B. Therefore, the

[8] The Strategic Options Report and Corridor and Preliminary Routeing and Siting Study Report for the Grimsby to Walpole Project are available at https://www.nationalgrid.com/electricity-transmission/network-and-infrastructure/infrastructure-projects/grimsby-to-walpole

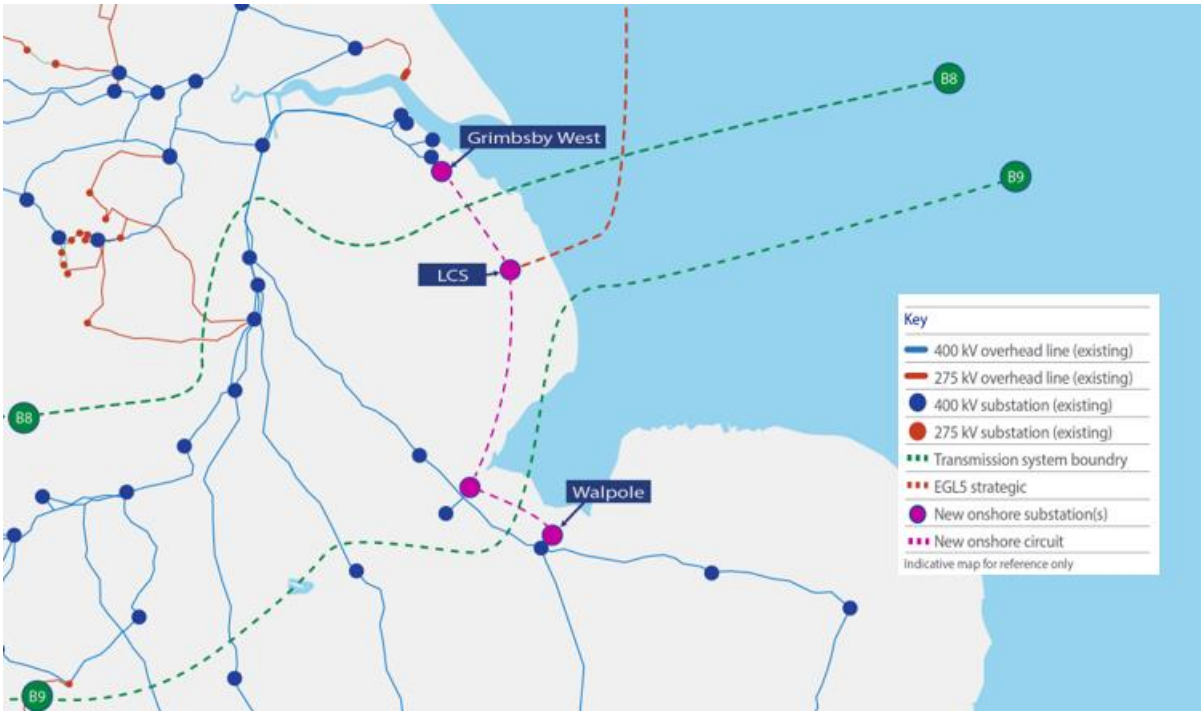
connection of EGL 5 to the NETS, via the LCS, is contingent on the GtW Project achieving consent. The GtW Project is currently in the pre-application stage of the national infrastructure planning process. Non-statutory consultation was held between 18 January to 13 March 2024. Analysis of consultation feedback and further technical studies and design work are ongoing ahead of statutory consultation planned for Summer 2025. Submission of the GtW DCO application is expected in Summer 2027. Subject to gaining development consent in 2028, it is anticipated that construction of the GtW Project would commence in 2029.

1.1.12 Also referenced in this Report are the NGET EGL 3 and EGL 4 Projects, which are two major reinforcements of the electricity transmission system to meet the requirements of generation connections in Scotland. The EGL 3 Project is located between Aberdeenshire in Scotland and Norfolk in England. The EGL 4 Project is located between Fife in Scotland and Norfolk in England. The EGL 3 and EGL 4 Projects, each comprise offshore HVDC cabling, onshore HVDC cabling, new converter stations and onshore HVAC cabling, with both EGL 3 and EGL 4 connecting at a new Walpole substation. Non-statutory consultation was held between Tuesday 23 April to Monday 17 June 2024, and statutory consultation will be undertaken at the same time as the Project's non-statutory consultation. Submission of the EGL 4 and EGL 4 Projects DCO application is expected in Spring 2026.

1.1.13 Reference is also made to the Ossian Offshore Wind Farm (OWF) Project, a joint venture between SSE Renewables (SSER), Copenhagen Infrastructure Partners (CIP) and Marubeni Corporation (Marubeni). The Ossian OWF Project's Onshore Transmission Infrastructure, relevant to the English Onshore Component of the Project, comprises the Onshore Export Cable(s) and Onshore Converter Station(s). One of these Onshore Converter Station(s) is proposed in the vicinity of the LCS-A (proposed by the GtW Project, refer to Paragraph 1.1.11), and it should be noted that there is a strong likelihood that Ossian's northern most identified offshore converter station search area overlaps with CS05. The Ossian OWF Project is currently in the pre-application stage of the national infrastructure planning process, with the Scoping Report[9] submitted to the Secretary of State in February 2025.

[9] The Scoping Report for the Ossian Offshore Wind Farm (OWF) Project is available at https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN0210006/documents

Figure 1-4 – Option 1 Lincolnshire Connection Substation (LCS) potential strategic option



1.1.14 The scope of this Report consists of the English Onshore Component of the Project i.e. the Landfall, the onshore underground cable routeing, and the siting of the converter station. The indicative location, in Lincolnshire within the East Midlands region of England, of these components is shown in . This Report has been developed in tandem with the English Marine Options Appraisal[10] (which focuses on the intertidal/nearshore approach to the Landfall Siting Areas (ending at mean high-water springs (MHWS), and the offshore cable routeing) to ensure a consistent and coordinated approach to routeing and siting.

[10] EGL 5 English Marine Options Appraisal (NGET, February 2025)

Figure 1-5 – EGL 5 Location – English Onshore Components

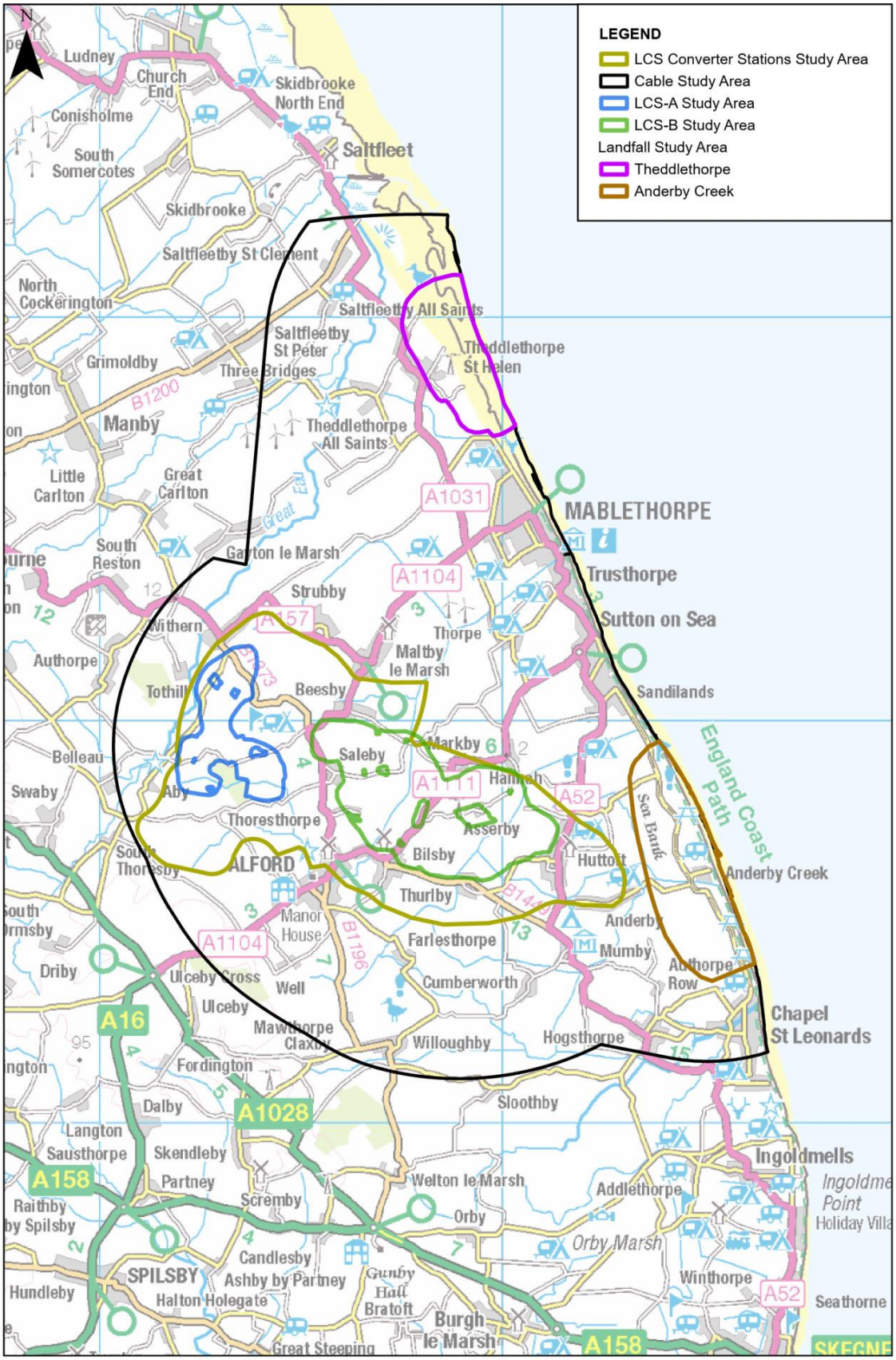


Figure 1-5 - EGL 5 Location - English Onshore Components

SCALE: 1:150,000

0 1 2 3 4 Km

1.1.15 The onshore transmission connection components associated with EGL 5 within England (described in this Report as the English Onshore components) are outlined below (and further described in **Chapter 2**):

- A proposed HVDC cables Landfall (ending at mean low water springs (MLWS)) on the Lincolnshire Coast;
- A TJB which will enable the connection of the offshore and onshore HVDC underground cable connections;
- Up to 9 km of onshore HVDC underground cables;
- A new converter station in the vicinity of one of the proposed LCS in East Lindsey District; and
- Up to 3 km of HVAC underground cables.

1.1.16 NGET will also need to commission local changes to the lower voltage distribution networks to facilitate the construction of the English Onshore components.

1.2 Purpose

1.2.1 This Report is the Corridor Preliminary Routeing and Siting Study (CPRSS), which has been undertaken to facilitate the gathering of feedback on the English Onshore Component of the Project from all interested parties as part of the non-statutory consultation. The CPRSS reports the process undertaken as part of the Options Identification and Selection Stage (Stage 2) shown in , to identify an emerging preferred Landfall, Corridor and emerging preferred Siting Zones or Siting Areas within which the required infrastructure for the English Onshore Component of the Project may be located. A description of the proposed Project infrastructure within the scope of this CPRSS is set out in **Chapter 2**.

1.2.2 This CPRSS sets out the routeing and siting activities undertaken to date, including the identification, refinement and assessment of Landfalls, preliminary Corridors within which HVDC and/or HVAC underground cables would be located, preliminary Siting Zones and/or preliminary Siting Areas within which converter stations would be located. This Report also explains NGET's emerging preferences for the broad location of new infrastructure to meet the need case for the Project, as set out below. These emerging preferences are presented as a 'graduated swathe'.

1.2.3 The graduated swathe is a way of showing the areas within the emerging preferred Corridors, preferred Siting Zones and/or preferred Siting Areas where the required Project infrastructure is considered more or less likely to be located. The Corridor, Siting Zones, and Siting Areas are shown with a colour shading, with the depth of shading indicating NGET's emerging view of where infrastructure would be better located based on the work undertaken to date. Darker shading indicates more likely locations, while lighter shading indicates less likely locations, as shown by the example (not forming part of the Project) in .

1.2.4 The use of the graduated swathe is intended to emphasise the preliminary nature of judgements made to date in respect of infrastructure locations within the emerging preferred Corridors, Siting Zones and/or Siting Areas. The feedback received from the non-statutory consultation will be considered in the detailed routeing and siting work for the Defined Proposal and Statutory Consultation Stage (Stage 3). This feedback may also lead to modification of the emerging preferred Corridor, Siting Zones and/or Siting Areas.

Figure 1-6 – Example annotated Graduated Swathe taken from a recent National Grid project, showing the key elements to aid interpretation

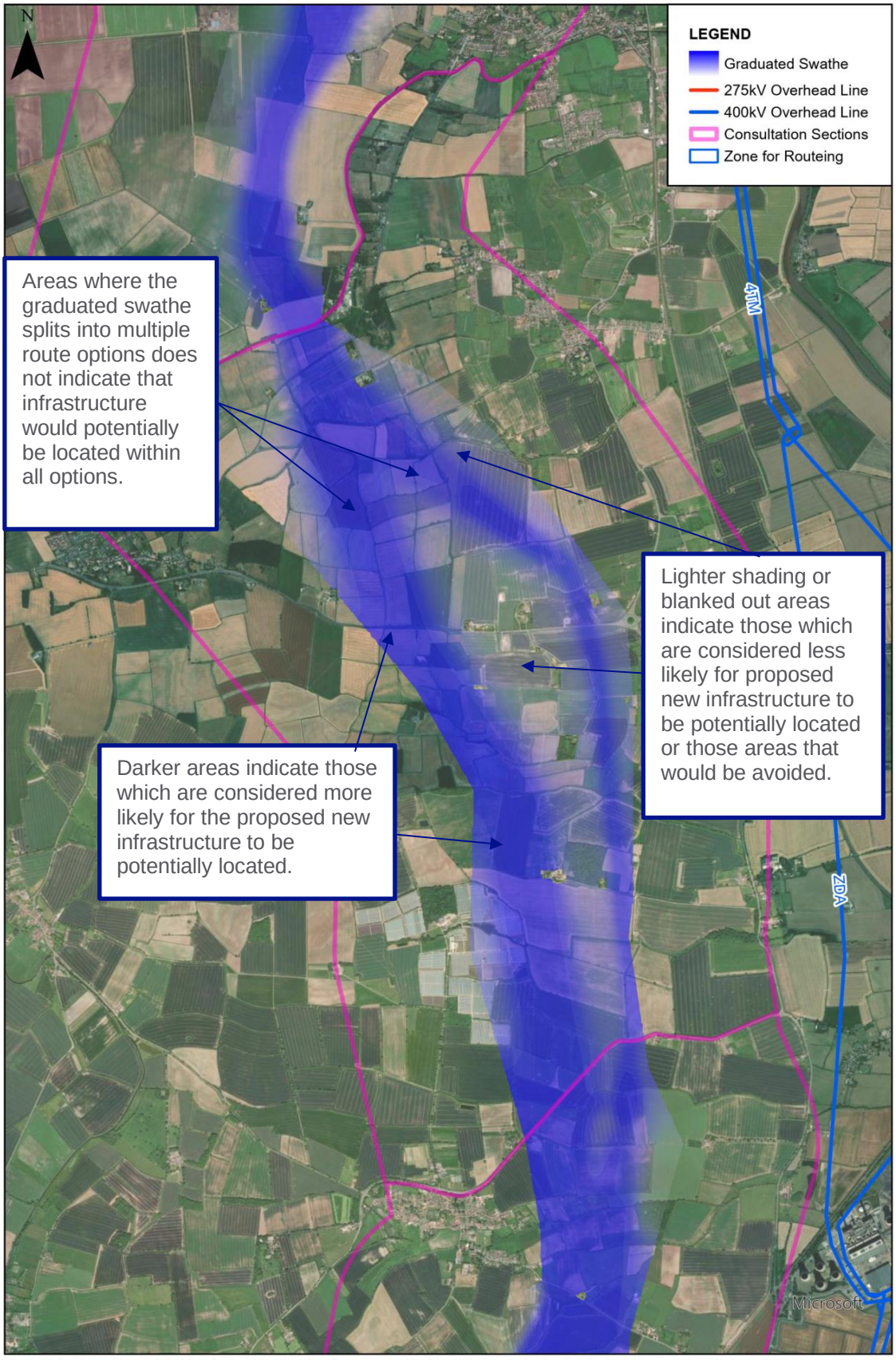


Figure 1-6 - Example annotated Graduated Swathe taken from a recent National Grid project, showing the key elements to aid interpretation

SCALE: 1:45,000

0 0.5 1 Km

1.3 Structure of this Report

1.3.1 The Report is structured as follows:

- **Chapter 2: Aspects of the Project (English Onshore Component of EGL 5)** – summarises the key components of the English Onshore Component of the Project.
- **Chapter 3: National Grid Electricity Transmission's Approach to Routeing and Siting** – an overview of NGET's guidance, its statutory duties and relevant policy.
- **Chapter 4: Option Identification and Selection Process** – sets out the process used to identify, appraise, and select Corridors and Siting Zones (or Siting Areas), following NGET's guidance and in line with relevant policy.
- **Chapter 5: Study Area, Corridor and Siting Zone Definition** – details the steps undertaken to identify the Study Area for the English Onshore Component of the Project and to define the Landfall, Corridors and Siting Zones (or Siting Areas) for appraisal (including sections and links).
- **Chapter 6: Options Appraisal – Underground Cable Corridors** – provides the key environmental and technical constraints for each preliminary Corridor between the Landfall and LCS.
- **Chapter 7: Options Appraisal – EGL 5 Converter Station Siting Zones** – provides the key environmental and technical constraints for each preliminary Siting Zone for the EGL 5 converter station.
- **Chapter 8: Option Selection** – provides comparative analysis of the Corridors, Siting Zones and/or Siting Areas to identify those emerging as preferred.
- **Chapter 9: Cost and Programme Performance** – shows the range of the best and worst performing cost and programme estimates for each of the preliminary Corridors.
- **Chapter 10: Development of Graduated Swathe** – summarises the approach taken to developing the graduated swathe for the English Onshore Component of the Project and its intended use.
- **Chapter 11: Summary and Next Steps** – presents a summary of the CPRSS and outlines the next steps in the English Onshore Component of the Project.

2. Aspects of the Project (English Onshore Components of EGL 5)

2. Aspects of the English Onshore Components of EGL 5

2.1 Introduction

2.1.1 To underpin its 2050 net zero ambitions, the UK Government has committed to fully decarbonising the power system by 2035. To fulfil this commitment and meet energy objectives, the UK Government has concluded that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure, and as stated within the Overarching National Policy Statement (NPS) for Energy (EN-1, see **Chapter 3** for further details) "*there is an urgent need for new electricity network infrastructure to be brought forward at pace".*

2.1.2 NGET is intending to request a direction pursuant to Section 35 of the Planning Act 2008 from DESNZ. If this direction is granted, the Project would be classed as nationally significant and as a low-carbon development, this would mean the Project would fall within the remit of CNP infrastructure. The Project would directly support the delivery of the UK Government's energy objectives, by reinforcing the electricity transmission system and connecting low carbon infrastructure to the NETS. The Project forms part of a major programme of reinforcement of the electricity transmission system to accommodate major increases in north-south power flows, helping take power generated from low-carbon sources (especially from offshore wind generation) to areas of consumer demand across the UK.

2.1.3 EGL 5 is being jointly developed by NGET and SSEN-T. EGL 5 will comprise a new 2 GW HVDC link between Scotland and England (Lincolnshire). It will include the construction of new infrastructure consisting of underground onshore and offshore HVDC cables, a converter station and HVAC underground cables.

2.1.4 The scope of this Report consists of the English onshore components ('the English Onshore Component of the Project'), located in the East Midlands region of England. These English onshore components for EGL 5 are:

- A proposed HVDC cables Landfall (ending at MLWS) on the Lincolnshire Coast;
- A TJB which will enable the connection of the offshore and onshore HVDC underground cable connections;
- Approximately up to 9 km of onshore HVDC underground cables;
- A new converter station in the vicinity of one of the proposed LCS in East Lindsey District; and
- Approximately up to 3 km of onshore HVAC underground cables.

2.1.5 NGET may also need to commission local changes to the lower voltage distribution networks to facilitate the construction of the new onshore transmission connections in England.

2.1.6 This Chapter provides more information in relation to the various aspects of the English Onshore Component of the Project, including the Landfall, HVDC/HVAC underground cables, new converter station and other works required to develop and deliver the Project.

2.2 Landfall

2.2.1 The Landfall is the interface between the English offshore and onshore components of EGL 5. The English Onshore Component ends at MLWS in line with onshore planning requirements and the English offshore components of EGL 5 end at MHWS in line with offshore planning requirements. Therefore, this Report has been developed in close parallel with the English Marine Options Appraisal[10] work to identify and select preferred and feasible Landfall locations.

2.2.2 The Landfall site extends from MLWS (where it overlaps with the English offshore components of EGL 5) across the intertidal zone to terminate at a TJB assumed to be located approximately 1 km inshore from the MLWS. The offshore HVDC cables will connect with the English onshore HVDC underground cables at a buried TJB.

2.2.3 A TJB is a permanent underground chamber constructed of reinforced concrete that houses the cable joints and a fibre chamber/link pit. A single TJB typically comprises an area of 15 m by 4 m (60 sqm). A larger area will be required temporarily during construction and installation of the TJB to accommodate temporary construction equipment and storage areas.

2.2.4 A temporary construction compound, which typically extends 150 m by 150 m (2.25 ha) will be required to construct the Landfall and the TJB. The temporary compound would contain all necessary plant and equipment plus parking and welfare facilities required. Once installation has been completed the land will be reinstated to pre-existing conditions; the only infrastructure visible on the surface (on otherwise fully reinstated land, see **Figure 2-1**) will be the cover of the link box pit.

2.2.5 Subject to site specific constraints and ground conditions present at identified Landfall sites, cable installation can be undertaken using open cut or trenchless methods (described further in Paragraph 2.3.23 below). In considering the alternative Landfall sites, consideration has been given to the most appropriate installation method taking account of the features present and the potential impacts that could occur during construction and installation.

2.2.6 It is recognised that a Landfall for the HVDC cables on the Lincolnshire coast is challenging, both technically and environmentally. However, National Grid and other energy infrastructure projects have successfully achieved cable Landfalls along the Lincolnshire coast, working closely and collaboratively with advising technical specialists and key stakeholders.

Figure 2-1 – Example TJB following reinstatement

2.3 Underground Cables

2.3.1 The English Onshore Component of the Project will largely comprise new HVDC underground cables (from Landfall to the converter station), which allow electricity to be transmitted from point to point in much larger volumes, over greater distances with fewer transmission losses compared to an equivalent HVAC system. The English Onshore Components of the Project will also include a section of HVAC underground cable, between the proposed converter station and substation to connect into the NETS. Both onshore HVDC and HVAC underground cables are installed using similar methods, which are described below, however at the HVAC transmission voltage of 400 kV the size, number and construction area of the underground cables required is greater than those that operate at lower voltages or HVDC cables.

Underground HVDC Cables (Onshore)

2.3.2 The English Onshore underground HVDC cables will include a Distributed Temperature Sensing (DTS) carrier tube and fibre optic cables for performance monitoring). The underground HVDC cable is typically 15 cm in diameter.

2.3.3 The exact configuration of the HVDC cable route depends on a number of factors including the constraints (such as crossings of major rivers, roads and railways) which are present, prevailing ground conditions, the length of each cable section, suitability of jointing positions and the number of bends and topography of the route.

2.3.4 The following paragraphs provide a high-level description of the HVDC cable route and of typical HVDC cable parameters including its design and construction which have been used to inform the routeing and siting for the English Onshore Component of the Project.

High Level Route Description

2.3.5 At the Landfall, where the onshore and offshore components of EGL 5 overlap, the HVDC cable continues from offshore to onshore environment. The English onshore HVDC cable will begin at and connect into a buried TJB (where the submarine and onshore HVDC cables connect). From the TJB, the HVDC cable will route towards the new converter station in the vicinity of the proposed 400 kV LCS (proposed by the GtW Project).

2.3.6 Connections from the converter station to substation will be via a HVAC underground cable as described below.

Physical Description of HVDC Cables

2.3.7 The below provides a summary of the key characteristics of the HVDC cable. The exact configuration of the HVDC cable is subject to detailed design following appointment of a contractor; however, the general characteristics below have informed this routeing and siting study.

2.3.8 The HVDC cable will have a permanent easement. The exact width of the permanent easement is still to be determined. There will be no above permanent ground infrastructure required along the new HVDC cables route except for small marker posts. These may be installed at field boundaries, crossings, and other locations as appropriate to highlight the presence of the HVDC cables to landowners, asset owners and those undertaking works within the vicinity.

2.3.9 The HVDC cables will be laid within one trench, within a single construction swathe. The typical width required for the construction and installation of the HVDC cable, including for access routes, soil storage and drainage, is approximately 45 m (see **Figure 2-2**). The typical width (subject to cable system design) of a single trench is approximately 2.5 m. The construction and installation of the HVDC cable will require access via a haul road. The haul road will run adjacent to the area for construction and installation of the HVDC cable and is typically 7 m in width.

2.3.10 Cables are normally buried with 0.9 m of material cover above the protective tile but could be buried deeper depending on the outcome of soil Agricultural Land Classification (ALC), drainage and ground investigation surveys, information from stakeholders, landowners; and ongoing design studies.

2.3.11 The HVDC cable will be installed in sections, typically every 800 m to 1.5 km. These sections will be connected at buried cable joint bays. The number, location and dimensions of cable joint bays required will be determined through feedback from non-statutory consultation, information from surveys and ongoing design studies.

2.3.12 The HVDC cable will be direct-buried or pulled through pre-installed ducts (via the methods described in Paragraph 2.3.23 below), where constraints such as road crossing and watercourse crossing dictate.

Figure 2-2 – Example HVDC Cable Construction

Viking Link Interconnector: Two HVDC cables in trench during construction

Viking Link Interconnector: Two HVDC cables in trench during construction

Underground HVAC Cables (Onshore)

2.3.13 Underground HVAC cables will connect the EGL 5 converter station to the proposed 400 kV LCS. The connection from the new converter station to the LCS will require two sets of three HVAC cables. Each HVAC cable will operate at 400 kV and is typically 15 cm in diameter.

2.3.14 The exact configuration of the HVAC cable route depends on several factors including the constraints which are present, prevailing ground conditions, the length of each cable section, suitability of jointing positions and the number of bends and topography of the route.

2.3.15 The following paragraphs provide a high-level description of the HVAC cable route and of typical HVAC cable parameters including its design and construction which have been used to inform the routeing and siting for the English Onshore Component of the Project.

High Level Route Description

2.3.16 The HVAC cables (including DTS carrier tube and fibre optic cables) will route between the new converter station (near the LCS) and the LCS into the NETS.

Physical Description of HVAC Cables

2.3.17 The below provides a summary of the key characteristics of the HVAC cables. The exact configuration of the HVAC cables is subject to detailed design following appointment of a contractor; however, the general characteristics below have informed this routeing and siting study.

2.3.18 The HVAC cables will have a permanent easement. The exact width of the permanent easement is still to be determined. There will be no above ground infrastructure required along the new HVAC cables route except for small marker posts or link pillars that will be installed at regular intervals along the route. Underground link boxes could also be used instead of link pillars at buried cable joint bays. The marker posts may be installed at field boundaries, crossings, and other locations as appropriate to highlight the presence of the HVAC cables to landowners, asset owners and those undertaking works within the vicinity. Link pillars will be required at buried cable joint bays, where the HVAC cable sections will be joined. Link pillars are typically 1 m by 1.5 m and are at a height of 1.5 m.

2.3.19 Each set of HVAC cable (two sets of three HVAC cables) will be laid within a single trench meaning that for the English Onshore Component there will be two trenches for the HVAC cable route. The HVAC cables will be within a single construction swathe. The typical width required for the construction and installation of the HVAC cables, including for access routes, soil storage and drainage, is approximately 75 m (see **Figure 2-3**). The typical width (subject to cable system design) of a single trench is approximately 3.25 m. The construction and installation of the HVAC cables will require access via a haul road. The haul road will run adjacent to the area for construction and installation of the HVAC cables and is typically 7 m in width.

2.3.20 Cables are normally buried with 0.9 m of material cover above the protective tile but could be buried deeper depending on the outcome of soil Agricultural Land Classification (ALC), drainage and ground investigation surveys, information from stakeholders, landowners; and ongoing design studies.

2.3.21 The HVAC cables will be installed in sections, typically every 800 m to 1.5 km. These sections will be connected at buried cable joint bays. The number and dimensions of cable joint bays will be determined through feedback from non-statutory consultation, information from surveys and ongoing design studies.

2.3.22 The HVAC cables will be direct buried or pulled through pre-installed ducts (via the methods described in Paragraph 2.3.23 below), where constraints such as road crossings and watercourse crossings dictate.

Figure 2-3 – Example HVAC Cable Construction

HVAC underground cables in construction prior to reinstatement

Underground Cable Installation Methods

2.3.23 There are several different installation methods available for the installation of HVDC and HVAC cables. The most appropriate for a given project, or location within a project, is determined based on environmental, land use, cost and technical factor. The open cut and trenchless methods of cable installation are summarised below:

- Open cut methods: These would typically be utilised in open agricultural land. This involves the excavation of a trench into which the HVDC or HVAC cables could either be directly laid, or a duct could be laid through which HVDC or HVAC cables could then be pulled. This is usually followed by land reinstatement.
- Trenchless methods: These would typically be utilised where specific features (such as main rivers, major roads, railway lines, flood defences or other significant infrastructure) need to be crossed. This would involve the installation of ducts or potentially a tunnel below the feature. The HVDC or HVAC cables would then be pulled through the ducts or installed within the tunnel.

2.3.24 Where conditions allow, HVDC or HVAC cables are typically installed using open cut methods. Open cut methods are generally preferred as they enable HVDC and HVAC cables to be installed at more technically efficient depths. Open cut methods are also generally more economical and often require a smaller construction footprint than trenchless methods. Where technically feasible, and unless other technical or environmental constraints and considerations determine otherwise, all underground cable installation will be by open-cut method.

2.3.25 Where specific environmental or infrastructure features, including main rivers such as the Wold Grift Drain, preclude the use of HVDC or HVAC cables in trenches, as described above, installation in ducts using a trenchless installation technique such as Horizontal Direct Drilling (HDD) is likely to be required. In this instance HVDC or HVAC cables are pulled into pre-installed ducts.

2.3.26 Where HDD is not technically viable then a tunnelled solution can be considered. Tunnels can be constructed using a variety of techniques, but all involve civil engineering activities, which result in additional costs, increased construction risks and extended programme durations.

2.3.27 In determining the most appropriate trenchless technique for installing HVDC or HVAC cables, NGET need to ensure the electrical performance of the HVDC or HVAC cables are not compromised.

2.3.28 The working width of the land required for construction of a trenchless crossings for HVDC cables is typically between 50 m and 100 m, and for HVAC cables this is typically 130 m.

2.3.29 Potential trenchless installation methods, such as Horizontal Directional Drilling (HDD), could be considered (where constraints prevent the use of the open cut method) for a HVDC or HVAC cable crossing of features such as main rivers, major roads, railway lines, flood defences or other significant infrastructure.

2.3.30 It is considered that the English Onshore Component of the Project will not be constructed using CTM tunnelling. Other installation methods mentioned above are considered to be less intrusive and more suitable for the Project.

2.4 Other Technical Considerations

2.4.1 To construct the new converter station and underground cables, a range of other minor temporary and permanent improvement works will need to be carried out to facilitate the construction of the English Onshore Component of the Project. Such improvements will be to the transmission system and electricity distribution network operated by NGET, NGED. It may be necessary for the new underground cables to cross overhead lines of a lower voltage owned and operated by the local electricity DNOs (around the English Onshore Component of the Project the DNOs are NPG and NGED, however the NPG boundary lies to the north of areas appraised for the emerging preferences for the English Onshore Components of the Project, which lie entirely within the NGED zone).

2.4.2 When crossing lower voltage overhead lines, it will be necessary to deploy a range of mitigation measures whilst maintaining supplies. It is likely that the English Onshore Component of the Project will need to cross the routes of existing 11 kV, 33 kV and 132 kV overhead lines in multiple locations dependent upon the final route. As the English Onshore Component of the Project design evolves the mitigation measures will be developed and assessed on a case-by-case basis.

2.4.3 NGET will work with NGED (and NPG if required) to design and undertake the replacement or rationalisation of any affected low voltage overhead lines with underground cables wherever this would be technically practicable and not prohibitively expensive. Managing interfaces with existing NGED (and if relevant, NPG) overhead lines will form part of this Project.

2.5 Converter Stations

2.5.1 The existing electricity networks in Great Britain operate using HVAC technology. To transmit electricity using HVDC technology, converter stations are required at each end of the electricity transmission link. The converter stations contain specialist electrical equipment which converts electricity from HVAC to HVDC (or vice versa depending on the direction of electricity transmission). The footprint of a converter station can vary according to HVDC technology requirements and capacity of the transmission connection being developed.

2.5.2 Some of the specialist electrical equipment must be located indoors in buildings approximately up to 30 m tall, while some could be located outdoors or in smaller buildings.

EGL 5 Converter Station and the LCS

2.5.3 The GtW Project[11] is being developed by NGET to reinforce the electricity transmission system to help deliver the UK Government's Net Zero targets. It forms part of a major programme of reinforcement of the electricity transmission system to accommodate substantial increases in north-south power flows. It will establish a new (wholly or largely overhead line) 400 kV transmission connection. As part of the GtW Project, two new substations are proposed: the LCS, comprising two 400 kV substations LCS-A and LCS-B, located in East Lindsey, which will provide a new point on the network where connections for customers and other planned transmission connections can be made.

2.5.4 The siting of the LCS was undertaken as part of the GtW Project. A new converter station for EGL 5 will be required (as part of the English Onshore components of the Project) in proximity to one of the proposed LCS.

2.5.5 In order to keep costs to a minimum and avoid or limit adverse impacts (and generally be in line with the principles for routeing and site selection outlined below in **Section 3.6**), it is assumed that the converter station would be located as near to one of the proposed LCS as possible. In order to inform the siting work, it has been assumed that the EGL 5 converter station with outdoor (AIS) HVAC switchgear could extend to approximately 350 m by 250 m (approximately 9 ha), with a construction compound of approximately 200 m by 200 m (approximately 4 ha). Permanent access would be needed to the EGL 5 converter station, together with peripheral landscaping, drainage, and other related works, which are assumed at this stage to be approximately 1 ha which is equivalent to approximately 15% of the converter station platform.

2.5.6 The proposed LCS will form part of the GtW Project DCO application and will not be consented as part of the Project. The Project's connection into the proposed LCS is therefore contingent on the GtW Project successfully obtaining their DCO.

[11] National Grid (2024) Grimsby to Walpole Combined Routing and Siting Study Report. Available at: Grimsby to Walpole | National Grid ET

3. NGET's Approach to Routeing and Siting

3. NGET's Approach to Routeing and Siting

3.1 Overview

3.1.1 This Chapter provides an overview of the key legislation, policy and guidance applicable to NGET's routeing and siting, a summary of NGET's approach to routeing and siting and the technology options considered for this Project.

3.2 NGET's Statutory Duties (Electricity Act 1989)

3.2.1 NGET has duties placed upon it by the Electricity Act 1989 ('the Electricity Act') and operates under the terms of its transmission licence. Those duties and terms of relevance to the development of the proposed connection described in this Report are set out below. Where NGET develops new infrastructure, it is required to have regard to these following statutory duties under the Electricity Act:

- Section 9 (General duties of licence holders) of the Electricity Act states that:

  "It shall be the duty of the holder of a licence authorising him to participate in the transmission of electricity:

  (a) to develop and maintain an efficient, co-ordinated and economical system of electricity transmission;…"

- Electricity Act – Schedule 9 (preservation of amenity including: considering impacts upon communities, landscape, visual amenity, cultural heritage, and ecological resources); and

- Section 38 and Schedule 9 of the Electricity Act state that:

  "(1) In formulating any relevant proposals, a licence holder or a person authorised by exemption to generate, distribute, supply or participate in the transmission of electricity:

  (a) shall have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and

  (b) shall do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects."

3.2.2 NGET have also had due regard to other statutory obligations and requirements, where relevant, in the undertaking of Options Identification and Selection Stage (Stage 2).

3.3 British Energy Security Strategy (2022)

3.3.1 In response to concerns over the security, affordability, and sustainability of the UK's energy supply the UK Government published its British Energy Security Strategy in July 2022.

3.3.2 The British Energy Security Strategy proposes to accelerate the UK towards a low-carbon and energy independent future. It has a focus on expanding domestic UK energy supply, accelerating the connecting network infrastructure to support an expansion in domestic UK energy supply whilst also working with international partners to maintain stable energy markets and prices.

3.3.3 Regarding offshore wind the British Energy Security Strategy states that:

> "By the end of 2023 we are set to increase our capacity by a further 15 per cent. But now we must go further and faster, building on our global leadership in offshore wind." [It aims to] "deliver up to 50 GW by 2030, including up to 5 GW of innovative floating wind."

3.3.4 The British Energy Security Strategy recognises that:

> "Accelerating our domestic supply of clean and affordable electricity also requires accelerating the connecting network infrastructure to support it. Within this decade, our modern system will prioritise two key features: anticipating need because planning ahead minimises cost and public disruption; and hyper-flexibility in matching supply and demand so that minimal energy is wasted. This more efficient, locally-responsive system could bring down costs by up to £10 billion a year by 2050."

3.3.5 To support this the British Energy Security Strategy includes several aims including, to:

- set out a "blueprint for the whole system by the end of 2022 in the Holistic Network Design (HND) and Centralised Strategic Network Plan (CSNP). The HND will identify strategic infrastructure needed to deliver offshore wind by 2030."; and
- "Dramatically reduce timelines for delivering strategic onshore transmission network infrastructure by around three years. We will work with Ofgem, network operators and the supply chain to find further savings, for example in the procurement, manufacture and construction stages. Overall, we aspire to halve the end-to-end process by the mid-2020s."

3.3.6 The Powering Up Britain paper[12] was published in March 2023 by the UK Government. This document provides an update of the strategy for secure, clean and affordable British energy for the long-term future.

3.3.7 When considering new electricity infrastructure, NGET have had regard to the British Energy Security Strategy and Powering Up Britain paper.

[12] Energy White Paper: Powering our net zero future, December 2020 https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future

3.3.8 The British Energy Security Strategy was published under the 2019 to 2022 Johnson Conservative government; therefore it is recognised that this does not fully reflect the current Starmer Labour government policy. References to this have been included for information purposes only, ensuring the Project is aligned with the current Starmer Labour government policy where it has departed from the policy published under the previous Conservative government.

3.4 Transmission Acceleration Action Plan

3.4.1 In response to the Electricity Networks Commissioner's report on accelerating electricity transmission network build the UK Government published its Transmission Acceleration Action Plan in November 2023[13].

3.4.2 The Transmission Acceleration Action Plan outlines a series of recommendation and actions aimed at modernising and expanding the electricity grid to meet the increasing demand for electricity and to support the transition to Net Zero by 2050.

3.4.3 The Transmission Acceleration Action Plan recommends that:

> "the development of a Strategic Spatial Energy Plan (SSEP), including a Marine Environmental Assessment and an offshore delivery route map, to enable planning of the network in a strategic way" and the "development of Centralised Strategic Network Plans (CSNPs) based on the SSEP, and that these should be used to enable resource planning."

3.4.4 Regarding design standards, the Transmission Acceleration Action Plan suggests the following recommendations:

> "Electricity Transmission Design Principles (ETDP) should be created to provide greater clarity on the type of asset to be used in different environments."
>
> "Engagement with communities hosting transmission infrastructure should be focused on the choices that they can influence within the ETDP design principles and guidelines."
>
> "A forum should be created between the Future System Operator (FSO), Transmission Owners (TOs), equipment manufacturers and Ofgem to review and update equipment standards used within Great Britain."
>
> "An automated Corridor routing process should be adopted as standard practice"
>
> "A route design process that uses the Electricity Transmission Design Principles (ETDP) should be adopted."

3.4.5 The Transmission Acceleration Action Plan states that:

> "Moving to a strategically planned approach for the transmission network allows a different approach, where strategic plans determine the need for projects, and a separate need case assessment is not required for regulatory approval."; and
>
> "the government agrees with the Commissioner's recommendation that regulatory approvals should be removed from the critical path of key transmission projects."

[13] Transmission Acceleration Action Plan, November 2023 https://assets.publishing.service.gov.uk/media/65646bd31fd90c0013ac3bd8/transmission-acceleration-action-plan.pdf

3.4.6 The overall goal of the Transmission Acceleration Plan is to halve the timeline for building new transmission infrastructure from the current 14 years to 7 years in order to support the UK's energy security and its target for Net Zero.

3.4.7 The Transmission Acceleration Action Plan was published under the 2022 to 2024 Sunak Conservative government; therefore it is recognised that this does not fully reflect the current Starmer Labour government policy. References to this have been included for information purposes only, ensuring the Project is aligned with the current Starmer Labour government policy where it has departed from the policy published under the previous Conservative government.

3.5 National Policy Statements (NPS)

3.5.1 National Policy Statements (NPS) EN-1 and EN-5 (current at the time of writing this CPRSS) set the policy context within which the routeing and siting for electricity infrastructure networks is undertaken. Taken together these Statements provide the primary national policy context for decisions on applications for electricity transmission projects classified as Nationally Significant Infrastructure Projects (NSIP).

3.5.2 The Project does not automatically qualify as an NSIP under section 14 of the Planning Act 2008. However, the Project will request a direction, pursuant to section 35 of the Planning Act 2008 from the DESNZ, to bring the Project into the DCO regime. Should a direction pursuant to section 35 of the Planning Act 2008 be issued by DESNZ, the Project would be classed as nationally significant development to which the NPSs would apply.

Overarching National Policy Statement for Energy – EN-1 (2023)

3.5.3 EN-1 sets out the need for new nationally significant infrastructure to be brought forward at pace to meet out energy objectives. This includes meeting energy security and carbon reduction strategies, the need for more electricity capacity to support increased supply from renewables, and the need to meet future increases in electricity demand. EN-1 Paragraph 3.3.70 states that all new grid projects have a role in efficiently constructing, operating, and connecting low carbon infrastructure to the National Electricity Grid.

3.5.4 EN-1 sets out the critical national priority (CNP) for low carbon infrastructure. The Government's energy security and net zero ambitions will only be delivered if the UK can enable the development of new low carbon sources of energy at speed and scale. Paragraph 4.2.5 of EN-1 specifically notes that all power lines in scope of EN-5 (as described in Paragraph 3.5.18) including network reinforcement and upgrade works, and associated infrastructure such as substations are considered to be critical low carbon infrastructure. These works do not have to be associated with a specific generation technology, as it is considered that new grid projects will contribute towards greater efficiency in constructing, operating and connecting low carbon infrastructure to the existing electricity transmission system.

3.5.5 EN-1 sets out the generic impacts and means of mitigation that are anticipated to arise most frequently from energy infrastructure developments. However, EN-1 (Paragraph 3.1.1) recognises that due to the significant amount of new large-scale energy infrastructure required to meet the UK's energy objectives it will not be possible to develop the necessary amounts of such infrastructure without some significant residual adverse effects. The application of policies set out in Parts 4 and 5 of EN-1 seek to minimise these effects.

3.5.6 In line with Part 5 of EN-1, this CPRSS considers the following topics (listed in the order used in NGET's Approach to Consenting[4]):

- Landscape (covering the 'landscape' impacts described in Section 5.10 of EN-1);
- Visual (as described in Section 5.10 of EN-1);
- Ecology (covering the 'biodiversity' impacts described in Section 5.4 of EN-1);
- Historic environment (as described in Section 5.9 of EN-1);
- Air quality (covering the 'air quality and emissions' and 'dust' impacts described in Section 5.2 of EN-1);
- Noise and vibration (as described in Section 5.12 of EN-1);
- Geology and soils (covering the 'geological conservation' impacts described in Section 5.4 of EN-1);
- Water (covering the 'flood risk' and 'water quality and resources' impacts described in Sections 5.8 and 5.16 of EN-1, respectively);
- Economic activity (covering the 'socio-economic' impacts and 'land use, including open space, green infrastructure, and green belt' impacts described in Sections 5.13 and 5.11 of EN-1, respectively);
- Aviation and defence (covering the 'civil and military aviation and defence interests' impacts described in Section 5.5 of EN-1); and
- Traffic and transport (as described in Section 5.14 of EN-1).

3.5.7 Greenhouse gases, coastal change, odour, artificial light, smoke, steam, insect infestation and waste management impacts, as described in Sections 5.6, 5.7, and 5.15 of EN-1, respectively, would not have a significant influence on the determination of the preferred routeing and siting for this Project. Where relevant, these topics will be considered as the Project development progresses into the Defined Proposal and Statutory Consultation Stage (Stage 3).

3.5.8 Electromagnetic fields will be considered as the Project development progresses into the Defined Proposal and Statutory Consultation stage (Stage 3). However, NGET designs all its infrastructure to be compliant with current regulations and guidance[14] on such matters.

[14] Energy Networks Association (2017) Electric and magnetic fields: the facts. London, Energy Networks Association. Present on the dedicated National Grid EMFs website www.emfs.info

3.5.9 EN-1 explains that in terms of:

- Biodiversity (Paragraph 4.6.6) – applicants, such as NGET, should seek opportunities to contribute to and enhance the natural environment by providing net gains for biodiversity;
- Historic Environment (Paragraph 5.9.25) – there is a desirability to sustaining and where appropriate enhancing the significance of heritage assets, their setting, and the positive contribution they can make to communities. Section 5.9.30 of EN-1 also makes clear that substantial harm to or loss of designated assets of the highest significance, including scheduled monuments; registered battlefields; grade I and II* listed buildings; grade I and II* registered parks and gardens; and world heritage sites, should be wholly exceptional;
- Landscape and Visual (Paragraph 5.10.6) – projects need to be designed carefully, taking account of the potential impact on the landscape and on sensitive visual receptors. The aim should be to minimise harm to the landscape and sensitive visual receptors, providing reasonable mitigation where possible and appropriate. Section 5.10.32 of EN-1 confirms that National Parks and National Landscapes (NL) have been confirmed by the Government as having the highest status of protection in relation to landscape and scenic beauty. It makes clear that development consent in these areas can be granted in exceptional circumstances. In such instances, the development should be demonstrated to be in the public interest and consideration of such applications should include an assessment of:
  - "the need for the development, including in terms of national considerations, and the impact of consenting or not consenting it upon the local economy;
  - the cost of, and scope for, developing elsewhere outside the designated area or meeting the need for it in some other way, taking account of the policy on alternatives; and
  - any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated."
- Socio-economics – applicants for a given project should identify the impacts of new energy infrastructure and potential mitigation measures.
- Coastal change - applicants for a given project should identify the impacts of new energy infrastructure and potential mitigation measures.
- Flood Risk – The relevant policy on flood risk for energy transmission Nationally Significant Infrastructure Projects (NSIPs) is set out in section 5.7 of EN-1. This requires that, when deciding on an application for an energy NSIP, the Secretary of State must be satisfied of the following:
  - the application is supported by a Flood Risk Assessment (FRA).
  - the Sequential Test has been applied as part of site selection [discussed further below].
  - a sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk.
  - the proposal is in line with any relevant national and local flood risk management strategy.

- sustainable urban Drainage Systems (SuDS) have been used unless there is clear evidence that their use would be inappropriate.
- in flood risk areas, the project is designed and constructed to remain safe and operational during its lifetime, without increasing flood risk elsewhere (subject to the exceptions set out in Paragraph 5.8.42).
- the project includes safe access and escape routes where required, and that any residual risk can be safely managed over the lifetime of the development.
- land that is likely to be needed for present or future flood risk management infrastructure has been appropriately safeguarded from development to the extent."

Sequential Test

3.5.10 The Sequential Test is set out in Planning Practice Guidance[15] and is explained within EN-1 at Paragraph 5.8.21. The Sequential Test ensures that a systematic, risk-based approach is followed to guide new development to areas with the lowest risk of flooding. It applies to all types of development and is used to assess the flood risk associated with potential sites[16].

3.5.11 In summary, the Sequential Test requires the following steps:

- Initially, the focus is on locating development in low-risk areas (i.e., Flood Zone 1). Paragraph 5.8.21 of EN-1 states that preference should be given to locating new development to areas with the lowest risk of flooding.
- If it is not possible to locate development in low-risk areas, the test moves on to compare reasonably available sites[17] within medium risk areas (i.e., Flood Zone 2). If there is no reasonably available site in Flood Zone 1, then projects can be in Flood Zone 2 provided that the Secretary of State is satisfied that the Sequential Test is met.
- Only where there are no reasonably available sites in low and medium risk areas, the test considers high-risk areas (i.e., Flood Zone 3a[18]). In these circumstances, energy NSIPs can be in Flood Zone 3 provided that Secretary of State is satisfied that the requirements of the Sequential Test and Exception Test (discussed further below) are met.

[15] See Paragraph: 024 Reference ID: 7-024-20220825 of the Planning Practice Guidance ('PPG').

[16] See Paragraph: 024 Reference ID: 7-024-20220825 of the Planning Practice Guidance ('PPG') and paragraph 5.8.21 of EN-1.

[17] 'Reasonably available sites' are defined in the PPG as those in a suitable location for the type of development with a reasonable prospect that the site is available to be developed at the point in time envisaged for the development.

[18] Note that the Flood Zone 3 category also contains Flood Zone 3b, which is 'functional floodplain'. EN-1 provides that, energy projects proposed in Flood Zone 3b should only be permitted if the development will not result in a net loss of floodplain storage, and will not impede water flows.

3.5.12 Therefore, the Sequential Test must be applied both during the site selection process and at the site level when a site has been selected. In other words, as well as applying the Sequential Test when selecting a site, development should take place on the area(s) of the selected site(s) with the lowest flood risk. Note that implicitly the application of the test at the site level will inform site selection – sites best able to accommodate development will perform better against the site selection test.

The Exception Test

3.5.13 If, following application of the Sequential Test, it is not possible for the project to be in zones of lower probability of flooding than Flood Zone 3 the Exception Test can be applied. The test is intended to provide a method of managing flood risk while still allowing necessary development to occur. EN-1 is clear that the Exception Test is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site. Given the sheer extent of Flood Zone 3 across the Study Area this is likely to apply to the English Onshore Component of the Project.

