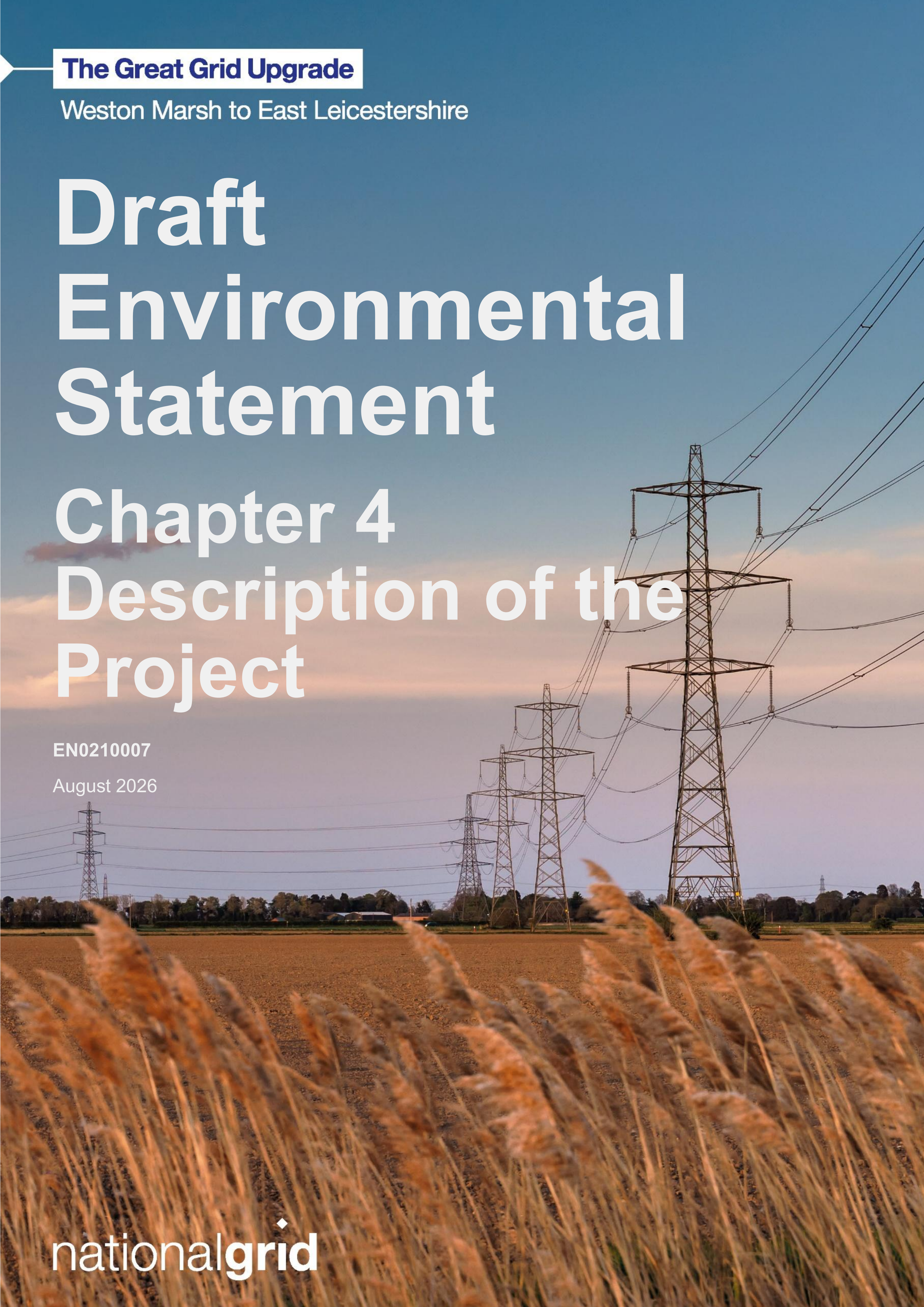


The Great Grid Upgrade

Weston Marsh to East Leicestershire

Draft Environmental Statement

Chapter 4 Description of the Project

EN0210007

August 2026

nationalgrid

Contents

4. Description of the Project 4-1

4.1 Introduction 4-1

4.2 Geographic Overview 4-2
Route Sections 4-2

4.3 Project Design Approach 4-15
Planning Policy and 'Good Design' 4-15
Good Design Principles 4-15
Other Design Considerations 4-17