3.5.14 The Exception Test is explained in Paragraphs 5.8.9, 5.8.10 and 5.8.11 of EN-1. For the Test to be passed:

- it must be demonstrated that the project provides wider sustainability benefits to the community.[19] that outweigh flood risk; and
- it must be demonstrated that the project will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.[20].

National Policy Statement for Electricity Networks Infrastructure EN-3 (2023)

3.5.15 EN-3 sets out the factors influencing site selection and design for renewable electricity generating stations. It also covers offshore transmission infrastructure projects which are directed into the NSIP regime under section 35 of the Planning Act 2008. These include interconnectors and Multi-Purpose Interconnectors (MPIs) that support the onshore network which are routed offshore. In summary EN-3 states that;

3.5.16 While EN-3 covers primarily renewable energy generation, it is explained in Paragraph 2.10.60 that "*applicants will consider several factors when considering the design and layout of sites, including proximity to available grid capacity to accommodate the scale of generation, orientation, topography, previous land–use, and ability to mitigate environmental impacts*."

3.5.17 EN-3 makes it clear that greater coordination of offshore-onshore transmission infrastructure is expected, as this will likely reduce the cumulative environmental impacts on coastal communities by installing smaller numbers of larger connections.

[19] This includes the wider benefits of the infrastructure project, including the national need for it as set out in the NPS.

[20] Exceptionally, where an increase in flood risk elsewhere cannot be avoided or wholly mitigated, the SoS may grant consent if it is satisfied that the increase in present and future flood risk can be mitigated to an acceptable level and taking account of the benefits of, including the need for, the nationally significant energy infrastructure.

National Policy Statement for Electricity Networks Infrastructure EN-5 (2023)

3.5.18 EN-5 sets out the factors influencing routeing and siting selection and the impacts and other matters which are specific to electricity networks infrastructure. In summary, EN-5 states that:

- Paragraph 1.1.2 of EN-5 states that a significant amount of new network infrastructure is required in the near term to directly support the government's ambition to deploy up to 50 GW of offshore wind capacity by 2030.
- Biodiversity (Paragraph 2.9.6) – consideration should be given to the effects on large birds, including feeding and hunting grounds, migration Corridors and breeding grounds.
- Landscape and Visual (Paragraph 2.9.9) - New substations, sealing end compounds (including terminal towers), and other above-ground installations that serve as connection, switching, and voltage transformation points on the electricity network may also give rise to adverse landscape and visual impacts.

3.5.19 While EN-5 covers above ground electricity lines, it is explained in Paragraph 1.6.4 that "*In addition, this NPS will apply to other kinds of electricity networks infrastructure including offshore transmission of any type (defined at section 2.12.4)…, underground cables at any voltage, associated infrastructure as referred to above and lower voltage overhead lines, where that infrastructure becomes subject to the 2008 Act – and so be covered by this NPS – in the following circumstances*:

1. if it constitutes associated development for which consent is sought along with an NSIP such as an offshore wind generating station or relevant overhead line...; or
2. if the Secretary of State gives a direction under section 35 of the 2008 Act (for developments which, when completed, will be wholly in one or more of the areas specified in subsection 35(3)) that it should be treated as an NSIP and requires a development consent order (DCO)".

3.5.20 EN-5 makes clear that the Horlock Rules should be followed by developers when designing their proposals for substations, and while it is the government's position that overhead lines should be the strong starting presumption for electricity networks developments in general, EN-5 Paragraph 2.9.20 explains that *"this presumption is reversed when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Area of Outstanding Natural Beauty)."*

3.5.21 EN-5 Paragraph 2.9.22 states that "*Regardless of the option, the scheme through its design, delivery, and operation, should seek to further the statutory purposes of the designated landscape. These enhancements may go beyond the mitigation measures needed to minimise the adverse effects of the scheme."*

3.5.22 EN-5 reiterates the assessment principles outlined in Section 4 of EN-1 i.e., that "*Applicants must show how any likely significant negative effects would be avoided, reduced, mitigated or compensated for, following the mitigation hierarchy".* This however is recognised in the context that there is an urgent need for CNP infrastructure and that this in general will outweigh any other residual impacts not capable of being addressed by application of the mitigation hierarchy.

3.6 The Holford and Horlock Rules

3.6.1 NGET consistently employs two sets of rules/guidelines for the routeing and siting of new energy transmission infrastructure:

- Holford Rules – guidelines for the routeing of new overhead lines; and
- Horlock Rules – guidelines for the design and siting of substations, converter stations and sealing end compounds (SECs)[21].

3.6.2 When considering new electricity infrastructure, NGET have regard to the degree to which routeing and siting options comply or deviate from these rules.

3.6.3 The general principles underlying the Holford Rules – the avoidance of adverse impacts by careful routeing – are to a degree also relevant to the routeing of underground cables, although the balance of impacts and constraints will often be different.

Holford Rules

3.6.4 Paragraph 2.9.16 of NPS EN-5 makes clear that the Holford Rules are *"a common-sense approach to overhead line route design"* and *"should be embodied in the applicants' proposals for new overhead lines"*. In summary, the Holford Rules state that routeing of high voltage overhead transmission lines should where practicable:

- Avoid altogether the major areas of the highest amenity value;
- Choose the most direct line with no sharp changes in direction;
- Be positioned against tree and hill backgrounds as far as possible;
- Prefer moderately open valleys with tree cover;
- Be kept as far as possible independent from smaller lines, converging routes and other poles, masts, wires, and cables to avoid a concentration of lines or 'wirescape'[22]; and
- Approach urban areas through industrial zones, where they exist; and when residential and recreational land intervenes between the approach line and the substations, carefully assess the comparative costs of undergrounding.

3.6.5 Whilst the guidelines were initially developed in 1959, they have been reviewed on several occasions by NGET and by the other UK transmission licence holders, including a review against the Electricity Act 1989. The guidelines have stood the test of time and have become accepted industry best practice in overhead line routeing.

3.6.6 The general principles underlying the Holford Rules – the avoidance of adverse impacts by careful routeing – are to a degree also relevant to the routeing of underground cables, although the balance of impacts and constraints will often be different.

---

[21] The National Policy Statement for Electricity Networks Infrastructure EN-5 NPS has incorporated the Horlock Rules. At Paragraph 2.9.18 it states *"The Horlock Rules – guidelines for the design and siting of substations – were established by National Grid in 2009 in pursuance of its duties under Schedule 9 to the Electricity Act 1989. These principles should be embodied in applicants' proposals for the infrastructure associated with new overhead lines".*

[22] Caused by multiple overhead lines running in different angles or the proximity of multiple overhead lines.

Horlock Rules

3.6.7 Paragraph 2.9.18 of NPS EN-5 makes clear that the Horlock Rules (guidelines for designing and siting substations) *"should be embodied in the applicants' proposals for the infrastructure"*. The Horlock Rules state that[23]:

- In the development of system options, consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements of new developments against the consequential environmental effects, to keep adverse effects to a reasonably practicable minimum;
- Siting should seek to avoid areas of the highest amenity, cultural or scientific value by the overall planning of the system connections;
- Areas of local amenity value, important existing habitats and landscape features should be protected as far as reasonably practicable;
- Siting should take advantage of the screening provided by landform and existing features and the potential use of site layout and levels;
- Proposals should keep visual, noise and other environmental effects to a minimum;
- Land use impacts of the proposal should be considered when planning siting;
- Early consideration should be given to the options available for pylons and ancillary development appropriate to individual locations;
- Space should be used effectively to limit the area required consistent with appropriate mitigation measures and to minimise the adverse impacts on existing land use and rights of way, whilst also having regard to the potential for any future extension;
- The design of access roads, perimeter fencing, earth shaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings;
- In open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines so as to avoid a confusing appearance; and
- The inter-relationship between pylons, ancillary structures and background and foreground features should be studied to reduce the prominence of structures from main viewpoints. Where practicable the exposure of pylons on prominent ridges should be minimised by siting pylons against a background of trees rather than open skylines.

3.6.8 The Horlock Rules predominately apply to the siting of substations and line approaches. The general principles underlying the Horlock Rules - the avoidance of areas of high amenity - apply equally to the siting of SECs, although the balance of impacts and constraints will often be different.

3.6.9 As detailed above, the National Policy Statement for Electricity Networks Infrastructure (EN-5) (2023) in Paragraph 2.9.18 confirms that the Horlock Rules "*should be embodied in Applicants' proposals for the infrastructure associated with new overhead lines"*.

[23] https://www.nationalgrid.com/sites/default/files/documents/13796-The%2orlock%20Rules.pdf (nationalgrid.com)

3.7 Clean Power 2030 Action Plan

3.7.1 The Clean Power 2030 Action Plan outlines the need for a secure and affordable energy supply, the creation of essential new energy industries, and to limit our contribution to the damaging effects of climate change. With help from the National Energy System Operator (NESO) the following next steps have been identified[24]:

- Fundamentally reforming the connections process, by "working with NESO, Ofgem (Office of Gas and Electricity Markets), TOs (Transmission Owners) and DNOs (Distribution Network Operators) to prioritise viable projects that align with the Clean Power 2030 Action Plan. Without these critical reforms, the queue will not align with our strategic needs and the projects we need will be delayed.";
- Regulatory reform "to ensure that the Clean Power 2030 target is better integrated into planning and investment decision making, enabling investment in networks ahead of need. This includes working with Ofgem to explore the appropriateness of tightening the incentives and penalties to drive the acceleration of network buildout delivery.";
- Improving networks planning and consenting "to provide the levers to accelerate the expansion and upgrades required across our transmission and distribution network to ensure energy infrastructure can support the delivery of the 2030 target."; and
- "Engaging with communities to enable them to benefit from living near new transmission network infrastructure."
- The Clean Power 2030 Action Plan was published under the current Starmer Labour government.

3.8 National Planning Policy Framework (NPPF) (2024)

3.8.1 The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England. The policies set out in this framework apply to the preparation of local and neighbourhood plans and to decisions on planning applications.

3.8.2 Paragraph 5 of NPPF states that the:

"*Framework does not contain specific policies for nationally significant infrastructure projects. These are determined in accordance with the decision-making framework in the Planning Act 2008 (as amended) and relevant national policy statements for major infrastructure, as well as any other matters that are relevant (which may include the National Planning Policy Framework). National policy statements form part of the overall framework of national planning policy, and may be a material consideration in preparing plans and making decisions on planning applications.*"

3.8.3 When considering new electricity infrastructure, NGET have regard to the NPPF.

[24] Clean Power 2030 Action Plan: A new era of clean electricity, December 2024 https://assets.publishing.service.gov.uk/media/677bc80399c93b7286a396d6/clean-power-2030-action-plan-main-report.pdf

3.9 National Grid Electricity Transmission's Approach to Consenting

3.9.1 NGET's Approach to Consenting[3] outlines the project development process for major infrastructure projects, from initial inception to consent and construction. NGET's Approach to Consenting is divided into six stages:

- Stage 1: Strategic Proposal;
- Stage 2: Options Identification and Selection;
- Stage 3: Defined Proposal and Statutory Consultation;
- Stage 4: Assessment and Land Rights;
- Stage 5: Application, Examination and Decision; and
- Stage 6: Construction.

3.9.2 A stepped approach (within Stage 2) has been adopted to identify potential routeing and siting options for the English Onshore Component of the Project. This considered the potential impacts on the environment, the local community, relevant planning policy, other existing and proposed developments as well as technical and engineering design information.

3.9.3 The aim of the approach is to balance consideration of these factors and identify an emerging preferred Landfall, emerging preferred Corridor, emerging preferred Siting Zones and/or Siting Areas within which the Landfall, underground cables and converter station could be routed and sited.

3.9.4 **Figure 1-2** presents an overview of NGET's Approach to Consenting; a summary of the main objectives of this stage of the consenting process can be seen below that stage. The English Onshore Component of the Project is at the Options Identification and Selection Stage (Stage 2).

3.9.5 This CPRSS has been undertaken as part of Stage 2. For the English Onshore Component of the Project, the activities identified in NGET's Approach to Consenting as being required at Stage 2 were broken down into the following 10 steps (as detailed in **Chapter 4**):

- Step 1 – Definition of the Study Area/s and data gathering;
- Step 2 – Scoping of environmental topics and baseline data-gathering;
- Step 3 – Ascribe weight to, confirm, and 'heat map' features;
- Step 4 – Identifying and defining Corridors, Siting Zones or Siting Areas;
- Step 5 – Landfall appraisal and confirmation of Corridors, Siting Zones or Siting Areas for appraisal;
- Step 6 – Undertake site visits and refinement of Corridors, Siting Zones or Siting Areas;
- Step 7 – Options appraisal of Corridors, Siting Zones or Siting Areas;
- Step 8 – Confirm emerging preferred Corridor(/s), Siting Zone(/s) or Siting Area(/s);

- Step 9 – Develop a graduated swathe for non-statutory consultation; and
- Step 10 – Undertake non-statutory consultation.

3.9.6 This CPRSS sets out the findings of the first nine steps of Stage 2 for the English Onshore Component of the Project. This CPRSS will inform subsequent non-statutory consultation, Step 10.

4. Options Identification and Selection Process (Stage 2)

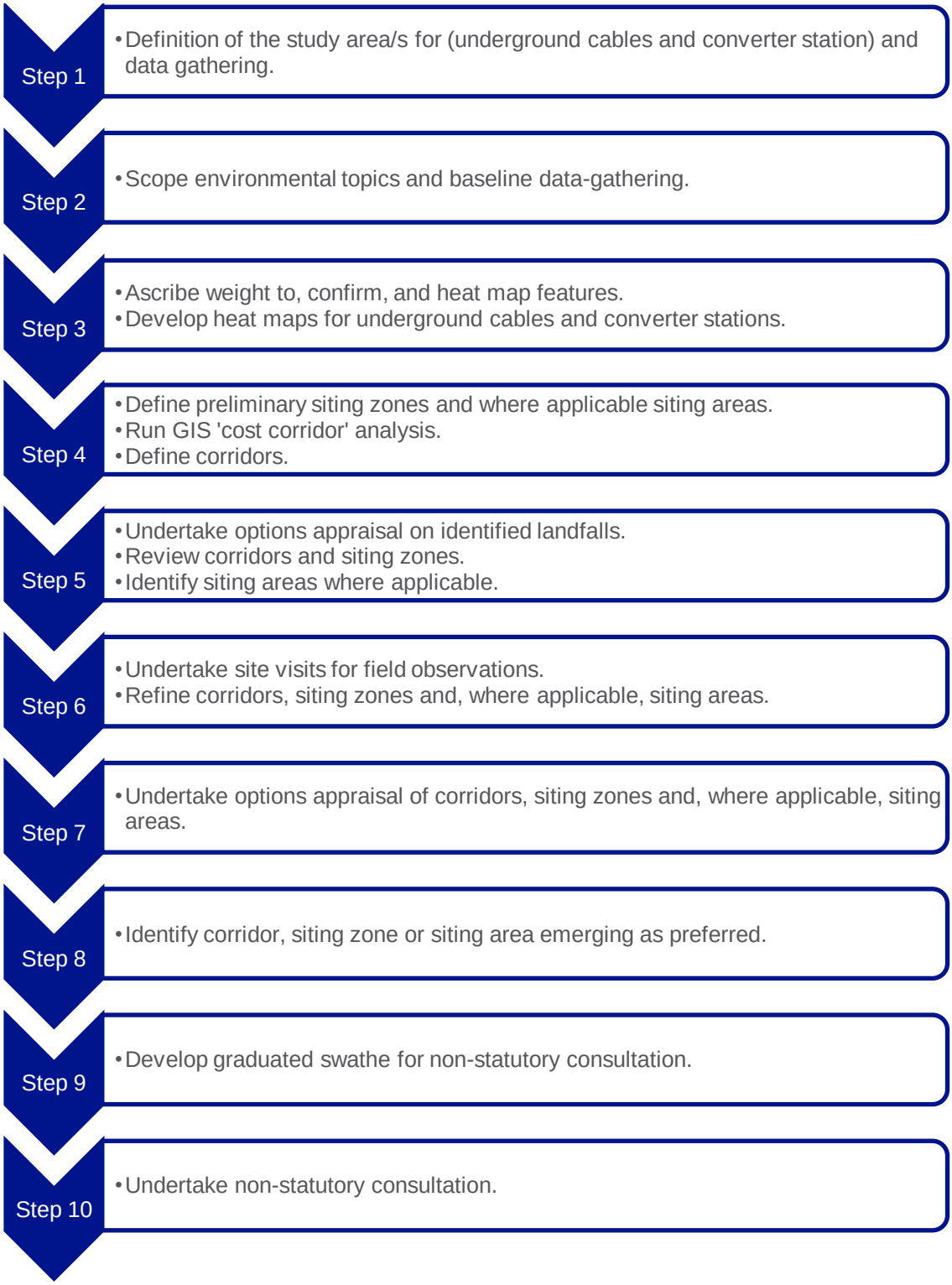
4. Options Identification and Selection Process (Stage 2)

4.1.1 The Strategic Proposal[25] Stage (Stage 1) identifies a Strategic Proposal, as described in **Section 1.2**. This CPRSS presents the findings of the Options Identification and Selection Stage (Stage 2) and identifies the Landfall, Corridor, Siting Zones and/or Siting Areas which are emerging as preferred for the English Onshore Component of the Project. The findings of this CPRSS will be used as part of the non-statutory consultation. The feedback received on the English Onshore Component of the Project during non-statutory consultation will be used to inform the design and alignment of the English Onshore Component of the Project. Following non-statutory consultation, the Project will progress to the Defined Proposal and Statutory Consultation Stage (Stage 3).

4.1.2 The methodologies employed for the 10 steps (as defined for this Project) of the Options Identification and Selection Stage (Stage 2) are summarised in **Figure 4-1** and are described below.

[25] The Strategic Proposal is defined by the Strategic Options Report, summarised in Section 1.1.

Figure 4-1 – CPRSS Methodology



4.1.3 The EGL 3 and EGL 4 Projects undertook a CPRSS[26] to inform its routeing and siting works for a non-statutory consultation exercise completed in 2024. The CPRSS for the EGL 3 and EGL 4 Projects followed a similar methodology to that proposed for the English Onshore Component of the Project. The EGL 3 and EGL 4 Projects had initially considered a three-ended link in part in the same locality to the Project, which has now been discounted. On the basis that the EGL 3 and EGL 4 Projects initial optioneering work had considered this similar infrastructure in the same locality as the Project, where applicable, the information and outcomes of the EGL 3 and EGL 4 Projects' CPRSS, in addition to feedback from stakeholders on the EGL 3 and EGL 4 Projects, have been used to inform the works undertaken as part of the CPRSS for the English Onshore Component of the Project.

4.2 Step 1: Define the Study Area

4.2.1 The study area is both the broad area within which transmission infrastructure required for the English Onshore Component will be located, as well as the area within which detailed environmental and socio-economic data will be gathered to inform Stage 2.Given the geographical extent of the English Onshore Component of the Project, distinct, but interrelated study areas have been defined for the Landfall, new EGL 5 Converter Station and the underground transmission connection between these connection points.

4.2.2 The study areas that have been developed are informed by:

- The connection points (start/end points) and strategic zones identified by the Strategic Proposal Stage (Stage 1);
- Other infrastructure projects at different stages of development which may affect availability of potential Landfalls or more generally availability of land for temporary and/or permanent use;
- The distribution of areas of the highest amenity value or environmental feature (for example internationally designated sites);
- The nature of the physical and human geography. The presence of major geographical features such larger settlements that may represent a natural boundary to a study area or dictate a need for a study area to extend to support routes around such features;
- Consideration of the likely balance of environmental impact between direct and indirect transmission routes; and
- Consideration of the Horlock Rules (for siting of stations) and Holford Rules (for routeing of an underground cable).

4.2.3 Based on these factors, the study areas developed should encompass the maximum extent within which a Project design which satisfies the statutory duties and obligations of NGET and meets the Project objectives (as detailed in the SOR for the Project) is likely to be located.

[26] National Grid (2024) Eastern Green Link 3 (EGL 3) and Eastern Green Link 4 (EGL 4) Corridor and Preliminary Routeing and Siting Study Report. Available at: Eastern Green Link 3 and Eastern Green Link 4 | National Grid Group

4.2.4 An initial study area was defined as part of the Strategic Proposal Stage (Stage 1) undertaken in 2024-2025, as presented in **Figure 1-3**. The initial study area informed the study areas developed at this stage (Stage 2).

4.2.5 The study areas developed must encompass the area within which Landfalls, preliminary Corridors and Siting Zones may be identified but exclude areas where these are unlikely to be feasible. They allow for the application of the principles of the Holford and Horlock Rules as described in **Chapter 3**. The study areas, described in **Chapter 5**, therefore encompass an area within which the identification and assessment of preliminary Corridors and Siting Zones could be completed.

4.2.6 The study areas, and factors that have influenced their definition, are described in **Chapter 5**.

4.3 Step 2: Scope Environmental Topics and Baseline Data-gathering

Scoping of Environmental Topics

4.3.1 NGET's Approach to the appraisal of design options considers the following topics and sub-topics:

- **Environmental:** Landscape and Visual Amenity; Ecology; Historic Environment; Air Quality; Noise and Vibration; Soils and Geology; Water; Greenhouse Gas Emissions;
- **Socio-economic:** Economic Activity; Traffic and Transport; Aviation and Defence;
- **Technical:** Technical Complexity; Construction/Delivery issues; Technology issues (which includes sustainability issues); Capacity issues; Network efficiency/benefits (which includes energy efficiency); and
- **Cost:** Capital cost; Lifetime cost; and Constraint costs (where applicable).

4.3.2 The environmental and socio-economic topics are aligned with applicable requirements of Section 5 of EN-1[2] and Section 2 of EN-5[1].

4.3.3 NGET notes that certain sub-topics (and potentially whole topics) will not form part of routeing and siting considerations where it is determined that due to the nature of the English Onshore Component of the Project, there would be no material impact or such topic would not be capable of being a differentiating factor in respect of routeing and siting decisions.

4.3.4 To identify the data-gathering required to contribute to the effective evaluation of options, and ultimately help inform decision-making, a review of the environmental topics and their constituent sub-topics was undertaken. The review considered the presence of features for a particular topic or sub-topic within the study areas, and whether the English Onshore Component of the Project could have a material impact on the features. If there were either no features, or no risk of a material impact, the topic or sub-topic was scoped-out of the appraisal process. This ensured that the CPRSS and appraisal process only addressed those sub-topics that are potentially material to the decision-making process.

4.3.5 It should be noted that where such sub-topics (and potentially whole topics) are not considered in detail at this early routeing and siting stage, this does not necessarily mean that such topics would be scoped-out for EIA purposes.

4.3.6 At this early development stage of the English Onshore Component of the Project, air quality and emissions, dust, noise and vibration, odour, artificial light, smoke, steam, insect infestation and waste management impacts were not considered in relation to initial routeing and siting on the basis that with the other topics applied, these topics would not be differentiating factors in the identification and selection of Corridors and Siting Zones/Areas. Furthermore, NGET designs all its infrastructure to be compliant with current regulations and guidance on electromagnetic fields and therefore this was not considered in relation to initial routeing or siting.

4.3.7 The environmental and socio-economic topics which were considered as part of the routeing and siting appraisal of this Project at Stage 2 include landscape and visual amenity, ecology, historic environment, soils and geology, water, economic activity, traffic and transport, and aviation and defence. In addition, coastal change is considered within the water topic at the Landfalls.

4.3.8 At this stage of the English Onshore Component of the Project, air quality and emissions and noise and vibration are accounted for by considering proximity to settlements, residential and other sensitive features. At this stage of the English Onshore Component of the Project, climate change from flooding and coastal erosion is considered as part of the water topic. Waste management, electric and magnetic fields and climate change (aspects relating to transmission loses) are not considered material to the decision-making process at this stage and will be considered as the English Onshore Component of the Project development progresses into the Defined Proposal and Statutory Consultation Stage (Stage 3).

Data Gathering

4.3.9 To identify connection options which best satisfy NGET's statutory duties and obligations and meet the need case for the Project, it is necessary to understand the presence, and distribution of, environmental, socio-economic, and technical constraints and opportunities within the study areas. As part of this process, geographical information system (GIS)[27] web mapping was developed comprising available environmental, socio-economic, and technical data within the study areas.

4.3.10 Data for each topic was gathered through a desk-based review of information on international, national, regional and locally important features. This data was collated to inform the scoping and the comparative environmental, socio-economic and technical appraisal of options. This included the following:

- Identification of designated sites and other features from British Geological Survey (BGS), Civil Aviation Authority (CAA), Environment Agency (EA), Forestry Commission (FC), Joint Nature Conservation Committee (JNCC), Marine Management Organisation (MMO), Ministry of Defence (MoD), Ministry of Housing, Communities and Local Government (MHCLG), Natural England (NE), Office for National Statistics (ONS), Ordnance Survey (OS), Sustrans, The Royal Society for the Protection of Birds (RSPB) and relevant local authorities;

[27] GIS is a system that enables the creation, management, analysis and mapping of all types of data.

- Identification of archaeological designations and other recorded sites, using GIS datasets available from Historic England;
- Review of the Local Development Plans for Lincolnshire County Council and East Lindsey District Council to identify further environmental features and opportunities, such as county and regional level designation or other locations important to the public;
- Review of Landscape Character Assessments of relevance to the study areas;
- Review of OS mapping (1:50,000 mapping and terrain data) and aerial photography (where available) to identify other potential features such as settlements, properties, walking routes, cycling routes etc;
- Extrapolation of OS OpenData to identify further environmental features including locations of watercourses and waterbodies; and
- Review of other local information through online and published media such as tourism sites and walking routes.

4.4 Step 3: Ascribe a weight to, confirm and 'Heat Map' features

4.4.1 To allow for the identification of Corridors and Siting Zones and/or Siting Areas, the various elements within the scoped-in sub-topics which may constrain routeing and siting were mapped.

4.4.2 Once mapped, the data sets were assigned a classification or "sensitivity weighting" based on their sensitivity to the technology likely to be required for the English Onshore Component of the Project. This classification was determined using professional judgement, whilst having regard to relevant environmental legislation, policy and best practice. A six-point scale was used to determine the "sensitivity weighting", as shown in **Table 4-1**.

Table 4-1 – Description Associated with Sensitivity Weighting

Classification Value	Classification Value Description
0	Areas with no identified constraint.
1	Very low potential to constrain the Project.
2	Low potential to constrain the Project.
3	Intermediate potential to constrain the Project.
4	High potential to constrain the Project.
5	Very High potential for the Project to be constrained.

4.4.3 The weighting of the different features varies between the potential technologies of the English Onshore Component of the Project (underground cables and converter station). For example, potential inundation by flooding is a far more important consideration for converter station siting than it is for underground cable routeing as it could result in a converter station ceasing to function, whilst an underground cable would likely function as normal in most circumstances in flood conditions.

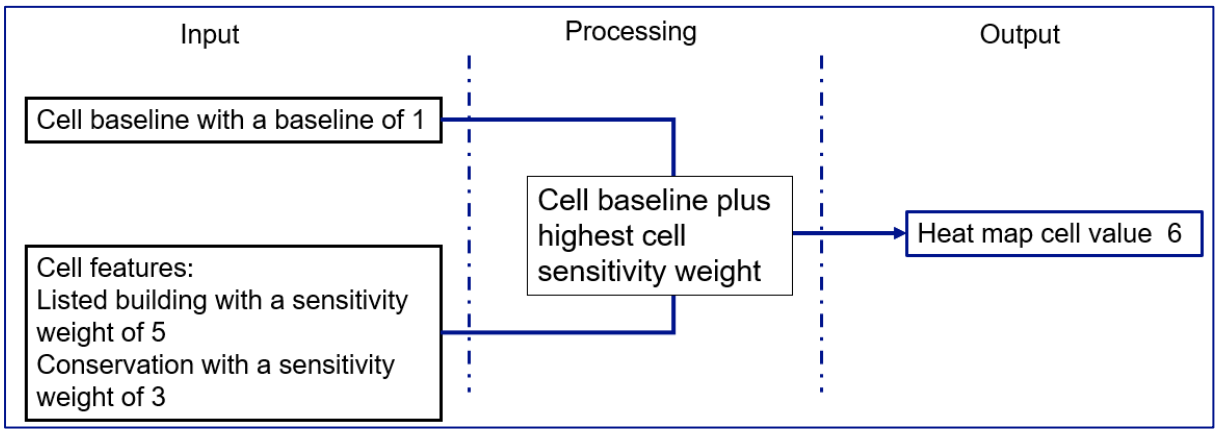
4.4.4 The sensitivity weighting effectively formed a robust scoping exercise to ensure a focus on features that materially inform decision-making. This gave the highest weight to features of national or international value, whilst not excluding features of more local importance.

4.4.5 Sensitivity weightings associated with these features were reviewed and confirmed between NGET and the Front-end engineering design (FEED) Contractor and were then combined to produce separate composite 'heat maps'[28], showing the highest 'weight' for each cell[29] of the map. These composite heat maps reflect the relative importance of different features and help to visualise the constraints to developing infrastructure for the English Onshore Component of the Project and, when combined with professional judgement, informed the identification of Corridors and Siting Zones, as described in **Chapter 5**.

4.4.6 For composite heat maps, and to enable further GIS analysis of the information within the heat maps, the study areas were broken down into 10 m square 'cells' based on the OS grid. Within each of these cells the sensitivity weighting of a feature is added to a 'baseline' score of one[30]. The heat map therefore shows numerical weightings of one to six.

4.4.7 To avoid the risk of double counting, the composite heat map shows the highest individual 'weight' identified in each cell, not the combined total of different weights identified. For example, if a cell has a baseline of one, contains a listed building with a weight of five and is located within a conservation area with a weight of three, then the cell would have a weight of six (baseline of one, plus listed building, five). This process is shown in **Figure 4-2**.

Figure 4-2 – Example of how Sensitivity Weighting is Incorporated into Heat Mapping



4.4.8 The sensitivity weighting enabled the exercise to focus on features that materially inform decision-making. This gave the highest weight to features of national or international value, whilst not excluding features of more local value. Features of the highest weight primarily informed the development of Corridors and Siting Zones whilst the lower

[28] A heat map is a graphical representation of data where values are depicted by colour. In the context of the Project the data is the environmental features which are weighted, and the colour will be determined by the sensitivity weighting allocated to each feature.

[29] The map was divided into 10 m square cells based on the OS National Grid.

[30] The entire study area starts with an even 'weight' of one, so that the lowest cost across a 'level playing field' is a straight line - the shortest line.

weighted features (or small areas of high weight) informed the development of the Corridors, Siting Zones and/or Siting Areas once the larger areas of higher weight had been avoided (where practicable).

4.4.9 The sensitivity weightings were reviewed prior to the development of Corridors and Siting Zones, particularly to allow the refinement of buffer zones and to test the weighting assumptions. An example of this is for the setting of heritage assets. For the development of an indicative Corridor, Siting Zone, or where applicable, Siting Area, an appropriate buffer all-round the asset was weighted. However, prior to the development of the indicative Corridors and Siting Zones, the assets within a Corridor and Siting Zones were preliminarily reviewed to identify any 'directionality' in the setting. For example, a listed building with a designed outlook would have a more extensive setting along the line of that outlook than in other directions. This review will be backchecked and verified by site visits as the English Onshore Component of the Project progresses.

4.4.10 The heat maps reflected the relative importance of different features and helped to visualise the constraints to developing infrastructure for the English Onshore Component of the Project and informed the identification of Corridors, Siting Zones and/or Siting Areas, as described in **Chapter 5**.

4.5 Step 4: Identifying and Defining Corridors, Siting Zones or Siting Areas

4.5.1 At this stage of the English Onshore Component of the Project, identification of preliminary routeing and siting options involves little detailed engineering design. It is led by environmental specialists who have due regard to the environmental and socio-economic considerations alongside the required technical parameters. The aim of identifying early Corridors, Siting Zones and/or Siting Areas is balancing high-level mitigation with engineering requirements; routeing and siting to avoid designated sites and other large-scale features, to minimise impacts upon the environment and local population as far as practicable, whilst ensuring that the options identified meet the English Onshore Component of the Project engineering requirements.

Identifying and Defining Landfalls

4.5.2 The identification of the potential Landfalls was led by the Project team in collaboration with the offshore cable routeing undertaken for the Project to ensure a consistent and coordinated approach to routeing and siting. Identification takes into consideration the outcomes of a Preliminary Landfall Siting Study (PLSS)[31] and the technical parameters (detailed in **Chapter 2**) and the relevant environmental and technical constraints identified from Step 1.

4.5.3 In siting Landfalls, areas that benefit from the below factors were identified:

- Appropriate topography;
- Presence of soft sediment to allow for burial of assets; and
- Narrow intertidal areas to minimise additional construction works.

[31] WSP (2024), EGL 5 Preliminary Landfall Siting Study.

Identifying and Defining Siting Zones or Siting Areas

4.5.4 A Siting Area is an area of land which has the capacity to accommodate the siting of a single converter station (with allowance for micrositing where relevant). A Siting Zone is an area which has the capacity to accommodate multiple Siting Areas, and therefore, configuration of converter station.

4.5.5 The identification of the preliminary Siting Zones and/or Siting Areas was led by the environmental specialists from the Project team. Identification takes into consideration the key drivers for each required converter station (as set out below), the technical parameters (detailed in **Chapter 2**) and the relevant environmental and technical constraints identified from Step 1.

4.5.6 In siting the converter station, areas that benefit from the below factors were identified:

- Appropriate topography;
- The availability of existing screening elements and the potential to introduce additional screening elements; and
- Proximity to major roads, to minimise the extent of required new access roads.

4.5.7 Key drivers for the location of a new EGL 5 converter station include:

- Seek to identify locations which are in reasonable proximity to either of the two new 400 kV LCS (LCS-A and LCS-B proposed by the GtW Project); and
- Balance the distance from the coast (to minimise the length of HVDC cables from potential Landfall locations) against the distance from either of the two new 400 kV LCS (to minimise the length of HVAC cables from potential EGL 5 converter station locations).

4.5.8 Where the identified area for Siting Zones results in the identification of one zone, then preliminary Siting Areas are identified. Identification of the Siting Zones and/or Siting Areas was informed by the Horlock Rules and Holford Rules to take account of the combined effects of both the converter station and underground cable connections. The following guiding principles informed identification:

- Using or adapting existing infrastructure will generally be of benefit/advantage compared with creating new infrastructure.
- Using available brownfield land[32] will generally be of benefit/advantage compared with utilising greenfield land[33].
- Shorter routes (for underground connections) will generally be of benefit/advantage compared with longer routes, as smaller scale infrastructure projects are generally likely to have lower environmental, safety, sustainability, and cost implications (for comparable technology options).
- Financially less expensive options, both in terms of capital and lifetime cost, will generally be of benefit/advantage, as these support NGET's statutory duty under Section 9 of the Electricity Act 1989 to develop and maintain an *'efficient, co-ordinated and economical'* transmission network.

[32] Land that is or was occupied by a permanent structure, including the curtilage of the developed land and any associated fixed surface infrastructure.

[33] Land, usually farmland, that has not previously been developed.

- Options which avoid, minimise and/or mitigate impacts on environmental or socio-economic features will generally be of benefit/advantage compared with those which have likely significant residual effects, as less environmentally damaging or socially disruptive sites support NGET's statutory duty under Schedule 9 of the Electricity Act 1989 to *'have regard to the desirability of preserving amenity'*, and will more readily achieve consent.

4.5.9 The identification of Siting Zones and/or Siting Areas was then used to inform the identification of Corridors, as set out below.

Identifying and Defining Corridors

4.5.10 The heat maps produced in Step 3 were used to undertake a GIS 'Corridor analysis'. This is a GIS tool that takes the weight applied to each cell as the 'cost' of crossing it and calculates the total cost of every possible path between the start and end points. From this it is possible to identify potential Corridors that minimise the environmental 'cost', where the environmental 'cost' is determined by the combination of distance and the sensitivity weighting applied by the heat map.

4.5.11 The GIS tool helps identify potential Corridors which are likely to have the least potential for adverse impacts on those aspects of the environment that can be mapped, by finding routes across the heat map surface to connect the start and end points of the English Onshore Component of the Project which have the least environmental 'cost' – the least interaction with environmental features. This approach ensures that potential Corridors prioritise key issues, including mapped technical constraints, whilst retaining all data to be considered so that further analysis can be undertaken to address areas identified as particularly constrained ('pinch points') and later for developing the graduated swathe.

4.5.12 The Corridors generated through the GIS Corridor analysis provided a starting point for the Project team environmental specialists. They work with the wider Project team as appropriate, employing professional judgement and their understanding of routeing considerations, to identify technically feasible preliminary Corridors. Corridors that were identified respond to the geographical features that have been identified. In some places this will result in a narrow Corridor being available, whereas in areas with fewer features, the width could be considerably wider. This has resulted in a variety of widths for the preliminary Corridors ranging between 300 m and 2.8 km. Corridors included aspects which cannot be mapped but are no less important considerations to the routeing of a transmission connection.

4.5.13 The options identified were then subject to review by the FEED Contractor and the Project team who used their professional judgement to recommend amendments (i.e., to park, refine or expand) to the Corridors. For example, where possible, Corridors were refined to limit nationally designated sites in line with the policy tests as set out in NPS EN-1[2]. In addition, Corridors were identified, where possible, or refined to avoid (or include areas where an alignment could avoid) flood zones of a medium risk (Flood Zone 2) and high risk (Flood Zone 3), in line with the policy tests (sequential and exception tests) as set out in NPS EN-1[2]. These recommendations were reviewed and implemented by the environmental specialists to ensure that changes were made in a manner consistent with environmental considerations.

4.5.14 As part of this exercise, the distribution and density of constraints (environmental, technical and socio-economic) was examined to identify areas where it might be particularly challenging to identify a technically feasible and/or environmentally acceptable transmission connections (subject to further analysis).

4.5.15 The outcome of Step 4 is a set of early Corridors, Siting Zones and/or Siting Areas to be subject to further analysis and informed by field observations at Steps 5 and 6. This approach allowed for the continued appraisal of multiple and interrelated options. The Corridors are described in **Chapter 6**.

4.6 Step 5: Landfall Appraisal and Confirmation of Corridors, Siting Zones or Siting Areas for Appraisal

4.6.1 The preliminary Landfalls identified underwent an Options Appraisal in accordance with NGET's Approach to Consenting (further detail is provided on Options Appraisal under Step 7) and a challenge and review workshop was held to reach a conclusion on the emerging preferred Landfall. The Landfall emerging as preferred was then used to further refine the potential Corridors, Siting Zones and/or Siting Areas identified.

4.6.2 The Corridors, Siting Zones and/or Siting Areas were then further reviewed by the environmental team, NGET and the FEED Contractor to confirm the technical feasibility and ensure that key issues, and the interaction of constraints, had been fully considered.

4.6.3 Prior to progressing to Step 6, the emerging preferred Landfall and the options (Corridors, Siting Zones and/or Siting Areas) progressing to options appraisal were confirmed by the Project team.

4.6.4 It should be noted that the EGL 3 and EGL 4 Projects have a Lincolnshire Landfall, and appraisal undertaken and feedback given (by statutory consultees) to date for these projects has been used to inform the appraisal for EGL 5.

4.7 Step 6: Site Visits and Refinement of Corridors, Siting Zones or Siting Areas

4.7.1 Following the identification of the emerging preferred Landfall and the Corridors, Siting Zones and/or Siting Areas for options appraisal (Steps 4 and 5), site visits were undertaken by landscape and ecology specialists, the FEED Contractor and NGET. The purpose of these visits was to ground truth the key environment, community and technical features, to allow closer consideration of particularly constrained areas during the desk studies and to identify further construction and design hazards that might mean Corridors, Siting Zones or Siting Areas would not be feasible.

4.7.2 Once the site visits were complete, a further review was undertaken of the Corridors, Siting Zones and/or Siting Areas by the Project team to identify, where applicable:

- Any options which are less preferred;
- Any new options that are identified; or
- Any amendments to existing options where applicable.

4.7.3 Where agreed, these changes were incorporated into the evolving routeing and siting process before progressing to Options Appraisal (Step 7).

4.8 Step 7: Options Appraisal of Corridors, Siting Zones or Siting Areas

4.8.1 In Step 7, the Corridors, Siting Zones and/or Siting Areas agreed at Step 6 are subject to an Options Appraisal in accordance with NGET's Approach to Consenting. NGET's guidance provides a thorough and consistent framework to inform the appraisal of project options and decision-making. Its aim is to ensure that decisions regarding the location or technology of a given project are based on a full understanding of the technical, socio-economic, environmental, and cost implications of identified options. It also enables NGET to document in a transparent manner the information on which judgements have been based.

4.8.2 NGET's Approach to Consenting notes that the analysis at the Options Identification and Selection Stage (Stage 2) is largely desk based. However, as described in Step 6, the Options Appraisal for this Project has also been informed by observations from site visits undertaken by the Project team. These observations have provided additional information to inform the Options Appraisal, which, in conjunction with that drawn from the desk-based studies, has provided an evidence-base appropriate to inform this stage of the English Onshore Component of the Project. As the English Onshore Component of the Project progresses to subsequent stages of more detailed design and assessment, additional surveys and analysis will add further information to the evidence base, which will be used to back-check the findings of this study.

4.8.3 The overall objective throughout the Options Appraisal was to take full consideration of all known environmental factors to minimise the risk of significant adverse impacts on the environment and communities whilst also considering engineering and economic considerations.

4.8.4 For each of the relevant environmental and socio-economic sub-topics (outlined in Step 2) the appraisal considers the potential impacts on relevant features, and whether such impacts could be avoided or mitigated through careful routeing or siting. Where impacts cannot be avoided or mitigated by careful routeing, other forms of mitigation were considered such as utilising trenchless crossings to cross features such as major roads and watercourses.

4.8.5 Once such mitigation measures were considered, a judgement was made as to the potential for residual impacts. The residual impacts considered in the Options Appraisal do not take account of further Project-specific environmental, socio-economic or technical mitigation measures which are likely to be included as part of the Environmental Impact Assessment (EIA) process undertaken at the Defined Proposal and Statutory Consultation Stage (Stage 3). The findings of the Options Appraisal for the relevant sub-topics are detailed within **Chapters 6** and **7**.

4.8.6 The Options Appraisals also took cognisance of the requirements of the Environment Act (2021)[34] regarding biodiversity net gain (BNG) and climate resilience and greenhouse gas emissions. The Environment Act introduces new environmental targets across waste and resource efficiency, air quality, water, nature, and biodiversity. BNG is mandatory under Schedule 7A of the Town and Country Planning Act 1990[35] (as inserted by Schedule 14 of the Environment Act 2021[36]) for developments. The requirement for 10% BNG is also included in the Environmental Action Plan 2021-2026[37]. It is anticipated that this requirement will also become obligatory for DCO projects in 2025, and therefore NGET will account for this within the Project in advance of this being made mandatory. It is also noted that NGET are subject to transmission licence obligations which include a target of 10% BNG. Higher value habitats are considered within the Options Appraisal for avoidance through careful routeing and siting where possible, for example priority habitats and traditional orchards, this aims to reduce biodiversity impacts and BNG requirements. The consideration of BNG in detail will form part of the later stages of the English Onshore Component of the Project, and will be subject to collaboration with landowners and Local Nature Partnerships.

4.8.7 The Project itself is designed to facilitate increased capacity for connection and transmission of electricity from renewable energy generation to the National Grid thus contributing to combating climate change. The subsequent stages of the Project will need to assess climate change both in terms of greenhouse gas emissions and climate resilience. However, both components of climate change have been inherently considered at a high-level in the Options Appraisals i.e., consideration of presence of peaty soils, Flood Zones and underground cable lengths. With regards to Flood Zones specifically, the Options Appraisal took cognisance of the policy tests (sequential and exception tests) as described within NPS EN-1, thus where possible supporting a preference for options that fall within areas of lower flood risk.

4.8.8 The process of comparison and selection of options is described under Step 8.

4.9 Steps 8 and 9: Confirm Emerging Preferred Corridor(/s), Siting Zone(/s) or Siting Area(/s) and Develop Graduated Swathe for Consultation

4.9.1 Following completion of Step 7, a challenge and review workshop was held and attended by NGET, the FEED Contractor and the environmental specialists. The purpose of the workshop was to review environmental preferences and, in accordance with EN-1 and EN-5, balance these against technical and cost inputs to reach a conclusion on the emerging preferred Corridors, Siting Zones and/or Siting Areas. The aim being to conclude upon options which provide the optimum balance of efficiency and economy, whilst having appropriate regard to environmental and socio-economic impacts.

[34] Environment Act 2021. Available online at: https://www.legislation.gov.uk/ukpga/2021/30/contents

[35] Town and Country Planning Act 1990, s. 7A. Available online at: https://www.legislation.gov.uk/ukpga/1990/8/schedule/7A

[36] Environment Act 2021, s. 14. Available online at: https://www.legislation.gov.uk/ukpga/2021/30/schedule/14/enacted

[37] Our 2021–2026 Environmental Action Plan April 2021 (National Grid, 2021). Available at: https://www.nationalgrid.com/electricity-transmission/document/136551/download

4.9.2 The environmental specialists and FEED Contractor then sought to identify areas within the emerging preferred Landfall, Corridors, Siting Zones and/or Siting Areas where the infrastructure for the English Onshore Component of the Project might be best located based on the work undertaken to date. Identified preliminary areas were then sifted taking into consideration the initial heat mapping and the Horlock and Holford Rules. Of pertinence for this review were:

- Horlock Rules 2, 3, 4, 5 and 6 – to avoid areas of amenity value and minimise noise, visual and land use impacts; and
- Holford Rules 1 and 2, and the Supplementary Notes – to avoid areas of amenity value and while taking this into consideration selecting a direct route.

4.9.3 A workshop attended by the Project team was then undertaken to discuss the outputs of the routeing and siting and to review the technical requirements for creating a graduated swathe. The outcome of this workshop is graphically represented in the form of a graduated swathe.

4.10 Step 10: Undertake Non-Statutory Consultation

4.10.1 The final step in the CPRSS was to prepare a report to record the entire process for the purpose of non-statutory consultation. The CPRSS process and outcomes are captured in this Report. This Report is intended to support public consultation to engage stakeholders, statutory consultees and interested parties, including the public.

6. Study Area and Corridor Definition

5. Study Area, Corridor, Siting Zone and Siting Area Definition

5.1 Introduction

5.1.1 **Figure 1-6** shows the location of the English Onshore Component of the Project, which is in the East Midlands region. This Chapter presents the details of defining the study areas for the English Onshore Component of the Project (Step 1 as shown in **Section 5.2**), the baseline data gathered for the study areas (Step 2 as shown in **Section 5.4**), production of the heat mapping (Step 3 as shown in **Section 5.5**), the identifying and selection of an emerging preferred Landfall (Step 5 as shown in **Section 5.6**) identifying and defining the Corridors, Siting Zones and/or Siting Areas (Steps 4 to 6 as shown in **Section 5.6**).

5.2 Defining the Study Areas (Step 1)

5.2.1 The following sections provide an overview of each of the three distinct but interrelated and overlapping study areas[38] for the English Onshore Component of the Project as shown in **Figure 5-1**.

5.2.2 The approach to developing the study area for the English Onshore Component of the Project was based on balancing:

- NGET's statutory duty to develop an efficient, co-ordinated and economical system of transmission (Section 9 of the Electricity Act 1989);
- NGET's statutory duty to preserve amenity under Section 38 and Schedule 9 of the Electricity Act 1989;
- Holford Rule 1 (which is to "avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the first line in the first place, even if the total mileage is somewhat increased in consequence"); and
- Horlock Rule 2 (which is to "as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections").

5.2.3 The connection points (Landfall, the new EGL 5 converter station and one of the new LCS) were taken as a start point for the definition of the study areas for the English Onshore Component of the Project. The Landfall and one of the new LCS mark the end points for the English Onshore Component of the Project.

[38] An area within which a range of potential corridor options, station Siting Zones or areas for the new infrastructure will be considered.

5.2.4 Three distinct but interrelated study areas have been defined since the SOR for each English Onshore Component of the Project as shown in **Figure 5-1** and are described below, these are:

- The Landfall;
- The new underground cable onshore connections; and
- The new EGL 5 converter station.

5.2.5 The study areas were defined to be sufficient to encompass the initial design (as outlined in **Chapter 2**) for the English Onshore Component of the Project, whilst satisfying NGET's statutory duties and obligations, meeting the Project objectives and not extending to include areas unlikely to yield such a design which could not be consented. The development of the three study areas is explained below.