4.4 Flexibility and Uncertainty 4-22
Application of the Rochdale Envelope 4-22
Draft Order Limits and Limits of Deviation 4-23
Known Uncertainty 4-24

4.5 Proposed Infrastructure 4-25
New Overhead Line 4-25
Substations 4-31
Reconductoring 4-33

4.6 Construction 4-34
Construction Programme 4-34
Construction Workforce 4-36
Construction Working Hours 4-36
Construction Compounds 4-36
Construction Access 4-39
Topsoil Stripping 4-41
Drainage 4-41
Vegetation Clearance Assumptions 4-41
Overhead Line Construction 4-43
Substation Construction 4-47
Reconductoring 4-48
Underground Cable and Cable Sealing End Compounds 4-49
Third-Party Services 4-49
Removal of Construction Equipment, Reinstatement and Restoration of Soils 4-49

4.7 Operation 4-50

4.8 Maintenance 4-50
Routine Maintenance 4-50
Repair and Refurbishment 4-51

4.9 Decommissioning 4-52
Overhead Line 4-52
Substations 4-53

Table 4.1 Description of principal features within the draft Order Limits east to west by Section 4-4
Table 4.2 Design mitigation measures 4-20
Table 4.3 Alternative scenarios considered in the assessment 4-24

Table 4.4	Range of tower heights in each Section	4-25
Table 4.5	Main and alternative tower dimensions	4-28
Table 4.6	Proposed construction compounds	4-37

Image 4.1	Components of a typical transmission connection (towers are synonymous with ‘pylons’ in this image’)	4-26
Image 4.2	Suspension tower (left) and tension tower (right)	4-27
Image 4.3	Main and alternative tower types (towers are synonymous with ‘pylons’ in this image’)	4-28
Image 4.4	Indicative conductor fittings	4-29
Image 4.5	Illustrative example of a typical AIS substation	4-31
Image 4.6	Indicative construction programme	4-35

References 4-54

4. Description of the Project

4.1 Introduction

4.1.1 This chapter provides a description of the Weston Marsh to East Leicestershire Project ('the Project') and represents the current understanding of the Project's scope, design parameters, and delivery. The current design parameters have been developed taking account of feedback received from the Stage 1 Consultation together with the ongoing environmental assessment and design work.

4.1.2 This report has been prepared in response to the Planning and Infrastructure Act 2025 (Ref 4.1) Following the changes introduced by the Act, this non-statutory Draft Environmental Statement (DES) (referred to in this document as "DES" and non-statutory DES") is being provided by the Applicant on a voluntary, non-statutory basis to support Stage 2 Consultation. The chapter is intended to provide consultees with an understanding of the nature and extent of the Project and to inform their responses to the consultation.

4.1.3 The Project is expected to include the following elements:

- approximately 60 km of new 400 kV overhead transmission line to the west of the proposed substation at Weston Marsh (to be delivered by the Grimsby to Walpole Project);
- a new 400 kV substation to be built in the vicinity of the existing 4VK (Cottam – Wymondley) 400 kV overhead line to the west of Corby Glen, South Kesteven (referred to as 'WMEL-A');
- a new 400 kV substation to be built in the vicinity of the existing ZA (Cottam – Sundon) 400 kV overhead line to the west of the village of Ab Kettleby and north west of Melton Mowbray, Melton (referred to as 'WMEL-B');
- reconductoring of approximately 66 km of the existing ZA 400 kV overhead line from WMEL-B to the existing Grendon Substation, east of Northampton; and
- realignment of short sections of existing 400 kV overhead line and local changes to the distribution networks to facilitate the construction of the new overhead line and substations.