Figure 5-1 – Study Area

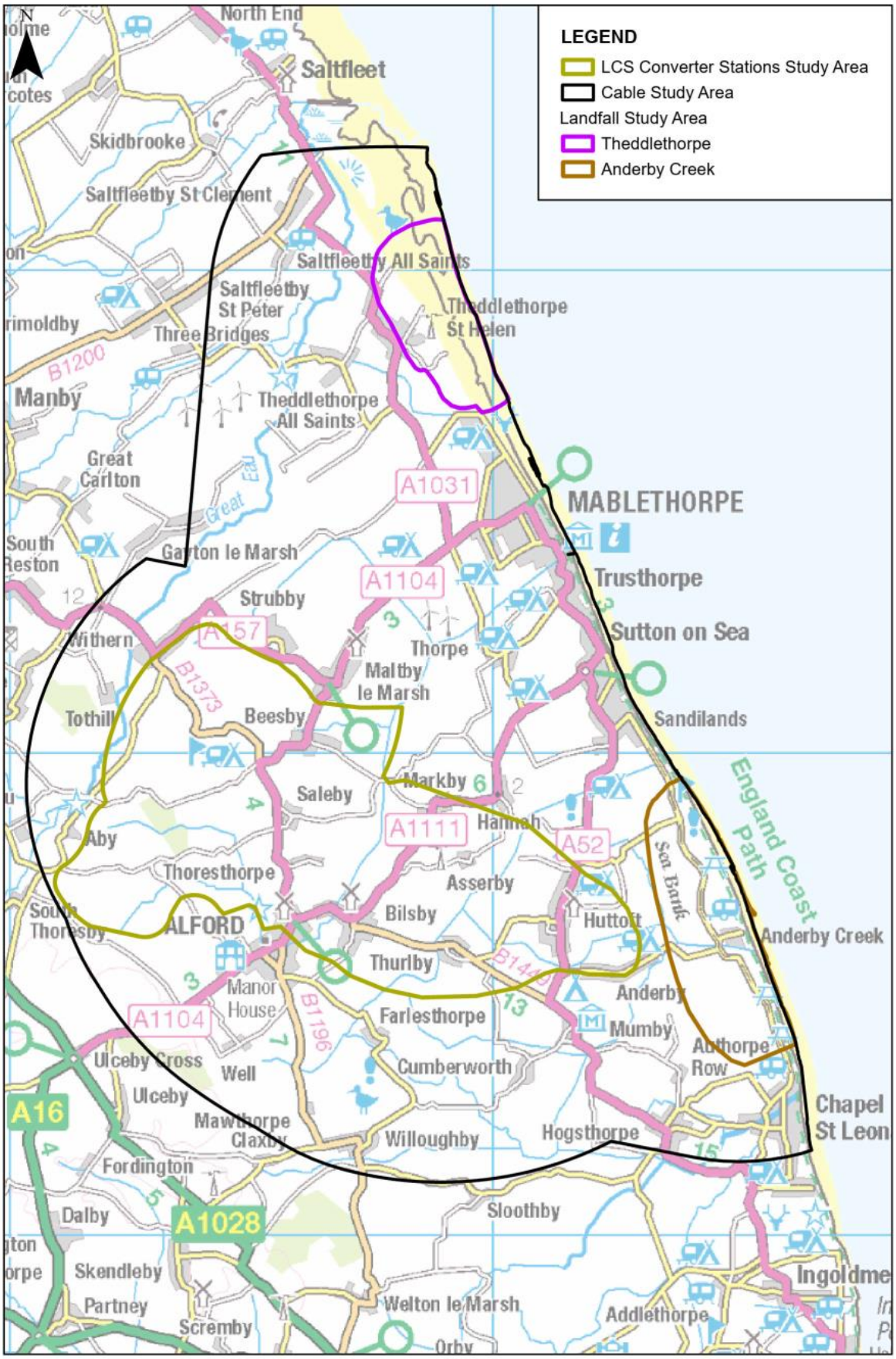


Figure 5-1 - Study Areas

Landfall

5.2.6 As part of the SOR consideration was given to strategic Project options which made Landfall on either the Lincolnshire coastline (between south of Cleethorpes and north of Chapel St Leonards) or the North Norfolk coastline (between Blakeney Point and Cromer). To support the review of potential Landfalls, and as described in **Chapter 4**, a desktop PLSS[39] was undertaken.

5.2.7 NGET have recently completed Landfall appraisal works for the EGL 3 and EGL 4 Projects in 2024. The information gathered as part of the works undertaken for the EGL 3 and EGL 4 Projects has been used to inform the PLSS and Landfall appraisal works for the English Onshore Component of the Project. The PLSS built upon the Landfall information presented The PLSS considered environmental, socio-economic and technical constraints along the coastline to identify potential Landfall locations. It also considered onshore and offshore areas adjacent (within 1 km) to preliminary Landfall study area to ensure feasibility of onwards onshore and offshore cable routeing.

5.2.8 Following the Strategic Options Appraisal, selection of a preferred option and the outcomes from the PLSS three sections of coastline were identified (1) Saltfleetby to Mablethorpe (described in this Report as Theddlethorpe), (2) Sandilands to Anderby Creek and (3) Anderby Creek to Chapel Point ((2) and (3) combined and described in this Report as Anderby Creek).

5.2.9 It should be noted that for the EGL 3 and EGL 4 Project an additional Landfall at Horseshoe Point was investigated. Consultation with Associated British Ports (ABP) Humber, Eastern Inshore Fisheries and Conservation Authority (IFCA), Lincolnshire Wildlife Trust and Historic England as well as initial options appraisal led to the Landfall being parked. This decision was backchecked in the EGL 5 PLSS[31] and no new evidence was identified that changed this original decision.

5.2.10 The appraisal therefore identified ‘Landfall Study Areas’ at Theddlethorpe and Anderby Creek. The Landfall Study Areas were subject to review by offshore environmental and engineering consultants to identify preliminary offshore subsea cable routes for each preliminary Landfall study area to determine the extent of coastline to be included in the Landfall Study Area.

5.2.11 The Landfall Study Areas are from MLWS to approximately 1 km inland and are shown with environment features and water features in **Figure 5-2** and **Figure 5-3** respectively. Landwards from the potential Landfall areas, the Landfall Study Areas overlap with the study area for the underground cables, these areas are referred to as ‘the Study Area’ (Paragraph 5.3.1) and are described further in **Section 5.3**.

[39] WSP (2024), EGL 5 Preliminary Landfall Siting Study.

Figure 5-2 – Landfall Study Areas and Key Environment Features

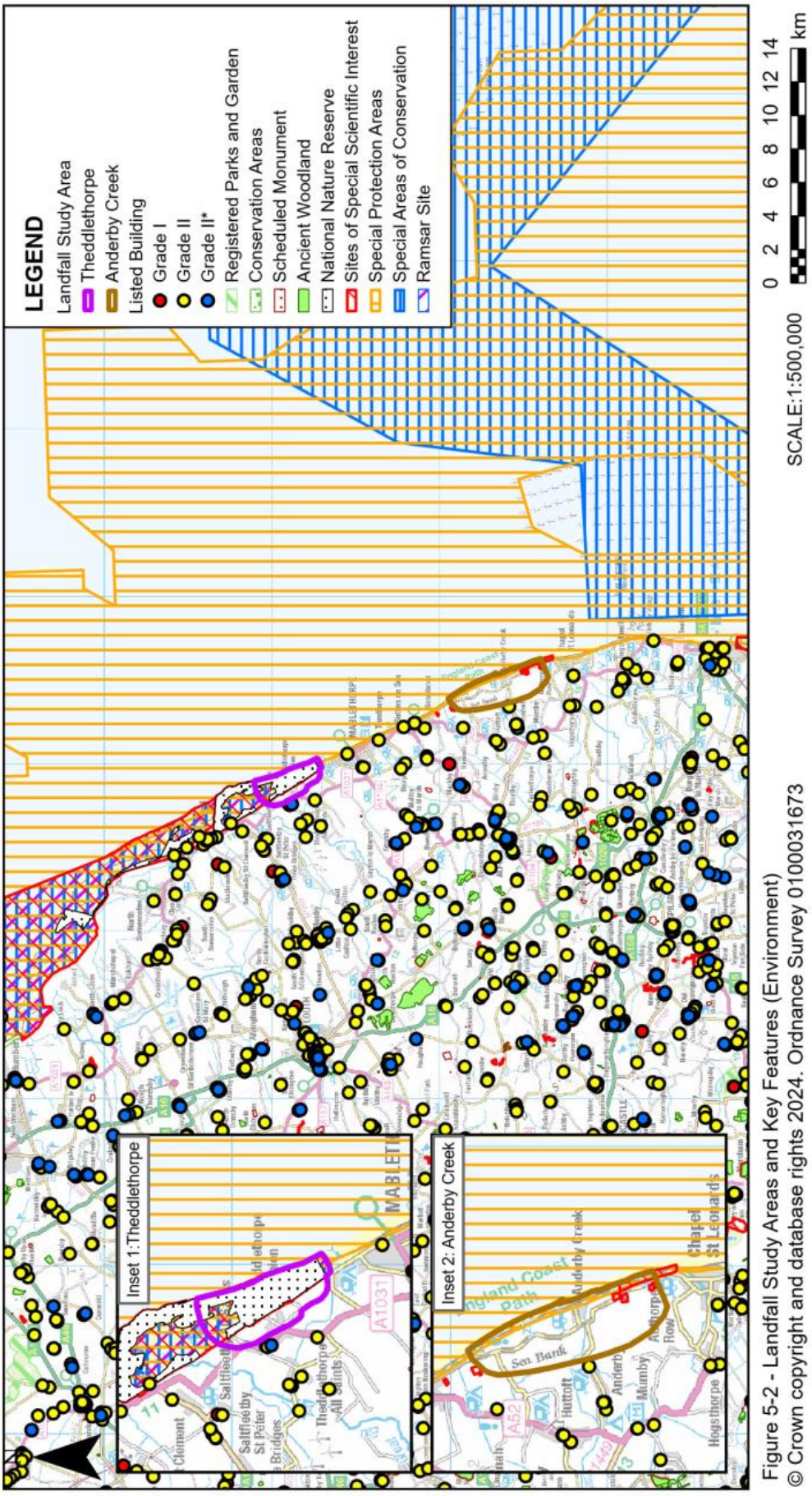


Figure 5-2 - Landfall Study Areas and Key Features (Environment)

Figure 5-3 – Landfall Study Areas and Key Water Features

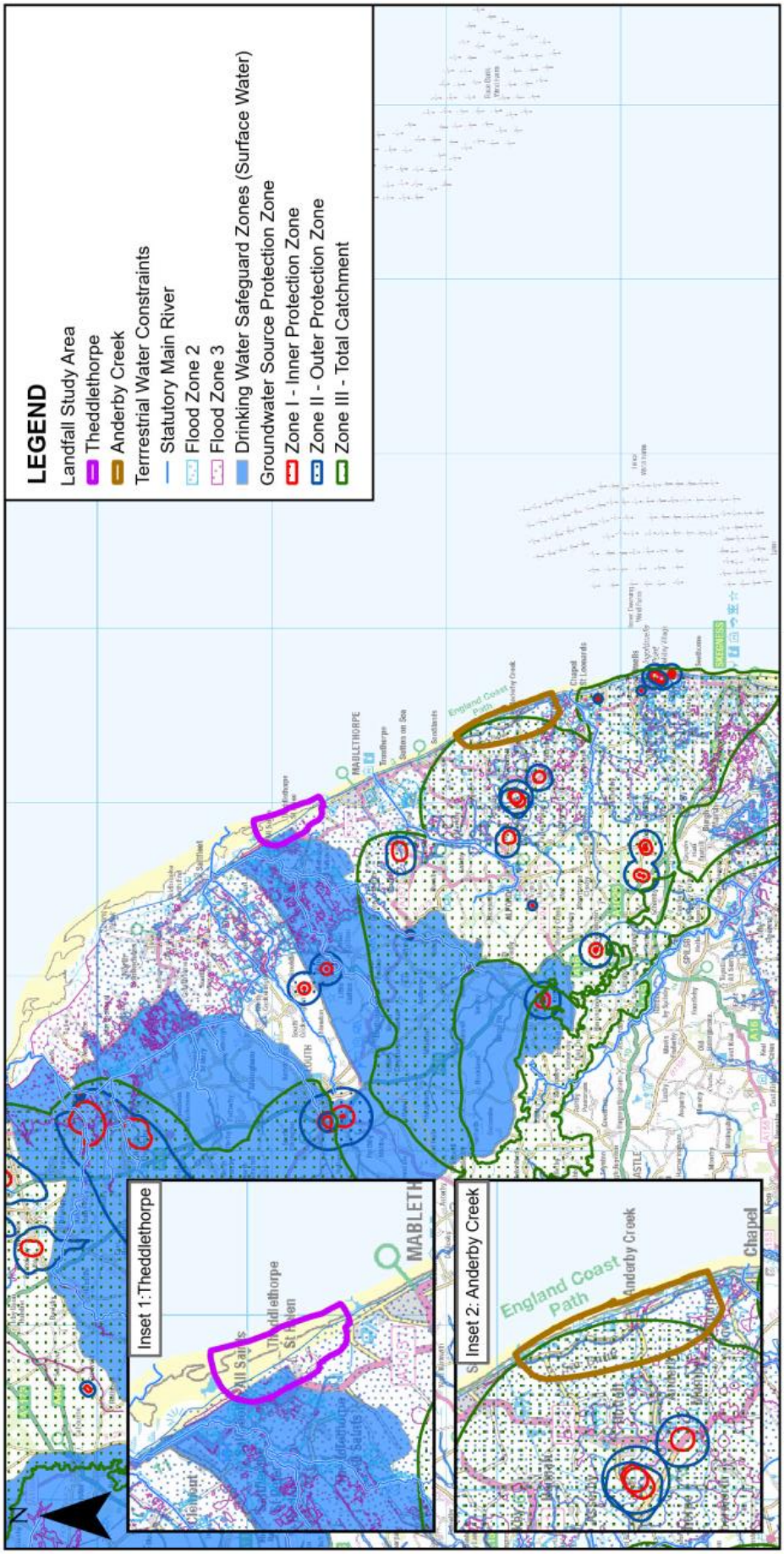


Figure 5-3 - Landfall Study Areas and Key Features (Water)

EGL 5 Converter Station

5.2.12 The process of defining the study area for the new EGL 5 converter station involved taking into consideration the two key drivers for the location of the new EGL 5 converter station, as described in Paragraph 4.5.7. A balance also needed to be achieved between the distance from the coastline (to reduce the length of HVDC cables required) and the distance from either of the proposed 400 kV LCS (to reduce the length of AC cables required). As such, the preferred locations (the preferred Siting Zones) for the LCS i.e., between the villages of Withern, Alford and Huttoft (see **Figure 5-4**), and the Landfall Study Areas (of Theddlethorpe and Anderby Creek) defined the inception point from which the EGL 5 converter station study areas were further developed.

5.2.13 The routeing and siting works for the EGL 3 and EGL 4 Projects (undertaken in 2024) sought to identify potential Siting Zones and/or Siting Areas for a potential converter station (which will now comprise the EGL 5 converter station) and direct current switching station (DCSS) to form part of a potential 'three-ended connection' as part of the EGL 3 and EGL 4 Projects. It has been confirmed that the EGL 3 and EGL 4 Projects no longer require a three-ended connection as part of their projects. However the information provided in support of the initial routeing and siting works by the EGL 3 and EGL 4 Projects (to potentially site a converter station and DCSS in proximity to one of the LCS) was used to inform the siting for the study area and siting works for the EGL 5 converter station.

5.2.14 Like the EGL 3 and EGL 4 Projects, to identify any sites suitable for the English Onshore Component of the Project, an initial search area of 2 km was identified. The search was focussed around each of the preferred locations for the proposed 400 kV LCS. An initial search area of 2 km was considered to yield suitable locations for siting as increasing the distance further from the preferred locations of the proposed LCS would increase the length of the HVAC and HVDC cables from the LCS and the Landfall Study Areas respectively. This increase in distance will increase the geographical spread of development and is likely to increase the scale of environmental and socio-economic impacts, costs and the duration of construction. The initial search area is shown in **Figure 5-4**.

5.2.15 Following identification of the initial search area, a high-level desk-based review was undertaken to identify the major areas of highest amenity, main centres of population and major technical constraints. Those identified for the new EGL 5 converter station, include:

- Centres of population at Anderby, Sutton-on-Sea, Maltby Le Marsh, Alford, Bilsby, Withern, Woodthorpe;
- Great Eau and Wold Grift Drain Main Rivers (and WFD waterbodies);
- Trusthorpe Pump Drain (upper end), Trusthorpe Pump Drain (lower end), Boygrift Drain and Anderby Main Drain WFD waterbodies;
- Areas of ancient woodland, most notably Greenfield Wood/Mother Wood;
- Strubby Glider Field and Strubby Airfield;
- Flood Zones 2 and 3 which cover a substantial extent of the initial search area;
- Grade I, II and II* listed buildings scattered throughout the initial search area;

- Proposed Outer Dowsing Offshore Wind Farm (OWF) underground cable, routing through the south of the initial search area;
- Proposed EGL 3 and EGL 4 underground cable routing through the centre of the initial search area;
- Proposed Ossian OWF underground cable, with its Transmission Infrastructure Scoping Boundary in the south of the initial search area; and
- Proposed GtW overhead line routing through the centre of the initial search area.

5.2.16 The initial search area was subject to a high-level desk-based review and refinement process which sought to avoid identified constraints where practicable and seek to reduce the amount of connection infrastructure required. The initial search area for the new EGL 5 converter station was amended as follows:

- To avoid Markby Prior Scheduled Monument;
- To avoid Site of St Mary's Priory, Greenfield Scheduled Monument;
- To avoid Viking Link Interconnector;
- To avoid areas substantially covered by groundwater Source Protection Zone (SPZ) I (Inner Protection Zone) and II (Outer Protection Zone); and
- To avoid areas substantially covered by Flood Zone 2 and 3.

5.2.17 The study area for the new EGL 5 converter station (described in this Report as the CS Study Area) and Siting Zones identified are shown in **Figure 5-4.**

Figure 5-4 – EGL 5 Converter Station Initial Search Area, Study Area, Siting Zones/Areas and Key Features

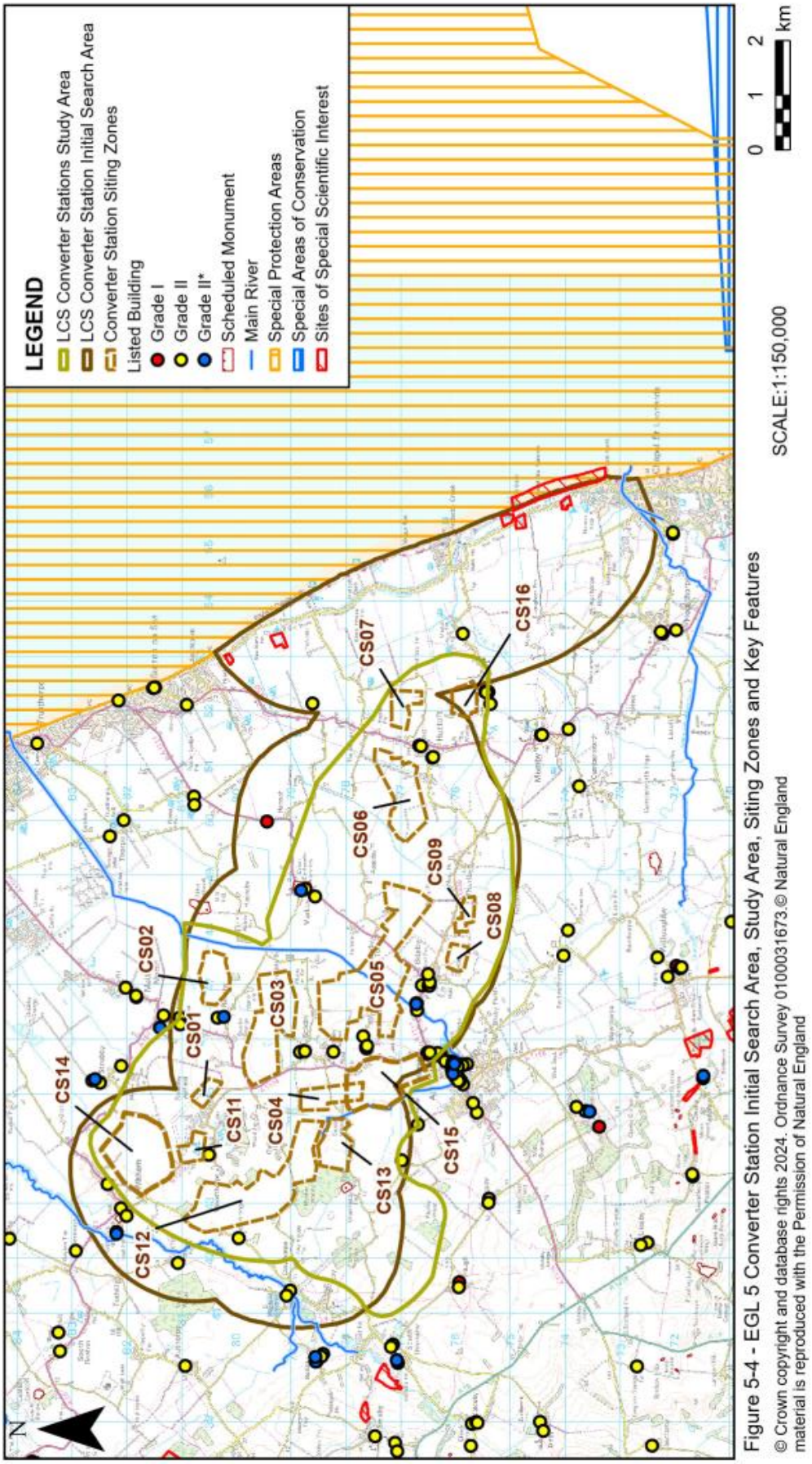


Figure 5-4 - EGL 5 Converter Station Initial Search Area, Study Area, Siting Zones and Key Features

Underground cables

5.2.18 The study area for the underground cables (as shown on **Figure 5-1**) was defined through a five-phase process which is outlined below**.**

5.2.19 The approach to defining the study area for the underground cables was based on balancing NGET's statutory duty to develop an efficient, co-ordinated and economical system of transmission (Section 9, Electricity Act 1989); NGET's statutory preservation of amenity duty under Section 38 and Schedule 9 of the Electricity Act 1989; and Holford Rule 1 which is to *"avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the first line in the first place, even if the total mileage is somewhat increased in consequence"*.

Phase I: Connection Points

5.2.20 The first phase involved joining two connection points[40], comprising the Landfall Study Areas in the east and the two preferred Siting Zones for the proposed LCS in the west, in the most economic and efficient manner: being a straight line between these connection points. The connection points used were the centre points of each study area (the process of defining the study areas for the Landfalls is described above in Paragraph 5.2.6 and above for the EGL 5 converter station in Paragraph 5.2.10). All other things being equal, a straight line would be the shortest route and therefore represent both the least cost solution and the least amount of new development, potentially minimising community and environmental impacts and resulting in a potentially shorter construction programme.

Phase II: High-level Constraints Review

5.2.21 A high-level desk-based review was then undertaken of the features representing major potential constraints between each of the connection points: the major areas of highest amenity value, main centres of population and major technical constraints. Major areas of highest amenity value included the Lincolnshire Wolds National Landscape ('the Lincolnshire Wolds NL'); Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site; Greater Wash SPA; Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC; Gibraltar Point SPA and Ramsar site; The Wash SPA and Ramsar site; The Wash and North Norfolk Coast SAC and the Inner Dowsing, Race Bank and North Ridge SAC. The main centres of population identified included Mablethorpe, Sutton-on-Sea and Alford. Key technical constraints for the underground cables, at this scale, were also identified; however, these did not change the study area. Key technical constraints comprised main rivers (such as Great Eau and Wold Grift Drain), existing gas pipelines (such as the Theddlethorpe to Hatton pipeline) and other existing high voltage underground cables (such as Viking Link Interconnector and Triton Knoll OWF, proposed project developments (such as Outer Dowsing OWF, EGL 3 and EGL 4 Projects, Ossian OWF and GtW Project), and A-roads/B-roads.

5.2.22 Where applicable the straight lines were amended to avoid the major areas of highest amenity value and main centres of population that had been identified. It was considered that the key technical constraints could be overcome via careful routeing and or construction mitigation.

[40] For the purposes of Phase I, the two LCS (LCS-A and LCS-B) proposed by the GtW Project are considered to represent one connection point.

Phase III: Initial Search Area

5.2.23 A search area was then introduced around the line established following Phase II, to allow for the development of a reasonable range of early Corridors. A search area totalling 10 km wide (5 km either side of the straight lines identified in Phase II) was considered sufficient to enable the development of early Corridor options that avoid the major constraints.

Phase IV: Refinement of Search Area

5.2.24 This initial 10 km wide search area was then reviewed and refined to exclude the major areas of highest amenity value and the main centres of population identified in Phase II.

5.2.25 At this stage, the search area was refined to avoid the populated areas of Chapel St Leonards, Alford, Manby; and to avoid the Lincolnshire Wolds NL.

Phase V: Expansion of Search Area

5.2.26 A high-level desk-based review of the unconstrained areas within the likely study area for the underground cables identified in Phase IV was then undertaken to identify areas where the likely study area could be expanded to avoid constraints and provide opportunities to reduce environmental impacts.

5.2.27 No areas for expansion were identified. However, the study area was refined to avoid Great Eau and the settlements of Withern, Aby, Alford and Hogsthorpe.

5.2.28 The Underground Cable Study Area begins to the north of Mablethorpe at the most northerly Landfall for the Project (Theddlethorpe) and then extends south to Anderby Creek, the most southerly Landfall for the Project, then west to the LCS Siting Zones to the north of Alford and east of Bilsby, one of which is the connection point for the Project.

5.3 Description of the Study Area

5.3.1 As the Landfall Study Areas, Underground Cable Study Area and CS Study Area overlap, the baselines of all study areas are summarised together below. These combined areas are referred to as ‘the Study Area’, located within the district of East Lindsey.

5.3.2 The eastern, coastal, extent of the Study Area is bounded by Theddlethorpe St Helen in the north and Anderby Creek in the south. The Greater Wash SPA is located along the Lincolnshire coastline to the east.

5.3.3 The western, inland, extent of the Study Area is bounded by multiple villages such as Maltby Le Marsh, Alford, Willoughby, Cumberworth and Hogsthorpe. The road network of the western extent comprises the A157, A1104, A1111 and A52 connecting Grimsby, Louth, Skegness and Boston. The Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC, Greater Wash SPA; Inner Dowsing, Race Bank and North Ridge SAC, and Humber Estuary Ramsar site, SAC and SPA are located along the Lincolnshire coastline to the east.

5.3.4 Both the coastal and inland extents of the Study Area are located within the district of East Lindsey and comprises the low-lying coastal plain landscape of the Lincolnshire Coast and Marshes National Character Area (NCA) as well as adjacent to the Lincolnshire Wolds NCA.

5.4 Scope of Environmental Topics and Data Gathering (Step 2)

5.4.1 To identify connection options which best satisfy NGET's statutory duties and obligations and meet the Project objectives identified in the Strategic Proposal Stage (Stage 1), it is necessary to understand the distribution of environmental and technical constraints (push factors) and opportunities (pull factors) within the Study Area. Data to inform this was gathered for the Study Area, as well as for the immediately surrounding areas for those topic areas where it was considered that there was potential for adverse impacts on a feature outside the Study Area boundary (for example, impacts on the setting of the Lincolnshire Wolds NL or designated heritage assets, or impacts on migrating wildfowl from an ornithologically designated site). The extent of this data gathering was based on the professional judgement of the Project environmental and engineering specialists, considering relevant environmental legislation, policy and best practice.

5.4.2 Features representing potential constraints to development were categorised as either 'seek to avoid' or 'seek to minimise' to either avoid or minimise impacts whilst achieving the Project objectives for each of the technology options (underground cables and converter stations). Features were categorised based on the level of constraint that the relevant environmental specialist considered them to represent based on professional judgement and relevant environmental legislation, policy and best practice. The sensitivity of sites and features relevant to the Project will be continually reviewed as the Project progresses in response to consultation feedback and further site-based assessment.

5.4.3 A list of the data obtained, to inform the onwards steps, is listed in **Table 5-1** for underground cables and **Table 5-2** for converter stations.

5.4.4 Buffers were also included for some features representing constraints, where it was considered that potentially significant indirect impacts could occur from beyond the asset itself, for example impacts on the setting of a listed building, to avoid or minimise that impact. The extent of the buffers was based upon the professional judgement of the relevant Project team subject matter expert, considering relevant legislation, policy and best practice. The buffers were not intended to be areas where transmission development must be avoided but instead are areas where transmission development should be minimised. The buffers are shown in **Table 5-1** for underground cables and **Table 5-2** for converter stations.

Table 5-1 – Data Gathering Features (Underground Cables)

Sub-topic	Constraint Name	Buffer
Air Quality	Residential Properties	25 m
	Education Establishments (such as schools and colleges)	N/A
	Buildings (other than residential properties e.g. retail, industrial estates)	N/A
Ecology	Ancient Woodland	50 m
	National Nature Reserves	N/A
	Ramsar site	500 m
	Special Area of Conservation (SAC)	500 m, 2 km
	Special Protection Area (SPA)	1 km
	Site of Special Scientific Interest (SSSI)	500 m
	Important Bird Area	500 m
	Local Nature Reserves (LNR)	N/A
	Priority Habitat Inventory	N/A
	Traditional Orchard	50 m
	National Forest Inventory Woodland	N/A
Economic Activity	Business parks/Retail and shopping centres/Industrial estates	N/A
	Best Most Versatile (BMV) agricultural land (Agricultural Land Classification (ALC) Grades 1, 2, 3)	N/A
	Wind farms and wind turbines	N/A
	Planning Applications/Consents (only for Nationally Significant Infrastructure Projects registered with the Planning Inspectorate and Major Development (as defined by the NPPF) or Infrastructure application registered with the relevant Local Authority)	N/A
	National Trust Inalienable Land	N/A
	Aggregates and Mineral Resource Areas	N/A
	Local Plan Allocations	N/A

Sub-topic	Constraint Name	Buffer
Geology and Soils	Peaty Soils	N/A
	Geological Sites of Special Scientific Interest	N/A
	Local Geodiversity Sites	N/A
	Aggregates and Mineral Resource Areas	N/A
Historic Environment	Scheduled Monuments	250 m
	Listed Buildings	250 m
	Registered Parks and Gardens	250 m
	Conservation Areas	N/A
	National Trust Properties & Inalienable Land	N/A
Landscape and Visual	National Landscapes (NL)	N/A
	Residential settlements and individual dwellings	25 m
	Viewpoints	N/A
	Recreational Areas	N/A
	Outdoor recreational facilities including golf courses, canals and caravan parks	N/A
	Local Landscape Designations	N/A
Aviation and Defence	Licensed Airfield/Aerodrome	N/A
	Ministry of Defence properties (including military airfields)	500 m
	Civil Aviation Authority Airports or Aerodromes	1 km
Noise and Vibration	Residential properties	25 m
	Education establishments (e.g., Schools and Colleges)	N/A
	Health care facilities (e.g., hospitals, hospices, clinics)	N/A
	Places of worship	N/A
Water	Statutory Main Rivers	N/A
	Water Framework Directive (WFD) surface waters	N/A
	Internal Drainage Board (IDB) surface waters	N/A

Sub-topic	Constraint Name	Buffer
	Flood Zones 2 & 3 excluding 'Areas Benefitting from Flood Defences'	N/A
	Groundwater vulnerability (medium/high to high)	N/A
	Principal Aquifers	N/A
	Groundwater Dependent Terrestrial Ecosystems	N/A
	Groundwater Source Protection Zones – Inner/Zone 1	N/A

Table 5-2 – Data Gathering Features (Converter Station)

Sub-topic	Constraint Name	Buffer
Air Quality	Residential Properties	25 m
	Education Establishments (such as schools and colleges)	N/A
	Buildings (other than residential properties e.g. retail, industrial estates)	N/A
Ecology	Ancient Woodland	50 m
	Special Protection Area (SPA)	500 m and 1 km
	Local Nature Reserves (LNR)	N/A
	Priority Habitat Inventory	N/A
	Traditional Orchard	N/A
	National Forest Inventory Woodland	N/A
Economic Activity	Business parks/Retail and shopping centres/Industrial estates	N/A
	Best Most Versatile (BMV) agricultural land (Agricultural Land Classification (ALC) Grades 1, 2, 3)	N/A
	Planning Applications/Consents (only for Nationally Significant Infrastructure Projects registered with the Planning Inspectorate and Large Scale Housing or Infrastructure application registered with the relevant Local Authority)	N/A

	National Trust Inalienable Land	N/A
	Aggregates and Mineral Resource Areas	N/A
	Local Plan Allocations	N/A
Geology and Soils	Aggregates and Mineral Resource Areas	N/A
Historic Environment	Scheduled Monuments	250 m
	Listed Buildings	250 m
	Conservation Areas	N/A
	National Trust Properties & Inalienable Land	N/A
Landscape and Visual	National Landscapes (NL)	2 km
	Residential settlements and individual dwellings	25 m
	Recreational Areas	N/A
	Outdoor recreational facilities including and caravan parks	N/A
	Local Landscape Designations	N/A
Noise and Vibration	Residential properties	25 m
	Education establishments (e.g., Schools and Colleges)	N/A
	Health care facilities (e.g., hospitals, hospices, clinics)	N/A
	Places of worship	N/A
Water	Statutory Main Rivers	N/A
	Water Framework Directive (WFD) surface waters	N/A
	Internal Drainage Board (IDB) surface waters	N/A
	Flood Zones 2 & 3 excluding ‘Areas Benefitting from Flood Defences’	N/A
	Groundwater vulnerability (medium/high to high)	N/A
	Principal Aquifers	N/A
	Groundwater Source Protection Zones – Inner/Zone 1	N/A

5.5 Ascribe a weight to, confirm and 'Heat Map' Features (Step 3)

5.5.1 Data gathered for features representing potential constraints to development was attributed a sensitivity weighting as described in **Chapter 4**. It should be noted that residential density, derived from OS AddressBase residential property data, was also included as part of the process. Sensitivity weightings were attributed by the relevant environmental specialist based on professional judgement, considering relevant environmental legislation, policy and best practice and agreed with the Project team. The data, once classified, was then used to create 'heat maps' showing the relative importance of the different features. This assisted in providing a visual representation of the relevant constraints for the English Onshore Component of the Project across the Study Area and informed the identification of early Corridors, Siting Zones and/or Siting Areas.

5.5.2 The heat maps were then reviewed by the Project team to ensure that the sensitivity weightings applied were appropriate in terms of their relative importance in decision-making for the type of infrastructure proposed, and to check whether there were features that were so extensive that they would affect all Corridors or Siting Zones or Siting Areas and thus not help in distinguishing between options.

5.5.3 The heat maps were reviewed again following these changes and approved for the identification of early underground cable Corridors, and converter station Siting Zones and/or Siting Areas. The heatmaps for each technology type for the English Onshore Component of the Project are shown in **Figure 5-5** and **Figure 5-6**.

Figure 5-5 – Converter Station Heatmap

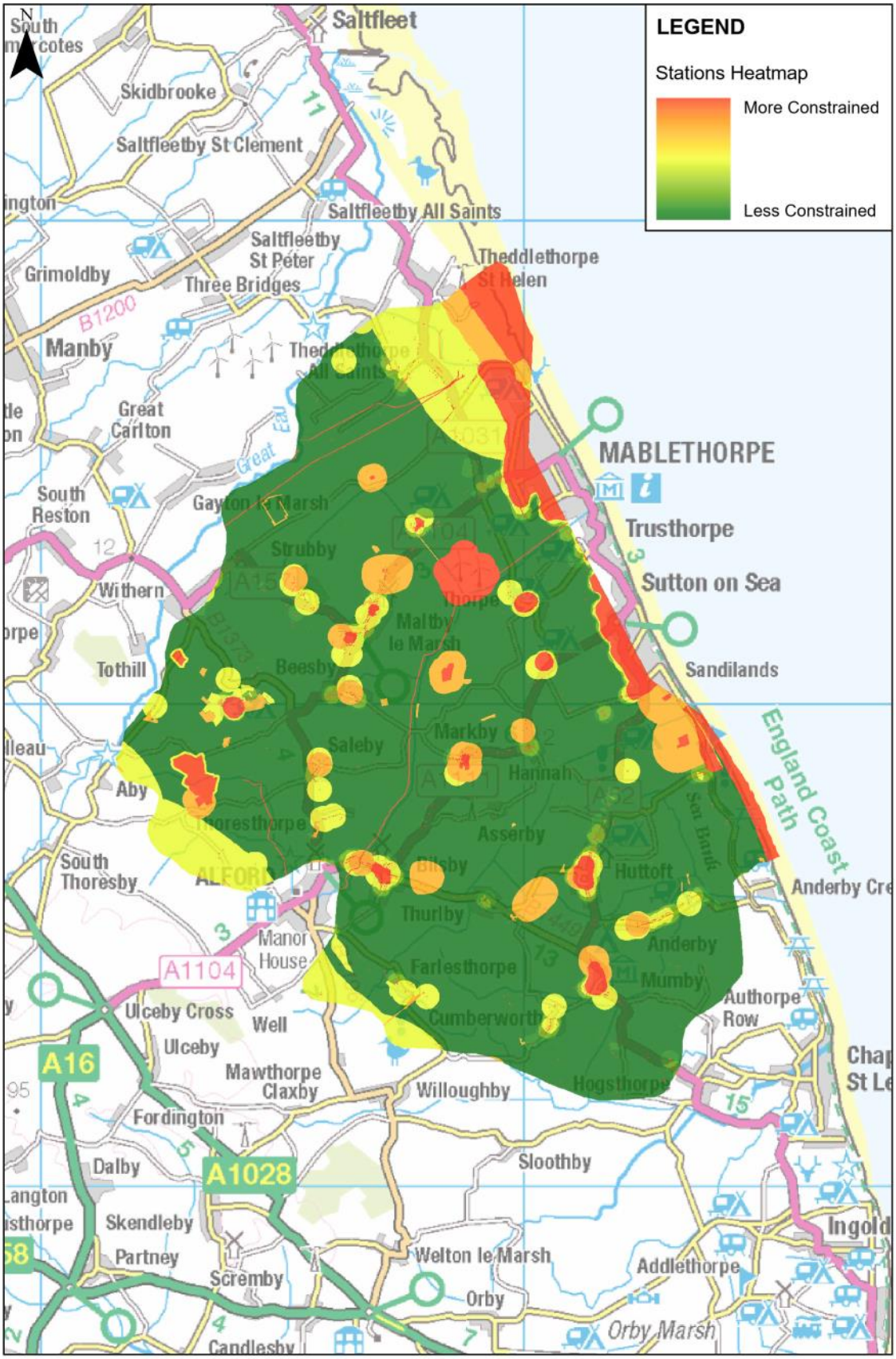


Figure 5-5 Converter Stations Heatmap

SCALE:1:125,000

0 1 2 km

Figure 5-6 – Underground Cable Heatmap

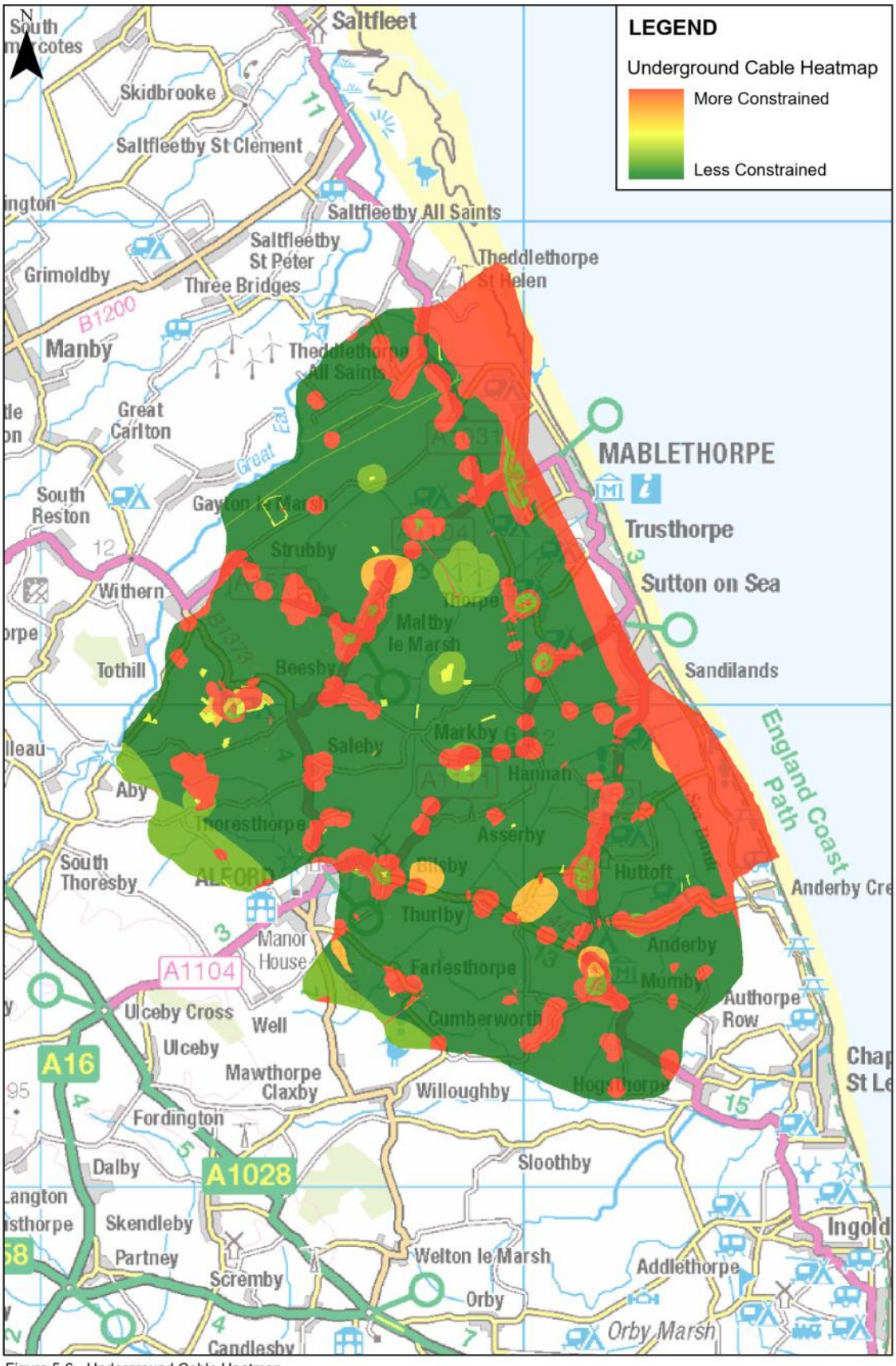


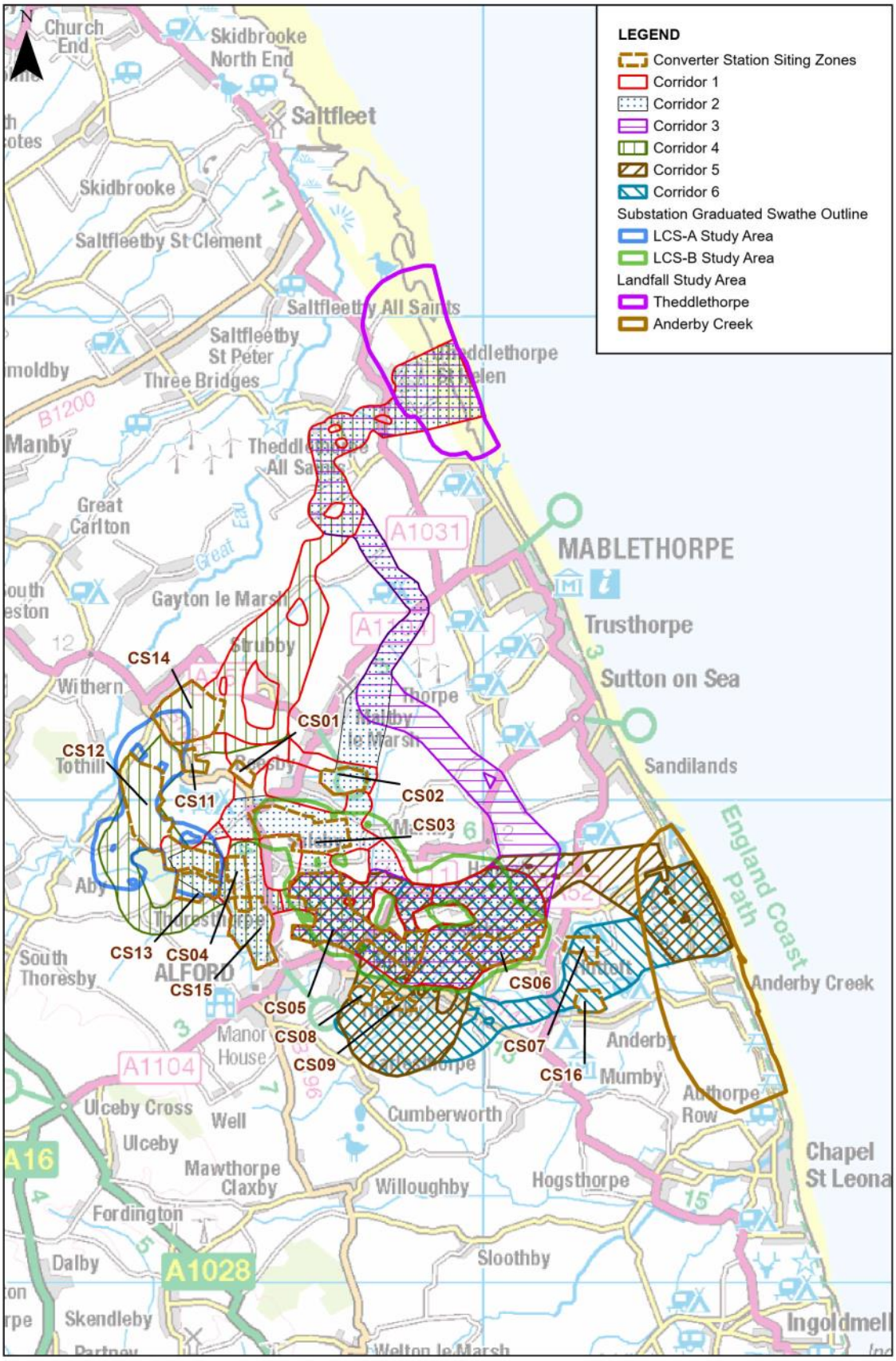
Figure 5-6 - Underground Cable Heatmap

SCALE:1:125,000

5.6 Identifying and Defining Corridors, Siting Zones or Siting Areas (Steps 4 to 6) and Landfall Appraisal (Step 5)

5.6.1 The process undertaken in **Section 5.2** and the heat maps derived for the underground cables and converter station informed the identification of options for preliminary Corridors, Siting Zones or Siting Areas within the Study Area. These are shown in **Figure 5-7**.

Figure 5-7 – Landfalls, Siting Zones, Siting Areas and Corridors Identified for EGL 5



EGL 5 Converter Station Siting Zones or Siting Areas (Step 4)

5.6.2 The identification of potential Siting Zones for the new EGL 5 converter station was undertaken and took into consideration the land take required to accommodate the required infrastructure; the distribution of environmental, socio-economic and technical constraints; and the Horlock Rules as detailed below.

5.6.3 In order to inform the siting work for the English Onshore Component of the Project's infrastructure, it has been assumed that the EGL 5 converter station with outdoor (AIS) HVAC switchgear could extend to 350 m by 250 m (approximately 9 ha), with a construction compound of up to 200 m by 200 m (approximately 4 ha). Permanent access would be needed to the EGL 5 converter station, together with peripheral landscaping, drainage, and other related works, which are assumed to be approximately 1 ha which is equivalent to approximately 15% of the converter station platform.

5.6.4 Therefore, the indicative maximum land take required to accommodate the footprint of a single converter station and associated infrastructure, a 'Siting Area', would be 14 ha. A 'Siting Zone' has the potential to contain more than one configuration of converter station (Siting Area), increasing flexibility.

5.6.5 As described in Step 3, the routeing and siting works for the EGL 3 and EGL 4 Projects (undertaken in 2024) recently sought to identify potential Siting Zones and/or Siting Areas for a potential converter station and DCSS. The information provided in support of the initial routeing and siting works by the EGL 3 and EGL 4 Projects (to potentially site a converter station and DCSS in proximity to one of the LCS) was used to inform the siting for the study area and siting works for the English Onshore Component of the Project's EGL 5 converter station including at Steps 4.

5.6.6 Following a review of the new EGL 5 converter station Siting Zones identified as part of the EGL 3 and EGL 4 Projects, Siting Zone DC10 (referred to in this Report as CS10, located on the site of Theddlethorpe Gas Terminal) was confirmed as not suitable (as also identified within the EGL 3 and EGL 4 Projects' CPRSS[26]). The other EGL 3 and EGL 4 Projects' Siting Zones were considered suitable for the English Onshore Component of the Project.

5.6.7 Following preliminary examination of the heat maps and the GIS datasets identified, three additional areas were also identified with potential to accommodate the new EGL 5 converter station for the English Onshore Component of the Project. These converter station (CS) Siting Zones are identified as CS14, CS15 and CS16, are presented in **Figure 5-8**.

Underground Cables (Step 4)

5.6.8 Following the development of the heat maps at Step 3, early Corridors were developed for the English Onshore Component of the Project between the potential connection points by environmental specialists working with others as appropriate. The early Corridors were identified, using the Corridors developed originally for the EGL 3 and EGL 4 Projects as a starting point. These Corridors were subject to a review and application of professional judgement of routeing considerations. This was to ensure that the Corridors identified were relevant to EGL 5 and technically feasible, whilst minimising the potential for adverse impacts on the environment. No new Corridors in addition to those considered by the EGL 3 and EGL 4 Projects were identified as worth including for appraisal (in terms of them being able to provide benefits for environmental, social or technical receptors and elements).

5.6.9 The GIS analysis using heat maps was used as a starting point to identify Corridors that aimed to:

- Entirely avoid the largest areas of highest amenity and largest settlements;
- Avoid smaller areas of higher amenity and smaller clusters of houses as far as possible;
- Avoid smaller areas of technical constraint as far as possible;
- Be broad enough to allow for smaller areas of high amenity and residential properties within the corridor to be avoided at the detailed design stage;
- Likewise, be broad enough for constraints not apparent at this stage (e.g., information arising from non-statutory consultation, not currently known to nget) to be avoided at the detailed design stage; and
- Provide options to connect from one corridor to another so that constrained sections of an otherwise suitable Corridor can be bypassed.

5.6.10 The consideration of the Holford Rules, as described in **Chapter 3**, in the development of the early Corridors was led by environmental specialists because the underlying aim of the rules is, in effect, to guide the design of linear transmission infrastructure to avoid important constraints. Rules 1 and 2 address the areas of high amenity (i.e., environmental constraints). Rule 1 applies at a broader scale, primarily in the development of the underground cable Study Area. Rule 2 considers amenity areas at a smaller scale and therefore was the main driver in developing the heat maps, the GIS analysis and is critical in developing Corridors. Rules 3 to 7 are not applicable to underground cables.

5.6.11 The landscape of the underground cable Study Area is generally very flat and open, with long views. The development of the preliminary Corridors was therefore driven by Rules 1 and 2, with technical and socio-economic considerations feeding in alongside environmental constraints. The development of preliminary Corridors aimed to ensure that areas of constraint are either excluded or, generally where smaller in size, can be avoided in detailed design, whilst avoiding unnecessary changes of direction.

Landfalls (Steps 4 to 6)

5.6.12 As outlined in Step 3, two Landfall Study Areas were identified and taken forward into the Options Appraisal following a preliminary Landfall appraisal.

5.6.13 The two Landfall Study Areas identified comprise:

- Theddlethorpe: This Landfall Study Area is located approximately 4.5 km north of the town of Mablethorpe on the Lincolnshire coastline. The potential Landfall location could be accessed via Crook Bank Road, directly off the A1031. The Landfall Study Area has a rural setting, with the former Theddlethorpe Gas Terminal immediately to the south and west and agricultural land to the west. The most prominent coastline features are the tidal flood defence sand dunes running north to south along the coastline.

- Anderby Creek: Anderby Creek is a small holiday village in Lincolnshire, to the north of Skegness. The potential Landfall location could be situated to the north or south of Anderby Creek and accessed via Roman Bank Road. This Landfall Study Area has a mainly rural setting with the most prominent coastline feature being a beach with tidal flood defence/sand dunes running north to south and with agricultural land to the west.

5.6.14 The two Landfall Study Areas were then subjected to an options appraisal considering the Landfall parameters and the environmental, socio-economic and technical topics for each Landfall Study Area. The options appraisal was informed by the data gathered as outlined in **Table 5-1** and **Table 5-2** and feedback received on the EGL 3 and EGL 4 Projects' CPRSS, Marine Non-Statutory Environmental Appraisal Scoping Reports (for the EGL 3 and EGL 4 Projects' English Offshore Scheme and Scottish Offshore Schemes) and EIA Scoping Report (for the EGL 3 and EGL 4 Projects' DCO).

5.6.15 Feedback provided on these documents received from the Marine Management Organisation (MMO) and Natural England both shared views around the need to avoid as far as practical the Saltfleetby to Theddlethorpe Dunes & Gibraltar Point SAC and Saltfleetby – Theddlethorpe Dunes SSSI (as shown in **Figure 5-2**), These designated sites cannot be avoided should a Landfall at Theddlethorpe be chosen, and adverse effects could not be ruled out in relation to the Saltfleetby to Theddlethorpe Dunes & Gibraltar Point SAC, meaning that the Project would not be able to satisfy the derogation requirements of The Conservation of Habitats and Species Regulations 2017 (as amended) ('The Habitats Regulations').

5.6.16 A review of trenchless crossings at the Landfalls identified an absence of existing information regarding feasibility of trenchless crossings at the Theddlethorpe Landfall and the need for a longer HDD crossing when compared to the Anderby Creek Landfall. An exit point on the beach would also be required at the Theddlethorpe Landfall outside of the Saltfleetby-Theddlethorpe Dunes & Gibraltar Point Special Areas of Conservation (SAC) but within the Humber Estuary SPA and Ramsar site, within the Greater Wash SPA, and within the Saltfleetby - Theddlethorpe Dunes SSSI and the Lincolnshire Coronation Coast National Nature Reserve (NNR), adding to the consenting complexity.

5.6.17 As part of the trenchless crossing at the Landfall, it would be necessary to carry out ground investigation works before confirming whether an HDD trenchless solution is feasible at either Landfall. For the Theddlethorpe Landfall it was identified that adverse effects arising from ground investigation surveys could not be ruled out, and as noted above it was clear that the Project would be unable to satisfy the Habitats Regulations derogation requirements. Alongside other factors, these would require demonstration that there were no alternative solutions to the delivery of the surveys, that would have a lesser or no effect on Habitats Sites. If information is not sufficient to confirm that an adverse effect on the integrity of the designated site cannot be ruled out, an investigation of alternative solutions is undertaken. To proceed with Theddlethorpe it would have been required, pursuant to The Habitats Regulations, to demonstrate that there were no feasible alternatives, which would not have been satisfied when Anderby Creek offers a feasible alternative solution.

5.6.18 When considering this information Anderby Creek is preferred as a Landfall over Theddlethorpe. Therefore, the Theddlethorpe Landfall Study Area has not been considered any further at this phase of the Project. The details and outcomes of the Landfall appraisal are set out in **Appendix A**.

Underground Cable Corridors, EGL 5 Converter Station Siting Zones or Siting Areas (Steps 5 and 6)

5.6.19 Following identification of the Anderby Creek Landfall Study Area as the emerging preferred Landfall the Corridors and Siting Zones preliminarily identified were subject to a review by the Project team to identify Corridors and Siting Zones to progress towards the options appraisal.

5.6.20 As part of this review it was decided by the Project team that increasing the distance of EGL 5, from the Anderby Creek Landfall Study Area, further west (to the proposed 400 kV LCS-A) was not preferred as this would increase the length of the proposed transmission connection from the Landfall site on the Lincolnshire coastline. This increase in distance would increase the geographical spread of development and would be likely to increase the scale of environmental and socio-economic impacts, costs and the duration of construction. The Project team therefore determined that a connection to the proposed 400 kV LCS-B was preferred for EGL 5 and taken forwards to inform the review of Corridors and Siting Zones to progress towards the options appraisal process.

EGL 5 Converter Station Siting Zones

5.6.21 The review exercise undertaken (to determine which Corridors and Siting Zones were suitable from a Landfall at Anderby Creek and a connection to the proposed 400 kV LCS-B) identified five Siting Zones (refer to parameters in Paragraph 5.6.3) for consideration at Options Appraisal, with a further Siting Zone (CS09) excluded as outlined below in Paragraph 5.6.26. From north to south these are:

- Siting Zone CS05 – an area, approximately 3.1 km by 800 m, located northeast of Bilsby spanning the A1111 Sutton Road;
- Siting Zone CS06 – an area, approximately 1.4 km by 500 m located northwest of Huttoft;
- Siting Zone CS07 – an area, approximately 675 m by 550 m located east of Huttoft;
- Siting Zone CS08 – an area, approximately 475 m by 350 m, located southeast of Bilsby;
- Siting Zone CS09 (discounted, refer to Paragraph 5.6.25) – an area, approximately 630 m by 230 m, located southeast of Bilsby; and
- Siting Zone CS16 – an area, approximately 580 m by 450 m, located north of Anderby.

Underground Cables

5.6.22 Following the review and identification of the Siting Zones for the new EGL 5 converter station, it was identified that two Corridor options initially identified at Step 3 would connect to the identified Siting Zones. These two Corridors were then subject to a back-check and review and further analysis by the Project team.

5.6.23 The review considered information gathered from the environment and technical site visits undertaken (ground-truthing key issues and pinch points identified during the desk studies) and further design and construction issues subsequently identified by the technical teams. Suggested amendments to the Corridors were implemented where they were consistent with environmental considerations. The changes implemented include:

- Removing the section of preliminary Corridor adjacent to the Landfall where the National Trust Sandilands Nature Reserve (former Sandilands golf course) is under construction.
- Removing sections of preliminary Corridors where clusters of residential properties were present.
- Removing sections of preliminary Corridors where there were natural and cultural designations (however for some Corridors, these could not be avoided).
- Removing sections of preliminary Corridors that no longer would be cost effective, useful or accessible following the above amends.

5.6.24 In addition, an exercise was undertaken to check the extent of potential constraints on both larger scale OS mapping and aerial photography.

Step 6

5.6.25 Following site visits, it was identified that a new development had been erected partially within Siting Zone CS09 and therefore significantly limited the potential for siting within this Siting Zone. Siting Zone CS09 was therefore discounted and not progressed to Options Appraisal. The Siting Zones and Corridors for consideration at Options Appraisal are shown in **Figure 5-8**.

Figure 5-8 – Landfall, Siting Zones and Corridors Defined for EGL 5

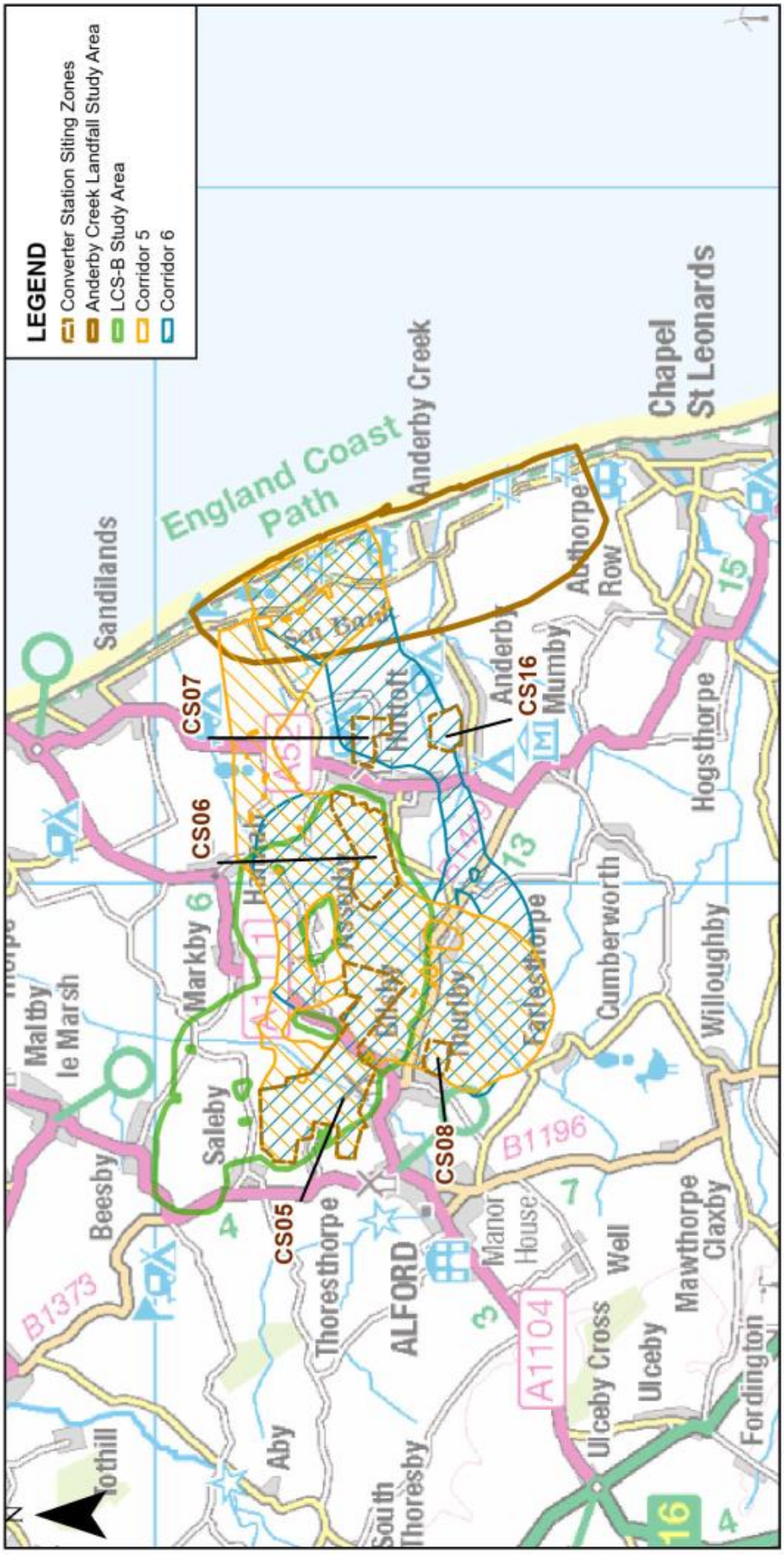


Figure 5-8 - Landfall, Siting Zones and Corridors Defined for EGL 5

5.7 Mitigation of Impacts Through Avoidance

5.7.1 The Study Area, preliminary Corridors and Siting Zones are effectively the first two stages of an iterative process looking at features which represent constraints at an increasingly smaller scale and finer grain. They were designed to comply with Holford Rules 1 and 2 and Horlock Rule 2, avoiding the major areas of highest amenity value altogether, where practicable, and allowing room within the Corridors to avoid smaller areas of high amenity value by local deviation. This approach seeks to minimise environmental impacts from the outset. The main constraints which influenced the formation of the preliminary Corridors, Siting Zones and/or Siting Areas and whether they have been avoided by this process, are listed in **Table 5-3**.

Table 5-3 – Major Features Representing Constraints within the Study Area

Topic	Constraint Type and Name	Avoided by Corridors and Siting Zones
Ecology	Site of Special Scientific Interest (SSSI): Saltfleetby-Theddlethorpe Dunes, Sea Bank Clay Pits	Avoided through selection of Anderby Creek as the emerging preferred Landfall and through definition of the preliminary Corridors.
	Ramsar site: Humber Estuary	Avoided through selection of Anderby Creek as the emerging preferred Landfall.
	Special Area of Conservation (SAC): Saltfleetby-Theddlethorpe Dunes & Gibraltar Point	Avoided through selection of Anderby Creek as the emerging preferred Landfall.
	Special Protection Area (SPA): Greater Wash	Adjacent to Corridors at the emerging preferred Landfall.
	Ancient woodland (9)	Avoided.
	Important Bird Areas (Humber Estuary)	Avoided through selection of Anderby Creek as the emerging preferred Landfall.
Economic Activity	Nationally Significant Infrastructure Project (4)	Viking Link Interconnector within Corridors and one Siting Zone. EGL 3 and EGL 4 Project within one Corridor and one Siting Zone. Ossian OWF within Corridors and Siting Zones. GtW Project within Corridors and three Siting Zones.
	MoD Properties: Theddlethorpe Range	Avoided through selection of Anderby Creek as the emerging preferred Landfall.

Topic	Constraint Type and Name	Avoided by Corridors and Siting Zones
Historic Environment	Registered Park and Gardens (1)	Avoided.
	Conservation Area (1)	Avoided.
	Scheduled Monuments (8)	Avoided.
Landscape and Visual	Lincolnshire Wolds NL	Avoided placement within the NL, although views towards and from the NL may still be impacted.
	Urban areas	Avoided.
Water	Statutory Main Rivers (3)	Within one Corridor and one Siting Zone.
	WFD surface waters	Within Corridors and one Siting Zone.
	IDB surface waters	Within Corridors and Siting Zones.
	Flood Zone 2 & 3	Within Corridors and Siting Zones.
	Groundwater Source Protection Zones – Inner/Zone 1	Within Corridors and Siting Zones.

5.8 Introduction to the Cost and Programme Model

NGET's Cost Estimates

5.8.1 Costs have been developed by NGET-using consistent assumptions such that route lengths are based on a route produced from a desktop exercise that is representative of the likely constraints to routeing. The costs of applying normal industry 'best practice' mitigation measures during construction and operation are inherent within the cost base used. Costs can therefore be compared at Step 7 (Options Appraisal) on a consistent basis noting that they could be higher or lower, but are consistent in relative terms. The scope of work for the new EGL 5 converter station are alike for all Siting Zones (and their connecting Corridors) and therefore, the cost of this work has not been included and is not a differentiator between options.

5.8.2 The costs included were estimated based on prices from the financial year 2023/24 and as such would need adjustment for inflation with time. However, they provide a consistent cost point for comparison of options at this stage. Lifecycle costs of assets have been calculated and represent a cost for operation and maintenance and fault restoration over a 40-year lifecycle but do not account for electrical losses.

NGET's Programme Estimates

5.8.3 To inform the Options Appraisal (Step 7), a logic linked activity schedule was built based on a generic build process for underground cables using assumptions such as cable type, cable length and crossing methods to standardise any unknown parameters, offering consistency across the Corridors. Any variables determined by the Corridors,

such as construction discipline and Corridor length were inputted to the schedule, producing estimates of construction duration and provision of an earliest operational date for each Corridor.

5.9 Next Step - Options Appraisal (Step 7)

5.9.1 As explained in **Chapter 4**, Options Appraisal (Step 7) is a structured process by which the environmental, socio-economic, technical, cost and programme implications are identified, reported and compared. It is a tool to aid objective and justified decision making and it enables NGET to document in a transparent manner the information on which judgements have been based. Options Appraisal is therefore focused on those sub-topics which assist in distinguishing between options.

5.9.2 Through the definition of study areas and preliminary options as areas that seek to comply with Holford Rules 1 and 2 and Horlock Rule 2 (seeking to minimise environmental effects from the outset), the preliminary options identified have already avoided several features such that they no longer represent differentiating factors. The constraints initially considered but found not to be differentiating factors for the Options Appraisal include:

- BMV agricultural land (ALC Grades 1, 2, 3a). BMV agricultural land is present across the identified study areas, apart from those defined as urban areas.
- Local Landscape Designations. None are directly affected by the Corridors or Siting Zones.
- Ordinance Survey (OS) marked viewpoints. None are located within 2 km of the Corridors or Siting Zones.
- Groundwater Dependent Terrestrial Ecosystems (GWDTE). GWDTE present within the defined study areas overlap with SSSIs.

5.9.3 The Options Appraisal, undertaken for each Project component (see **Figure 5-8**), described in **Chapters 6** and **7** below include the environmental and socio-economic sub-topics and constraints shown in **Table 5-4**.

Table 5-4 – Options Appraisal Sub-Topics and Constraints

Sub-topic	Constraint Name
Ecology	Ramsar site
	SAC
	SPA
	SSSI
	Priority Habitat Inventory
Historic Environment	Scheduled Monuments
	Listed Buildings
	Conservation Areas

Sub-topic	Constraint Name
Landscape	Lincolnshire Wolds NL
Visual	Residential settlements and individual dwellings
	Formal outdoor recreational facilities including golf courses, holiday parks, and caravan parks
Water	Statutory Main Rivers
	WFD surface waters
	Flood Zones 2 & 3 excluding 'Areas Benefitting from Flood Defences'
	Groundwater Source Protection Zones (SPZ) – Inner/Zone I
	Aquifers
	Groundwater vulnerability
Economic Activity	Business parks/Retail and shopping centres/Industrial estates
	Wind farms and wind turbines
	Planning Applications/Consents (only for Nationally Significant Infrastructure Projects registered with the Planning Inspectorate and Large Scale Housing or Infrastructure application registered with the relevant Local Authority)
	Local Plan Allocations
Aviation and Defence	Licensed Airfield/Aerodrome
	Unlicensed Airfield/Aerodrome
	MoD Land
Traffic and Transport	Major and Minor Roads
	Public Rights of Way (PRoW)
Geology and Soils	Best Most Versatile (BMV) Provisional Agricultural Land Classification (ALC)

5.9.4 For the environmental, socio-economic and technical issues the appraisal considers the potential impacts on relevant receptors, and whether such effects could be avoided or mitigated through careful routeing or siting. Where impacts cannot be avoided or mitigated by careful routeing or siting, other forms of mitigation have been considered. The residual impacts considered in the Options Appraisal do not take account of further project-specific environmental, socio-economic or technical mitigation measures which are likely to be included as part of the EIA process undertaken at the Defined Proposal and Statutory Consultation Stage (Stage 3).

5.9.5 As discussed in Paragraph 5.4.4, buffers were also included for some features representing constraints, where it was considered that potentially significant indirect impacts could occur from beyond the asset itself, for example impacts on the setting of a listed building, to avoid or minimise that impact. The extent of the buffers was based

upon the professional judgement of the relevant Project team subject matter expert, considering relevant legislation, policy and best practice. Outside of these defined buffers significant effects are less likely and therefore receptors outside these areas are unlikely to be a differentiating factor. These distances are illustrated within the options appraisals chapters summary tables for each environmental topic (**Chapters 6** and **7**).

5.9.6 The environmental, socio-economic and technical appraisals for the Landfalls are described in **Appendix A**, the appraisals for the underground cable Corridors are described in **Chapter 6,** the appraisals for the converter station Siting Zones are described in **Chapter 7,** with the cost and programme implications outlined in **Chapter 9**.

6. Options Appraisal – Underground Cables

6. Options Appraisal – Underground Cable Corridors

6.1 Introduction

6.1.1 This Chapter details the outcomes of the Options Appraisal (Step 7 as described in **Chapter 4**) for the underground cable Corridors between the Anderby Creek Landfall Study Area (described within this Chapter as 'the Landfall') and the proposed 400 kV LCS-B (to be consented by the GtW Project, as described in **Chapter 1**). The Corridors have been developed through definition of a study area (Step 1), mapping and weighting of features (Step 2 and Step 3), and an iterative identification, review and refinement process (Steps 4, 5 and 6). Two cable Corridors between the Landfall and the proposed 400 kV LCS-B have been appraised (shown on **Figure 6-1**).

Figure 6-1 – Corridors between the Anderby Creek Landfall Study Area and LCS-B

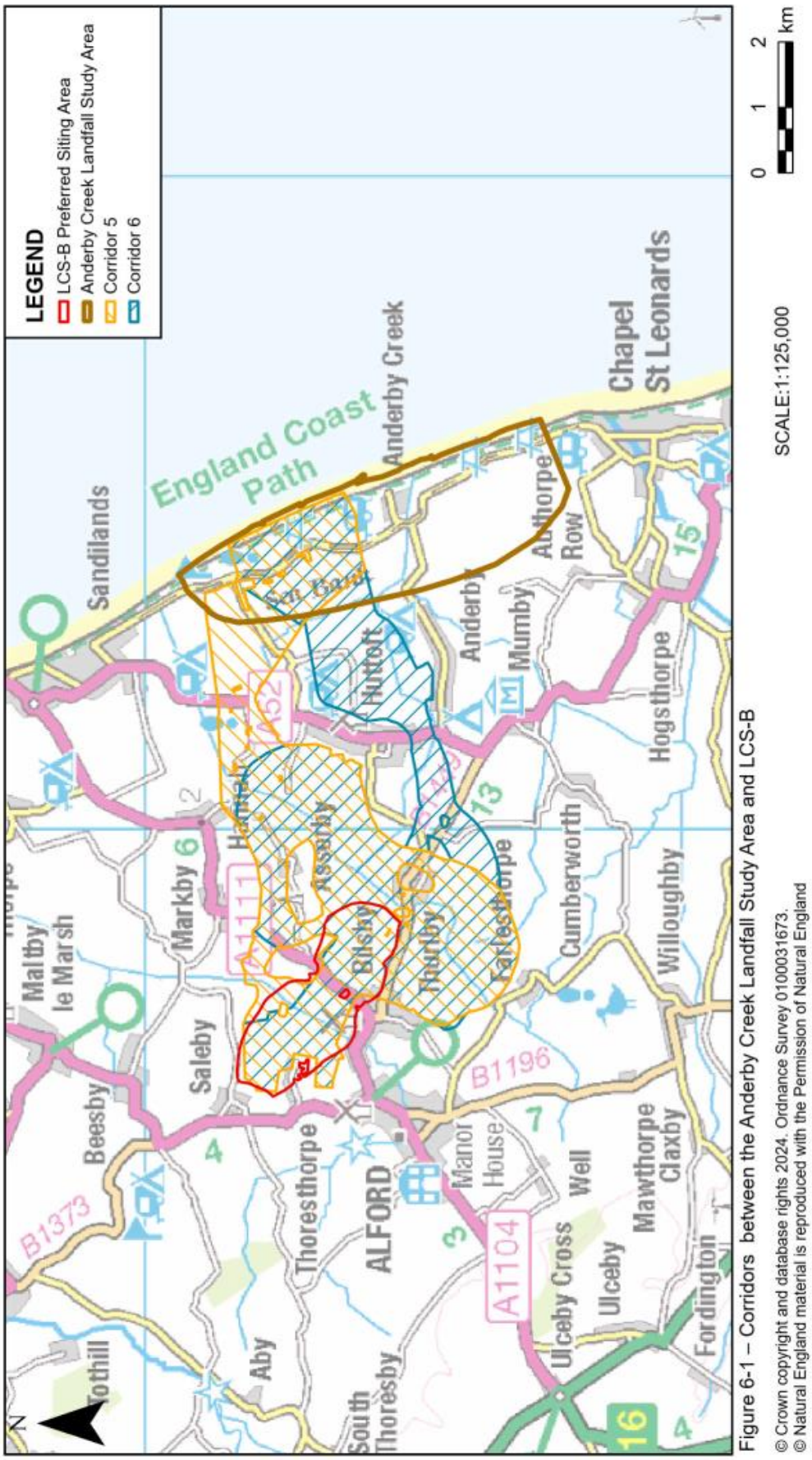


Figure 6-1 – Corridors between the Anderby Creek Landfall Study Area and LCS-B

Underground Cable Corridors

6.1.2 The Corridors for the proposed underground HVDC cables for the English Onshore Component of the Project from the Anderby Creek Landfall to the proposed 400 kV LCS-B are described below:

- Corridor 5 (see **Figure 6-1**): This Corridor begins at the connection with the Anderby Creek Landfall, and routes west, north of Huttoft, extending over the A52 and then A1111, before finishing at the A1104 between Beesby and Alford.
- Corridor 6 (see **Figure 6-1**): This Corridor begins at the connection with the Anderby Creek Landfall, and routes west, south of Huttoft, extending over the A52 and the A1111, before finishing at the A1104 between Beesby and Alford.

6.2 Options Appraisal

6.2.1 The Options Appraisal below has considered environmental, socio-economic and technical topics for each Corridor option and was informed by data gathered as set out within **Table 5-1** and **Table 5-2**. For the current Project stage, relevant data comprised desk-based study information, supplemented by site visits to select locations, in proximity to important receptors.

6.2.2 As detailed in **Chapter 5**, for the environmental, socio-economic and technical topics, the appraisal considers the potential impact on relevant receptors, and whether such effects could be avoided or mitigated through careful routeing or siting. Where impacts cannot be avoided or mitigated by careful routeing or siting, other forms of mitigation have been considered. The main cable installation method is assumed to be open-cut as this is the most economic and efficient installation method. Therefore, the application of trenchless cable installation, as a means of crossing main rivers, major roads and railways, and substantive areas of environmental sensitivity is regarded as an additional means of mitigating impacts. The residual impacts considered in this Options Appraisal do not take account of further detailed project-specific environmental, socio-economic or technical mitigations which are likely to be developed later through the EIA process to be undertaken at the Project's Defined Proposal and Statutory Consultation Stage (Stage 3).

6.3 Environmental Factors

Landscape and Visual

6.3.1 Both Corridors 5 and 6 are located within one National Character Area (NCA), the Lincolnshire Coast and Marshes NCA (No 42) (see **Figure 6-2**). This NCA is a low-lying, broad plain which forms the most easterly NCA in Lincolnshire[41]. Its long eastern coastline is bounded largely by the North Sea with the northerly extent of the coastline joining the large expanse of the Humber Estuary while to the south lies the entrance to The Wash.

[41] Lincolnshire Coast and Marshes - National Character Area Profiles

6.3.2 The Lincolnshire Coast and Marshes NCA (No 42) is characterised by a wide coastal plain extending from Barton-upon-Humber in the north, across to Grimsby at the mouth of the Humber and south to Skegness. Both Corridors are located within this NCA and it is therefore not a differentiating factor.

6.3.3 The closest nationally designated landscape area is the Lincolnshire Wolds National Landscape (NL) located c.3.5 km from Corridors 5 and 6. The Lincolnshire Wolds NL is located within the Lincolnshire Wolds NCA (No 43), a long, narrow; north-south aligned NCA stretching between the Humber and The Wash[42]. It is situated on the highest land in Lincolnshire, giving long views and strong visual links with adjacent NCAs. To the east, where the English Onshore Component of the Project will be located, there are views of the Lincolnshire coast and marshes and the North Sea.

6.3.4 The proximity to the Lincolnshire Wolds NL and the character of the landscape within each of the Corridors is detailed within **Table 6-1**.

6.3.5 For both Corridors, there is a risk that installation of the underground cables could influence the setting of the area, including that of the Lincolnshire Wolds NL, however given the short-to medium-term nature of construction, and the distance and screening of landform and vegetation, the change will have a likely limited impact on the setting of the Lincolnshire Wolds NL. Careful routeing would help to limit the potential for significant adverse impacts on landscape character by seeking to limit impacts upon woodland, tree planting, hedgerows, and by seeking more direct routes where possible. As the permanent works are underground (excluding marker posts), impacts with the potential to cause significant adverse effects to the landscape character of the area would be limited to the construction and installation phase. Careful siting of temporary construction and installation sites and facilities together with the control of site working measures and practices will further mitigate and help to reduce the severity of any potential adverse effects.

6.3.6 Visual receptors in proximity to each of the Corridors comprise residential properties (either within or at the edge of settlements or scattered properties) and recreational receptors (people using public rights of way (PRoW), roads and cycle routes). The main settlements in this area are: Asserby, Thurlby, Huttoft, Bilsby, Saleby, Markby, Hannah, Thoresthorpe, and Farlesthorpe. The most densely settled areas are those in proximity to Huttoft and Bilsby which has resulted in narrower Corridors and/or Corridors with a greater number of potential residential receptors. Other recreational receptors include National Trust Sandilands Nature Reserve (former Sandilands Golf Course), campsites and caravan parks. The potential likelihood and severity of effects upon visual amenity is greater for receptors in closer proximity to the Corridors. Identified receptors within 250 m of the Corridor are likely to experience temporary effects upon their visual amenity of a greater magnitude than those outside of 250 m, as detailed in **Table 6-1**.

[42] Lincolnshire Wolds - National Character Area Profiles

6.3.7 There is a risk that installation of the underground cables within the Corridors will have an adverse effect upon visual amenity of the identified key receptors. As the permanent works are underground, impacts with the potential to cause significant adverse effects upon visual amenity are temporary and related only to the construction and installation phase (with the exception of infrequent temporary maintenance and repair activities during operation). Careful routeing would seek to limit impacts upon woodland, tree planting, hedgerows, and would also seek to increase or maximise distances from residential properties. In addition, careful siting of temporary construction and installation sites and facilities together with the control of site working measures and practices will further mitigate and help to reduce the severity of any potential adverse effects.

Figure 6-2 – Environment features between the Anderby Creek Landfall Study Area and LCS-B

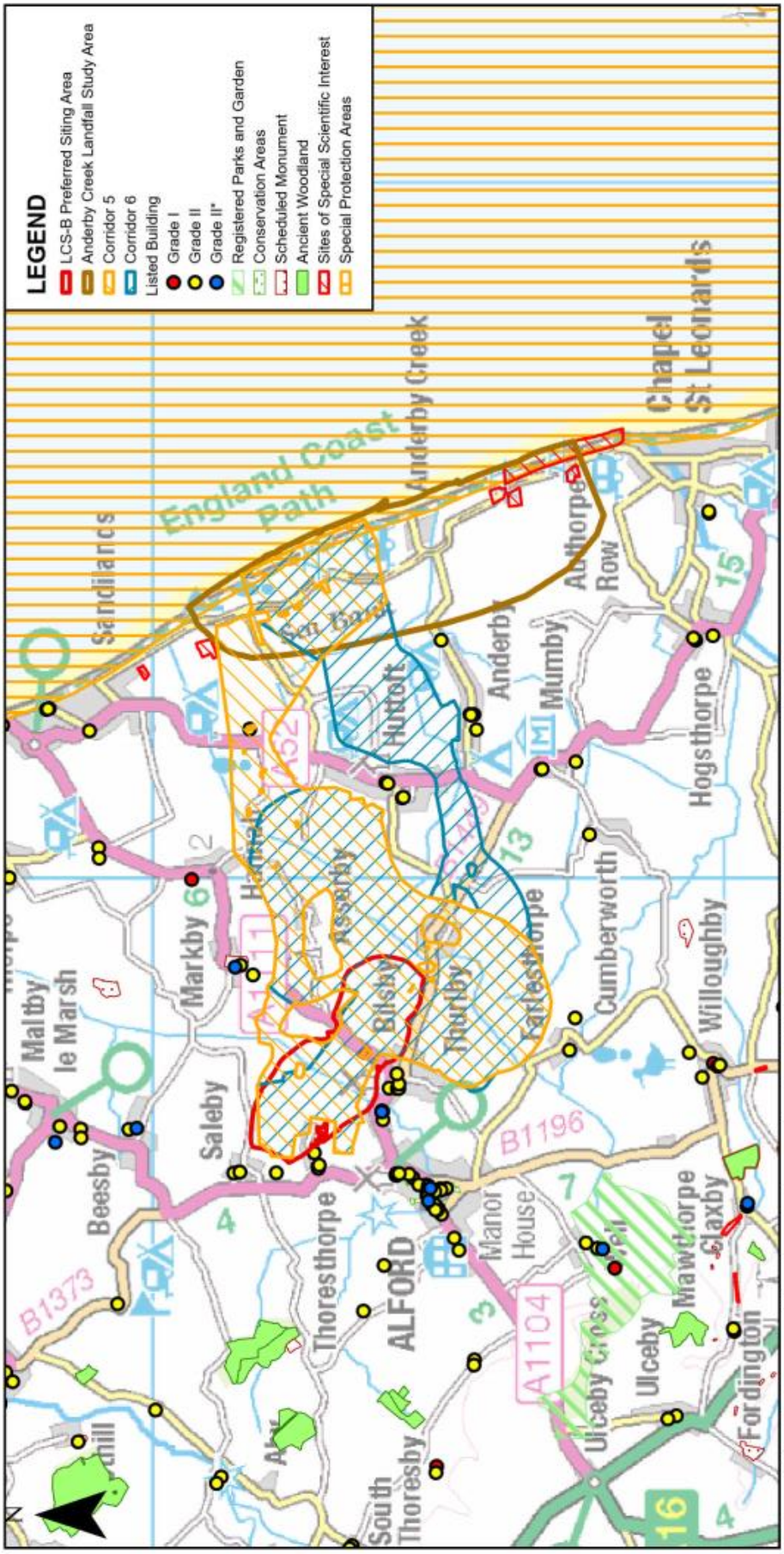


Figure 6-2 - Environment features between the Anderby Creek Landfall Study Area and LCS-B

Table 6-1 – Landscape character and key visual receptors

Corridor	Landscape Character of the Corridor	Proximity to Lincolnshire Wolds NL	Key visual receptors
Corridor 5	Characterised by small settlements, holiday parks, scattered dwellings and open farmland of irregular sizes and shapes. The established field pattern has boundaries which vary from vegetated with mature hedgerow, mature hedgerow trees and drainage ditches to open boundaries.	Approximately 3.5 km east	Approximately 14 residential properties are present within the Corridor. These properties are primarily located along Crawcroft Lane and Sutton Road in the east of the Corridor, however scattered properties are also present to the west and south of the Corridor. Outside of the Corridor, but within 250 m of the Corridor, there are approximately 81 residential receptors. These are primarily located adjacent in Bilsby, to the west of the Corridor. Within the wider area are the settlements of Anderby, Sutton on Sea, Huttoft and Alford. In addition to residential receptors, other key visual receptors include recreational receptors (users of identified features). Those identified within 250 m of the Corridor include 15 PRoW. Other recreational receptors identified include one caravan park located within the eastern part of the Corridor and the National Trust Sandilands Nature Reserve (former Sandilands golf course) which lies adjacent to the most north easternly extent of the Corridor. Other recreational receptors in the wider area are those using major and minor roads which cross or route parallel to the Corridor. Recreational routes including 15 PRoW, which predominantly route in the centre and east of the Corridor, some of which are unavoidable, but others can be avoided. The properties within the Corridor along the A52 create narrower areas (where receptors would be closer to construction) for routeing.

Corridor	Landscape Character of the Corridor	Proximity to Lincolnshire Wolds NL	Key visual receptors
Corridor 6	Characterised by small settlements, open farmland with large fields pattern with a mix of open boundaries, and those with linear belts of tree planting or drainage ditches.	Approximately 3.2 km east	Approximately 15 residential properties are present within the Corridor. These properties are located throughout the Corridor. Outside of the Corridor, but within 250 m of the Corridor there are approximately 100 residential receptors. These are primarily attributed to Huttoft and Bilsby. Within the wider area are the settlements of Anderby, Sutton on Sea, Huttoft and Alford. In addition to residential receptors, other key visual receptors include recreational receptors (users of identified features). Those identified within 250 m of the Corridor include 20 PRoW. Other recreational receptors identified include one holiday park and one caravan park. Other recreational receptors in the wider area are those using major and minor roads which cross or route parallel to the Corridor. Narrower areas of the Corridor (where receptors would be closer to construction) are present within the Corridor along the A52.

Ecology

6.3.8 **Table 6-2** below provides a summary of all statutory ecological designations which occur within 2 km of the Corridors, and International/European statutory ecological designations which occur within 10 km of the Corridors. The Table also details the priority habitats and other designated sites within each Corridor. Designated sites of ecological importance identified are shown in **Figure 6-2**.

6.3.9 Both Corridors between the Landfall and the proposed 400 kV LCS-B are located within 10 km of National Site Network (NSN) sites (formerly Natura 2000 sites, comprising SPA and SACs) and/or Ramsar sites, all of which are located along the Lincolnshire coastline. The NSN and Ramsar sites located closest to the Corridors are: the Greater Wash SPA, the Humber Estuary SAC, SPA, and Ramsar site, Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC, and Inner Dowsing, Race Bank and North Ridge SAC.

6.3.10 The Greater Wash SPA is designated for its range of marine habitats comprising intertidal mudflats and sandflats, subtidal sandbanks and biogenic reef, including Sabellaria reefs and mussel beds. The site is also designated for the protection of red-throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*), and little gull (*Hydrocoloeus minutus*) during the non-breeding season, and for breeding Sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*) and little tern (*Sternula albifrons*). This area supports the largest breeding populations of little terns within the UK NSN by protecting important foraging areas, and supports the second largest aggregations of non-breeding red-throated diver and little gull. Greater Wash SPA is located adjacent to the east of both Corridors 5 and 6.

6.3.11 The Humber Estuary SPA and Ramsar site and the Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC are designated for their specific wetland and coastal habitats, which comprise tidal sand and mudflats, salt and freshwater marshes and sand dunes. These habitats support migrant birds between May and October and wildfowl during the winter months, in addition to breeding populations of bittern, marsh harrier, avocet and little tern, as well as providing habitat for European Protected Species (EPS), including the natterjack toad (*Epidalea calamita)*. These statutory ecological designations are located approximately 8.2 km to the north of Corridors 5 and 6 at their closest point.

6.3.12 Inner Dowsing, Race Bank and North Ridge SAC are designated for marine habitats comprising biogenic reefs formed by ross worm (*Sabellaria spinulosa*) and a wide range of sandbank types in offshore waters. These statutory ecological designations are located approximately 6.9 km south of Corridors 5 and 6 at their closest point.

6.3.13 Impacts on NSN and Ramsar sites are predominantly limited to potential pollution pathways and disturbance of functionally connected habitats, resulting in the risk of injury and mortality for vulnerable bird species, if present. These impacts are associated with temporary construction and installation activities as there are no permanent above ground-structures or operational activities from the underground HVDC cables. The potential effects upon NSN and Ramsar sites will be considered in detail within a Habitats Regulations Assessment (HRA) (conducted in the absence of mitigation), as the English Onshore Component of the Project development progresses. With the implementation of careful routeing and standard construction measures, both Corridors are considered capable of being acceptable when considering the potential impacts on identified NSN and Ramsar sites. Given the proximity of Corridors 5 and 6, to the NSN and Ramsar sites, the need for further mitigation and/compensation measures would need to be considered (following detailed ecological assessments) as a means of

determining whether the impacts of underground cable installation along these Corridors (especially when considering potential cumulative impacts) are acceptable. Should the work done in support of a HRA identify adverse effects on the integrity of the NSN and Ramsar sites, the emerging preferences identified will be revisited.

6.3.14 Within 2 km of the Corridors are the following SSSI or NNR sites:

- Sea Bank Clay Pits SSSI – a series of isolated clay workings. The pits are a GWDTE and support rare aquatic plant communities and invertebrate fauna such as nationally scarce species of beetles. This site is within 20 m of Corridor 5 and 6.
- Chapel Point to Wolla Bank SSSI – a series of intertidal deposits and designated for its glacial sedimentary geological features (finite buried interest). This site is within 2 km of Corridor 5 and 6.

6.3.15 Impacts on the identified SSSI sites are predominantly limited to potential pollution pathways and functionally connected habitats. Both Corridors are considered capable of being acceptable when considering the potential impacts on identified SSSIs and NNRs following the implementation of careful routeing and standard construction practices and measures.

6.3.16 Other important sites and habitats identified within the Corridors comprise priority habitats. The installation of the underground cables has the potential to result in habitat loss/degradation and impacts to protected species. The implementation of the following will help to reduce the magnitude of impact on the statutory ecological designations, species and priority habitats within the Corridors:

- Careful routeing and siting of both temporary and permanent infrastructure to avoid statutory ecological designations and areas of priority habitat; and
- Implementation of a Code of Construction Practice (CoCP) setting out specific procedures for the protection of habitats and species; including pollution prevention measures (safe storage of chemicals and materials, silt fencing, pollution/spill response plan), toolbox talks, biodiversity protection zone fencing etc.

6.3.17 In addition, the provision of mitigation, compensation and enhancement measures would be considered and provided if necessary and appropriate. It is also noted that the consideration of BNG will be included in the later stages of the English Onshore Component of the Project, and NGET will be committed to deliver the 10% net gain.

Table 6-2 – Sites designated for Nature Conservation and Priority habitats

Corridor	NSN and Ramsar sites within 10 km	National statutory designated sites within 2 km	Other designated ecological sites and priority habitats within the Corridor
Corridor 5	Greater Wash SPA – adjacent to the east of the Corridor. Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC and the Humber Estuary SPA and Ramsar site - approximately 8.2 km north of the Corridor. Inner Dowsing, Race Bank and North Ridge SAC – approximately 6.8 km southeast of the Corridor.	Sea Bank Clay Pits SSSI - within 20 m of the Corridor. Chappel Point to Wolla Bank SSSI – within 200 m of the Corridor.	Priority habitats include river habitat headwater areas within the centre, coastal and floodplain grazing marsh (CFPGM) in the centre, coastal and sand dunes in the east, reedbeds in the east, and deciduous woodland adjacent to and within an excluded area in the centre of the Corridor. Sandilands Nature Reserve (and Local Wildlife Site (LWS)) is assumed to be operational during construction of the Project with proposed priority wetland and coastal dune habitat created and established by 2029.
Corridor 6	Greater Wash SPA – adjacent to the east of the Corridor. Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC and the Humber Estuary SPA and Ramsar site - approximately 8.4 km north of the Corridor. Inner Dowsing, Race Bank and North Ridge SAC – approximately 6.8 km southeast of the Corridor.	Sea Bank Clay Pits SSSI - within 20 m of the Corridor. Chappel Point to Wolla Bank SSSI – within 200 m of the Corridor.	Priority habitats include river habitat headwater areas within the centre, coastal and floodplain grazing marsh (CFPGM) in the centre, coastal and sand dunes in the east, reedbeds in the east, deciduous woodland adjacent to and within an excluded area in the centre, and lowland meadow in the south of the Corridor. Sandilands Nature Reserve (and LWS) is assumed to be operational during construction of the Project with proposed priority wetland and coastal dune habitat created and established by 2029.

Historic Environment

6.3.18 Whilst there are no designated heritage assets present within Corridor 6, there is one designated heritage asset present within Corridor 5 (see **Figure 6-2**), Stain Glebe Farm, a Grade II Listed Building. There is considered sufficient space within the Corridor to avoid any direct impacts on this identified designated heritage asset through the application of careful routeing. Therefore, the impact on this designated heritage asset would be limited to effects upon its setting which would be temporary and only during the construction and installation phase.

6.3.19 There are numerous designated heritage assets within 1 km of both Corridor 5 and Corridor 6, the majority of which comprise scattered Grade II listed buildings. The designated heritage assets within 1 km of each Corridor are detailed in **Table 6-3** and shown in **Figure 6-2**.

6.3.20 There may be potential impacts upon the setting of designated heritage assets from construction and installation activities where routeing is in proximity and has an increased potential to disturb buried archaeology due to an assumed greater presence. However, due to the width of the Corridors there is sufficient flexibility to materially reduce impacts through careful routeing and the implementation of standard construction and installation practices and measures. Therefore, the impact on such designated heritage assets would be limited to effects upon setting which would be temporary and only during the construction and installation phase.

6.3.21 In addition to the identified designated heritage assets, there is a risk of unrecorded archaeology within both Corridors. The presence and extent of unrecorded archaeology would be determined through surveys at a later stage of the English Onshore Component of the Project following consultation with relevant stakeholders. Careful routeing will seek to avoid known non-designated heritage assets. Where direct construction impacts on below ground archaeological remains (either known or previously unrecorded) cannot be avoided, these may be managed through standard mitigation measures such as preservation by record.

Table 6-3 – Identified Designated Heritage Assets identified within 1 km

Corridor	Designated heritage assets within 1 km
Corridor 5	Three Grade I Listed Buildings, located north, south, and southwest of the Corridor. 26 Grade II Listed Buildings, one of which falls within the Corridor; the remaining are located mainly to the north and south of the Corridor in the vicinity of Anderby and Huttoft. *Stain Glebe Farm* Grade II Listed Building is within the eastern limb of the Corridor; however, it could be avoided with careful routeing. Two Grade II* Listed Buildings, located north and south of the Corridor. Alford Conservation Area located 600 m to the southwest of the Corridor.

Corridor	Designated heritage assets within 1 km
Corridor 6	Two Scheduled Monuments, the closest is Churchyard Cross, St Andrew's Churchyard, located 170 m south of the eastern limb of the Corridor. One Grade I Listed Building, located to the north of the centre of the Corridor. One Grade II* Listed Building, *Church of the Holy Trinity*, located approximately 1 km northwest of the Corridor, near Bilsby. 16 Grade II Listed Buildings scattered around the Corridor. The closest is the Church of St Andrew located 155 m south of the Corridor.

Water Environment

6.3.22 There are several surface water and groundwater features within and adjacent to the Corridors. Potential effects on these features include:

- Turbid run-off which could enter the water environment during construction;
- Changes to surface water runoff patterns affecting flood risk during construction;
- Potential damage to flood defences or surface water drainage infrastructure during construction;
- Pollution or flow disruption of groundwater caused through excavation or piling as part of construction work;
- Changes to surface water drainage at identified features during operation;
- Potential risk that infrastructure could result in the release of sediment-laden runoff and pollution to controlled water bodies (surface water and groundwater), changes to hydrological regime and physical disturbance to watercourses; and

6.3.23 Potential risk of impacts on water resource availability, including impacts to groundwater levels from any dewatering required during construction.

6.3.24 Careful routeing will seek to avoid areas sensitive to the water environment (e.g., environmentally designated sites, sources of water use/abstractions), Flood Zones 2 and 3, and minimise watercourse and drain crossings. Appropriate construction methods would be considered at sensitive locations and development and adherence to appropriate management measures would be required. Further detailed assessments of impacts would be undertaken including both a Flood Risk Assessment (FRA) and Water Framework Directive (WFD) assessment. Water environment features are shown in **Figure 6-3** and detailed in **Table 6-4**. Other watercourses and drains, including Internal Drainage Board (IDB) watercourses, are present within each of the Corridors and are also likely to require crossing in addition to the features listed in **Table 6-4**.

Figure 6-3 – Water environment features between the Anderby Creek Landfall Study Area and LCS-B

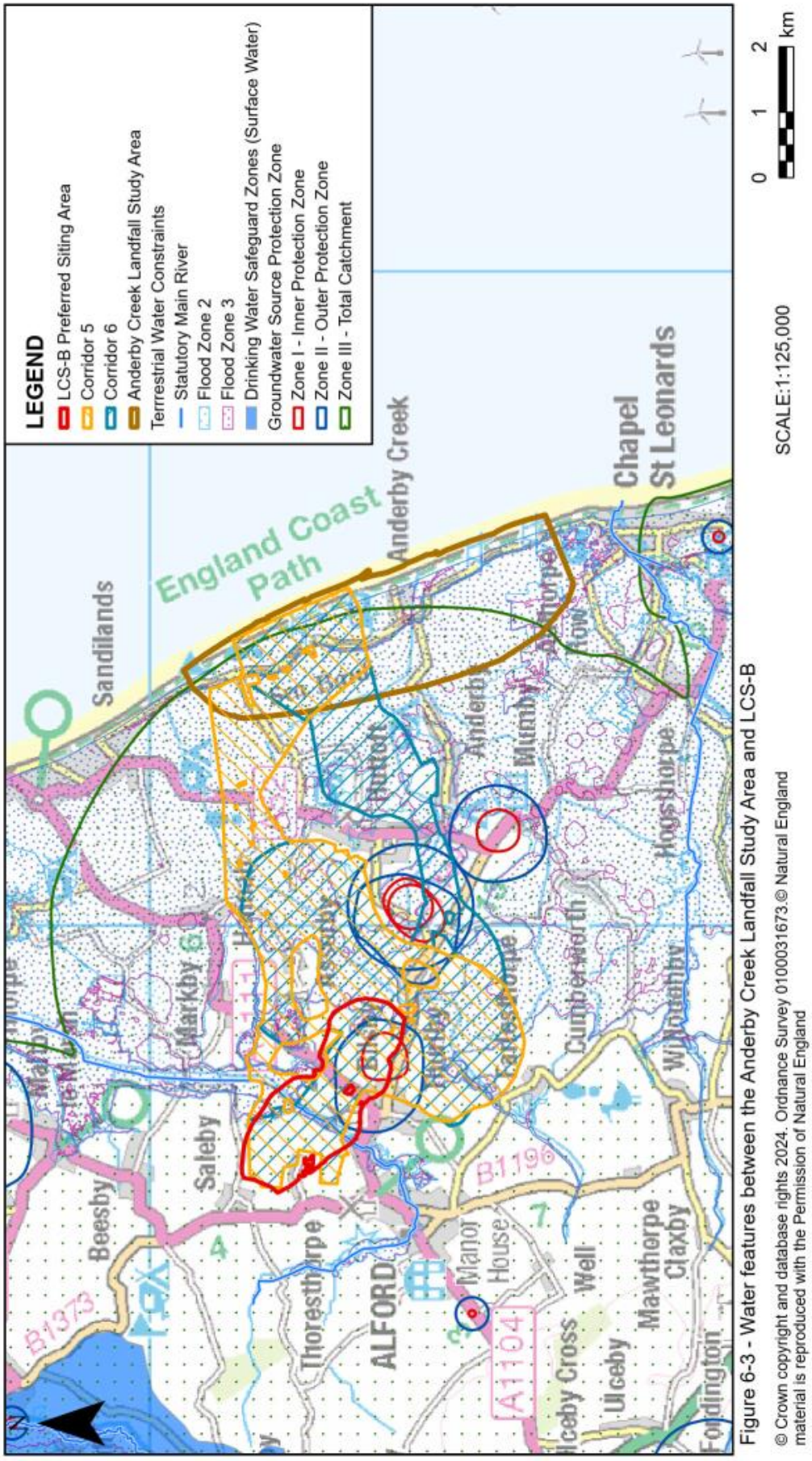


Figure 6-3 - Water features between the Anderby Creek Landfall Study Area and LCS-B

Table 6-4 – Water environment features within and adjacent to Corridor

Corridor	Water Environment Features Within and Adjacent to Corridor
Corridor 5	Groundwater vulnerability is predominantly medium through the centre and western part of the Corridor, and low toward the east. Groundwater Source Protection Zones (SPZ) lie within the Corridor. SPZ I (Inner Protection Zone) and SPZ II (Outer Protection Zone) lie within the Corridor in the south western boundary, leaving only a 90 m gap in the Corridor for routeing through. Another SPZ II is located south of the centre section of the Corridor, this could be avoided with careful routeing. Flood Zone (FZ) 2 and FZ3 are present across the Corridor, primarily attributed to Wold Grift Drain, the Anderby Main Drain and the Boy Grift Drain. WFD blue line watercourses are present and include Wold Grift Drain and the Boy Grift Drain, these flow north to south through the Corridor and are unavoidable. Other watercourses including IDB watercourses are present throughout the Corridor but can be avoided with careful routeing.
Corridor 6	Groundwater vulnerability is predominantly low with sections of medium and medium-high vulnerability at Landfall. SPZ lie within the Corridor. SPZ I and SPZ II lie within the centre and west of the Corridor, however SPZ I can be avoided with careful routeing. SPZ II is unavoidable in this Corridor. FZ2 and FZ3 are present across the Corridor, primarily attributed to Boy Grift Drain. WFD blue line watercourses are present and include Boy Grift Drain which will require crossing, and the Anderby Main Drain which can be avoided with careful routeing and siting. Other watercourses including IDB watercourses are present throughout the Corridor but can be avoided with careful routeing.

Socio-Economics

6.3.25 Except for recreational paths, including PRoW which can be found within **Table 6-5** for each Corridor, there are few socio-economic features identified within or immediately adjacent to each of the Corridors. Community features (e.g., caravan sites and holiday parks) are located within or adjacent to Corridors 5 and 6. There are no aviation and defence features located within or adjacent to the Corridors other than low priority military flying areas. Key allocations identified within local plans and major planning applications (as defined by the NPPF) and proposals are located adjacent to Corridors 5 and 6.

6.3.26 There is a potential risk that the English Onshore Component of the Project could result in temporary effects upon amenity and operations of identified features and temporary closures and disruption to recreational activities, routes and roads. This includes cumulative effects upon common receptors from other proposed large-scale developments (such as the Viking Link Interconnector, GtW Project, the EGL 3 and EGL 4 Projects and Ossian OWF) within the wider area. Following careful routeing potential permanent effects upon identified features could be limited.

6.3.27 Careful routeing and design of construction access is likely to reduce, and where possible avoid effects on identified receptors. In addition, standard mitigation and management measures would be implemented via a COCP to reduce the potential risks identified for each Corridor. Further discussion with relevant stakeholders in the area should take place to fully understand the scale of the risks and their potential effects.

Table 6-5 – Socio-Economic features identified within the Corridors.

Corridor	Community receptors and recreational routes	Aviation and defence features	Proposed development (allocations and applications)
Corridor 5	Community receptors are those at the disused golf course to the northeast (now being transformed to a nature reserve), and one caravan park located within the east part of the Corridor. The nature reserve, also proposing to create and maintain a series of paths, boardwalks and engagement/learning features, is assumed to be operational during construction of the Project. These could be avoided with careful routeing. Recreational routes including 15 PRoW, which predominantly route in the centre and east of the Corridor, some of which are unavoidable, but others can be avoided.	The Corridor lies within low priority military low flying areas less likely to raise concerns.	Viking Link Interconnector which crosses north of the Corridor from east to west making Landfall south of Sandilands and routeing onwards to connect into Bicker Fen substation. The Corridor lies within the Ossian OWF Transmission Infrastructure Scoping Boundary. The EGL 3 and EGL 4 Projects cross the very east of the Corridor as well as a small part of the south of the Corridor.

Corridor	Community receptors and recreational routes	Aviation and defence features	Proposed development (allocations and applications)
Corridor 6	Community receptors are those at the disused golf course to the north (now being transformed to a nature reserve), one caravan park located in the very northeast part of the Corridor and one holiday park located near Thurlby, which can easily be avoided with careful routeing and siting. The nature reserve, also proposing to create and maintain a series of paths, boardwalks and engagement/learning features, is assumed to be operational during construction of the Project. Recreational routes including 20 PRoW, predominantly route in the centre and east of the Corridor, most PRoW in the east are unavoidable, but others can be avoided.	The Corridor lies within low priority military low flying areas less likely to raise concerns.	Viking Link Interconnector which crosses north of the Corridor from east to west making Landfall south of Sandilands and routeing onwards to connect into Bicker Fen substation. The Corridor lies within the Ossian OWF Transmission Infrastructure Scoping Boundary. The EGL 3 and EGL 4 Projects cross east to west of the south part of the Corridor.

Other Considerations

6.3.28 Other environmental topics were also considered as part of the options appraisal and include geology and soils. As discussed in **Section 4.3**, although scoped-out as factors which could be influential to siting decisions at this early development stage of the English Onshore Component of the Project, air quality and emissions and noise and vibration are accounted for by considering proximity to settlements, residential and other sensitive features.

6.3.29 Geological features identified within and immediately adjacent to the Corridors comprise:

- Corridor 5:
  - The Wold Grift Drain Nitrate Vulnerable Zone is present in the western edge of the Corridor.
  - The Corridor lies within Grade 2 and Grade 3 Provisional Agricultural Land Classification (ALC).
  - Sea Bank Clay Pits SSSI geological site is located adjacent to the northeast of the Corridor, primarily designated for Biology but also includes marsh and swamp lowland, but can be avoided through careful routeing.
- Corridor 6:
  - The Corridor lies predominantly within Grade 3 Provisional ALC.

6.3.30 Potential impacts resulting from construction and installation activities include: mobilisation of, and spills of, contaminants (including those that may be associated with historic Landfalls and petroleum exploration activities); and sterilisation of mineral deposits. However, for both Corridors, further investigation into soil type and ground conditions would be undertaken as part of future design stages and standard mitigation measures regarding pollution and contaminated materials would be implemented. Careful routeing reflecting the outcomes of these investigations will reduce the potential for adverse effects.

6.3.31 Overall, there are residential properties and other receptors sensitive to air quality and noise and vibration impacts within and/or adjacent to the Corridors. There are residential properties associated with numerous settlements and villages, including Anderby, Huttoft, Thurlby, Bilsby, Asserby, Markby, and Hannah; as well as numerous individual dwellings scattered throughout the Corridors. There is a potential risk of temporary effects upon receptors within and adjacent to the Corridors, limited to localised changes in air quality and noise and vibration during construction and installation activities. However, both Corridors are considered sufficient in size to allow for careful siting and routeing and to reduce the likelihood and magnitude of these effects. These construction effects could then be further reduced through implementation of a COCP. No potential adverse air quality, noise or vibration impacts are anticipated during operation. It is assumed that loss from agricultural productivity would be appropriately compensated where applicable.

6.4 Engineering

6.4.1 All Corridors have engineering and system factors to consider when routeing underground cables between the Landfall and the proposed 400 kV LCS-B. Features relevant to engineering are shown in **Figure 6-4.**

Figure 6-4 – Engineering features between the Anderby Creek Landfall Study Area and LCS-B

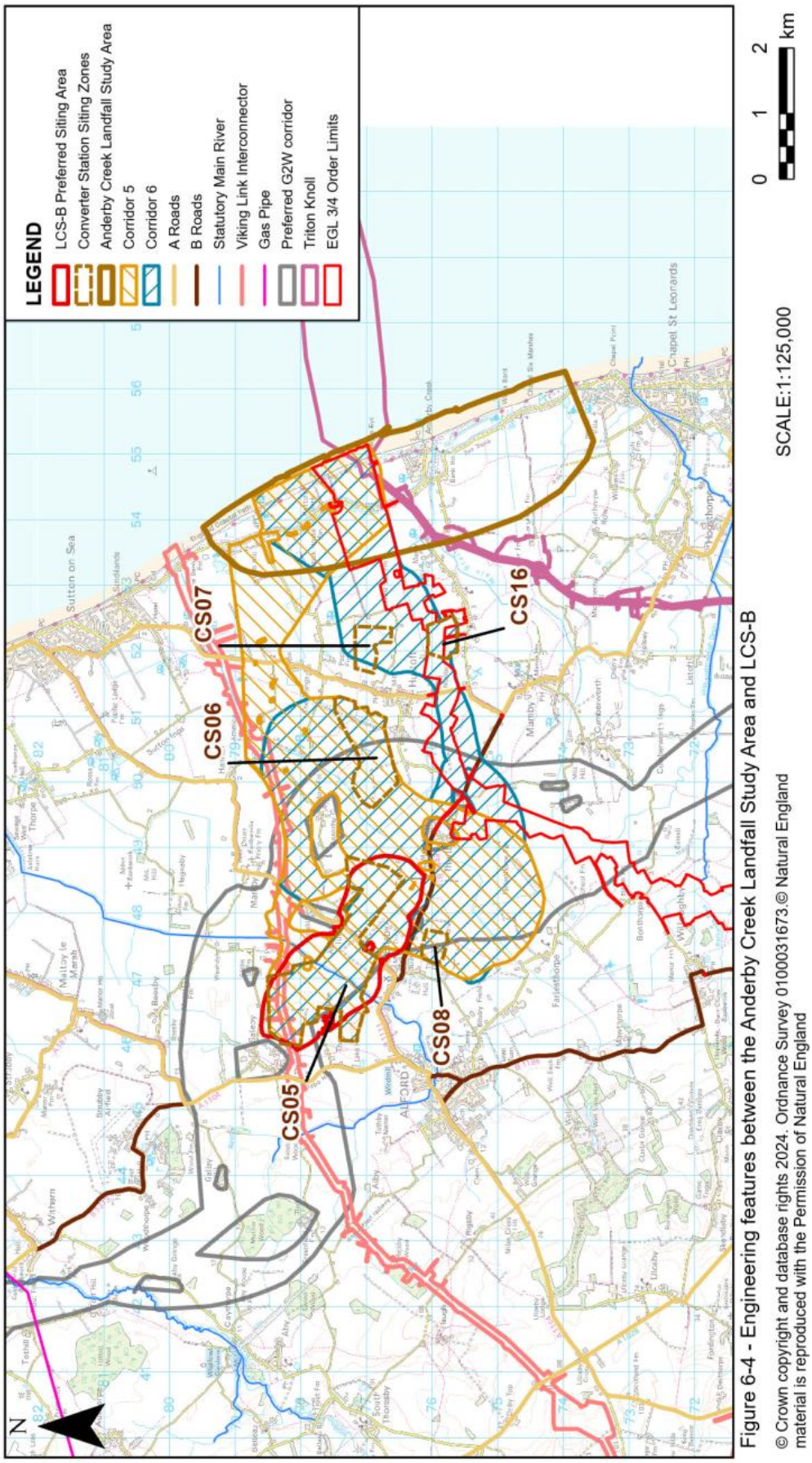


Figure 6-4 - Engineering features between the Anderby Creek Landfall Study Area and LCS-B

Routeing Flexibility

6.4.2 Overall, routeing flexibility is generally good along the Corridors due their width and the lack of major engineering constraints for large sections. However, at certain locations within the Corridors there are narrower areas (caused by features such as settlement and woodland) where flexibility of routeing the HVDC cables is decreased, these are referred to as “pinch points”. Within these more constrained areas there is a potential for increased technical complexity which may result in additional costs and construction and installation durations. The routeing flexibility identified for the Corridors are:

- Corridor 5: There is a large degree of optionality throughout the Corridor to accommodate alternative routeing options if required. Routeing is all through arable land, with flexibility to cross all major constraints at a perpendicular angle. A requirement to limit the length of HVAC cables to less than 5 km has been set to reduce the risk of requirement for additional electrical infrastructure. In all cases, the HVAC cable length would be less than 5 km and thus would not impact the route by virtue of potentially requiring additional electrical infrastructure . For routes to Siting Zone CS08 through Corridor 5, options are highly limited as there are pinch points on either side of the Corridor when the route crosses an existing farm building past the B1449. There is also a potential pinch point of approximately 170 m when the route crosses the A52, however the construction swathe would still be feasible with the available space.
- Corridor 6: There is a large degree of optionality throughout the Corridor to accommodate alternative routeing options if required. Routeing is all through arable land, with flexibility to cross all major constraints at a perpendicular angle. For routes through Corridor 6 to Siting Zones CS05, CS06 and CS08 the HVAC cable length would be less than 5 km and thus would not impact the route by virtue of potentially requiring additional electrical infrastructure. For routes through Corridor 6 to Siting Zones CS07 and CS16 HVAC cable lengths are around 5 km and therefore there is a potential risk of reactive power transfers above National Grid limits. There is also the added risk of running these HVAC cables parallel to other HVDC cable projects in the Corridor (EGL 3 and EGL 4 Project) to maintain sufficient electrical separation between the HVAC and HVDC cables, which may further limit flexibility within the Corridor.

6.4.3 For routes to Siting Zone CS08 through Corridor 6 options are highly limited as there are pinch points on either side of the Corridor when the route crosses an existing farm building past the B1449. There is also a potential pinch point of approximately 270 m in routeing between Huttoft and Thurlby, however the construction swathe would still be feasible with the available space. The constraints associated with this pinch point also depend on other projects routeing through this Corridor (EGL 3 and EGL 4 Project), and whether it is the HVDC cable swathe (routes through Siting Zones CS05, CS06 and CS08) or the HVAC cable swathe (routes through Siting Zones CS07 and CS16) that passes through this pinch point, as the HVAC cabling has a larger associated swathe.

Access

6.4.4 Accessibility for construction and installation of the HVDC underground cables varies between Corridors, as well as within the Corridors themselves. Both Corridors are accessible from existing A-roads, B-roads and various minor inter-connecting roads. However, there are also constraints or limited access points from major roads and therefore this may necessitate more circuitous and inefficient access or the construction of new access and haul roads. These are detailed in **Table 6-6**.

Table 6-6 – Access Constraints between the Landfall and LCS-B

Corridor	Access Constraints
Corridor 5	Access available from the A52, A1111, A1104 and the B1449. Routes will be required to travel through small villages/towns. Routes predominantly pass through farmland/fields which do not have existing vehicle access. In the cable route, it is likely there will be between one and three trenchless crossings that do not pass over/close to an access road, and therefore access may be challenging at these locations.
Corridor 6	Access available from the A52, A1111, A1104 and the B1449. There is good access within the Corridor but routes will be required to travel through small villages/towns. The route passes through arable land where trenchless crossings within fields with no clear existing access. For routes through Corridor 6 this ranges between three and eight trenchless crossings where access may be challenging. Within Corridor 6 the cable routeing is likely to run parallel to minor roads for a large proportion of the route, which will facilitate access to the haul road running parallel to the cable during construction.

6.4.5 The Corridors are constrained by key features such as large water courses (including Wold Grift Drain, Boy Grift Drain, West Bank Drain and potentially Roman Bank), there may be a need to overcome these through installation of culverts or bridges. This will increase technical complexity, cost and programme. Alternatively, the use of minor roads may require highways improvements and remediation works also increasing technical complexity, cost and construction duration.

Existing and Proposed Infrastructure

6.4.6 Both Corridors between the Landfall and the proposed 400 kV LCS-B would interact with both existing and proposed infrastructure developments which have the potential to constrain cable routeing. Those currently identified (being major roads major gas pipelines, and those required for energy supply and transmission) are detailed below.

6.4.7 Although proximity to major roads would be beneficial to the English Onshore Component of the Project as they would enable ease of access to sites, cable routeing within proximity to major roads increases the likelihood of road crossings. This would increase the complexity of construction as alternate construction methods, such as trenchless cable installation methods, may need to be used increasing the cost and duration of construction. Additionally, crossing railways would also likely require alternative construction and installation methods which would also increase the

complexity, cost and duration of construction. The number of major roads and existing utilities which have been identified as requiring a crossing are shown in **Table 6-7**.

Table 6-7 – Major Road and Utility Crossings between the Landfall and LCS-B

Corridor	Road Crossings	Railway Crossings	Utility Crossings
Corridor 5	4 to 7*	0	3 to 6*
Corridor 6	3 to 6*	0	5 to 7*

**Number of crossings are provided as a range due to variation between the two EGL 5 converter station Siting Zones.*

6.4.8 Corridor 5 and Corridor 6 both interact with the existing Viking Link Interconnector which routes from its Landfall south of Sandilands in a south-westerly direction towards its converter station and connecting substation, at Bicker Fen. Whilst the route of the Viking Link Interconnector can largely be avoided through careful routeing, this is also dependent on routeing requirements into the proposed 400 kV LCS-B such as the specific bay allocation within the substation.

6.4.9 Both Corridors 5 and 6 would interact with at least one existing low voltage (220 kV or lower) overhead line. Where these existing assets would require crossing, modification (such as the undergrounding or diverting of the existing assets) may be required to facilitate routeing. This would increase the technical complexity and cost of construction and installation and the duration of the programme.

6.4.10 Both Corridors 5 and 6 interact with the preferred Corridor for NGET's proposed GtW 400 kV overhead line and EGL 3 and EGL 4 Projects. Given the proposed and preferred Corridor of the GtW Project and EGL 3 EGL 4 Projects, close interaction and/or crossing of the GtW Project's overhead line route may be required which may pose a technical constraint to routeing within these EGL 5 underground cable Corridors. Close co-ordination and collaboration with the GtW Project and EGL3 and EGL 4 Projects is ongoing and will be required as the Projects continue to develop. As part of this ongoing engagement, consideration will be given to potential co-ordination and co-location opportunities, as a means of reducing community and environmental impacts, and also of reducing the overall construction and installation programmes.

Watercourse Crossings and Flooding

6.4.11 As detailed in **Table 6-8**, Flood Zone 2 (FZ2) and Flood Zone 3 (FZ3) are present within both Corridors. Where FZ2 and FZ3 are present within Corridors, they are completely unavoidable. As such, there is no end-to-end solution (from the Anderby Creek Landfall Study Area to the proposed 400 kV LCS-B) that provides an opportunity to entirely avoid both FZ2 and FZ3. These areas of FZ2 and FZ3 are attributed to flooding from the sea and from various watercourses including the Boy Grift Drain and Wold Grift Drain. Any Project infrastructure required to be routed through or located within FZ2 and FZ3 will be developed and designed accordingly, including any necessary mitigations and compensations.

6.4.12 Both Corridors contain watercourses that will require crossing, including Wold Grift Drain, Boy Grift Drain, West Bank Drain, and potentially Roman Bank. The construction and installation methods for crossing identified watercourses will be determined as the English Onshore Component of the Project develops, and in close consultation with relevant key stakeholders, specifically the Environment Agency (EA) and Internal Drainage Boards (IDBs). However, there are several larger watercourses, some of which are heavily engineered, and crossing of these would be technically complex, and highly likely to require the use of challenging trenchless cable installation methods. All crossings where trenchless cable installation methods are determined to be required would increase the complexity, cost, land requirements and duration of construction and installation. Larger watercourses mentioned above (identified, using aerial imagery, as having a width > 10 m from the top of their opposing banks) are the most likely to increase the technical complexity of construction and installation. Watercourses of a moderate width (identified, using aerial imagery, with a width of between 5 m and 10 m from the top of opposing banks) are also likely to increase the technical complexity of construction and installation. Smaller watercourses (identified, using aerial imagery, with a width of less than 5 m in width from the top of opposing banks) are unlikely to increase the complexity of construction and installation. Ground investigation will be carried out at each of these water crossings to determine crossing method including depth, monitoring requirements and bank stability. The number of the large and moderate watercourse crossings for each Corridor are detailed in **Table 6-8** below.

Table 6-8 – Number of Large & Moderate Watercourse Crossings within each Corridor

Corridor	Number of large watercourses likely to require crossing	Number of moderate watercourses likely to require crossing
Corridor 5	1 to 2*	1 to 6*
Corridor 6	1 to 2*	6 to 8*

**Number of crossings are provided as a range due to variation between routeing options through different EGL 5 converter station Siting Zones.*

Ground Conditions

6.4.13 Ground conditions vary across and within all Corridors. Further study and investigation of soils, land drainage, hydrology and hydrogeology would be undertaken during the next phase of the English Onshore Component of the Project, to determine any necessary mitigations, and any required implementation of good and best practices. Both Corridors contain varying material types including but not limited to chalk bedrock, glacial till and tidal flat deposits which would require further geotechnical investigation to better understand ground conditions. Cable installation within and across these material types have the potential to increase overall cost and programme duration of the English Onshore Component of the Project. These geotechnical risks are present throughout both Corridors and are not considered to present a differentiating factor between them.

Future Connections

6.4.14 The EGL 5 converter station will need to be, as previously stated, sited in close proximity to the proposed 400 kV LCS-B. However, the impact of this close proximity will be considered to ensure that the location of the EGL 5 converter station does not impact the ability of the proposed 400 kV LCS-B to accept future connections to the NETS by spatially limiting potential cable routes.

6.4.15 An EGL 5 converter station location which is too close in proximity to the proposed 400kV LCS-B may limit routeing flexibility connectivity for future connections from the east, however this will be considered in more detail as the Project siting is refined. .

6.4.16 Siting Zone CS06 should have low impact on future connections as there is available space to the north, south and west using Corridors 5 and 6 to allow future connections to the proposed 400 kV LCS-B.

6.4.17 Exact impacts of the EGL 5 converter station Siting Zone on future connections are subject to further routeing analysis.

6.5 Comparative Appraisal and Conclusion

6.5.1 The findings detailed above were considered and the relative merits of the different options for the HVDC underground cables between the Anderby Creek Landfall Study Area and the proposed 400 kV LCS-B were compared.

6.5.2 This section sets out the factors that influenced the decision-making process for determining the emerging preferred Corridor between the Landfall and the proposed 400 kV LCS-B. As the design progresses, regular back-checks and reviews will be undertaken to ensure that the emerging preferred Corridor being taken forward at this stage remains the optimum Corridor when all environmental, socio-economic and technical considerations are considered.

Comparative Appraisal

6.5.3 From an environmental and socio-economic perspective, although there are minor differentiating features, such as the presence of the Grade II Listed Building in Corridor 5, these are avoidable through careful routeing and as such do not give rise to a preference following a comparative review.

6.5.4 From an engineering perspective, Corridor 5 was identified as being marginally preferred, with Corridor 6 a close second. This is due to several factors including additional flexibility due to the larger number of alternative options being available, fewer medium/high risk constraints to cross and shorter cable route lengths for equivalent EGL 5 converter station Siting Zones. However, this is subject to further coordination and design development with other projects in the area; including GtW Project, EGL 3 and EGL 4 Projects and Ossian OWF.

6.5.5 As such, it was considered that, subject to the selection of the preferred EGL 5 converter station Siting Zone, both Corridors 5 and 6 are to be retained as the emerging preferences for the underground cable routes between the Anderby Creek Landfall Study Area and the proposed 400 kV LCS-B, with a marginal preference for Corridor 5 as presented in **Chapter 10**.

7. Options Appraisal – EGL 5 Converter Station Siting Zones

7. Options Appraisal – EGL 5 Converter Station Siting Zones

7.1 Introduction

7.1.1 This Chapter details the outcomes of the Options Appraisal (Step 7 as described in **Chapter 4**) for the preliminary Siting Zones for the new EGL 5 converter station. The Siting Zones have been developed through the definition of a study area (Step 1), mapping and weighting of features (Step 2 and Step 3), and an iterative identification, review and refinement process (Steps 4, 5 and 6). The Siting Zones have been developed to accommodate the EGL 5 converter station and associated construction compound, incoming cables, permanent access, peripheral landscaping, drainage, and other related works (refer to parameters set out in Paragraphs 2.5.5 and 5.6.3). The Siting Zones progressed for options appraisal, see **Figure 7-1**, comprise:

- Siting Zone CS05: an area which is approximately 3.1 km by 800 m (approximately 235 ha) and is located approximately 300 m north of Bilsby and approximately 190 m east of Thoresthorpe. The Siting Zone overlaps with the Wold Grift Drain and the A1111.
- Siting Zone CS06: an area which is approximately 1.4 km by 500 m (approximately 85 ha) and located west (approximately 100 m) of Huttoft. The Siting Zone is approximately 240 m west of the A52.
- Siting Zone CS07: an area which is approximately 675 m by 550 m (approximately 26 ha) and is located approximately 550 m northeast of Huttoft. It is approximately 260 m east of the A52.
- Siting Zone CS08: an area which is approximately 475 m by 350 m (approximately 15 ha) and is located between Alford (1.45 km east of Alford) and Thurlby (approximately 1.42 km west of Thurlby) and approximately 280 m southeast of Bilsby. The B1449 is immediately north of the Siting Zone.
- Siting Zone CS16: an area which is approximately 580 m by 450 m (approximately 24 ha) and is located approximately 150 m north of Anderby and 570 m southeast of Huttoft. It is approximately 490 m east of the A52.

7.1.2 As part of the refinement of Siting Zone options (see Paragraph 5.6.22), Siting Zone CS09 was considered not suitable for development due to recent new development in this location and as such was not considered further within the Options Appraisal.

Figure 7-1 – EGL 5 Converter Station Siting Zone locations

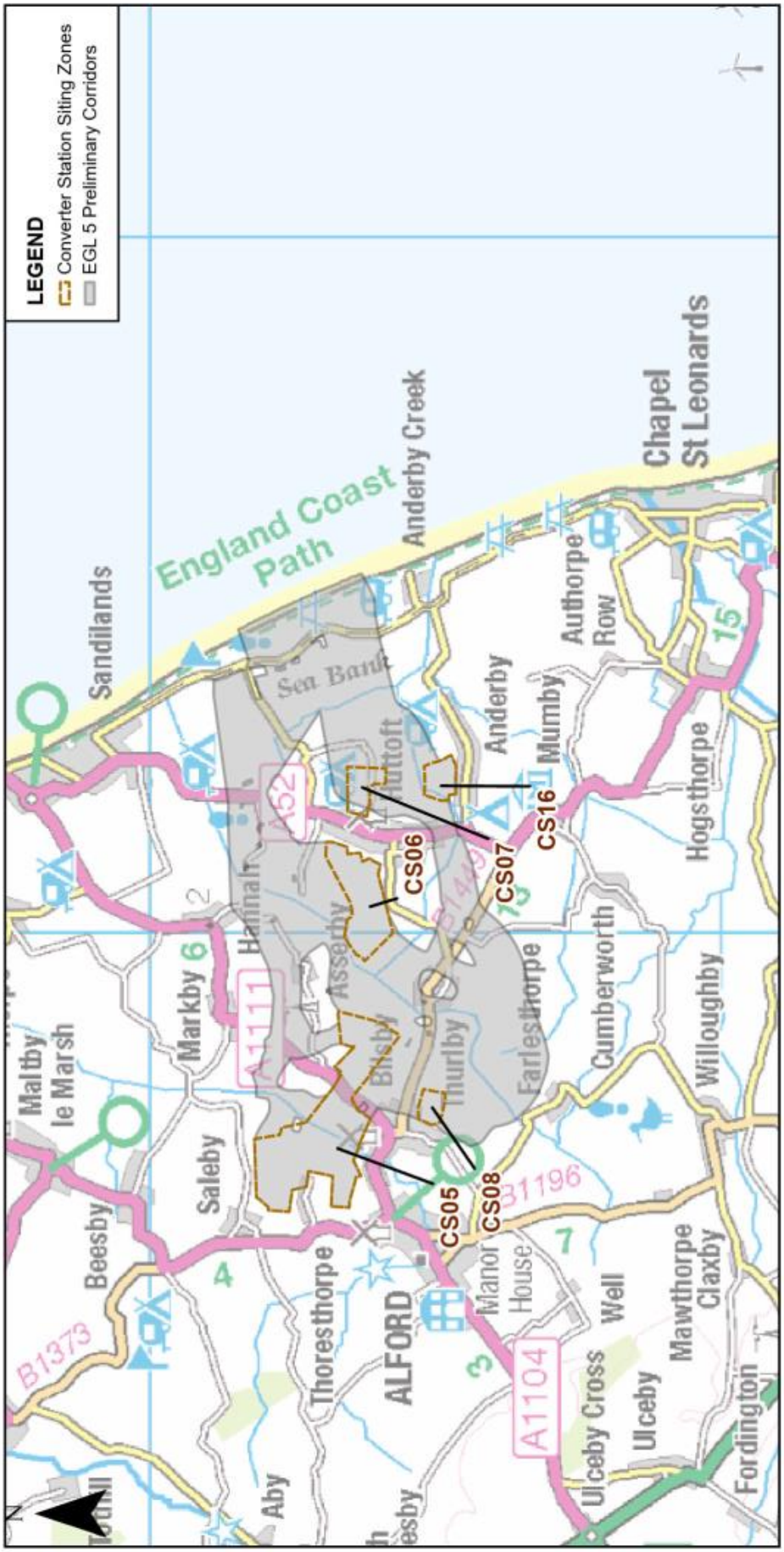


Figure 7-1 - EGL 5 Converter Station Siting Zone Locations

7.2 Options Appraisal

7.2.1 The appraisal of the Siting Zones has considered the potential effects of connections (new HVDC and HVAC underground cables, as detailed in **Chapter 5**) of the English Onshore Component of the Project into and out of each Siting Zone.

7.2.2 The appraisal of environmental, socio-economic and technical issues for the new EGL 5 converter station has considered, as detailed in **Chapter 5**, the potential effects on relevant receptors, and whether such effects could be avoided or mitigated through careful siting. Where impacts cannot be avoided or mitigated by careful siting, other forms of mitigation have been considered in accordance with the mitigation hierarchy.

7.2.3 For the current Project stage, the relevant data to inform the appraisal comprises desk study information, supplemented by site visits to select locations, on important receptors.

7.3 Environmental Factors

Landscape and Visual

7.3.1 The EGL 5 Converter Station Siting Zones are all located within a radius of approximately 3.5 km from each other. However, all the Siting Zones (**Figure 7-2**) are located:

- Within the Lincolnshire Coast and Marshes NCA (NCA 42), which is characterised by wide coastal plains. This extends from Barton-upon-Humber in the north, to Grimsby at the mouth of the Humber and south to Skegness; and
- Over 3 km away from Lincolnshire Wolds NL (the closest nationally designated landscape). Although all are within 8 km of the Lincolnshire Wolds NL, the scale of potential impacts on the Lincolnshire Wolds NL and its setting are specific to each Siting Zone.

7.3.2 The Lincolnshire Wolds NL is comprised of several Local Character Areas (LCA) which are defined by key characteristics. The closest LCA to the Siting Zones is the South Eastern Claylands LCA, the key characteristics of which are:

- *"Views across the Middle Marsh to the coast"* – Construction corridors will be visible within views of the wider of area.
- *"Extensive oak-ash woodland"* – provides an opportunity to improve the connectivity of green infrastructure assets as part the mitigation.
- "Ridge top roads and their associated archaeology" – enables views of the wider landscape.

7.3.3 The landscape and visual amenity characteristics of each of the EGL 5 converter station Siting Zones is described below in **Table 7-1**. No residential properties are identified within the Siting Zones; however, Dryby Farm is located adjacent to the south corner of CS05.

7.3.4 Ongoing design refinement and micrositing will help reduce impacts to landscape and visual receptors. Siting should seek to avoid mature woodland, hedgerows and tree planting, where practicable, and be set back from settlements and residential properties as far as possible. Implementation of standard working measures and practices during construction will reduce the severity of impacts.

Figure 7-2 – Key landscape and visual features adjacent to EGL 5 Converter Station Siting Zones

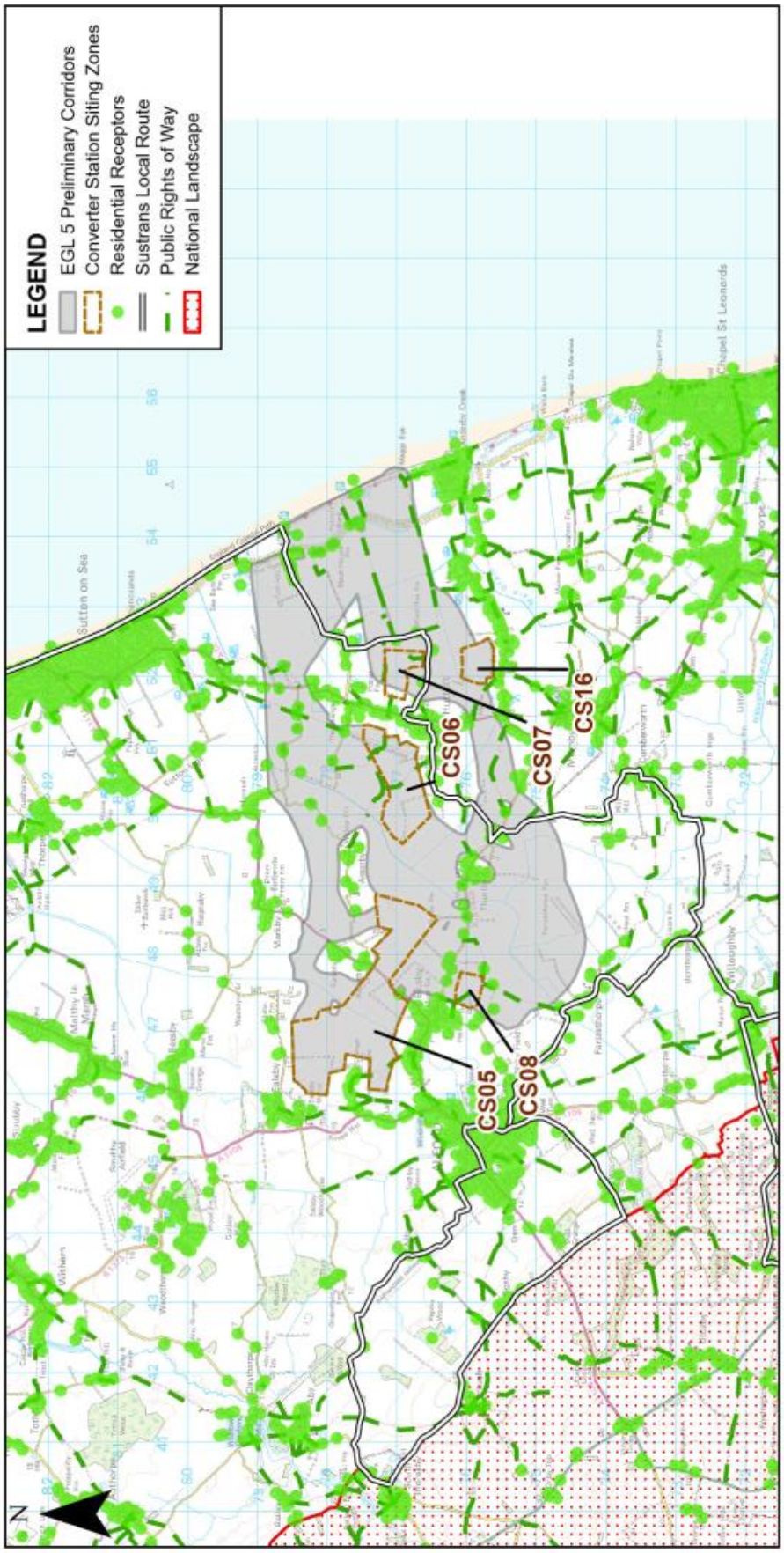


Figure 7-2 – Key landscape and visual features adjacent to EGL 5 Converter Station Siting Zones

Table 7-1 – Landscape characteristics of the EGL 5 Converter Station Siting Zones

Siting Zone	Landscape Character of the Siting Zone	Proximity to the Lincolnshire Wolds NL	Key visual receptors
CS05	Characterised by large scale arable fields bound by drainage ditches. There are some hedgerows and boundary trees along roads but limited internal structure. The topography is gently undulating, rising either side of a watercourse through the centre of the site to localised high points in the east and west. Scattered surrounding settlement includes the village of Bilsby to the south, Thoresthorpe to the west and Saleby to the northwest. East of the site, there are more open views across gently sloping landforms to the east, but there are few visual receptors to the east. Views will be mostly screened by raised landform towards the Lincolnshire Wolds NL alongside the existing vegetation structure within the wider landscape, despite the relative proximity.	Approximately 3.5 km from the Lincolnshire Wolds NL.	Surrounding CS05, the key visual receptors are residential properties. Approximately 40 residential properties are located at Saleby (200 m to the northwest), 10 residential properties are located at Thoresthorpe (500 m to the west), 60 properties are located in Bilsby (100 m to the south) as well as scattered properties at Asserby Turn and around Glebe Farm (east of Saleby). The closest residential property is Dryby Farm which slightly overlaps with the furthest southern point of the Siting Zone. The nearest collection of properties are in the village in Bilsby, 100 m south of the Siting Zone. Other key sensitive receptors include recreational receptors. Those identified are users of PRoW Sale/284/3 which crosses through the southwest of the Siting Zone.

Siting Zone	Landscape Character of the Siting Zone	Proximity to the Lincolnshire Wolds NL	Key visual receptors
CS06	Characterised by arable fields of varying size and shape, with a smaller scale pattern and more intact field boundaries of trees/hedgerows in the east and northwest of the village of Huttoft. A linear, tree-lined dismantled railway is a distinctive feature in the landscape, screening views to the west including from the village to the east. A gentle undulation in topography means that the western part of the site is relatively elevated and is very open with glimpsed views to the Lincolnshire Wolds NL in the west. However, the physical separation of the site from the NL alongside the sloping topography and vegetation within the wider landscape to the west will serve to ensure that no significant effects upon the setting of the NL will result.	Approximately 6.3 km from the Lincolnshire Wolds NL.	Surrounding CS06, the key visual receptors are residential properties. Approximately 100 are located at Huttoft (400 m to the southeast), and in isolated properties on Mill Lane (to the north), and Alford Road (to the south). The closest residential property, located off Mill Lane, is located 50 m north of the Siting Zone. Other key sensitive receptors include recreational receptors. Those identified are users of PRoW routes Hutt/12/1, Hutt/11/1, Hutt/14/1 and Hutt/14/2 which cross through the centre and east of the Siting Zone.

Siting Zone	Landscape Character of the Siting Zone	Proximity to the Lincolnshire Wolds NL	Key visual receptors
CS07	Characterised by small scale open arable fields bound by drainage ditches east of Huttoft. Boundary vegetation within the site is limited, and views are open, however trees and occasional hedgerows on the edge of Huttoft and in the wider landscape mean views are less expansive than elsewhere. Due to the physical separation of the Lincolnshire Wolds NL from the Siting Zone, it is considered unlikely that the development will result in significant adverse effects upon the setting of the NL during construction or operation.	Approximately 7.2 km from the Lincolnshire Wolds NL.	Within CS07, the key sensitive receptors are recreational receptors. Those identified are users of PRoW Hutt/2/2 (which crosses the southeast of the Siting Zone) and Hutt/4/1 (which crosses the north of the Siting Zone). The presence of these PRoW mean there is limited flexibility within the Siting Zone to be able to microsite the EGL 5 converter station and avoid PRoW. Other key visual receptors include residential properties. Those identified are the approximate 100 residential properties located at Huttoft (500 m to the southwest), Poplar Farm (to the north) and isolated properties on Jolly Common Lane (to the south and east respectively). The closest residential properties, Eastfield Farm and The Tree, are located 40 m east and south of the Siting Zone respectively.

Siting Zone	Landscape Character of the Siting Zone	Proximity to the Lincolnshire Wolds NL	Key visual receptors
CS08	Characterised by a large arable field southeast of the village of Bilsby and is surrounded by smaller pastures with mature hedgerows and boundary trees. Views towards the Lincolnshire Wolds NL will be mostly screened by raised landform despite the relative proximity.	Approximately 3.7 km from the Lincolnshire Wolds NL.	Within CS08, the key sensitive receptors are recreational receptors. Those identified are users of PRoW Bils/74/3, which crosses the centre of the Siting Zone. The presence of this PRoW means there is limited flexibility within the Siting Zone to be able to microsite the EGL 5 converter station and avoid PRoW. Other key visual receptors include residential properties. Those identified are the small collection located 250 m east of Bilsby, and on several isolated farms/cottages accessed from Thurlby Road (to the north) and Ancroft Fen Lane (to the south). The closest residential property, Ancroft Fen, is located 15 m south of the Siting Zone.
CS16	Characterised by open, irregular arable fields of medium size bound by drainage ditches. Vegetation combined with localised changes in topography will limit the intervisibility between the site and nearby residential receptors. However, frequent upper-storey views are expected from the residential properties near Huttoft and Anderby. The distance from the Lincolnshire Wolds NL alongside the intervening vegetation serve to limit impacts on its setting.	Approximately 6.6 km from the Lincolnshire Wolds NL.	Surrounding CS16, the key visual receptors are residential properties. Approximately 25 residential properties located at Anderby (130 m south) and 30 in the south of Huttoft (700 m northwest). The closest residential property, Fair View, is located 40 m south of the Siting Zone. Other key sensitive receptors include recreational receptors. Those identified are users of PRoW Ande/1/1 which passes immediately south of the Siting Zone.

7.3.5 Landscape and visual impacts will be both temporary, relating to the construction works, and permanent, due to the introduction of new infrastructure (EGL 5 converter station) into the landscape. Siting Zones located furthest from the Lincolnshire Wolds NL, most separated from settlement and/or those located on previously disturbed land are factors preferred to reduce the magnitude of landscape and visual impacts. In addition, Siting Zones adjacent to (where practicable) the proposed 400 kV LCS-B (proposed as part of the GtW Project) would also be preferrable to limit the spread of landscape and visual impacts to a wider area.

7.3.6 Siting Zones CS07 and CS08 would be less preferred from a landscape and visual perspective due to the potential impacts upon key sensitive receptors (residential properties and a play area (for CS07), with PRoW crossing the siting zones), including users of PRoW. The opportunities for micro-siting the EGL 5 converter station are very limited given that the Siting Zones are crossed by the PRoW, and although PRoW may be able to be diverted, visual impacts for users are likely to still occur.

7.3.7 Siting Zones CS05, CS06 and CS16 are preferred from a landscape and visual perspective as they contain features which offer screening and provide a sense of visual enclosure. CS05 offers the opportunity to co-locate infrastructure with the proposed 400 kV LCS-B. Despite the proximity to the Lincolnshire Wolds NL, the converter station would be largely contained by the existing topography and vegetation that characterises the eastern slopes of the Lincolnshire Wolds NL. Although there is some potential for minor cumulative impacts on the Lincolnshire Wolds NL (in combination with the GtW Project), siting within zone CS05, within the immediate context of the proposed 400 kV LCS-B, would help to limit the potential spread of effects in the surrounding area.

Ecology

7.3.8 All the EGL 5 converter station Siting Zones are located between 2.3 km (Siting Zone CS07) and 7 km (Siting Zone CS08) from NSN and Ramsar sites (see **Figure 7-3**). The Humber Estuary SPA and Ramsar site, Saltfleetby-Theddlethorpe Dunes SAC and Inner Dowsing, Race Bank and North Ridge SAC are all situated over approximately 7.6 km from the Siting Zones (at their closest points) and are therefore not considered further. The nearest NSN to the Siting Zones is the Greater Wash SPA (as described in Paragraph 6.3.10) which is located approximately 2.3 km to the east of CS07. No national statutory ecological designations are identified within 2 km of the Siting Zones (see **Figure 7-3**) and are therefore not considered further. Priority habitats have been identified within, or immediately adjacent to the EGL 5 converter station Siting Zones (see **Figure 7-3**) and are detailed in **Table 7-2**.

7.3.9 Several measures could be implemented to reduce the magnitude of impact on the above designated sites, species and priority habitats, these include:

- Careful siting of converter station infrastructure, and routeing of underground cable connections to avoid areas of priority habitat; and
- Implementation of a COCP, or similar, setting out specific procedures for the protection of habitats and species.

7.3.10 In addition, the provision of compensation and enhancement measures would be made. It is also noted that the consideration of BNG will be included in the later stages of the English Onshore Component of the Project.

Figure 7-3 – Key ecological features adjacent to EGL 5 Converter Station Siting Zones

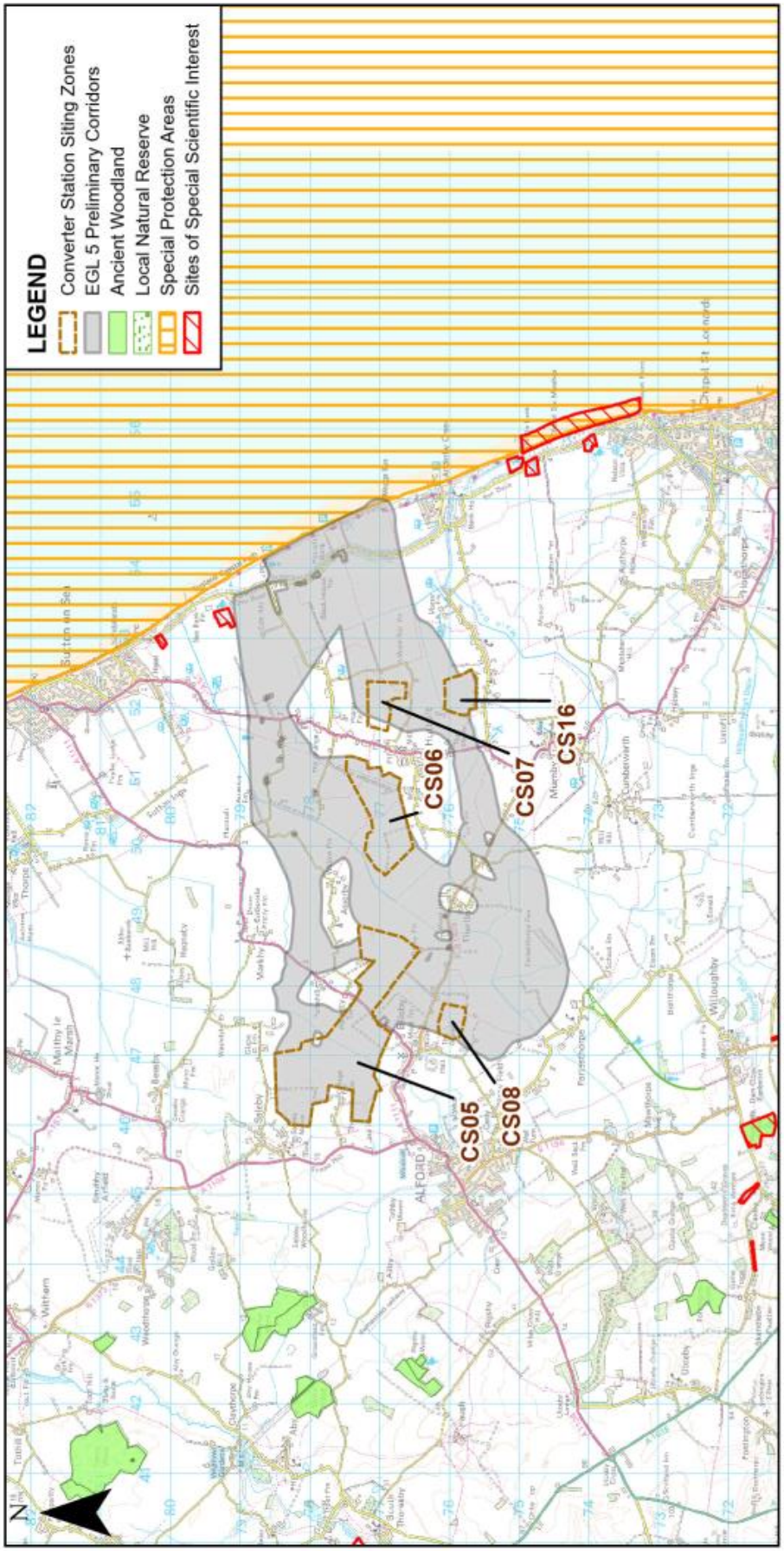


Figure 7-3 – Key ecological features adjacent to EGL 5 Converter Station Siting Zones

7.3.11 Due to the distance of the Siting Zones from the Greater Wash SPA potential impacts of the proposed infrastructure are limited to pollution during construction and effects upon functionally connected habitats. Siting Zones CS07 and CS16 are located the closest at approximately 2.2 km and 2.7 km away respectively, with Siting Zone CS08 located the furthest away, at approximately 6.8 km. The potential effects upon NSN and Ramsar sites will be considered in detail within a HRA (conducted in the absence of mitigation), as the English Onshore Component of the Project development progresses. However, for the purposes of Options Appraisal, the Siting Zones located further from the NSN and Ramsar sites are considered to have a lesser likelihood of resulting in adverse environmental effects. With the implementation of careful siting (and routeing for connections) and standard construction measures, all Siting Zones are considered capable of being acceptable when considering the potential impacts on identified sites.

7.3.12 Outside of the statutory ecological designations, the construction of the EGL 5 converter station has potential to result in habitat loss/degradation and impacts to protected species. Further impacts to habitats may arise because of pollution of soils and watercourses during construction.

Table 7-2 – Relevant Sites Designated for Nature Conservation and Priority Habitat

Siting Zone	Priority habitats within and adjacent to the Siting Zone
CS05	Deciduous woodland located 160 m to the south of the Siting Zone which can be avoided. Potential Coastal and Floodplain Grazing Marsh (CFPGM) located within the Siting Zone which can be avoided.
CS06	Deciduous woodland located 30 m to the south of the Siting Zone which can be avoided. Potential CFPGM located within the Siting Zone which can be avoided.
CS07	Deciduous woodland located 80 m to the south of the Siting Zone which can be avoided. Potential CFPGM located within the Siting Zone which can be avoided.
CS08	None
CS16	Deciduous woodland located 145 m to the south of the Siting Zone which can be avoided. Potential CFPGM located within the Siting Zone which can be avoided.

7.3.13 From an ecological perspective there is a need to balance the requirement for greater distances from the Lincolnshire coastline (where the NSN and Ramsar sites are located) and a greater length of underground cables (resulting in the increased risk of disturbance on ecological receptors) by routeing further inland. Therefore, it is considered that Siting Zones that are both closest to and furthest from the coastline would both be less preferable overall. Additionally, Siting Zones on (wholly or fully) previously disturbed land would also be preferred as this would limit the risk of new impacts on undisturbed land. Furthermore, Siting Zones adjacent to (where practicable) the proposed 400 kV LCS-B would be preferrable to help limit the spread of impacts upon potentially functionally linked land and upon habitat connectivity to a wider area.

7.3.14 When considering the above criteria, Siting Zones CS05, CS06 and CS08 are preferred from an ecological perspective. These Siting Zones are all located between approximately 3 km and 7 km west of the coastline, and although Siting Zones CS05 and CS06 have the potential to contain priority habitat, this is considered avoidable through careful siting. Overall, Siting Zone CS05 is most preferred from an ecology perspective as it would also offer the opportunity for co-location with the proposed 400 kV LCS-B, limiting the potential spread of impacts on functionally linked habitats.

Historic Environment

7.3.15 No designated heritage assets are located within the EGL 5 converter station Siting Zones. However designated heritage assets are located within 1 km of all Siting Zones and therefore may be subject to adverse effects during construction and operation. Those identified are listed in **Table 7-3** and shown on **Figure 7-4**. Potential risks to these designated assets include:

- Physical impacts to designated heritage assets (from underground cabling into and out of the Siting Zones);
- Ground disturbance causing the removal/truncation of buried archaeological remains; and
- Change in the character and setting of designated heritage assets during construction and operation.

7.3.16 There are also numerous non-designated assets in addition to the risk for unrecorded archaeology within all Siting Zones.

7.3.17 Wherever possible, the EGL 5 converter station and HVDC underground cables to and from the Siting Zones would avoid designated heritage assets and known non-designated heritage assets. However, in addition to the identified designated heritage assets, there is a risk of unrecorded archaeology within all Siting Zones. The presence and extent of unrecorded archaeology would be determined through surveys at a later stage of the English Onshore Component of the Project following consultation with relevant stakeholders. Where direct construction impacts on below ground archaeological remains (either known or previously unrecorded) cannot be avoided, these may be managed through standard mitigation measures such as preservation by record.

Figure 7-4 – Key heritage features adjacent to EGL 5 Converter Station Siting Zones

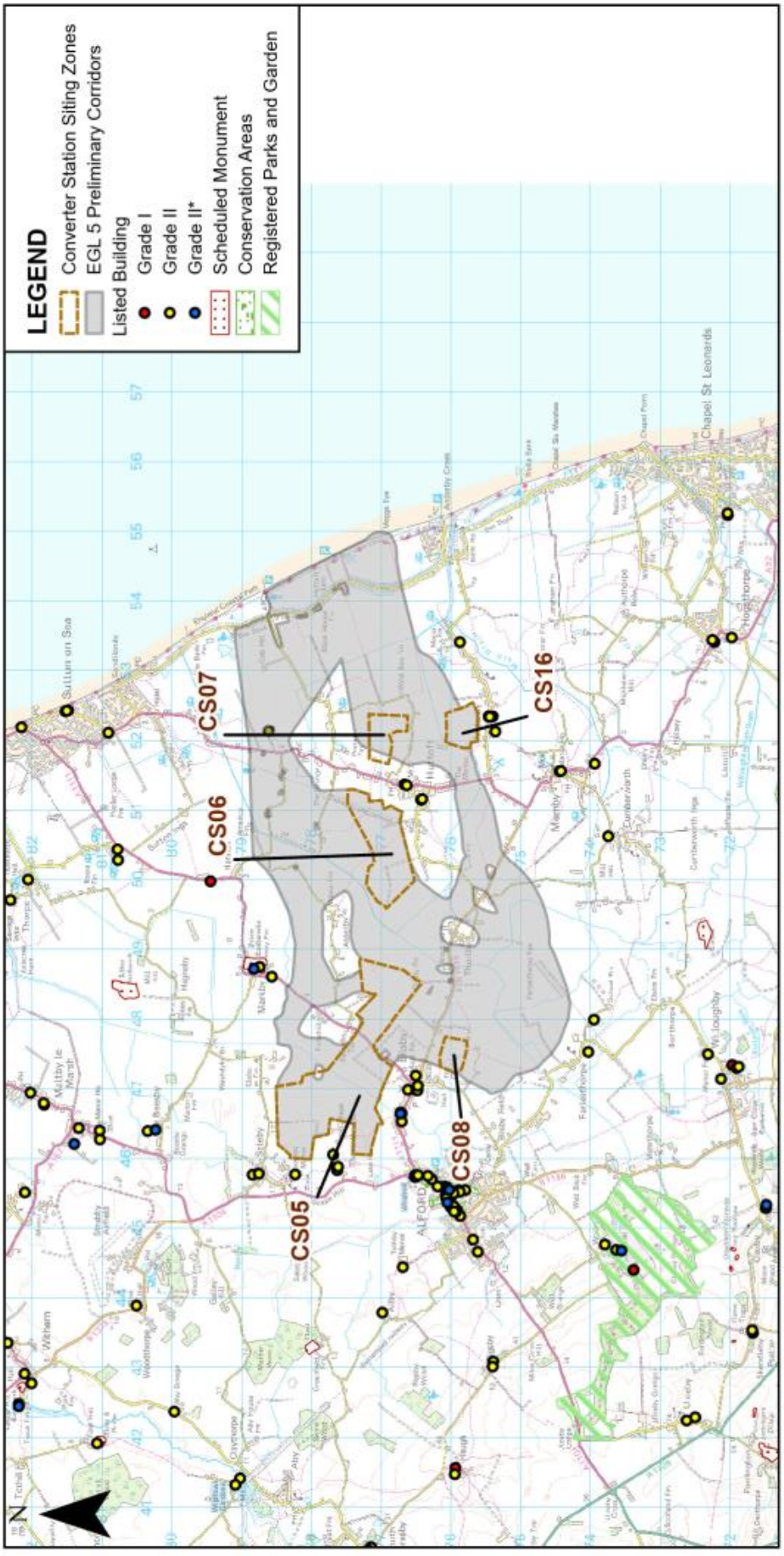


Figure 7-4 Key heritage features adjacent to EGL 5 Converter Station Siting Zones

Table 7-3 – Identified Designated Heritage Assets within 1 km

Siting Zone	Designated heritage assets within 1 km
CS05	Two Scheduled Monuments, *Churchyard cross, St Margaret's Churchyard, Saleby* and *Churchyard Cross, Holy Trinity Churchyard* located 500 m northwest and 300 m south of the Siting Zone, respectively. One Grade I Listed Building (*Windmill*), located 700 m southwest of the Siting Zone. One Grade II* Listed Building (*Church of the Holy Trinity*) located 300 m south of the Siting Zone. 21 Grade II Listed Buildings, mainly located to the south and west of the Siting Zone. The closest of which is *Manor Farmhouse* located approximately 230 m west of the Siting Zone. Alford Conservation Area located 680 m southwest of the Siting Zone. All the identified assets within 1 km are screened by existing development at Thoresthorpe and Bilsby and/or woodland screening to the west and south which, despite the distance and intervening vegetation, it is likely the development will impact on the setting of these assets during construction or operation.
CS06	One Grade I Listed Building, *Church of St Margaret*, located 325 m southeast of the Siting Zone. Three Grade II Listed Buildings, the closest of which is *Cross in Churchyard, South Side*, located 340 m south of the Siting Zone. All of the identified assets within 1 km are screened by existing development and woodland screening at Huttoft to the east which, despite the distance and intervening vegetation, it is likely the development will impact on the setting of these assets during construction or operation.
CS07	One Grade I Listed Building, *Church of St Margaret*, located 680 m southwest of the Siting Zone. Three Grade II Listed Buildings, the closest of which is *Huttoft Mill* located 370 m southwest of the Siting Zone. All of the identified assets within 1 km are screened by existing development and woodland screening at Huttoft to the west which, despite the distance and intervening vegetation, it is likely the development will impact on the setting of these assets during construction or operation.
CS08	One Scheduled Monument, *Churchyard Cross Holy Trinity Churchyard*, located 850 m northwest of the Siting Zone. One Grade II* Listed Building, *Church of the Holy Trinity*, located 880 m northwest of the Siting Zone. Eight Grade II Listed Buildings, the closest of which is *Moat Farm* located 370 m northwest of the Siting Zone. All the identified assets within 1 km are screened by existing development and vegetation screening at Bilsby to the northwest which, despite the distance and intervening vegetation, it is likely the development will impact on the setting of these assets during construction or operation.
CS16	One Scheduled Monument, *Churchyard Cross St. Andrew's Churchyard*, located 155 m south of the Siting Zone.

Siting Zone	Designated heritage assets within 1 km
	One Grade I Listed Building, *Church of St. Margaret*, located 885 m northwest of the Siting Zone. Eight Grade II Listed Buildings, the closest of which is *Church of St. Andrew* located 155 m south of the Siting Zone. All the identified assets within 1 km are screened by existing development at Anderby and Huttoft and/or vegetation screening to the south and northwest which, despite the distance and intervening vegetation, it is likely the development will impact on the setting of these assets during construction or operation.

7.3.18 Overall, from a heritage perspective the Siting Zone with the fewest heritage assets identified within 1 km is the most preferred. As such, Siting Zones CS06 and CS07 are preferred as these Siting Zones contain the fewest designated heritage assets, with only one Grade I Listed Building and three Grade II Listed Buildings within 1 km. The assets identified are partially screened by vegetation and/or existing development, therefore present fewer constraints.

7.3.19 Siting Zones CS05 and CS16 have the most heritage assets identified within 1 km. However, it is noted that CS05 is the largest Siting Zone and therefore potentially presents the greatest opportunity in reducing adverse effects through targeted mitigation planting and careful siting of infrastructure, particularly to the southeast of the Siting Zone where distance from heritage assets is increased.

Water

7.3.20 Water environment features within proximity of the Siting Zones are shown in **Figure 7-5**. Careful siting will seek to avoid, where possible, areas sensitive to the water environment (e.g., environmentally designated sites, sources of water use/abstractions), Flood Zones 2 (FZ2) and 3 (FZ3) and minimise watercourse and drain crossings.

7.3.21 All Siting Zones overlie a principal bedrock aquifer and groundwater vulnerability is also medium across all Siting Zones and therefore not considered differentiating factors.

7.3.22 Siting Zones CS05, CS06 and CS08 are partially within a groundwater Source Protection Zone (SPZ) identified as Zone II (Outer Protection Zone). Siting Zone CS05 is also adjacent to an area of SPZ identified as Zone I (Inner Protection Zone) to the south. Except for Siting Zone CS08 (where the extent of the SPZ II is such that it cannot be avoided) the SPZ II could be avoided within these Siting Zones.

7.3.23 FZ2 and FZ3 are present within Siting Zones CS05, CS06, CS07 and CS16 however the coverage of FZ2 and FZ3 within these Siting Zones is limited and these could be avoided with careful siting. Flood Zone coverage comprises:

- 12.2% (FZ2) and 8% (FZ3) of CS05;
- 19.8% (FZ2) and 8.6% (FZ3) of CS06;
- 16.5% (FZ2) and 0.5% (FZ3) of CS07; and
- 18% (FZ2) and 11.5% (FZ3) of CS16.

7.3.24 Watercourses (either statutory main rivers, WFD river waterbodies, Internal Drainage Board (IDB) watercourses, and/or drains) are present within Siting Zones CS05, CS06 and CS07. When considering statutory main rivers and WFD waterbodies, the Wold Grift Drain (both a statutory main river and WFD river waterbody) crosses Siting Zone CS05 from southwest to northeast across the centre of the Siting Zone. With careful siting it should be possible to avoid siting upon Wold Grift Drain, especially within CS05 due to the size of, and therefore potential flexibility for siting within, the Siting Zone.

Figure 7-5 – Key water features adjacent to EGL 5 Converter Station Siting Zones

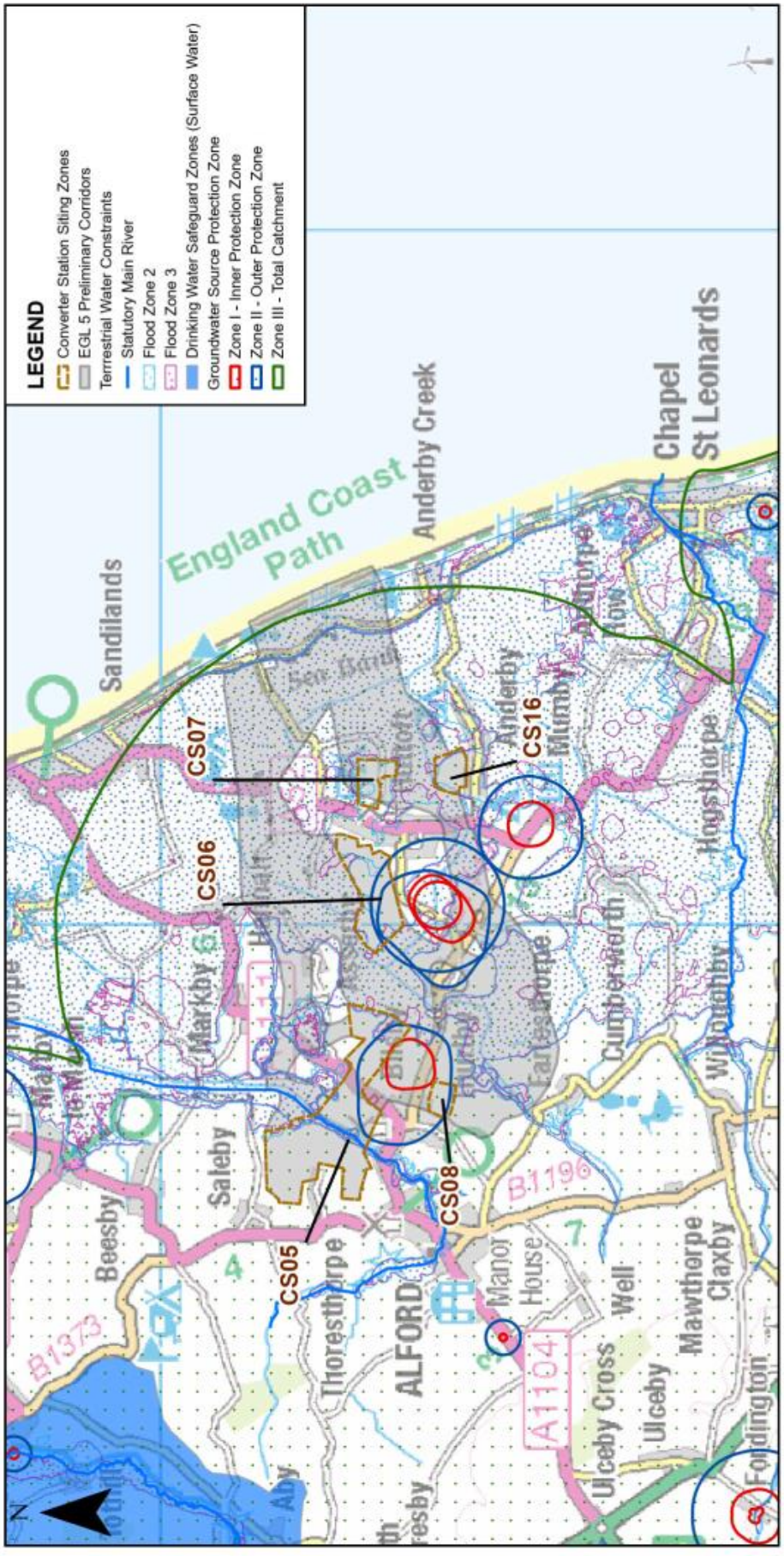


Figure 7-5 - Key water features adjacent to EGL 5 Converter Station Siting Zones

7.3.25 IDB watercourses are located within Siting Zones CS06 and CS07. Other drains are also located within Siting Zone CS05. However, due to the distribution of these IDB and drains it is considered that direct impacts could be avoided in all Siting Zones through careful siting of infrastructure.

7.3.26 Development of, and adherence to a CoCP which would set out principals for storage and handling of oils, fuel or any other potentially polluting substance, management of surface water and soil management. Appropriate construction methods would be considered at sensitive locations and development and adherence to appropriate management measures would be required. Further detailed assessments of impacts would be undertaken including a Flood Risk Assessment (FRA) and Water Framework Directive (WFD) assessment.

7.3.27 Siting Zones CS05, CS07, and CS16 are preferred from a water environment perspective as these Siting Zones all contain few water related receptors.

7.3.28 Siting Zones CS06 and CS08 are less preferred due to the presence of major and minor watercourses, SPZ II and areas of Flood Zones 2 and 3 which whilst identified as avoidable, with the exception of SPZ II coverage in Siting Zone CS08, may constrain the flexibility to site infrastructure within the zone (see also paragraphs 7.4.10 – 7.4.12 on this narrative). However it is noted that Siting Zone CS05 offers the opportunity to co-locate infrastructure with the proposed 400 kV LCS-B, which would potentially limit the spread of impacts on water features in the area.

Socio-Economics

7.3.29 There are few relevant socio-economic receptors in proximity to the EGL 5 converter station Siting Zones (see **Table 7-4**). Those identified are residential properties and users of PRoW in the vicinity of the Siting Zones. Additionally there are other project developments and infrastructure in the area, namely EGL 3 and EGL 4 Projects, Ossian OWF Onshore Transmission Infrastructure, the Viking Link Interconnector and the GtW Project. A low priority military low flying area is present within all Siting Zones, however this does not present any constraints.

7.3.30 All Siting Zones contain at least one PRoW. Whilst it is considered that permanent impacts on these routes can be avoided through careful siting, there may be a requirement for temporary closure and diversion of affected routes during construction.

7.3.31 Due to the presence of the GtW Project's proposed 400 kV overhead line, LCS 400 kV substations and associated connection infrastructure, there is a potential for cumulative impacts on the receptors identified in **Table 7-4** below. As such, co-location of infrastructure is considered preferable to reduce the spread of potential impacts across the wider region.

7.3.32 It is considered that ongoing careful design and micrositing of infrastructure is likely to reduce, and where possible avoid, impacts upon identified receptors. Construction phase impacts may occur; however these can be mitigated using standard best practice measures or through a CoCP (or equivalent). Changes in air quality and dust will be monitored in line with guidance set out by the Institute of Air Quality Management (IAQM). Avoidance of important agricultural activities and seasons (e.g. harvesting) may need to be considered during construction. Impacts may arise because of construction traffic and would be addressed through a Construction Traffic Management Plan (CTMP).

Table 7-4 - Identified socio-economic features within or immediately adjacent to Siting Zones

Siting Zone	Community receptors and recreational routes	Proposals (allocations & applications)
CS05	Farmhouses located adjacent to the west and north of the Siting Zone. Residential and commercial properties and places of worship to the south of the Siting Zone in Bilsby. Users of the PRoW Sale/284/3 which crosses through the southwest of the Siting Zone.	Overlap with the GtW Project Overlap with the Viking Link Interconnector in northern part of Siting Zone Overlap with Ossian OWF Transmission Infrastructure Scoping Boundary Overlap with the Theddlethorpe Geological Disposal Facility (GDF) search area
CS06	Farmhouses located adjacent to the north of the Siting Zone. Residential and commercial properties, including a primary school, to the southeast of the Siting Zone in Huttoft. Users of the PRoW Hutt/12/1, Hutt/11/1, Hutt/14/1 and Hutt/14/2 which cross through the centre and east of the Siting Zone.	Overlap with the GtW Project Overlap with Ossian OWF Transmission Infrastructure Scoping Boundary
CS07	Isolated properties on Jolly Common Lane to the south and east, and on Sea Lane to the north. Residential and commercial properties, including a playing field, to the southwest of the Siting Zone in Huttoft. Users of the PRoW Hutt/2/2 which passes through the southeast of the Siting Zone and Hutt/4/1 which crosses through the north of the Siting Zone.	Overlap with Ossian OWF Transmission Infrastructure Scoping Boundary
CS08	Users of the PRoW route Bils/74/3, which crosses through the centre of the Siting Zone.	Overlap with the GtW Project Overlap with Ossian OWF Transmission Infrastructure Scoping Boundary
CS16	Users of the PRoW Ande/1/1, which passes immediately to the south of the Siting Zone.	Overlap with the EGL 3 and EGL 4 Projects Overlap with Ossian OWF Transmission Infrastructure Scoping Boundary

7.3.33 Except for PRoW, there are no socio-economic receptors within the Siting Zones and few socio-economic receptors adjacent to the Siting Zones. Therefore no one Siting Zone is considered substantially preferred. However there is the potential to limit the spread of impacts into the surrounding area by seeking to locate near to the proposed GtW Project's infrastructure. As Siting Zones CS07, and CS16 do not offer this opportunity they are less preferred.

Other Considerations

7.3.34 Other environmental topics that were also considered as part of the options appraisal include geology and soils. As discussed in **Section 4.3**, although scoped-out as factors considered in respect of siting at this early development stage of the English Onshore Component of the Project, air quality and emissions and noise and vibration are accounted for by considering proximity to settlements, residential and other sensitive features.

7.3.35 Except for agricultural land, and underlying bedrock, there are no relevant geology receptors identified within or immediately adjacent to the Siting Zone. All Siting Zones lie within BMV ACL Grade 2 (very good quality agricultural land) and Grade 3 (good to moderate quality agricultural land). CS05, CS06, and CS08 are within the Welton Chalk bedrock formation comprising chalk and superficial drift deposits of Till, Devensian comprising Diamicton. CS07 and CS16 are within the Burnham Chalk bedrock formation comprising Cretaceous chalk, with superficial deposits of Quaternary till.

7.3.36 There are scattered properties (residential, commercial and agricultural) surrounding the Siting Zones. For each of the Siting Zones, there is a potential risk of temporary impacts limited to localised changes in air quality and noise and vibration during construction. No potential adverse air quality impacts are anticipated during operation, although there is the potential for localised changes in noise and vibration on settlements adjacent to the Siting Zones. However, each Siting Zone is considered sufficient in size to allow for careful siting of the required infrastructure (at a later stage) to therefore reduce the likelihood and magnitude of these effects. Scattered properties are in the vicinity of each Siting Zone such that they do not constitute a differentiating factor in terms of potential air quality and noise impacts.

7.3.37 It is noted that the desire to co-locate the EGL 5 converter station with the proposed 400 kV LCS-B may have adverse effects the local area by increasing the concentration of construction traffic, and therefore potential impacts upon noise, air quality and amenity, in the surrounding area. However, these adverse effects would be managed through measures included within the CoCP for each project and could provide opportunity to coordinate in respect of peripheral landscaping, drainage, and other related works. There is also potential to, pending further design and development, coordinate access roads, bellmouths and construction laydown areas as well as potential to consider a more coordinated approach to delivery of the infrastructure where appropriate.

7.4 Engineering Factors

Construction Area and Access

7.4.1 All Siting Zones are within 1 km from local A-roads and B-roads (see **Figure 7-6**) and therefore road infrastructure required for new permanent access or upgrades to existing roads is unlikely to be substantial. However, roads in the Siting Zones may need to be temporarily modified or upgraded to accommodate for deliveries of abnormal indivisible loads (AIL) for construction.

7.4.2 Construction of the infrastructure required within each of the Siting Zones may lead to the use of minor roads through settlements. However, it is considered that secondary access points would be constructed for smaller vehicles to avoid construction traffic routeing through settlements.

Siting Flexibility

7.4.3 All Siting Zones are large enough to accommodate the infrastructure required for the EGL 5 converter station (see **Figure 7-6**). However, due to the size and shape of Siting Zones CS07, CS08 and CS16, these Siting Zones have less flexibility for micrositing for both the permanent and temporary design cases for the new EGL 5 converter station and for routeing connecting underground HVDC cables. Should these Siting Zones be identified as preferred, additional land outside of the Siting Zones may be required for temporary infrastructure (such as construction compounds) subject to further design studies.

7.4.4 Siting Zone CS05 provides increased flexibility in comparison to other slightly smaller Siting Zones when considering the detailed siting of the EGL 5 converter station, with flexibility in siting available even if only the region to the east of the proposed 400 kV LCS-B site is considered as a connection point.

7.4.5 Each Siting Zone will require a connection to the HVDC underground cables from the Anderby Creek Landfall. It will also require an onward connection via underground HVAC cables to the proposed 400 kV LCS-B. All Siting Zones are free from significant constraints. However, the locations of Siting Zones CS05 and CS06 through Corridor 5 allow for the shortest deviations of underground cables between the new Landfall at Anderby Creek and onward routeing towards the proposed 400 kV LCS-B. Additionally, the shortest HVAC cable lengths are associated with Siting Zone CS05, followed by CS08 and CS06.

Existing and Proposed Infrastructure

7.4.6 The existing Viking Link Interconnector (HVAC underground cables) routes through the north of Siting Zone CS05, therefore increasing technical complexity and limiting siting flexibility at the north of the Siting Zone. The size of the Siting Zone provides sufficient space to accommodate the required EGL 5 converter station whilst primarily avoiding the Viking Link Infrastructure. However, a crossing of the Viking Link Interconnector may be required as part of the routeing from the Anderby Creek Landfall (subject to detailed siting and routeing at a later stage of the English Onshore Component of the Project).

7.4.7 Connection, and therefore proximity, to the proposed 400 kV LCS-B is a key driver for the English Onshore Component of the Project, as described in **Chapter 2**. Except for Siting Zones CS07 and CS16, the Siting Zones overlap with the GtW Project. This overlap is either with the GtW Project's proposed 400 kV overhead line Corridor and/or either of the proposed 400 kV LCS substation Siting Zones. Siting and routeing near the infrastructure proposed by the GtW Project may increase the technical complexity of construction. However, siting and routeing near the GtW Project would offer opportunities in terms of shared infrastructure (such as haul roads). This also applies to EGL 3 and EGL 4 Projects, the Order Limits for which overlap the English Onshore Components of the Project at Landfall (for both Corridors 5 and 6), and continue to overlap Corridor 6, south of Huttoft and a small section of Corridor 5 south of Thurlby. Close co-ordination with the GtW, EGL 3 and EGL 4 Projects is ongoing and will be required as the English Onshore Component of the Project continues. As part of this ongoing engagement with these Projects, discussions include the identification of shared opportunities to limit potential for impacts upon communities through coordination of construction programmes and infrastructure.

Ground Conditions

7.4.8 Geotechnical constraints, such as ground conditions, geology, and soil characteristics, have been considered for each of the Siting Zones. For all Siting Zones, further investigation into soil type and ground conditions would be carried out as part of future design stages and standard mitigation measures regarding pollution and contaminated materials would be implemented.

7.4.9 No relevant geotechnical constraints have been identified for Siting Zone CS08. For the other Siting Zones (CS05, CS06, CS07 and CS16) the main risk identified is the variation in material type within each Siting Zone. The mixture of geology, which includes glacial till, glaciofluvial, alluvium and tidal flat deposits, has the potential to increase technical complexity of construction as these materials may result in areas of reduced bearing capacity and variable permeability. In addition, the presence of these materials may necessitate further geotechnical investigation, increasing overall cost and programme duration of the Project.

Figure 7-6 – Key engineering features adjacent to EGL 5 Converter Station Siting Zones

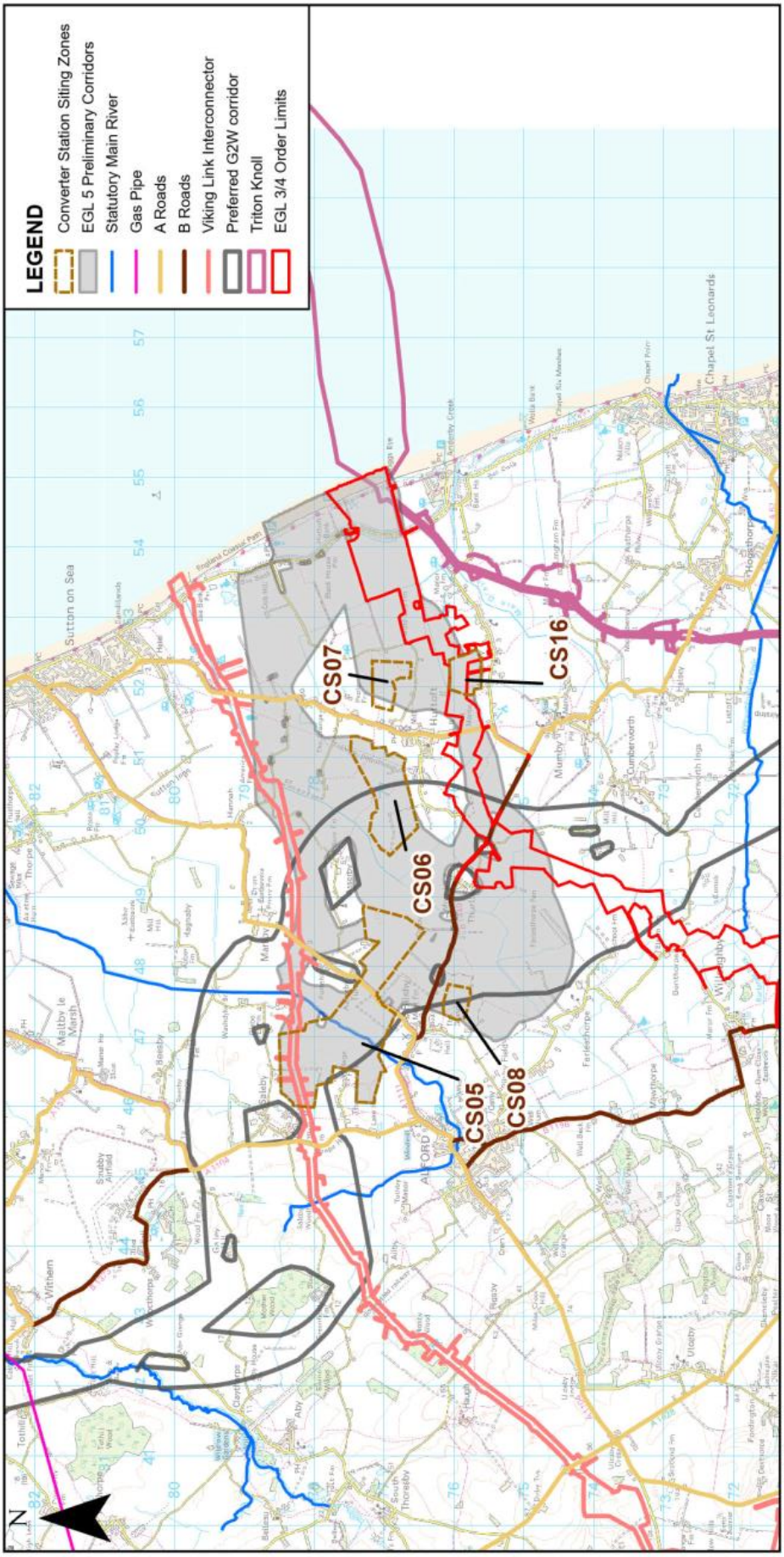


Figure 7-6 - Key engineering features adjacent to EGL 5 Converter Station Siting Zones

Flooding

7.4.10 As described in Paragraph 7.3.23, FZ2 and FZ3 are present within Siting Zones CS05, CS06, CS07 and CS16, attributable to nearby watercourses. Coverage of FZ2 and FZ3 within these Siting Zones is limited and could be avoided through careful siting of infrastructure. Infrastructure required within FZ2 and FZ3 will be designed accordingly, and the mitigation and compensation required will be determined as the English Onshore Component of the Project progresses.

7.4.11 Wold Grift Drain intersects Siting Zone CS05, and siting on or adjacent to this watercourse would increase the technical complexity of construction, design and operational requirements of infrastructure. However, there is likely to be sufficient space within the Siting Zone to avoid siting infrastructure on or immediately adjacent.

7.4.12 Further assessment of flood risk (such as an FRA) for a preferred EGL 5 converter station site will be undertaken in more detail at a later stage of Project development and will identify appropriate mitigation.

Future Connections

7.4.13 There is the potential that siting the converter station in close proximity to the LCS-B substation, within Siting Zone CS05, may limit routeing for future connections from the east or require future connections to undertake cable crossings, subject to further investigations. Siting Zones CS06, CS07 and CS16 are anticipated to have lesser impacts on future connections, noting any restrictions would be dependent on routeing into the proposed 400 kV LCS-B due to the specific bay allocation. Similarly, Siting Zone CS08 is expected to have limited impact, routing into the substation would be from the south, giving a higher degree of flexibility to future connections.

Conclusion

7.4.14 Siting Zone CS05 contains sufficient space (even when noting potential constraints of Wold Grift Drain, Viking Link Interconnector and potential proximity of a LCS 400 kV substation) to site the required infrastructure. Siting within this zone would also limit the deviation of the underground HVDC cables routeing from a new Landfall at Anderby Creek and on to the proposed LCS-B 400 kV. This Siting Zone also offers the opportunity to be located near to the proposed 400 kV LCS-B, allowing the opportunity for efficient design and construction of both projects such as use of shared permanent and construction access roads. Siting near to the proposed 400 kV LCS-B and co-location of infrastructure is likely to allow for more coordination with the GtW Project, an approach encouraged in NPS EN-1[2] Paragraph 3.3.80 “…coordination of onshore transmission…should be considered at both the strategic and more detailed project design levels”.

7.5 Horlock Rules

7.5.1 The following paragraphs provide commentary to the extent to which the appraised options for siting the new EGL 5 converter station accord with the Horlock Rules (relating to substation siting, as described in **Chapter 3**). These rules represent NGET’s guiding principles for the siting new energy transmission infrastructure and a primary mechanism by which compliance with national policy is assured.

7.5.2 At this early stage of development, Horlock Rules 7, 9, 10 and 11 are not considered applicable as they are primarily concerned with the detailed design of converter stations following site selection.

7.5.3 When reviewed against the applicable Horlock Rules:

- Defining Siting Zones has taken into consideration environmental features and potential impacts upon identified features (Horlock Rule 1).
- All Siting Zones have been defined to exclude areas of highest amenity value and interest in the area (Horlock Rules 2 and 3). However, all Siting Zones are within 10 km to areas of high amenity value (as all are within 8 km of the Lincolnshire Wolds NL).
- Sufficient space is available within the Siting Zones to enable micro-siting to avoid identified socio-economic constraints and further reduce effects upon environmental features present (Horlock Rules 4 and 5).
- All Siting Zones offer the opportunity to utilise screening provided by existing features (such as hedgerows, treelines and where possible blocks of woodland) to reduce intrusion into surrounding areas (Horlock Rule 4). This is varied for the Siting Zones as some are screened by hedgerows and treelines, with some screened by woodland blocks. Given the predominately open landscape, there is a requirement to achieve greater distances from receptors and use of screening (most likely by planting) will be necessary.
- All Siting Zones are predominantly located on agricultural land and therefore do not wholly align with Horlock Rule 6 (reducing effect on agricultural land and drainage), although this is unavoidable. Not all Siting Zones contain drainage features such as drains or ditches, however due to the size of Siting Zones CS06, CS07 and CS16, and the distribution of drainage features within their boundaries, it will be more difficult to avoid drainage features within these Siting Zones.
- No vacant or available brownfield land for siting of the required infrastructure has been identified within the EGL 5 Converter Station Study Area. However, when considering proximity to the proposed LCS 400 kV substation infrastructure (in line with Horlock Rule 8 – space to be used effectively to limit the area required for development) the proximity of Siting Zone CS05 may help to limit the area required for development.

7.6 Comparative Appraisal and Conclusion

7.6.1 Following comparative appraisal of the EGL 5 converter station Siting Zones, Siting Zones CS07, CS08 and CS16 are least preferred due to the limited flexibility for siting, and therefore potential increased technical complexity for siting within these zones. These Siting Zones are all considerably spatially constrained with very little optionality for the siting of the converter station. The limited flexibility for siting within these zones may mean that potential environmental and socio-economic impacts cannot be avoided or adequately mitigated.

7.6.2 Siting Zones CS07 and CS16 are less preferred as these Siting Zones result in the longest lengths of HVAC due to their distance from the preferred Siting Zones for the proposed 400 kV LCS-B. This additional length of underground cabling would increase the geographical spread of development on the basis that HVAC cabling requires a much wider construction Corridor and therefore the risk of encountering technical constraints and increase the likelihood, and scale, of potential adverse environmental and socio-economic impacts.

7.6.3 Locating the proposed EGL 5 converter station within CS05 offers the opportunity to be located near to the proposed 400 kV LCS-B. From an environmental perspective, the co-location of infrastructure is considered preferable to reduce the spread of potential impacts across the wider region. From an engineering perspective, this would offer opportunities in terms of shared infrastructure (such as haul roads). CS05 also allows for the shortest deviations of underground HVDC cables between the new Landfall at Anderby Creek and the proposed 400 kV LCS-B.

7.6.4 On balance, Siting Zones CS05 and CS06 would be preferred. Environmentally there are few factors to differentiate between the two Siting Zones. While CS05 and CS06 do have constraints, it is considered that the size of the Siting Zones are such that these constraints could be avoided and/or adequate mitigation could be implemented to reduce the magnitude of potential impact. Therefore, Siting Zones CS05 and CS06 are the emerging preferences for the EGL 5 converter station.

8. Option Selection

8. Option Selection

8.1 Introduction

8.1.1 The Options Appraisal and a comparative appraisal for each aspect of the English Onshore Component of the Project (listed below from east to west) is presented in **Appendix A, Chapter 6** and **Chapter 7**:

- A new Landfall on the Lincolnshire coastline;
- New underground cables for EGL 5 between the Landfall and the proposed 400 kv LCS-B; and
- One new EGL 5 converter station.

8.1.2 Each of the comparative appraisals identified a single or set of emerging preferences for each component of the English Onshore Component of the Project in isolation whilst considering the various constraints and opportunities alongside the cost performance, relevant National Planning Policy and NGET's statutory duties.

8.1.3 This Chapter summarises the outcomes of the comparative appraisals in **Chapter 6** and **Chapter 7** and considers all components as an end-to-end solution to ensure that there were no circumstances where an accumulation of smaller constraints in a 'discarded' option might justify reconsidering decisions in identification of the components.

8.1.4 As the design progresses, regular reviews will be undertaken to ensure the emerging preferences taken forward at this stage remains the optimum solution when all environmental, socio-economic and technical aspects are considered.

8.2 Emerging Preferences

8.2.1 The emerging preference for the new Landfall (as identified in **Appendix A**), the new HVDC and HVAC underground cables between the Landfall and the proposed 400 kV LCS-B (as identified in **Chapter 6**) and the new EGL 5 converter station (as identified in **Chapter 7**) were considered to confirm the Corridor and Siting Zone(/s) emerging as preferred (Step 8 explained in **Chapter 4**).

8.2.2 The emerging preference for the new Landfall is to use Anderby Creek. The emerging preferences for the new EGL 5 converter station is to use Siting Zones CS05 or CS06. The emerging preferences (subject to further coordination and design development with other projects in the area; including GtW Project, EGL 3 and EGL 4 Projects and Ossian OWF) for the underground cable routes are Corridor 5 and Corridor 6 from the Anderby Creek Landfall (with a marginal preference for Corridor 5 as presented in **Chapter 10**), both of which overlap with the preferred Siting Zones for the new EGL 5 converter station. These emerging preferences overlap (shown on **Figure 8-1**) and therefore form part of the end-to-end solution.

8.2.3 After considering the emerging preferences of the Landfall, underground cable Corridors and new EGL 5 converter station Siting Zones in combination, the emerging preference for the EGL 5 Project is the Anderby Creek Landfall, Corridor 5 or Corridor 6 (with Corridor 5 marginally preferred), and CS05 or CS06. Feedback from non-statutory consultation will inform the refinement of this set of emerging preferences.

Figure 8-1 – Emerging Preferred Landfall, Corridors and EGL 5 Converter Station Siting Zones

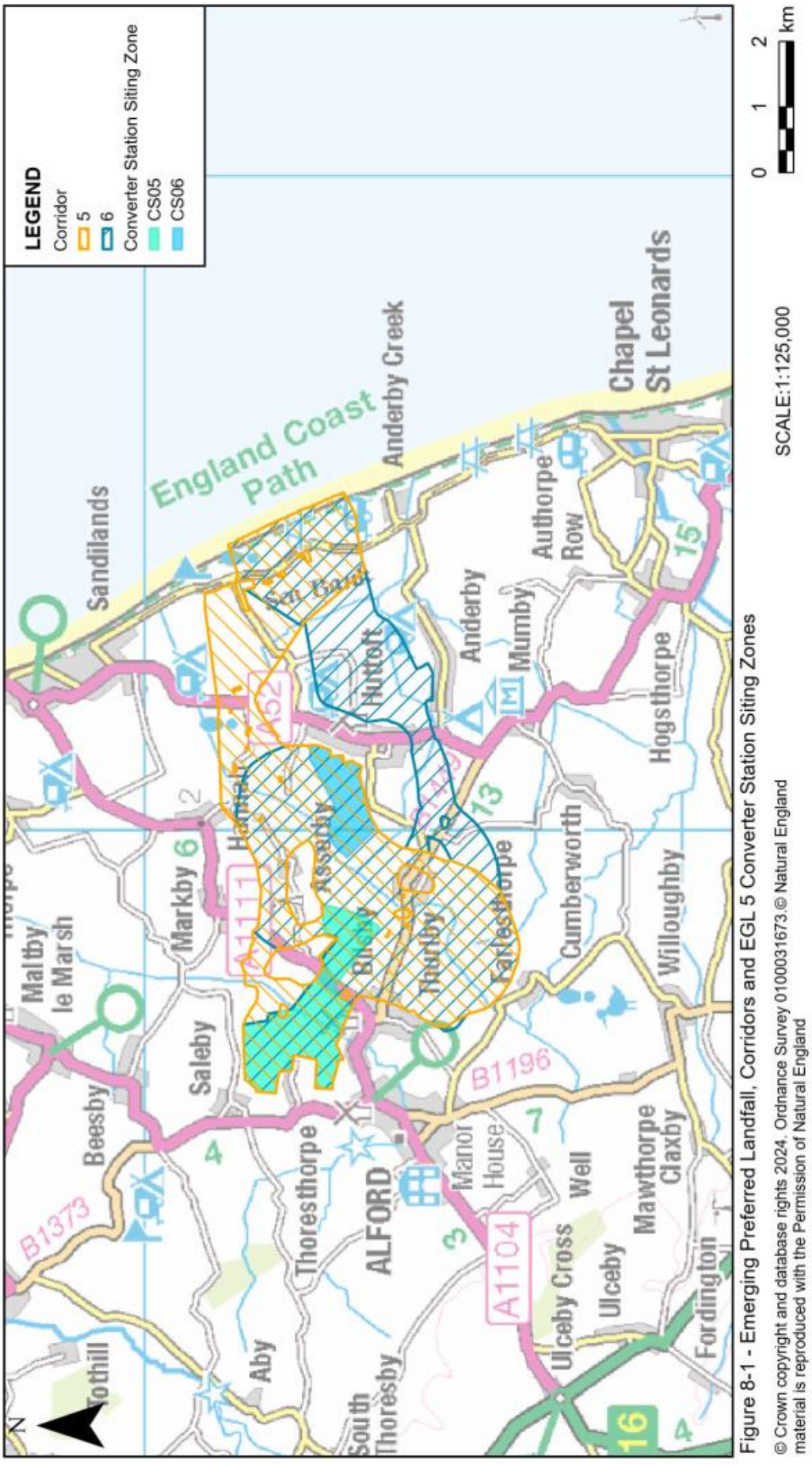


Figure 8-1 - Emerging Preferred Landfall, Corridors and EGL 5 Converter Station Siting Zones

9. Cost and Programme Performance

9. Cost and Programme Performance

9.1 Introduction

9.1.1 As detailed in Chapter 3, Section 9 of the Electricity Act requires National Grid to develop and maintain an 'efficient, co-ordinated and economical' transmission network, amongst other things. Therefore, due regard must be given to the potential cost associated with the different options for each Project component.

9.1.2 In line with the methodology identified within **Chapter 5**, following the Corridor appraisal process, the Corridors were costed and an outline, activity-based schedule was produced for each one to provide an estimate of the likely earliest operational date (in-service date). This Chapter describes the analysis undertaken to determine the difference in cost and programme estimates of different options for the underground cable components.

9.1.3 Cost and programme estimates in relation to the proposed EGL 5 converter station are not considered materially different, when the HVDC underground cables are excluded, between each Siting Zone. Costs of converter stations are primarily driven by the amount of energy that needs to be transmitted. This is not affected by the choice of Siting Zones, and as such are common across all considered options for the new converter station. Converter station costs and the duration of their construction are therefore not a differentiating factor. As a result, the Siting Zones or Siting Areas are not considered further in this Chapter.

9.1.4 Cost and programme estimates are high level at this stage as they are based on simple indicative underground cable distances which will ultimately change as the detailed design is developed during further stages of the English Onshore Component of the Project. The cost and programme estimates are subject to further design, survey work and are also highly subject to market forces such as resource availability and external market rates.

9.2 The Cost and Programme Estimate Options

9.2.1 A model has been built to determine the cost and programme estimates associated with the potential transmission connections between the proposed Landfall, converter station and substation. The model consists of connection points (at the Landfall, the EGL 5 converter station and the proposed 400 kV LCS-B) and connection lines (between these connection points).

9.2.2 For each Corridor it was assumed that the connection line would follow the most direct path possible within the Corridor, whilst considering key routeing constraints and professional underground cable design judgement. The Corridors and paths used are shown in **Figure 9-1**.

Figure 9-1 – Options used within the cost and programme estimate model

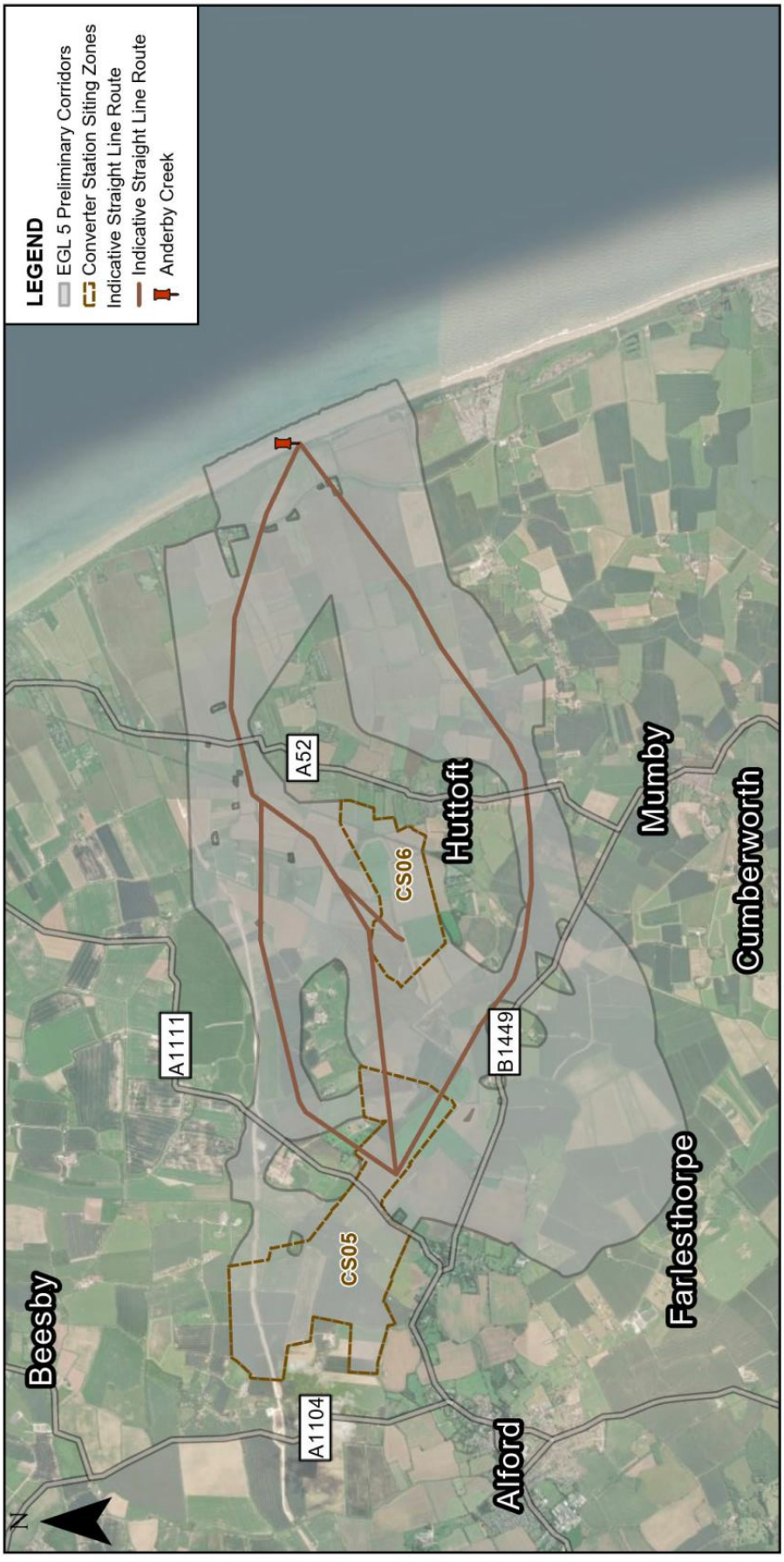


Figure 9-1 - Options used within the cost and programme estimate model

9.3 National Grid's Cost and Programme Estimates

Cost Estimates

9.3.1 Cost estimates have been developed by NGET using the following assumptions:

- Route lengths are based on an indicative route through Corridors. They have been determined from a preliminary desktop exercise that is informed by the likely constraints to routeing and professional judgement to seek the most direct route possible; and
- The costs of applying industry 'best practice' mitigation measures during construction and operation are included within the cost base used.

9.3.2 This means that cost estimates of different options can be compared on a consistent basis, such that there is no systematic bias in the costing. While there is potential for costs to end up higher or lower from those which have been estimated, this will be the case across all options considered. Therefore, the relative preference for Corridor options on the basis of cost should be unchanged by any future fluctuations despite estimates having the potential to shift in absolute terms. This method is adopted at the early stages of a project. It also allows cost estimates to be generated for the different options considered prior to selecting an emerging preference and the later development of a detailed alignment.

9.3.3 The cost estimates developed include estimates of the indicative 'capital cost' for the different options. The capital cost estimates consist of the sum of the estimates for the initial capital cost of developing, consenting, installing and commissioning the new transmission assets and the associated procurement of equipment and land. Cost estimates for the different options were estimated based on costs from the financial year 2023/24. It is considered that the cost estimates provide a consistent cost point for comparison of different options at this stage. Underground cable specifications which satisfied the design requirements were assumed based on previous projects of a similar nature, allowing for a unit cost per kilometre of underground cable to be defined. This cost was applied to the estimated route lengths of Corridor to obtain a baseline estimate for the capital cost. Engineering Underground cabling can take the form of open cut direct buried cable or trenchless cable installation methods (described in more detail in **Chapter 2**). For cost estimates an open cut direct buried cable method has been used. Trenchless cable installation methods may be required where an underground cable route must cross linear constraints (such as major roads, rivers, railways and gas pipelines). Where use of trenchless cable installation methods are required, this will result in additional cost to underground cable installation.

Programme Estimates

9.3.4 To determine programme estimates for the identified options, a logic linked activity schedule was built for each construction discipline e.g. civils engineering based on a generic build process for underground cables using assumptions such as cable length, open cut direct buried cable method and joint type to standardise any unknown parameters and offer consistency for programme estimates across the identified options. Variables determined by the identified options, such as construction discipline and route length were inputted to the schedule, producing estimates of construction duration and the provision of an earliest operational date for each of the identified options. The schedule was defined at activity level based on how long it takes to construct one kilometre of underground cable before the differentiating variables for each option were inputted to calculate a duration of construction and testing. The critical path construction activities were used to define the earliest in-service date (EISD). Programme estimates assume that construction of the underground cable will form the critical path.

Results

9.3.5 The results are detailed below within **Table 9-1**. Cost estimates are calculated for each Corridor option and converter site option whilst also including mid and furthest points for consideration.

Table 9-1 – Cost estimates

Landfall	Converter Site	Cable Corridor	HVAC (km)	HVDC (km)	Cost (£m)
Anderby Creek	**CS05**	Corridor 5	0.82	8.40	£41.0m
	CS05	Corridor 6	0.82	9.03	£43.7m
	CS06	Corridor 5	2.33	5.16	£36.6m
	CS06	Corridor 6	2.33	7.15	£45.1m

9.3.6 Differences from the cost model were largely dictated by the route length (with longer routes naturally resulting in a higher cost and longer programme estimates).

9.3.7 The selection of an emerging preference for a transmission connection considers other factors alongside costs and programme including environmental, socio-economic and technical. The analysis shows that the emerging preference for the English Onshore Component of the Project (as detailed in **Chapter 8**) is either Corridor 5 or Corridor 6 with a marginal preference for Corridor 5. There are strong environmental, socio-economic and technical drivers for the selection of the emerging preference which are not outweighed by the outcome of the cost and programme analysis.

10. Development of the Graduated Swathe

10. Development of the Graduated Swathe

10.1 Introduction

10.1.1 Following the selection of the emerging preferred Landfall, Corridors and Siting Zones, a preliminary routeing and siting exercise was undertaken to identify where it might be more appropriate to locate the required permanent infrastructure within the Landfall, Corridors and Siting Zones emerging as preferred. This exercise considered the Holford Rules and the Horlock Rules, having regard to local sites and features. These include features such as known residential properties, larger areas of woodland and existing infrastructure. The outcome of the preliminary routeing exercise is a 'graduated swathe' - coloured shading of varying intensity to indicate areas more likely (darker colour) and less likely (lighter colour) to be the location of the proposed infrastructure. Detailed plans showing the location of the proposed graduated swathe are included in **Chapter 10**.

10.1.2 A graduated swathe is both preliminary and indicative. It is intended as a tool for non-statutory consultation (Step 9 explained in **Chapter 4**) and engagement with communities and other stakeholders, including landowners. The feedback from non-statutory consultation will inform the further development of the English Onshore Component of the Project. However, it should be noted that feedback will be sought for the emerging preferred Corridors and emerging preferred Siting Zones and that the graduated swathe indicates where infrastructure is more or less likely to be located.

10.1.3 Within the area covered by the graduated swathe there are areas where there is greater flexibility for routeing and areas where there is less flexibility. This is reflected in the way the width of the darker parts of the graduated swathe varies: in some areas the darker shading covers a broader area (greater flexibility) and in other areas the darker shading is more focused (less flexibility).

10.1.4 The outcomes of the analysis, as depicted in the graduated swathe (an example graduated swathe is depicted in **Figure 1-5**), may be subject to change as the design and consenting process continues, more information becomes available, and the views of stakeholders and communities are considered. It does not rule out development within other parts of the emerging preferred Corridors or Siting Zones, or indeed outside of these emerging preferences, based on consultation feedback received, the findings of detailed surveys and subsequent design development.

10.1.5 As discussed in **Chapter 3**, future detailed localised routeing of the new underground cables will have due regard to principles of good design. To limit the number of direction changes and develop a more coherent design solution, opportunities will be sought to develop straight sections of route wherever practicable. Accordingly, any detailed design proposal will be a response to local environmental, technical and socio-economic considerations.

10.1.6 Additionally, as discussed in **Chapter 4** the siting of the EGL 5 converter station has taken into consideration the sequential and exception tests regarding siting infrastructure within flood zones at high and medium risk of flooding (including rivers or the sea, surface water and reservoirs). This has been done through use of the Environment Agency datasets for flood risk from rivers, the sea, surface water and reservoirs. As the proposed design of the English Onshore Component of the Project

progresses, the sequential approach will also be applied, as part of the design process and as part of a FRA, to steer the development of infrastructure within areas of lowest flood risk (where possible) whilst also taking into consideration other factors.

10.2 Developing the Graduated Swathe

10.2.1 The development of the graduated swathe was informed by the location of sensitive sites and features within and beyond the Corridors and Siting Zones, which were identified from online mapping and site visits to the emerging preferred Corridors and Siting Zones, like those that informed the earlier options appraisal work, as described in **Chapter 5**. The emerging preferred Corridors and Siting Zones were appraised to identify areas that may be more, or less, sensitive to the introduction of the English Onshore Component of the Project's infrastructure. Outline engineering preliminary designs were then developed to identify where new infrastructure might most appropriately be routed or sited, designing in accordance with the Horlock Rules (and where applicable Holford Rules), whilst considering environmental features and technical requirements.

10.2.2 To effectively portray the graduated swathe between the new Landfall, the EGL 5 converter station and proposed 400 kV LCS-B, avoidance of properties has been included in the analysis.

10.2.3 Known (primarily residential) properties and their curtilages, and larger settlements have been excluded from the graduated swathe wherever possible.

10.3 Description of Graduated Swathe

10.3.1 For the purposes of consultation, the graduated swathe has been split into its different infrastructure components (converter stations and underground cables). A summary of the graduated swathe for each infrastructure component of the English Onshore Component of the Project is provided below.

Landfall

10.3.2 The Landfall Study Area was subject to further environmental and engineering review. The review sought to identify the areas within the Anderby Creek Landfall Study Area most suitable for accommodating the incoming offshore HVDC cables, the TJB, the outgoing HVDC onshore cables and the associated construction compound.

Anderby Creek

10.3.3 Within the Anderby Creek Landfall Study Area the area identified as most suitable for the Landfall infrastructure is situated north of Anderby Creek and south of the National Trust Sandilands Nature Reserve (former Sandilands Golf Course), as shown in **Figure 10-1**. These areas of the Anderby Creek Landfall Study Area are considered most suitable due to its mainly rural setting, few statutory designated sites and narrower beach and dunes. The areas further north and south of the area identified are comparatively more constrained by the National Trust Sandilands Nature Reserve, residential properties, EGL 3 and EGL 4 Projects making Landfall and the Outer Dowsing OWF.

Figure 10-1 – Anderby Creek Landfall Graduated Swathe

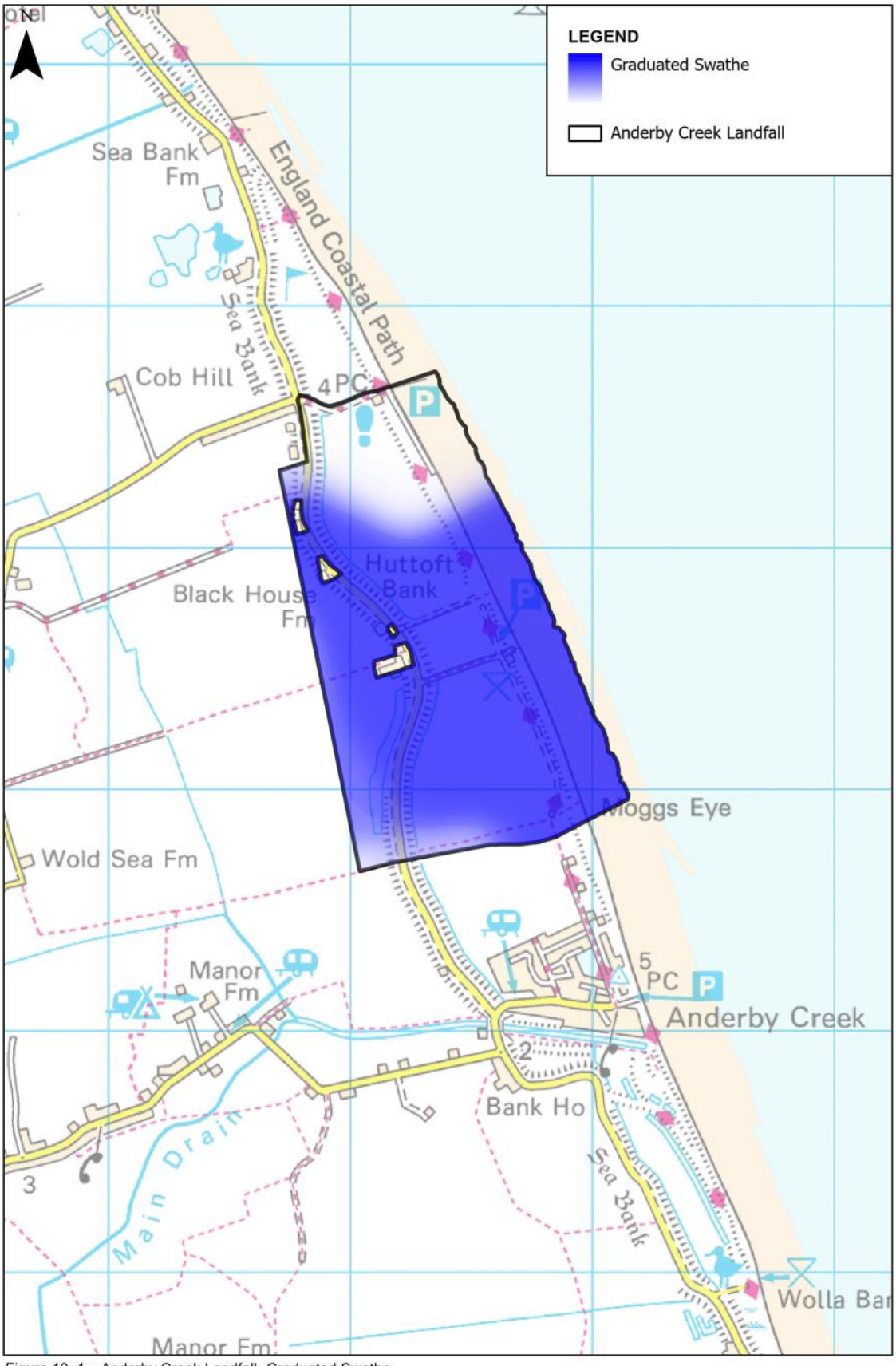


Figure 10–1 – Anderby Creek Landfall- Graduated Swathe

EGL 5 Converter Station

10.3.4 Within the EGL 5 converter station Siting Zones emerging as preferred, outline potential layouts were developed by engineering specialists and reviewed by environment specialists and the Project team.

CS05

10.3.5 The emerging preferred Siting Zone CS05 would allow infrastructure to be located adjacent (where practicable) to the area that has been proposed for the proposed 400 kV LCS-B (proposed by the Grimsby to Walpole (GtW) Project, see **Figure 10-2**) to reduce cumulative impacts upon the surrounding environment, particularly cumulative visual impacts upon nearby sensitive visual receptors. CS05 was also identified as it allows for converter station siting outside of Flood Zones 2 and 3, away from designated heritage assets and in an undulating landscape with existing visual screening features. As such, the graduated swathe identified within Siting Zone CS05 (referred to as 'EGL 5 West Converter Station' at Stage 1 (non-statutory) consultation) is darkest at its eastern end but retains siting flexibility over the entirety until siting and design details for the proposed 400 kV LCS-B are further developed (for the GtW Project) following non-statutory consultation.

CS06

10.3.6 The emerging preferred Siting Zone CS06 has the benefit of being located further from the Lincolnshire Wolds NL, and although other constraints are present, the size of the Siting Zone is such that micrositing would allow for avoidance. The graduated swathe identified within Siting Zone CS06 (referred to as 'EGL 5 East Converter Station' at Stage 1 (non-statutory) consultation), is darkest at its west, furthest from residential receptors in the village of Huttoft and recreational receptors utilising the PRoW that cross the Siting Zone.

10.3.7 The graduated swathe for the new EGL 5 converter stations are shown in **Figure 10-2**.

Figure 10-2 – EGL 5 Converter Stations Graduated Swathe

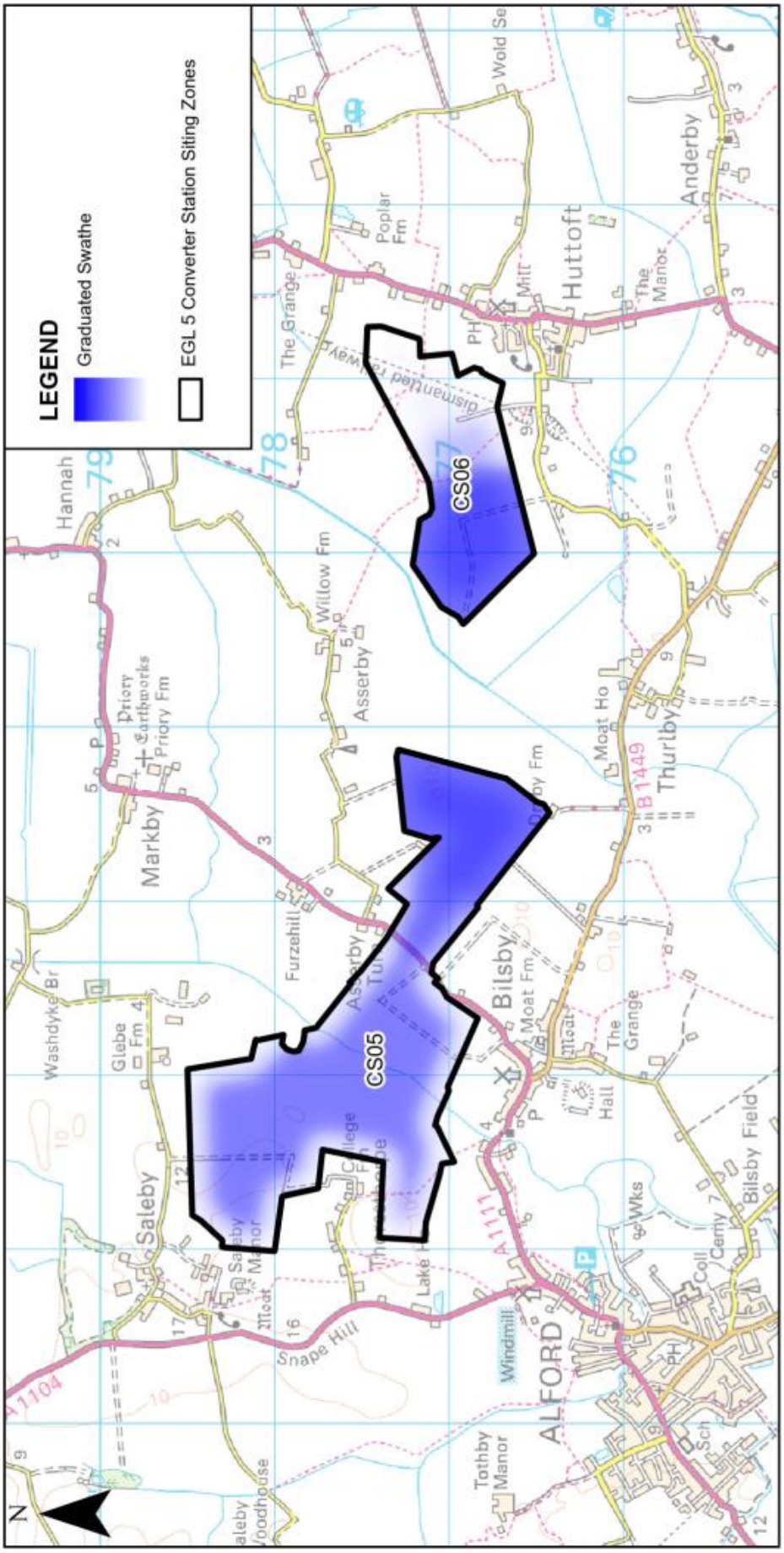


Figure 10–2 – EGL 5 Converter Station Graduated Swathe

Underground Cables

10.3.8 The graduated swathe for the underground cable, routeing between the Anderby Creek Landfall and the proposed 400 kV LCS-B, is shown on **Figure 10-3**. This swathe presents the potential routes from both emerging preferred Corridors as follows, reflecting the marginal preference for Corridor 5 outlined above in **Section 6.5** and **Chapter 8** with darker shading, but acknowledging further coordination and design development with other projects in the area; including GtW Project, EGL 3 and EGL 4 Projects and Ossian OWF is required where possible.

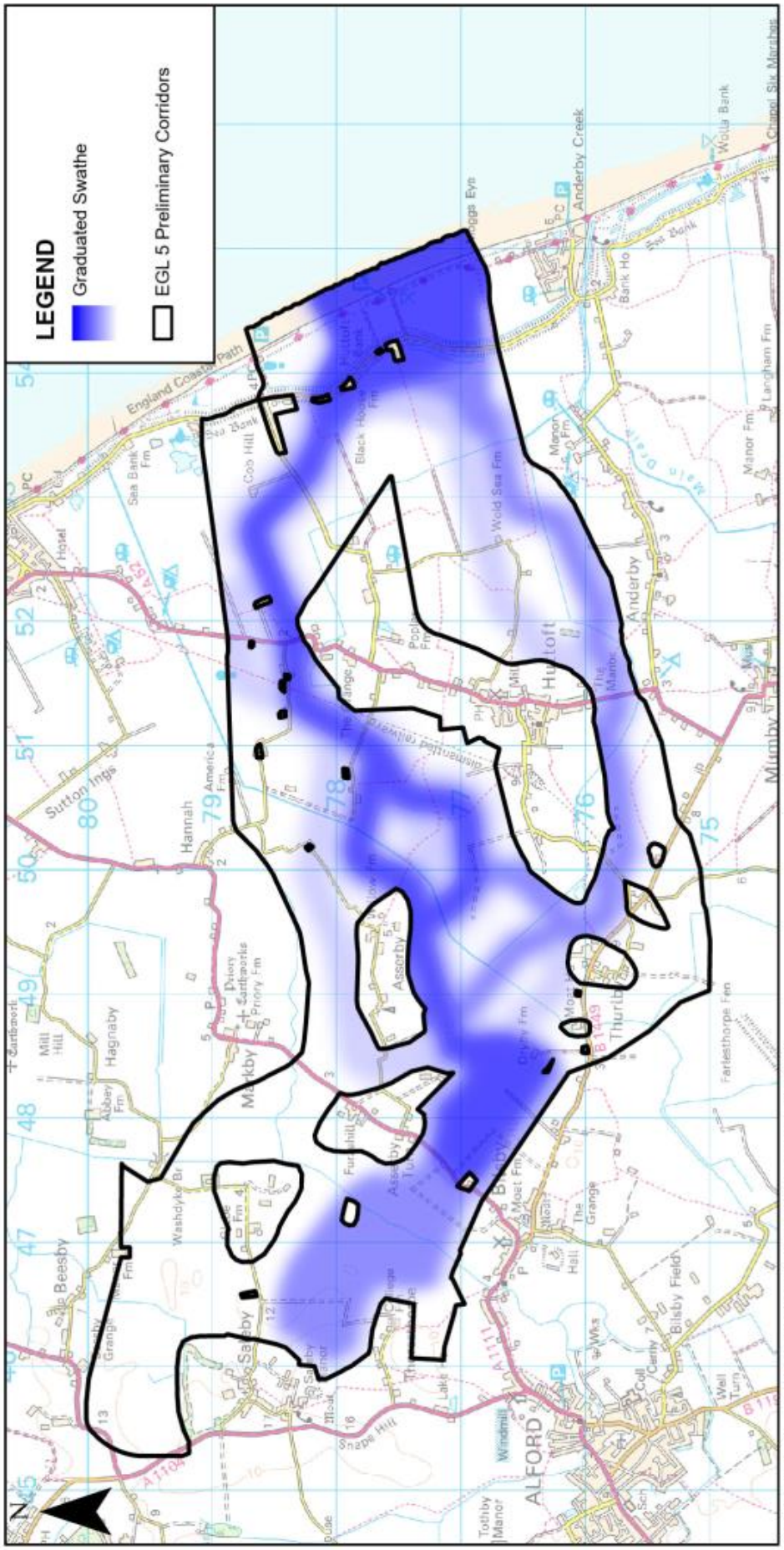
Corridor 5

10.3.9 The emerging preferred Corridor 5, north of Huttoft, runs from the Anderby Creek Landfall to the proposed 400 kV LCS-B, via either of the emerging preferred EGL 5 converter station Siting Zones (CS05 and CS06). From the Anderby Creek Landfall, the underground cable would route west, crossing Roman Bank and Sea Lane, and then the A52 (Sutton Road) north of Huttoft. It then routes southwest past Asserby (towards the location of CS06 and then CS05) and finishes at the A1111 (Sutton Road), northwest of Thurlby. This route is shown as darkest blue on the graduated swathe, marginally preferred from an engineering perspective with regard to route length and crossing and spatial constraints as detailed in **Section 6.5**.

Corridor 6

10.3.10 The emerging preferred Corridor 6, south of Huttoft, runs from the Anderby Creek Landfall to the proposed 400 kV LCS-B, via either of the emerging preferred EGL 5 converter station Siting Zones (CS05 and CS06). From the Anderby Creek Landfall, the underground cable would route southwest, crossing Roman Bank before routeing north of Anderby and south of Huttoft, crossing Mumby Road between the two. It then crosses Huttoft Road, before routing north on the eastern side of Thurlby to connect with either CS06 or CS05 and terminate at the A1111 (Sutton Road). This route is shown as a lighter blue on the graduated swathe when compared to Corridor 5, north of Huttoft, however is also retained as an emerging preference for the underground cable for routeing flexibility.

Figure 10-3 – Landfall to LCS-B Graduated Swathe



10.4 Summary of the Graduated Swathe

10.4.1 The graduated swathe represents the current thinking on where the English Onshore Component of the Project's infrastructure is more likely to be located based on the current appraisals of constraints that have been identified, as shown on **Figure 10-4**. This will be further informed by feedback received during consultation and therefore there is the potential for the current indicated preference to move within the Corridor. In some instances, feedback may indicate that the preference should be to route through areas currently being shown as less preferable. This will be addressed at the next stage of the English Onshore Component of the Project. We shall also summarise the feedback within a Consultation Report during the next stage of the English Onshore Component of the Project when feedback has been fully reviewed. This will be fully considered through the development of the English Onshore Component of the Project, whilst maintaining the principles used to develop the current graduated swathe such as, for instance, the avoidance where practicable of areas of highest constraint such as settlements.

Figure 10-4 – EGL 5 English Onshore Components Graduated Swathe

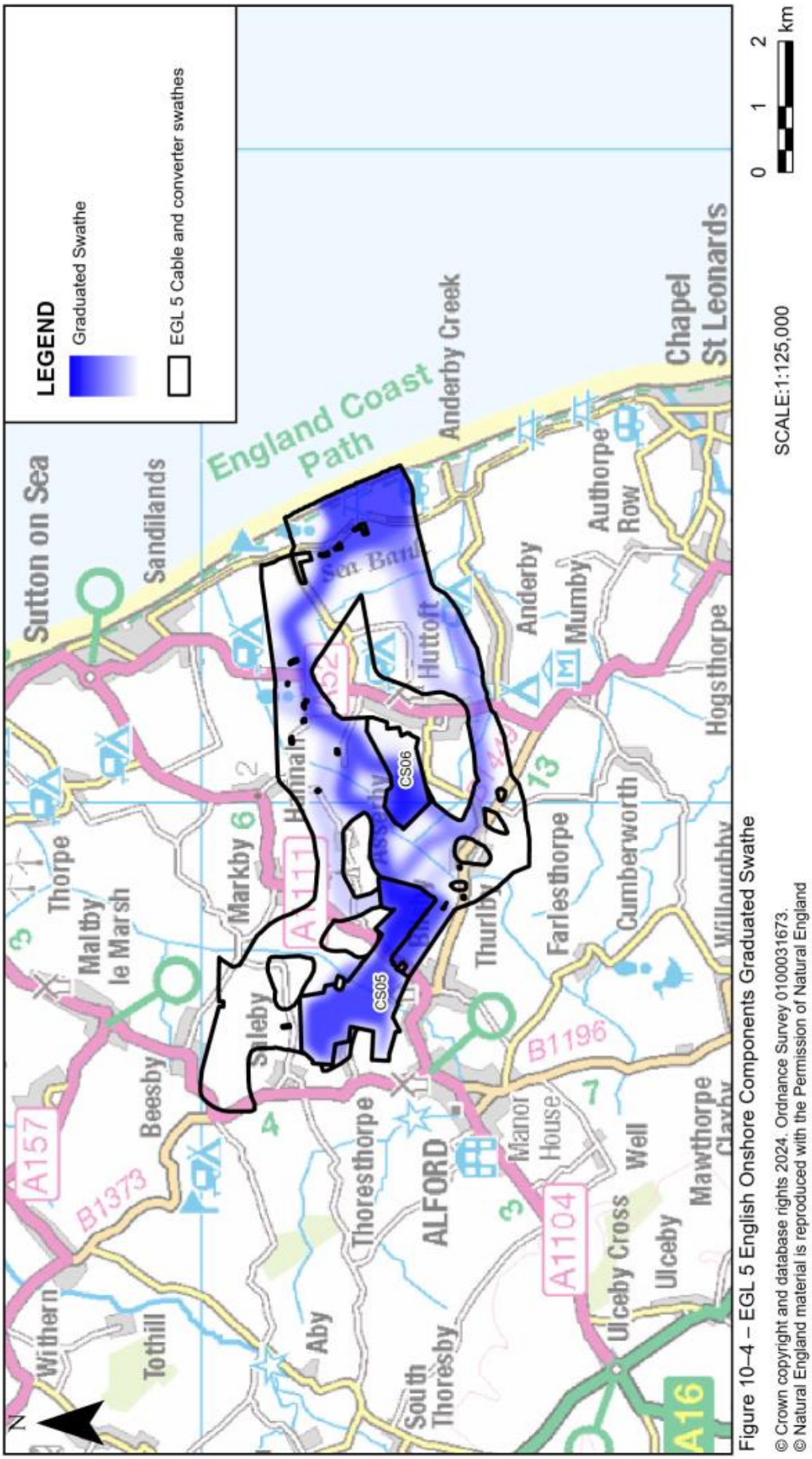


Figure 10–4 – EGL 5 English Onshore Components Graduated Swathe

11. Summary and Next Steps

11. Summary and Next Steps

11.1 Summary of Options Identification and Selection Process (Stage 2)

11.1.1 A detailed Options Identification and Selection Process (Stage 2) (see **Chapter 4**) has been undertaken to identify:

- the proposed Landfall location for a new HVDC cable Landfall on the Lincolnshire coastline;
- the proposed Corridors for the underground cables from the proposed Landfall location on the Lincolnshire coastline to the proposed 400 kV LCS-B, via a new EGL 5 converter station; and
- the proposed Siting Zones for the EGL 5 converter station near the proposed 400 kV LCS-B (proposed by the GtW Project).

11.1.2 The process sought to connect the proposed Landfall and 400kV LCS-B (via the EGL 5 converter station) by a proposed Corridor. The connection is expected to wholly comprise underground cables.

11.1.3 For the English Onshore Component of the Project, two preliminary Landfall study areas (in **Appendix A**), two preliminary Corridors (in **Chapter 6**), and five Siting Zones near the proposed 400 kV LCS-B (in **Chapter 7**) were identified and appraised.

11.1.4 In summary, the emerging preferred Landfall, Siting Zones and Corridors for are as follows:

- **Landfall** – Anderby Creek was identified as the preferred Landfall location over Theddlethorpe. Anderby Creek offers the best opportunity for Landfall installation particularly from an ecological perspective and it poses fewer onshore engineering constraints.
- **Connection between the Landfall and LCS-B** – the connection routes between Anderby Creek and the proposed 400 kV LCS-B, via a new EGL 5 Converter Station.
    - As described in **Chapter 6**, two underground cable Corridors 5 (north of Huttoft) and 6 (south of Huttoft) were defined and reviewed between the Anderby Creek LSA and the proposed 400 kV LCS-B. The emerging preferred Corridors (see **Chapter 7**) represent the best opportunity to limit environmental and socio-economic impacts and technical complexity, whilst also representing the most direct, and more economic and efficient routes; and

- **New EGL 5 Converter Station** – of the five Siting Zones considered (CS05, CS06, CS07, CS08 and CS16, as set out in **Chapter 7**) the areas identified as most suitable for the EGL 5 converter station were Siting Zones CS05 (EGL 5 West Converter Station) and CS06 (EGL 5 East Converter Station). Siting Zone CS05 offers the best opportunity to limit potential landscape and visual effects in-combination by aiming to co-locate infrastructure near the proposed 400 kV LCS-B (proposed as part of the GtW Project). Siting at zones CS05 or CS06 would also help to reduce the potential for other environmental and socio-economic effects whilst minimising the length of underground cable required (from Anderby Creek) as well as technical complexity during construction and operation. The Siting Zones also best align with the Horlock Rules.

11.1.5 Following the identification of the preferred Landfall, Corridors and preferred Siting Zones, a graduated swathe has been identified within these. The graduated swathe is a way of showing the areas within the emerging preferences where the required Project infrastructure is considered more or less likely to be located. The graduated swathes are shown with a colour shading, with the depth of shading indicating NGET's emerging view of where infrastructure would be better located based on the work undertaken to date. Darker shading indicates more likely locations, while lighter shading indicates less likely locations.

11.1.6 The use of the graduated swathe is intended to emphasise the preliminary nature of judgements made to date in respect of infrastructure locations within the emerging preferred Corridors and Siting Zones. The graduated swathe represents the current thinking on where the English Onshore Component of the Project infrastructure may be located. This will be informed by feedback received during non-statutory consultation and therefore there is the potential for the final design of the English Onshore Component of the Project to extend beyond the graduated swathe. This will be fully considered through the development of the English Onshore Component of the Project, whilst maintaining the principles used to develop the current graduated swathe, for instance, the avoidance of areas of highest constraint such as settlements.

11.2 Non-statutory Consultation

11.2.1 This Report will be used as part of the non-statutory consultation and to facilitate engagement with key stakeholders, including landowners and the public (Step 10 explained in **Chapter 4**). The non-statutory consultation will take place in Spring/Summer 2025.

11.2.2 The Landfall, Siting Zone and Corridor preferences identified in this Report, in conjunction with the other elements of the Options Identification and Selection Process (Stage 2), will be kept under review throughout the development of the English Onshore Component of the Project.

11.3 Analysing Non-statutory Consultation Feedback

11.3.1 The feedback from non-statutory consultation will inform the further development of the English Onshore Component of the Project. During the non-statutory consultation, feedback on the preferences identified in this Report and on the graduated swathe will be gathered from consultation events and written feedback.

11.3.2 Information from surveys undertaken to obtain baseline data and ongoing design studies will also inform the development of the English Onshore Component of the Project.

11.4 Defined Proposal and Statutory Consultation (Stage 3)

11.4.1 Following the completion of non-statutory consultation, including the analysis of the feedback, NGET will commence the Defined Proposal and Statutory Consultation Stage (Stage 3). As part of this, the design will be subject to an Environmental Impact Assessment (EIA), further statutory consultation, and iterative design development prior to submission of the application to the Secretary of State for a Development Consent Order (DCO).

Appendix A

Landfall Options Appraisal

Appendix A Landfall Options Appraisal

Landfall definition and appraisal

Introduction

As outlined in **Chapter 4**, two preliminary Landfalls were identified and taken through for further definition and into the Options Appraisal following a desktop Preliminary Landfall Siting Study (PLSS).[43]. The PLSS considered environmental, socio-economic and technical constraints along the coastline to identify potential Landfall locations. It also considered onshore and offshore areas adjacent (within 1 km) to preliminary Landfall study area to ensure feasibility of onwards onshore and offshore cable routeing.

Prior to the PLSS being undertaken for EGL 5, an appraisal had been carried out for the EGL 3 and EGL 4 Projects in 2024 for potential Landfalls on the Lincolnshire and North Norfolk coastlines. This information was used as a starting point for EGL 5 Landfall identification and appraisal, and was reviewed, updated accordingly for the EGL 5 Need Case and assumed parameters, and updated with any new data. This appraisal was presented within the SOR for Stage 1, in which two preferred Landfalls for Lincolnshire were identified (Theddlethorpe and Anderby Creek). These two locations were taken forward to Stage 2 for further appraisal within the PLSS, as outlined below. The appraisal for EGL 5 has also utilised information from the EGL 3 and EGL 4 EIA Scoping Report (where relevant for this stage), and the responses from statutory consultees within the responding Scoping Opinion from the Secretary of State.

Defining the Potential Landfalls

The EGL 5 PLSS identified two sections of coastline Saltfleetby to Mablethorpe (described in this Report as Theddlethorpe), and Anderby Creek (a combination of both coastline between Sandilands and Chapel Point) as potential Landfalls on the Lincolnshire coastline. These preliminary areas were used as a starting point for identifying the onshore Landfall study areas for each of Theddlethorpe and Anderby Creek (described as Landfall Study Areas in this Report) and were subject to review by offshore environmental and engineering consultants to identify preliminary offshore subsea cable routes for each preliminary Landfall Study Area to determine the extent of coastline to be included in the Landfall Study Area.

Landfall Study Areas were defined as a search area of 1 km around each of the preliminary Landfall areas and associated preliminary offshore subsea cable routes. The Landfall Study Areas are from MLWS to approximately 1 km inland and are shown in **Figure A-1**. Landwards from the potential Landfall areas, the Landfall Study Areas overlap with the study area for the underground cables and are described further in **Section 5.3**.

[43] WSP (2024), EGL 5 Preliminary Landfall Siting Study.

The two Landfall Study Areas identified comprise:

- Theddlethorpe: This Landfall Study Area is located approximately 4.5 km north of the town of Mablethorpe on the Lincolnshire coastline. The potential Landfall location could be accessed via Crook Bank Road, directly off the A1031. The Landfall Study Area has a rural setting, with the former Theddlethorpe Gas Terminal immediately to the south and west and agricultural land to the west. The most prominent coastline features are the tidal flood defence sand dunes running north to south along the coastline.
- Anderby Creek: Anderby Creek is a small holiday village in Lincolnshire, to the north of Skegness. The potential Landfall location could be situated to the north or south of Anderby Creek and accessed via Roman Bank Road. This Landfall Study Area has a mainly rural setting with the most prominent coastline feature being a beach with tidal flood defence/sand dunes running north to south and with agricultural land to the west.

Appraisal of Landfalls

The two identified Landfalls were then subject to an options appraisal and a challenge and review workshop was held to identify a Landfall emerging as preferred.

Landfall appraisal parameters

Internationally and nationally important ecological designated sites as well as Environment Agency tidal flood defences are present along the coastline within and adjacent to both Landfall Study Areas. Therefore, the options appraisal has been undertaken on the assumption that a trenchless cable installation method (partial or wholly) would be used (where possible) to avoid or limit effects on the ecological designated sites, and the species for which these sites are designated for, and to protect the integrity of the tidal flood defences. Further information on the types of trenchless methods which could be used is provided in **Chapter 2**. For the purposes of this Report, it is assumed that a partial or wholly trenchless cable installation method would be applied to the design of the Project at the Landfall location. Further information is provided below regarding the assumptions made at each of the Landfall Study Areas, (described below as Theddlethorpe LSA and Anderby Creek LSA).

- Theddlethorpe LSA: It is assumed a long trenchless cable installation method would be used (where possible, subject to engineering feasibility). The objective of which would be to install the underground cables beneath both the Environment Agency tidal flood defences and a portion of the intertidal zone (distance to be confirmed following detailed ground investigation works) and sand dunes falling within the ecological designated sites. This could potentially reduce the extent of access requirements to the beach for installation activities, thereby by reducing potential impacts. A shorter cable installation method beneath the Environment Agency tidal flood defences has also been considered (details of which are provided within Engineering and System Factors). This method would require an exit point on the beach (outside of the Saltfleetby-Theddlethorpe Dunes & Gibraltar Point Special Area of Conservation (SAC) but within the Humber Estuary SPA and Ramsar site, within the Greater Wash SPA, and within the Saltfleetby - Theddlethorpe Dunes Site of Special Scientific Interest (SSSI) and the Lincolnshire Coronation Coast National Nature Reserve (NNR); and therefore, suitable access to the beach for installation activities, or access from offshore (via a flat bottomed vessel) would be required. As

such, this method is possible but currently not preferred and therefore, the environmental appraisal has assumed a complete trenchless solution, unless specifically stated otherwise.

- Anderby Creek LSA: It is assumed that one trenchless cable installation method would be used (where possible, subject to engineering feasibility) to install the underground cable beneath the intertidal zone, sand dunes and tidal flood defences. Using this method of installation would avoid the requirement to take access to the beach for installation activities thereby reducing impacts, specifically on beach visitors.

As described in **Chapter 2** the permanent infrastructure at the preferred Landfall location would be nominal and entirely below ground, comprised of the incoming offshore HVDC cables, the outgoing HVDC onshore cables and a TJB which would connect the two. Once construction works are complete the land would be reinstated to pre-existing conditions and the only permanent above ground infrastructure visible would be the cover of the TJB (located on the landward side of the Environment Agency tidal flood defences, an example is shown in **Figure 2-1**). The potential for adverse environmental effects such as setting effects on designated heritage assets, landscape character effects or effects on views from the presence of above ground infrastructure at the preferred Landfall location during the operational stage of the Project would be minimal. Therefore, the options appraisal has focused on the potential effects likely to occur during the temporary construction period in identifying the preferred Landfall Study Area.

The Options Appraisal below has considered environmental, socio-economic and technical topics for each Landfall Study Area and was informed by data gathered as outlined in **Table 5-1** and **Table 5-2**. Cost and programme performance are considered separately for all Project options in **Chapter 9**. For the current Project stage, relevant data comprises desk study information, supplemented by site visits to selected locations and at important receptors. The appraisal has also utilised information from the EGL 3 and EGL 4 Marine Non-Statutory Environmental Scoping Report and EGL 3 and EGL 4 EIA Scoping Report, and the responses from statutory consultees responding to these documents.

Figure A-1 – Landfall Study Areas

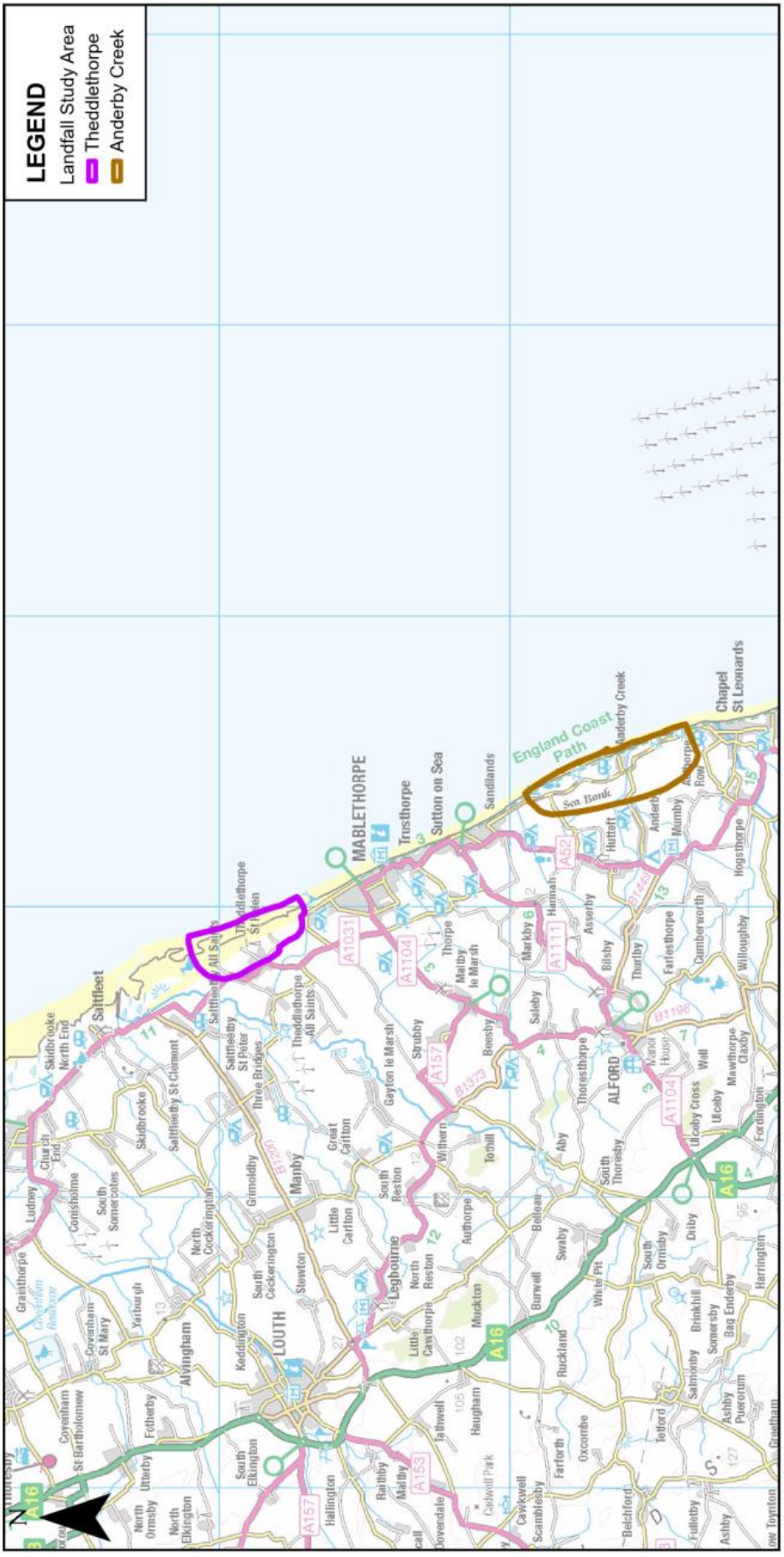


Figure A-1 - Landfall Study Areas

Environmental Factors

Ecology

Cable installation works, both onshore and offshore, have the potential to:

- Directly impact upon protected species within and connected to/dependent upon the associated statutory ecological designations, and;
- Result in a loss of habitat, disruption to the formation of shifting dunes and impact upon marine and terrestrial protected species during surveys, seabed preparations and cable installation.

The ecological features present at the Landfalls are shown in **Figure A-2**.

As outlined above, it is assumed that a partial or wholly trenchless cable installation method would be used to avoid direct impacts upon ecologically designated sites. In addition, it is also considered that numerous mitigations could be applied to avoid and minimise ecological impacts, including, but not limited to, the following:

- Careful routeing and siting of infrastructure within the selected preferred Landfall Study Area, as well in relation to the onshore and offshore cable Corridors and routes, to avoid areas of priority habitat and ecological designations;
- Implementation of standard construction management measures by way of a CoCP which would set out specific procedures for the protection of habitats and species, including pollution prevention measures (safe storage of chemicals and materials, silt fencing, pollution/spill response plan (including a Frac-out Emergency Plan) etc), toolbox talks, biodiversity protection zone fencing etc;
- Adherence to policies and measures included within relevant offshore management plans, such as the East Inshore and East Offshore Marine Plan[44]; following the plans to guide development and ensuring that proposals are consistent with existing legislation and policy; and
- Implementation of offshore and ecological management plans, such as Marine Environmental Management Plans which would set out specific procedures for protection of marine and bird life, including seasonal restrictions to construction and installation.

[44] HM Government (April 2014) East Inshore and East Offshore Marine Plans. Available at: https://assets.publishing.service.gov.uk/media/5a7ec0eced915d74e33f2342/east-plan.pdf

Figure A-2 – Landfall Study Areas and Key Environment Features

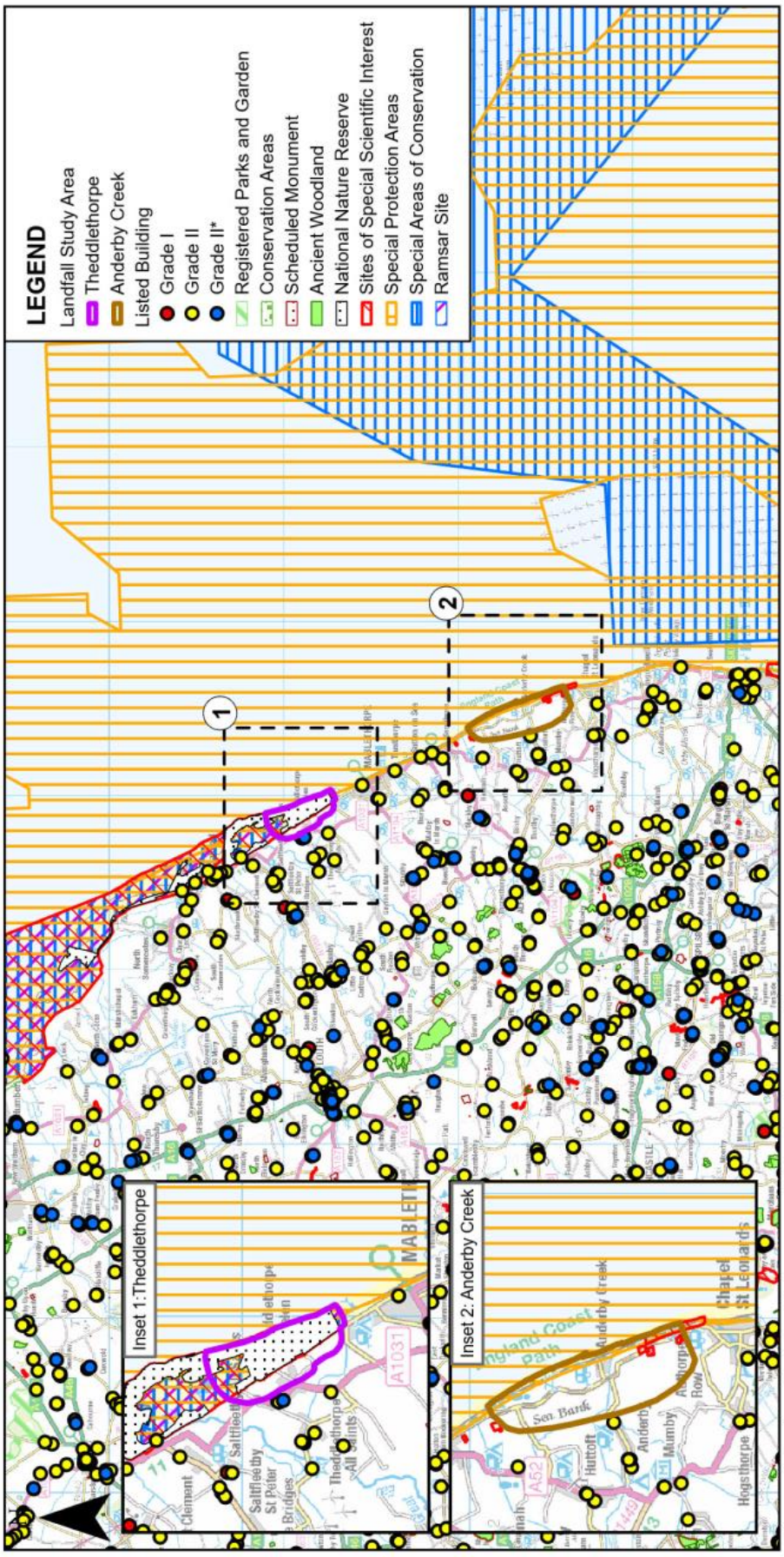


Figure A-2 - Landfall Study Areas and Key Environment Features

Theddlethorpe Landfall Study Area

Theddlethorpe LSA is in proximity to important ecological areas and overlaps with ecologically designated sites. Theddlethorpe is situated within the Lincolnshire Coronation Coast National Nature Reserve (NNR) and numerous NSN and Ramsar sites are present. The ecologically designated and important ecological areas identified within or adjacent to Theddlethorpe LSA are as follows.

- Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC: This site comprises tidal sand and mudflats, salt and freshwater marshes and sand dunes. The dunes support migrant birds May – October and wildfowl in the winter months. The dunes also provide habitat for the natterjack toad, a European Protected Species. The Saltfleetby - Theddlethorpe Dunes Site of Special Scientific Interest (SSSI) which overlaps with this SAC is also a Ground Water Dependent Terrestrial Ecosystem (GWDTE).
- Saltfleetby – Theddlethorpe Dunes SSSI: This site is designated primarily for its Annex I habitats, comprising 'white dunes' (shifting dunes along the shoreline with Marram Grass, *Ammophilia arenaria*), 'grey dunes' (fixed coastal dunes with herbaceous vegetation), dunes with *Hippophae rhamnoides,* and Humid dune slacks.
- Lincolnshire Coronation Coast NNR, which includes and extends the protected area of the Donna Nook NNR; home to a colony of grey seals which utilise the Lincolnshire beaches during winter months for breeding. The reserve contains important mudflat, saltings, sand dunes, slacks and inter-tidal areas.
- Humber Estuary designated sites' comprising the Humber Estuary SAC, Humber Estuary SPA, Humber Estuary Ramsar site and Humber Estuary SSSI sites. The Humber Estuary designated sites are identified for their extensive wetland and coastal habitats that support migratory and wintering waterbirds in addition to breeding populations of bittern, marsh harrier, avocet and little tern. The Humber Estuary SSSIs are also a GWDTE. The Humber Estuary designated sites also fall within the Humber Estuary Management Scheme; a scheme developed to facilitate the sustainable management of the Humber Estuary European Marine Site, overseen and administered by the Humber Nature Partnership.
- Greater Wash SPA, classified for the protection of red-throated diver, common scoter, and little gull during the non-breeding season, and for breeding Sandwich tern, common tern and little tern. The area includes a range of marine habitats, including intertidal mudflats and sandflats, subtidal sandbanks and biogenic reef.

Combined, these designated sites cover approximately 90% of the Theddlethorpe LSA as shown on **Figure A-2**. Priority habitats within the Theddlethorpe LSA include tidal sands and mudflats, coastal lagoons, salt and freshwater marshes and sand dunes (including the Annex I dune habitats outlined above). Land within and adjacent to the Theddlethorpe LSA also falls within the Lincolnshire Coastal Grazing Marshes Project[45] which supports local farmers and landowners to conserve the remaining traditional grazing marsh by providing access to grants, advice and training as well as help to local

[45] https://www.lincsmarshes.org.uk/

people and visitors to access, enjoy and understand the full range of heritage features found in the Grazing Marshes[46].

As outlined above, a trenchless cable installation method would be used (where possible), with the TJB located on the landward (west) side of the Environment Agency tidal flood defences and outside of the statutory ecological designations to avoid these nationally and internationally designated sites. To avoid direct impacts on the statutory ecological designations and tidal flood defences, a trenchless cable installation would need to be between 0.9 and 1.4 km in surface length. An alternative approach would be to combine both open cut and trenchless cable installation methods. This would entail the construction of the Landfall using open cut methods (an open cut trench) of between 300 m and 600 m from the MLWS to the exit point on the beach (outside the SAC sites but within the SSSI and NNR) to the east of the defences. The remainder of the HVDC cables would be installed via trenchless cable installation of between 600 m and 700 m beneath the Environment Agency tidal flood defences with an exit point on the landward (west) side of the Environment Agency tidal flood defences. This could avoid direct impacts on the Saltfleetby - Theddlethorpe Dunes and Gibraltar Point SAC but would still require intrusive works within the Humber Estuary Ramsar site and SPA and Saltfleetby - Theddlethorpe Dunes SSSI and the Lincolnshire Coronation Coast NNR. Further discussion is provided on the feasibility of this length of cable in Comparative Appraisal and Summary.

Anderby Creek Landfall Study Area

The ecologically designated and important ecological areas identified at Anderby Creek LSA comprise the following.

- Greater Wash SPA (as described above). The eastern extent of the Landfall Study Area, generally comprising the beach area and land seaward of MHWS (as shown on **Figure A-2**) falls within the Greater Wash SPA.
- Small areas of land at the southern end of the Anderby Creek LSA fall within the Sea Bank Clay Pits SSSI and Chapel Point to Wolla Bank SSSI. Sea Bank Clay Pits SSSI comprises a series of isolated clay workings. The pits are a GWDTE and support rare aquatic plant communities and invertebrate fauna such as nationally scarce species of beetles. Chapel Point to Wolla Bank SSSI is designated as a geological SSSI for its nationally important geological features. The habitats here include reedbeds and coarse grassland.

There are no SACs or Ramsar sites within 2 km of the Anderby Creek LSA. The Greater Wash SPA covers approximately 50% of the Anderby Creek LSA as indicated on **Figure A-2**. Priority habitats include coastal sand dunes which are located sporadically along the entire coastline within the Anderby Creek LSA. There are mudflats in the southern section of the Anderby Creek LSA. Land within and adjacent to the Anderby Creek LSA also falls within the Lincolnshire Coastal Grazing Marshes Project. In addition, in the northern part of the Anderby Creek LSA, the National Trust is constructing an approved[47] project to create new habitat for a variety of wildlife, especially migrating birds, along with breeding birds, at the former Sandilands golf course[48], expected to be complete in Autumn 2025.

[46] https://www.lincsmarshes.org.uk/about-the-project

[47] https://www.bbc.co.uk/news/uk-england-lincolnshire-67707961

[48] https://www.nationaltrust.org.uk/visit/nottinghamshire-lincolnshire/sandilands

As outlined above, a trenchless cable installation method would be used, with the TJB located on the landward (west) side of the Environment Agency tidal flood defences and would be located to avoid the beach area and therefore the Greater Wash SPA. The trenchless cable installation would be approximately 800 m from the MLWS to the landward side of the Environment Agency tidal flood defences. Furthermore, there is sufficient flexibility to carefully site infrastructure within the northern part of the Anderby Creek LSA and avoid the SSSIs in the south of the Anderby Creek LSA.

Landscape and Visual

Theddlethorpe Landfall Study Area

As shown in **Figure A-2**, the Landfall Study Area is located within Lincolnshire Coast and Marshes LCA (NCA 42). It is characterised by a flat, open coastal landscape including a wide sandy beach to the east and the North Sea to the centre and east of the Theddlethorpe LSA. At the centre and west of the Theddlethorpe LSA the landscape is characterised by sand dunes, open farmland and residential coastal properties (Duneside Cottages and Haven Cottage) with the village of Theddlethorpe St Helen to the west. Although predominantly rural in character, a former Gas Terminal (Theddlethorpe Gas Terminal) is located to the south of the Theddlethorpe LSA. Potential effects on landscape character from infrastructure at the Theddlethorpe LSA would be limited to temporary effects during installation of the TJB and onwards HVDC cables due to the use of trenchless cable installation (where possible) with no above ground infrastructure once construction is completed (except for the cover of the TJB).

The closest nationally designated landscape area is the Lincolnshire Wolds NL, located approximately 13 km west. Given the distance of the Lincolnshire Wolds NL from the Theddlethorpe LSA, the temporary nature of the construction works and that there will be no permanent above ground infrastructure (except for the cover of the TJB) at the Landfall, potential adverse visual effects on the Lincolnshire Wolds NL are considered unlikely.

The potential key visual receptors surrounding the Theddlethorpe LSA are the settlements of Theddlethorpe St Helens (500 m west); Mablethorpe (900 m south with Trusthorpe and Sutton-on-Sea further south along the coastline) and Saltfleet (4 km north). Scattered properties are also located in the vicinity of the Landfall Study Area, to the north, west and south and there are approximately five residential properties within the boundary of the Theddlethorpe LSA. In addition to these residential receptors, recreational receptors include those using PRoW within and around the Landfall Study Area as well as much of the land west of the Landfall Study Area, which is open access land under Section 16 of the Countryside and Rights of Way (CRoW) Act 2000, and those utilising commercial businesses, specifically holiday parks. Recreational receptors also include those using the beach (which is a designated bathing water area).

The presence of construction plant and equipment and associated activities within the Theddlethorpe LSA could have temporary adverse impacts on the visual amenity of these key receptors. Visual amenity may also be affected for receptors at a greater distance, however those closer to the Landfall would be likely to experience a greater effect. Any construction infrastructure within the Theddlethorpe LSA may lead to temporarily decreased visual amenity for residential and recreational receptors within the settlement of Theddlethorpe St Helens depending on the final location of the Landfall. Careful siting and routeing at the next phase of the English Onshore Component of the Project would help to limit potential effects on visual amenity. Longer

term, as there would be no permanent above ground infrastructure (except for the cover of the TJB) at the Landfall, permanent effects on visual amenity are considered unlikely to occur.

Anderby Creek Landfall Study Area

As shown in **Figure A-2**, the Anderby Creek LSA and surrounding area is located within Lincolnshire Coast and Marshes LCA. Much of the land within the eastern section of the Anderby Creek LSA is open access land and comprises sand dunes and beach. From the centre to the west of the Anderby Creek LSA, the landscape is characterised by tidal flood defences, open farmland and marshland and scattered residential properties. The village of Anderby Creek including Beachside Caravan Park and Ravenna Holiday Park, sits within the Anderby Creek LSA boundary. Approximately 150 m south of Anderby Creek LSA boundary are residential properties and a holiday park on the northern outskirts of Chapel St Leonards as well as the North Sea Observatory 700 m south. Other landscape character features within and around the Anderby Creek LSA include pumping stations, public access car parks, restaurants and cafes and scattered residential properties.

Potential effects on landscape character from infrastructure at the Anderby Creek LSA would be limited to temporary effects during installation of the TJB and onwards HVDC cables due to the use of trenchless cable installation (where possible), with no above ground infrastructure once construction is completed (except for the cover of the TJB).

Given the distance of the closest nationally designated landscape (the Lincolnshire Wolds NL at 9 km west), the temporary nature of the construction works and the fact there will be no permanent above ground infrastructure (except for the cover of the TJB) at the Landfall, potential adverse visual effects of the construction works on the Lincolnshire Wolds NL are considered unlikely.

The potential key visual receptors surrounding the Anderby Creek LSA are the settlements of Anderby, Hutoft and Mumby between 1.7 km and 3.6 km to the west and Alford (9 km west), Hogsthorpe (2.3 km southwest), Chapel St Leonards 200 m south with Ingoldmells and Addlethorpe further to the south; and Sutton-on-Sea (1.5 km) and Mablethorpe (5 km) to the north. Scattered properties are also located in the vicinity of the Anderby Creek LSA, to the north, west and south as well as properties within Anderby Creek which is within the boundary of the Anderby Creek LSA. In addition to these residential properties, recreational receptors include those using PRoW and commercial businesses (holiday parks). Recreational receptors are also those using the beach (which is a designated bathing water area).

The presence of construction plant and equipment and associated activities within the boundary of the Anderby Creek LSA could have temporary adverse impacts on the visual amenity of these key receptors. Visual amenity may also be affected for receptors at a greater distance however those closer to the Landfall location would be likely to experience a greater effect. Any construction infrastructure within the Anderby Creek LSA may lead to temporarily decreased visual amenity within the settlement of Anderby Creek depending on the final location of the Landfall.

Careful siting and routeing at the next phase of the English Onshore Component of the Project would help to limit potential for effects on visual amenity. Longer term, as there would be no permanent above ground infrastructure (except for the cover of the TJB) at the Landfall, permanent effects on visual amenity are considered unlikely to occur.

Historic Environment

There are few designated heritage assets identified within and in proximity to the Theddlethorpe LSA and Anderby Creek LSA; however, those identified are appraised below. The potential for unknown below ground archaeological remains will be considered during the next phase of the English Onshore Component of the Project once a preferred Landfall location has been selected. Information from historic environment records will be used to inform the siting of the Landfall and routeing of the onwards HVDC cables to avoid or minimise effects on any such potential remains identified. There would be no permanent above ground infrastructure (except for the cover of the TJB) at the Landfall, and therefore permanent setting effects on the features outlined below are considered unlikely.

Theddlethorpe Landfall Study Area

As shown in **Figure A-2**, within 2 km of the Theddlethorpe LSA designated heritage assets comprise one Grade II* (*Church of St Helen*) and three Grade II (*Stable Block At The Hall*, *The Hall and Ashleigh Farm*) Listed Buildings, all of which are located over 700 m to the west and/or southwest of the Theddlethorpe LSA, respectively. Therefore, potential adverse impacts upon these designated heritage assets would be limited to temporary impacts upon their setting during the construction phase. However, given the distance of the identified assets from the Landfall Study Area, and the presence of existing vegetation and the intervening settlement at Theddlethorpe St Helen, construction at the Landfall site is likely to be adequately screened by these intervening features. Therefore, it is considered that potential adverse effects during construction, upon the setting of the identified heritage assets, would be both temporary and limited.

Anderby Creek Landfall Study Area

As shown in **Figure A-2,** within 2 km of the Anderby Creek LSA the designated heritage assets comprise four Grade II Listed Buildings (*Stain Glebe Farm, Dairy Farm, Church of St Leonard, and War Memorial*), all of which are located over 1 km west/southwest of the Anderby Creek LSA, respectively. Therefore, potential effects upon these designated heritage assets are limited to those upon their setting during construction. However, given the distance of the identified assets from the Anderby Creek LSA, and the presence of existing vegetation and settlement at Chapel St Leonards, as well as scattered properties along Sea Lane, construction of the Landfall is likely to be adequately screened. Therefore, it is considered that potential adverse impacts during construction, upon the setting of the identified heritage assets, would be both temporary and limited.

Water Environment

This section considers potential effects on the terrestrial water (freshwater) environment. Potential effects on the offshore (marine) water environment have been considered as part of the EGL 5 marine options appraisal process.

The potential impacts of the construction in the Landfall Study Area include:

- Changes to the surface and groundwater flow and patterns;
- Pollution (including frac-out) and runoff (sediment and turbidity) to the surface and groundwater environments;
- Physical disturbance to watercourses;

- Impacts to water resource availability from dewatering; and
- Potential damage to Environment Agency tidal flood defences.

As outlined above, it is assumed that a trenchless cable installation method would be used, where possible, to avoid direct impacts to Environment Agency tidal flood defences along the coastline as well as to ecologically designated sites. In addition, it is also assumed that several standard construction management measures would be implemented to avoid and minimise effects on the water environment. Such measures would be likely to include silt fencing, settlement lagoons and pollution control measures (including a Frac-out Emergency Response Plan) which would be implemented by way of a COCP and/or Drainage Management Plan. In addition, careful siting of the Landfall infrastructure and routeing of the onwards HVDC cables would be undertaken at the next phase of the English Onshore Component of the Project to avoid effects on and limit impacts to water environment features, including GWDTEs.

Additionally, given the assumption of a trenchless cable installation method, where possible, potential changes to coastal morphology and erosion patterns within any of the Landfall Study Areas were not considered to be a differentiating factor in this appraisal. This is because a trenchless cable installation method would avoid any direct disturbance to the coastline surface structure or morphology. Furthermore, due to the absence of any infrastructure (except for the cover of the TJB) at the surface, there is unlikely to be any impact upon coastal processes unless the cable becomes exposed during natural sediment transportation processes. However, should another installation method other than a wholly trenchless cable installation method be taken forward, the outcomes of this appraisal will be reviewed taking into consideration potential impacts on coastal morphology and erosion patterns.

Theddlethorpe Landfall Study Area

Flood Zones 2 and 3 are present on the landward (west) side of the Environment Agency tidal flood defences running along the entire coastline within the Theddlethorpe LSA and extending approximately 2 km inland in all directions. Coastal flood defences include dunes, man-made drains and a sea wall which are present in proximity to Mablethorpe. The Theddlethorpe LSA falls within Environment Agency's Saltfleet to Gibraltar Point Beach Management Strategy 2021-2024[49], through which beaches between Mablethorpe and Ingoldmells, including Theddlethorpe, are nourished annually with sand to provide additional flood protection. The strategy explains how current beach nourishment will not continue to be sustainable in the future due to the effects of climate change. As such, the strategy sets out a plan to change the management regime, to form a sustainable flood management approach for the next 100 years.

Areas within the Theddlethorpe LSA form part of the Saltfleetby – Theddlethorpe Dunes SSSI, which is a GWDTE. The Landfall Study Area falls within an area of medium-high risk regarding groundwater vulnerability, and the onshore HVDC cables would need to route through areas of medium-high, medium and low groundwater vulnerability. Furthermore, the entirety of the Theddlethorpe LSA is located above a principal bedrock aquifer.

[49] Saltfleet to Gibraltar Point Strategy Enhancing the Lincolnshire Coast. Available online at: https://consult.environment-agency.gov.uk/lincolnshire-and-northamptonshire/sgp-lbm/. Accessed 30 January 2025.

The Theddlethorpe LSA is within a surface water drinking water protected area and safeguarding zone. Many drains are located within the Theddlethorpe LSA, including The Cut and numerous unnamed drains, which flow into the North Sea. It is also noted that the water bathing quality at Mablethorpe Town Beach, south of the Theddlethorpe LSA, is classified as ‘excellent’ and the waters are used by swimmers and beach goers.

The use of trenchless cable installation methods would be likely to avoid permanent impacts to the tidal flood defences and impacts to groundwater flow patterns. It is also considered that trenchless cable installation would minimise the potential for impacts upon Theddlethorpe beach, thereby reducing the potential to conflict with the Environment Agency’s Saltfleet to Gibraltar Point Beach Management Strategy 2021-2024. Furthermore, the implementation of standard construction management.

Figure A-3 – Landfall Study Areas and Key Water Features

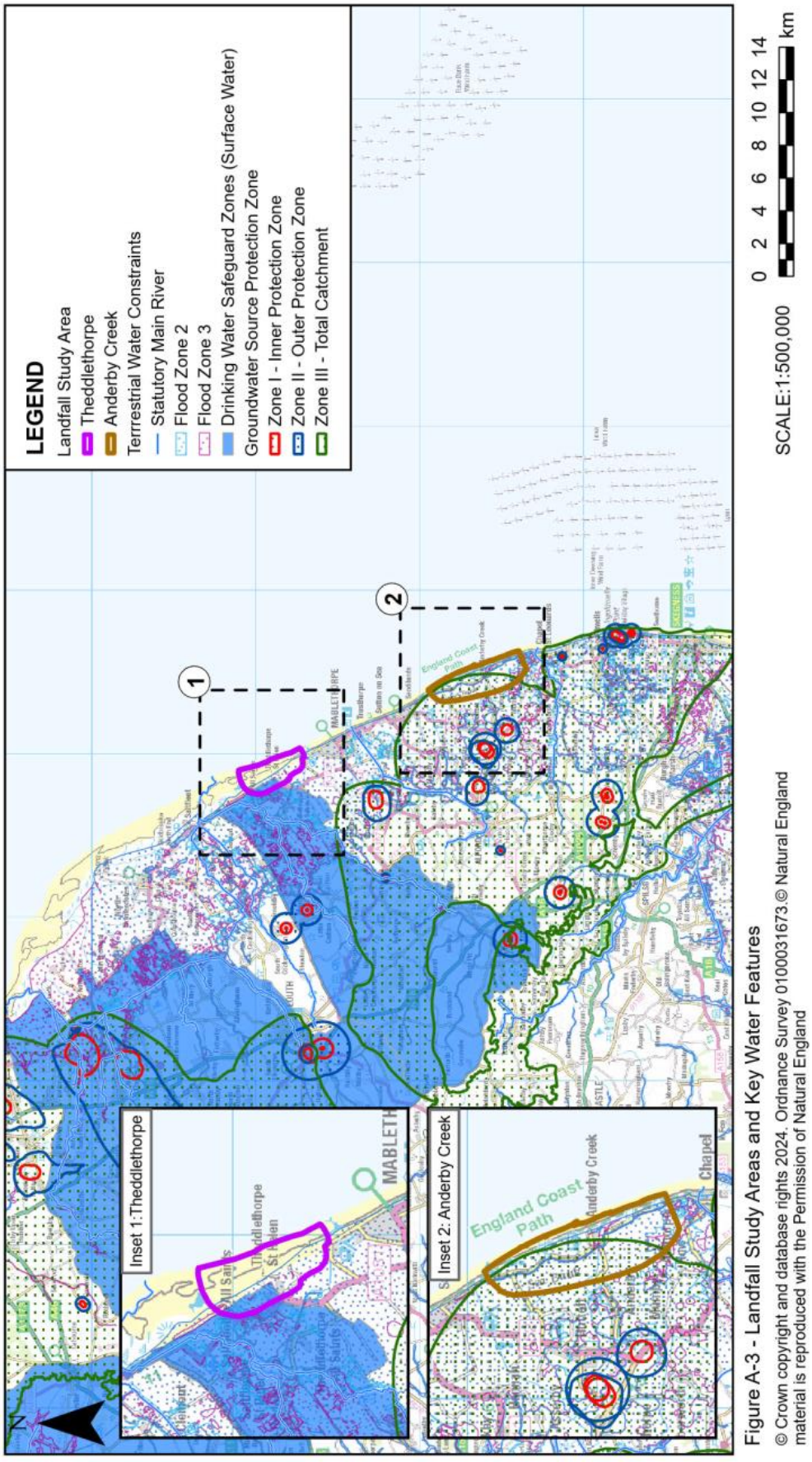


Figure A-3 - Landfall Study Areas and Key Water Features

Anderby Creek Landfall Study Area

Flood Zones 2 and 3 are present on the landward (west) side of the Environment Agency tidal flood defences running along the entire coastline within the Anderby Creek LSA and extending approximately 1 km inland. This Anderby Creek LSA also falls within the Saltfleet to Gibraltar Point Beach Management Strategy 2021-2024 area, with the beaches at Wolla Bank, in the southern part of the Anderby Creek LSA undergoing beach nourishment. The strategy explains how current beach nourishment will not continue to be sustainable in the future due to the effects of climate change. As such, the strategy sets out a plan to change the management regime, to form a sustainable flood management approach for the next 100 years.

Sea Bank Clay Pits SSSI forms part of the southern extent of the Anderby Creek LSA and it is a GWDTE. The onshore HVDC cables would need to route through areas of medium-high, medium and low risk regarding groundwater vulnerability from the Anderby Creek LSA within which the immediate coastline is a medium-high risk for groundwater vulnerability. Furthermore, the entirety of the Landfall Study Area is located above a principal bedrock aquifer.

It is also noted that the water bathing quality at Moggs Eye Beach and Anderby Beach, which are within the northern and central parts of the Anderby Creek LSA, are classed as 'excellent' and are used by swimmers and beach goers.

Water Framework Directive blue line watercourses are located within the Anderby Creek LSA, including the Anderby Main Drain (centrally, south of Anderby Creek) and the Boy Grift Drain (north of Anderby Creek), which flow into the North Sea.

The use of a trenchless cable installation method would likely avoid permanent impacts to the tidal flood defences and to groundwater flow patterns and the implementation of standard construction management measures would minimise the risk of water quality effects during construction and installation. It is also considered that trenchless cable installation would reduce the potential for impacts upon the beaches at Wolla Bank, thereby reducing the potential to conflict with the Environment Agency's Saltfleet to Gibraltar Point Beach Management Strategy 2021-2024. Measures may also be required to mitigate effects on bathing water areas, such as construction programme restrictions to avoid the bathing water season (May to September), depending on the final location of the Landfall.

Socio-economics

Theddlethorpe Landfall Study Area

As shown in **Figure A-4**, the relevant socio-economic receptors within the boundary of the Theddlethorpe LSA are RAF Theddlethorpe (a bombing and gunnery range which was closed down in 1973 due to its proximity to the Theddlethorpe gas terminal); Harbour Energy's proposed Viking Carbon Capture and Storage (CCS) Project (hereafter referred to as the 'the Viking CCS Project', currently at decision); the proposed Theddlethorpe Geological Disposal Facility (GDF) and designated bathing waters. In addition, several PRoW are located within the far western extent of the Landfall Study Area, along Crook Bank, Sea Lane and Brickyard Lane.

RAF Theddlethorpe intersects the north of the Theddlethorpe LSA and although closed, consultation with the MoD would be required to obtain detailed plans and locations of potential unexploded ordnance. The proposed Viking CCS Project is seeking to re-purpose existing gas pipelines from the terminal to transport carbon-dioxide to geological storage facilities out at sea. This project occupies the south of the Theddlethorpe LSA.

The Theddlethorpe LSA also falls entirely within the search area for the Nuclear Waste Services (formerly known as Radioactive Waste Management) proposed Theddlethorpe GDF. The former Theddlethorpe Gas Terminal site has been identified as a potential location to provide access for an underground nuclear GDF offshore.

The water bathing quality at Mablethorpe Town Beach to the south of the Theddlethorpe LSA is classified as 'excellent' and attracts swimmers and beach goers to the area. There are three car parks and PRoW from which access to the coastline, and to the beach can be taken within the Landfall Study Area. These comprise Churchill Lane Car Park to the north, a car park off Brickyard Lane in the centre, and Crook Bank Car Park to the south. There is a camping site located 750 m west of the Theddlethorpe LSA in Theddlethorpe St Helen, and the Swallow Park Caravan Site is located 800 m south of the Theddlethorpe LSA.

Careful siting and routeing of the next phase of the English Onshore Component of the Project would minimise adverse effects on the identified socio-economic receptors. In addition, standard construction management measures included within a COCP or CTMP plan would also minimise effects on local PRoW and access to local facilities. Construction works for the Landfall could result in the need to temporarily close one of the car parks within Theddlethorpe LSA and as a result beach users may need to divert and travel a greater distance to other car parks depending on the final location of the Landfall. Impacts on the operation of the Viking CCS Project, assuming it is consented, would need to be avoided or mitigated through careful routeing and siting of the English Onshore Component of the Project's infrastructure.

Anderby Creek Landfall Study Area

As shown in **Figure A-4**, the relevant socio-economic receptors within the boundary of the Anderby Creek LSA are the former Sandilands Golf Course (where the National Trust is currently constructing a nature reserve), the Outer Dowsing OWF, the North Sea Observatory (700 m south of the Anderby Creek LSA), and bathing waters associated with Moggs Eye and Anderby Beaches. In addition, six PRoW are located across the Anderby Creek LSA, primarily to the west.

To the north of the Landfall is the former Sandilands Golf Course, National Trust wetland nature reserve and multi-purpose visitor hub, which is expected to be complete in Autumn 2025.[50].

[50] https://www.nationaltrust.org.uk/visit/nottinghamshire-lincolnshire/sandilands/sandilands-planning-submission-press-release

Figure A-4 – Landfall Study Areas and Key Socio-Economic Features

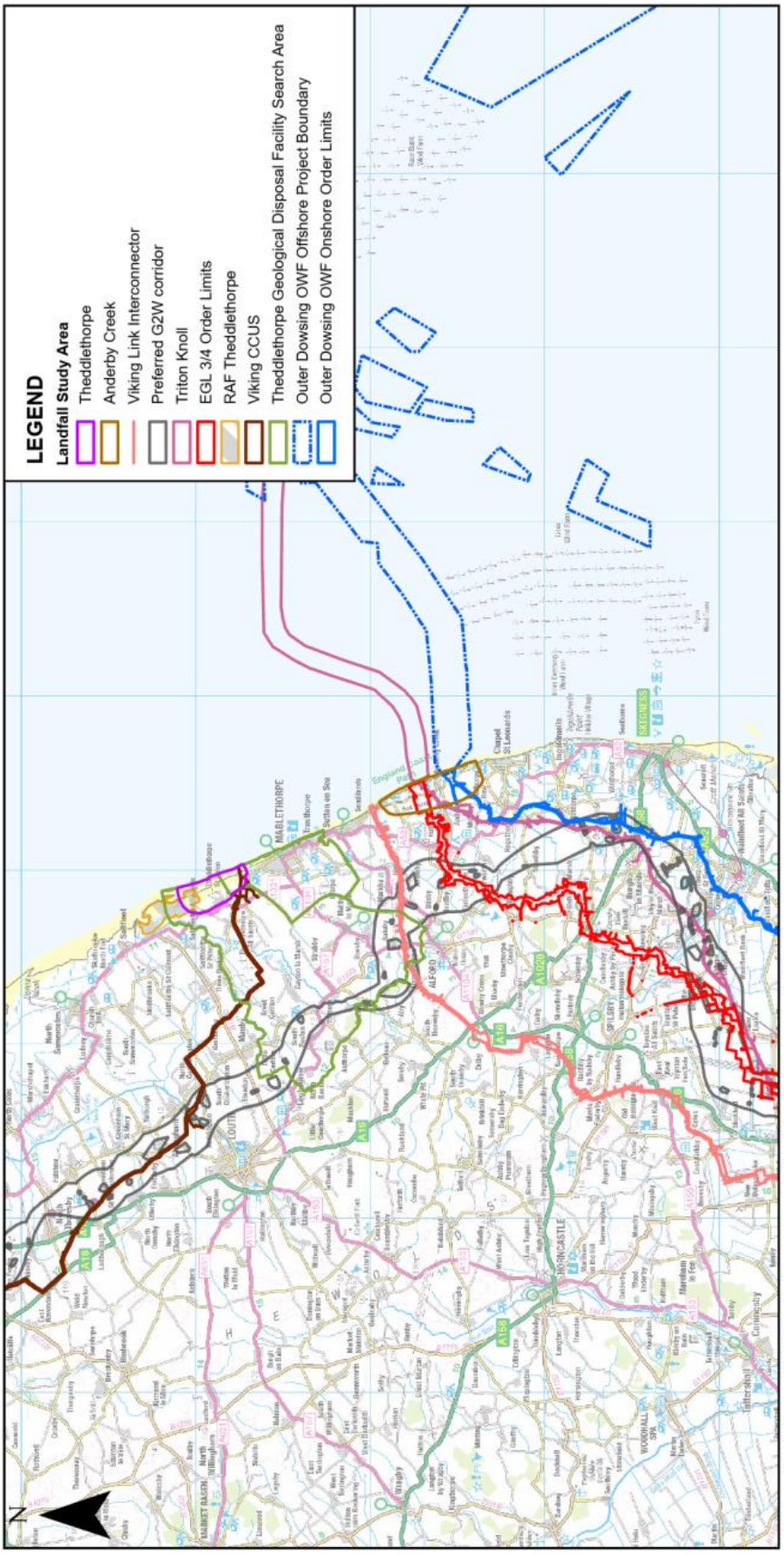


Figure A-4 - Landfall Study Areas and Key Socio-Economic Features

The North Sea Observatory is 700 m south of the Anderby Creek LSA boundary, and functions as an exhibition and art space, and has a café. Construction of the Landfall at the south of the Anderby Creek LSA has the potential to temporarily disrupt visitors to and the operations of the observatory depending on construction traffic flows. There are also several campsites as well as holiday parks, within and adjacent to the Anderby Creek LSA. These are concentrated around Anderby Creek.

The Outer Dowsing OWF (currently at examination) proposes to make Landfall to the south of Anderby Creek, therefore offshore, intertidal and onshore interactions may occur.

The quality of bathing water at the Moggs Eye and Anderby beaches is classed as 'excellent' and attracts swimmers and beach goers to the area. It is a designated bathing water area. The bathing water season in England is generally from May to September (inclusive) and should development of a Landfall not be able to avoid works during this period, this would have the potential to disrupt use of the beach and sea. There are five car parks from which access to the coastline, PRoW and the beach can be taken within the Anderby Creek LSA. These are accessed via Huttoft Bank/Roman Bank/Anderby Road which runs parallel to the coastline and comprise Huttoft Car Terrace and Marshes Yard (Moggs Eye) in the north, Anderby Creek in the centre and Wolla Bank Beach and Chapel Six Marshes in the south of the Anderby Creek LSA. Further car parks are available to the north in Sandilands and south in Chapel St Leonards. Construction and installation works at the Landfall could result in the need to temporarily close one of the car parks within the Anderby Creek LSA and as a result beach users may need to temporarily divert and travel a greater distance to other car parks, although this will depend on the final location of the Landfall.

Careful siting and routeing of the next phase of the English Onshore Component of the Project, together with close collaboration with other developers and projects, would minimise adverse effects on the identified socio-economic receptors. In addition, standard construction management measures included within a COCP would also minimise effects on socio-economic receptors and could include measures around the timing of works to minimise effects on beach users, specifically during the bathing water season. Measures implemented by way of the CTMP would also help minimise disruption on local roads which could impact visitors to local facilities and holiday makers as well as those using PRoW within and around the Anderby Creek LSA. Careful routeing and siting at the next phase of the English Onshore Component of the Project would be needed to:

- Avoid the former golf course/proposed National Trust nature reserve at the northern end of the Anderby Creek LSA and avoid effects on those visiting this site; and
- Avoid effects on the construction and operation of the Outer Dowsing OWF should it be consented.

Other environmental considerations

Other environmental topics were also considered as part of the options appraisal and include air quality, noise and geology.

Theddlethorpe Landfall Study Area

No relevant geological features are identified for the Theddlethorpe LSA.

There are five residential properties within the western area of the Theddlethorpe LSA, near Theddlethorpe St Helen which is 500 m to the west. These receptors could experience temporary air quality (dust), noise and vibration impacts from construction activities. The Theddlethorpe LSA is of sufficient size to allow for the careful siting and routeing of the English Onshore Component of the Project infrastructure and construction compounds to maximise the intervening distance to an acceptable level between construction works and these receptors. Furthermore, the implementation of standard construction management measures such as construction working hours, acoustic screening and dust management measures, by way of a COCP, as well as traffic management measures by way of a CTMP, would further reduce and manage construction impacts.

Anderby Creek Landfall Study Area

Chapel Point to Wolla Bank SSSI, as shown in **Figure A-2**, falls within the Anderby Creek LSA. The site was designated for its geological interest as it contains important intertidal sediments that aid with the interpretation of sea level changes in the early Holocene. The SSSI is situated within the southern part of the Anderby Creek LSA and as such, there is sufficient flexibility to avoid the SSSI by carefully siting infrastructure within the north of the Anderby Creek LSA.

There are residential properties associated within the village of Anderby Creek located in the centre of the Anderby Creek LSA. In addition, residential properties are located 150 m to the south of the Anderby Creek LSA towards the northern part of Chapel St Leonard, and scattered individual properties are located to the west. These receptors could potentially experience temporary air quality (dust) and noise and vibration impacts during construction. However, the Anderby Creek LSA is sufficient in size to allow for careful siting and routeing of the English Onshore Component of the Project infrastructure and construction compounds to maximise the intervening distance to an acceptable level between construction works and these receptors. Furthermore, the implementation of standard construction management measures such as construction working hours, acoustic screening and dust management measures, by way of a COCP, as well as traffic management measures by way of a CTMP, would further reduce and manage construction impacts.

Engineering and System Factors

When considering a preferred Landfall, the key engineering factors include a site which is relatively free from technical and infrastructure constraints (including those arising from environmental and socio-economic factors).

The proposed Landfall sites, Anderby Creek and Theddlethorpe, were appraised by a comprehensive analysis technical complexity, for construction and cabling in regard to crossings (Roads, Utilities, Watercourses, Railways) and other construction issues such as the possible construction of long haul-roads because of limited accessibility and capacity issues regarding HDDs or existing HV cables in the routeing for EGL 5.

The following tables show both Anderby Creek and Theddlethorpe terrestrial appraisals. They consist of the technical evaluation of guaranteed and potential Landfall crossings, the main risks, and opportunities. Furthermore, the potential delivery and construction issues as well as capacity constraints are also considered. Each risk is accompanied by a possible mitigation and the following implications and conclusions for each subtopic.

Table A-1 – Technical Terrestrial Appraisal for Anderby Creek

Subtopics	Technical complexity	Construction / delivery issues	Technical issues	Capacity issues
Main Risks, Constraints and Opportunities	**1.** Road Crossings – The A52 is guaranteed to cross in Landfall for both Northern and Southern options for Transition Joint Bay. Additionally, if routeing takes place through Southern CS sites, the B1449 has potential to cross the HVAC and HVDC. **2.** Existing utilities – The WPD 33 kV Overhead Conductor is guaranteed to cross in Landfall for both Northern and Southern options of TJB. **3.** Watercourses – The Huttoft Main Drain is guaranteed to cross. In addition, Boy Grift drain has potential to cross if routeing takes place along the South. The South Fen, Jolly Common and Boy Grift Drains also have potential to cross if routeing takes place through Northern CS Sites.	**1.** Haul roads smaller than 3 km to Landfall site and throughout Corridor due to distance from A52. **2.** Small haul road routeing through settlements required.	**1.** One trenchless crossing has the potential to increase the depth of cables and Transition Joint Bay and therefore reduce system capacity. Option to avoid this by routeing through Northern routes. Use of HDD construction technology.	**1.** One existing HV cable crossing has the potential to increase depth of cables and therefore reduce system capacity.

Subtopics	Technical complexity	Construction / delivery issues	Technical issues	Capacity issues
Likely Mitigation and Assumptions	**1.** Potential for trenchless crossing to be required or significant traffic management and diversions. Carry out Cable pulling calculations to confirm the suitability of trenchless crossing and specify cable profile and alignment. **2.** Utilities listed are unavoidable due to crossing Corridor. **3.** High risk watercourses are large and will require trenchless crossings. Available space for trenchless crossing must be considered for medium risk watercourses if required and/or preferred.	**1.** Assume construction of secondary access points for smaller vehicles to alleviate construction traffic through primary access. **2.** Assume construction of secondary access points for smaller vehicles to alleviate construction traffic through primary access and settlements. **3.** Calculation of construction vehicle movements and analysis of existing roads. Confirm the suitability of existing roads and any modifications required. Carry out swept path analysis and visibility splays to confirm suitability of roads and bellmouths for construction traffic.	**1.** Avoid where possible.	**1.** Avoid where possible **2.** Carry out cable thermal rating calculations to specify cable depths and spacing.

Subtopics	Technical complexity	Construction / delivery issues	Technical issues	Capacity issues
Implications and Conclusion	**1.** Increased cost, programme, and temporary land take requirement for trenchless crossing. **2**. Increased cost and requirements for outages of lines where diversion / undergrounding is required. Avoid where possible. High risk crossing of high-pressure gas mains. **3.** Increased cost, programme, and temporary land take requirement for trenchless crossing	**1.** Increased cost and programme **2.** Increased cost and programme **3.** Increased cost and programme	**1.** If encountered within the Corridor and unavoidable, this could have a significant impact on the capacity of the cable circuits, reducing achievable rating.	**1.** If encountered within the Corridor and unavoidable, this could have a significant impact on the capacity of the cable circuits, reducing achievable rating. **2.** Increased cost and programme.

The cable routes that originate from the Anderby Creek Landfall site and head to the EGL 5 converter station Siting Zones, start from the same northern landing field. Should the Landfall site move towards the south, to accommodate a preferred offshore cable route, then the number of crossings would increase to include another watercourse constraint. The length of the cable route through the Corridor would likely differ from the one included in **Table 6-1** above.

The cable alignments under consideration from Anderby Creek Landfall do not extend through any significant pinch points within the Corridor, and therefore has good flexibility should further constraints be identified at a later design stage.

The Landfall site has good options for routeing, containing the same number of technical constraints. Generally, there is adequate access to the Landfall site from the A52 and various minor connecting roads along the site. There are no major restrictions for a construction haul road within the Corridor, and any haul road constructed is likely to be relatively short. There are no high-risk roads, watercourses, or utility crossings, guaranteed to cross at Landfall. The watercourse, Boy Grift Drain, is guaranteed to be crossed either at Medium Risk or High Risk level, depending on the considered route. One medium risk road crossing is guaranteed to require a trenchless crossing which would incur an increased cost, programme and temporary land take, presenting a technology issue as well for the use of HDD.

Table A-2 – Technical Terrestrial Appraisal for Theddlethorpe

Subtopics	Technical complexity	Construction / delivery issues	Technical issues	Capacity issues
Main Risks, Constraints and Opportunities	**1.** Road Crossings – One road, the A1031, is guaranteed to cross in Landfall. **2.** Existing utilities – There is one 900 mm Gas Line (Theddlethorpe to Hatton), one 750 mm Gas Line (Theddlethorpe to Hatton), two underground Gas Lines and one Viking CCS Pipeline guaranteed to cross in Landfall. There is potential for the crossing of the Viking Link 525 kV underground power cable before reaching the proposed 400 kV LCS-B, as it sits inside Substation Area and cuts through all possible routes. **3.** Watercourses - Three watercourse crossings, The Cut, West Bank and Mill and Harps Drain, are guaranteed to cross in Landfall for the currently considered routes. There is the option to route south to avoid the Mill and Harps Drain crossing.	**1**. Long haul roads greater than 3 km throughout the Corridor due to the distance from the A1031, but smaller haul roads connecting to Landfall site. **2.** Long haul road routeing through settlements are required. **3**. Pinch point with one internal drainage when routeing in Landfall site. Potential pinch point at the A1104 crossing limits flexibility along the South part of the Corridor.	**1**. Up to three trenchless crossings have the potential to increase the depth of cables and therefore reduce system capacity. Usage of HDD construction technology.	1. One existing HV cable crossing has the potential to increase depth of cables and therefore reduce system capacity

Subtopics	Technical complexity	Construction / delivery issues	Technical issues	Capacity issues
Likely Mitigation and Assumptions	**1**. There is the potential for trenchless crossings to be required or for the implementation of significant traffic management and diversions. Carry out cable pulling calculations to confirm the suitability of trenchless crossing cable profile and alignment. **2**. Utilities listed are unavoidable due to the crossing Corridor. Suitable protection measures are required for the crossing of high-pressure gas mains. **3.** High risk watercourses are large and will require trenchless crossings. Available space for trenchless crossings must be considered for watercourses if required and/or preferred.	**1.** It is assumed that there will be construction of secondary access points for smaller vehicles to alleviate construction traffic through primary access. **2.** Calculation of construction vehicle movements and analysis of existing roads. Confirm the suitability of existing roads and any modifications required. Carry out swept path analysis and visibility splays to confirm suitability of roads and bellmouths for construction traffic. **3.** Local narrowing of the Corridor required. Potential for the requirement to split circuits between pinch points.	**1.** Avoid where possible. The number of trenchless crossings may be reduced if multiple pipelines cross with one crossing (minimum 2 trenchless crossings required).	1. Avoid where possible. 2. Carry out cable thermal rating calculations to specify cable depths and spacing.

Subtopics	Technical complexity	Construction / delivery issues	Technical issues	Capacity issues
Implications and Conclusion	**1.** Increased cost, programme, and temporary land take requirement for trenchless crossing. **2.** Increased cost and requirement for outages of lines where diversion / undergrounding is required. Avoid where possible. High risk crossing of high-pressure gas mains. **3.** Increased cost, programme, and temporary land take requirement for trenchless crossing.	**1.** Increase cost and programme. **2.** Increase cost and programme. **3.** Reduced flexibility and therefore risk to Corridor routeing if further constraints found within this area.	1. If encountered within the Corridor and unavoidable, this could have a significant impact on the capacity of the cable circuits, reducing achievable rating.	1. If encountered within the Corridor and unavoidable, this could have a significant impact on the capacity of the cable circuits, reducing achievable rating. 2. Increased cost and programme.

Any chosen cable route originating from the Theddlethorpe Landfall site follows a common Corridor section to the EGL 5 converter station Siting Zones which have equal amounts of guaranteed high-risk constraints. There are no additional high-risk crossings that depend on onward routeing to the proposed converter station sites. The number of trenchless crossings from Landfall increases if eastern routeing takes place from the Gas line high risk crossing.

The Theddlethorpe Landfall Site has good options for routeing. Generally, there is adequate access available from the A1031, A1104 and various minor connecting roads. Long haul roads will be required to route through settlements from A1104. There are four gas pipe crossings which cannot be avoided along the route, with the closest one being less than 2 km from Landfall site. This poses a high risk to the asset and construction operatives during construction. Trenchless crossings and existing HV cable crossings are likely to present a technology issue regarding the use of HDD construction techniques, increasing cable length and therefore potentially lowering capacity of HVDC.

From a technical complexity standpoint, Anderby Creek Landfall Study Area is favourable because it has fewer high and medium-risk crossings compared to Theddlethorpe Beach Landfall. Theddlethorpe has a greater number of constraints, particularly the five high-risk gas mains, including Viking CCS pipeline (Carbon capture and storage), that are guaranteed to be crossed. In terms of construction access, Anderby Creek requires a smaller number of haul roads than Theddlethorpe, reducing the risks associated with large trucks passing through various settlements and lowering both operational and maintenance risks. Furthermore, Theddlethorpe presents a higher risk of further road constrains, as haul roads larger than 3 km could potentially be

added. Additionally, Theddlethorpe would require a higher number of trenchless crossings than Anderby Creek. While the amount of these trenchless crossings at Theddlethorpe could be reduced, the increased length of HDD comes with its own set of risks, including potential technological challenges and a possible reduction in the overall system capacity.

Comparative Appraisal and Summary

From an engineering and environmental perspective, the Theddlethorpe Landfall Study Area is the least preferred. Regardless of the method of installation at the Landfall it is likely that there would be some disturbance to the statutory ecological designations and priority habitat of saltmarsh and mudflats. A shorter trenchless cable installation method would still require some sections of open cut in the intertidal area, with the potential to damage or disturb important habitats in the area. A completely trenchless cable installation method would materially reduce disturbance, but the length of trenchless cable installation required to do this may not be technically feasible, may serve to over tension the cable comprising its integrity and performance, and would still require access to the saltmarsh and mudflat priority habitats for geotechnical investigations and would increase the potential for frac-out events.

To proceed with Theddlethorpe it would have been required, pursuant to The Habitats Regulations, to demonstrate that there were no feasible alternatives, which would not have been satisfied when Anderby Creek offers a feasible alternative solution. Therefore, Theddlethorpe is the least preferred Landfall Study Area and has not been considered any further at this phase of the English Onshore Component of the Project. As such, onward onshore underground cable routeing from Theddlethorpe has not been considered within **Chapter 6** of this Report.

From an engineering perspective, Anderby Creek is the preferred Landfall Study Area. The Theddlethorpe Landfall Study Area is located near the Viking CCS Project; therefore, it is likely that this would need to be crossed onshore, increasing the technical complexity of the English Onshore Component of the Project at the crossing location. However, discussions are on-going with Harbour Energy, the Project's promoter, in relation to both the detailed design of its project, and any physical separation requirements that would need to be adhered to. In addition, to avoid disturbing the environmental constraints completely at this location (specifically the statutory ecological designations and tidal flood defences) a trenchless cable installation method of more than 1.4 km would be required. A shorter trenchless cable installation method could be implemented to avoid disturbance to the SAC and tidal flood defences, but this would still require open cut trenches across the beach area which is still located within other statutory ecological designations (Ramsar site, SPA, SSSI, NNR).

Disturbance to environmental constraints within the Anderby Creek Landfall Study Area (priority habitats and the Environment Agency tidal flood defences) could be avoided using a much shorter wholly trenchless crossing (approximately 800 m) than that required at Theddlethorpe. This would also have the benefit of avoiding the need to access the beach area thereby minimising installation impacts. In addition, a Landfall at Anderby Creek would avoid potential impacts upon MoD assets and require comparatively fewer crossings of existing drains than within Theddlethorpe Landfall Study Area. However, regardless of which option is taken forward, careful routeing and implementation of mitigation measures following geophysical and geotechnical investigations would be required to minimise impacts from the Landfall.

With regards to ecological constraints, Anderby Creek is the more preferred Landfall Study Area. Fewer designated sites are present and direct effects on those that fall within the Study Area could be avoided through careful routeing and siting (Greater Wash SPA, Sea Bank Clay Pits SSSI and Chapel Point to Wolla Bank SSSI) and through a trenchless cable installation method (Greater Wash SPA). At Theddlethorpe, the need to avoid the Saltfleetby to Theddlethorpe Dunes & Gibraltar Point SAC and Saltfleetby – Theddlethorpe Dunes SSSI (as expressed by the MMO and Natural England in feedback on the EGL 3 and EGL 4 Project) is not possible and adverse effects upon the integrity of the designated site could not be ruled out therefore a successful case for derogation (required under The Habitats Regulations) was considered unlikely to be made. One of the key tests which would need to be met at derogation stage is demonstrating that there are no feasible alternative solutions that would be less damaging or avoid damage to the designated site. As Anderby Creek offers a feasible alternative which would be less damaging from a habitats perspective, it would not have been possible to meet this derogation test at Theddlethorpe.

There are few factors to differentiate between the Theddlethorpe and Anderby Creek Landfall Study Areas when considering other terrestrial environmental receptors.

From a landscape and visual perspective both Landfall Study Areas are likely to result in temporary adverse visual impacts for those receptors nearest to the construction works. While both Landfall Study Areas are remote from visual receptors, Anderby Creek is in proximity to a comparatively greater number of visual receptors. At Theddlethorpe, depending on the final location of the Landfall, construction works would be seen in the context of the former Theddlethorpe Gas Terminal. Therefore, Theddlethorpe Landfall Study Area would be marginally preferred. However, once construction works are complete, the potential for adverse landscape and visual impacts (following careful routeing and siting) would be limited given that there would be no permanent above ground infrastructure (except for the TJB cover) at the Landfall, thus there is no strong preference for either location.

As the works at the Landfall Study Areas would be primarily underground with no permanent above ground infrastructure (except for the TJB cover), most impacts with the potential to affect the setting of designated heritage assets are related to construction. Overall, there are few designated heritage assets in proximity to either of the Landfall Study Areas and therefore there is no preference for either option in relation to heritage assets.

Both Landfall Study Areas are located within areas of Flood Zones 2 and 3 which are also at risk of tidal flooding and contain Environment Agency tidal flood defences, primarily sand dunes. For either area the use of trenchless cable installation methods would be required (in line with advice received from the Environment Agency following introductory engagement with the Project) to avoid direct impacts to the tidal flood defences. Theddlethorpe Landfall Study Area would require comparatively longer lengths of trenchless cable installation which is likely to be less feasible from an engineering perspective compared to Anderby Creek. Theddlethorpe also has comparatively more drains than Anderby Creek. Therefore, from a freshwater perspective, Anderby Creek is the preferred Landfall Study Area.

From a socio-economic perspective there is little to differentiate between the Landfall Study Areas. Both areas have the potential to interact with planned developments (Viking CCS Project at Theddlethorpe and Outer Dowsing OWF south of Anderby Creek). Both also have several recreational receptors in and around their Landfall Study Areas including PRoW, campsites, holiday parks and beach car parks which provide access to the beaches in these areas. Overall, there is a slight preference for Anderby Creek due to the presence of Theddlethorpe Range (a closed RAF firing range) within the Theddlethorpe Landfall Study Area and therefore there is a greater potential for unexploded ordnance at this location. However, it is noted that the density of beachside facilities and car parks south of Sandilands indicates a greater use of the beaches within the Anderby Creek Landfall Study Area by beach-goers.

Overall, when considering air quality, noise and geology, there is little to differentiate between the Landfall Study Areas and therefore there is no preference for either Theddlethorpe or Anderby Creek in relation to these aspects of the environment.

In terms of the marine environment, the English Marine Options Appraisal[10] established that Theddlethorpe and Anderby Creek share many of the same marine ecological constraints, with the preference from a marine perspective therefore driven by the technical complexity of an HDD. At Anderby Creek, a shorter, less complex HDD could be undertaken, and Anderby Creek was therefore identified as the preferred Landfall Study Area.

Overall, Anderby Creek Landfall Study Area is preferred over the Theddlethorpe Landfall Study Area as it has fewer statutory ecological designations, and is likely to be more feasible in terms of the length of trenchless cable that would need to be installed to avoid direct disturbance to the statutory ecological designations as well as tidal flood defences present at all the Landfall Study Areas. However, it is noted that due to the presence of multiple existing and proposed Landfalls at Anderby Creek, a proposed Project Landfall in this area has the potential for cumulative effects upon the ecological environment and communities. In addition, further engineering studies may identify a suitable design solution at Theddlethorpe that mitigates the potential impacts upon the statutory designated ecological sites and tidal flood defences. Therefore, both the Theddlethorpe and Anderby Creek Landfall Study Areas are being taken forward as emerging preferences to determine the most suitable onshore HVDC cable route.

Onshore HVDC cable routeing from Anderby Creek is considered in **Chapter 6** of this Report.

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com