4.1.4 The Project would include other required works, such as temporary and permanent diversions to existing overhead line routes, temporary access tracks/haul roads, permanent access roads, highway works, temporary works compounds, work sites and ancillary works. The Project would also include utility diversions and drainage works. There would also be land required for mitigation, compensation (if required) and enhancement of the environment including Biodiversity Net Gain.

4.1.5 As set out in **Chapter 1 Introduction**, this DES has been informed by the Environmental Impact Assessment (EIA) Scoping Opinion adopted by the Planning Inspectorate (on behalf of the Secretary of State) on 17 December 2025. The comments received on the description of the Project in the EIA Scoping Opinion have been taken into account in the production of this chapter. The EIA Scoping Report and EIA Scoping Opinion are included in **Appendix 5A Scoping Report** and

Appendix 5B Scoping Opinion of this DES. An explanation of how the comments have or will be addressed is included in **Appendix 5C National Grid's Response to the Scoping Opinion**.

4.1.6 This chapter is supported by **Figure 4.1 Proposed Project Design** which shows the currently proposed permanent and temporary works.

4.1.7 This chapter is supported by the following appendices:

- **Appendix 4A Draft Outline Code of Construction Practice** (CoCP).
- **Appendix 4B Draft Outline Materials and Waste Management Plan** (MWMP).

4.2 Geographic Overview

4.2.1 The Project is located in the East Midlands region within the following local authority administrative areas:

- the eastern part of the Project lies within South Holland (Lincolnshire County);
- the central part of the Project lies within South Kesteven (Lincolnshire County) and Melton (Leicestershire County); and
- the southern reconductoring part of the Project lies within Harborough (Leicestershire County), North Northamptonshire and West Northamptonshire (unitary authorities).

4.2.2 The Project is located in an area that is predominantly rural, with large parts of the land under arable use. The towns of Spalding, Bourne, Melton Mowbray, Market Harborough, Kettering, and Wellingborough are located within 5 km of the Project. There are also multiple villages and individual properties near to the Project.

4.2.3 There are numerous overhead lines of varying voltage in the vicinity of parts of the Project, as shown on **Figure 1.1 Project Location Plan**. Most notable are the existing 400 kV 4ZM overhead line which routes parallel to the eastern edge of the draft Order Limits near Weston Marsh, the existing 400 kV 4VK to which the proposed WMEL-A Substation would connect, and the existing 400 kV ZA to which the proposed WMEL-B Substation would connect. There is also one existing 400 kV substation located within 1.5 km of the draft Order Limits, the existing Spalding North Substation.

Route Sections

4.2.4 As described in DES **Chapter 1 Introduction**, the Project has been divided into five Sections based on the boundaries of the local authorities in which works would be required, including the new 400 kV overhead line, the new substations, and the reconductoring. The five Sections are described in **Table 4.1** and shown in **Figure 1.2 Draft Order Limits**:

- Section 1: Infrastructure within South Holland District;
- Section 2: Infrastructure within South Kesteven District;
- Section 3: Infrastructure within Melton Borough, with an additional area of offsite highway works in Charnwood Borough;
- Section 4: Infrastructure within Harborough District; and

- Section 5: Infrastructure within Northamptonshire (including both North Northamptonshire and West Northamptonshire unitary areas).

Table 4.1 Description of principal features within the draft Order Limits east to west by Section

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
Section 1	South Holland	Lincolnshire	The infrastructure within this Section includes approximately 11 km of new 400 kV overhead line from the new Weston Marsh Substation B to South Forty Foot Drain.	As shown in **Figure 1.2 Draft Order Limits** Sheet 1 this Section runs in a predominately westerly direction from the new Weston Marsh Substation B to South Forty Foot Drain. The Section falls within The Fens National Character Area (NCA) and is characterised by flat low-lying topography and productive arable land use. It is a large scale and predominantly open landscape, divided by linear ditches and drains and occasional linear tree belts along field boundaries. This is a relatively well settled landscape consisting largely of dispersed clusters and individual properties. See **Figures 6.1** to **6.4** for more information on the baseline landscape. The closest town is Spalding, with the villages of Weston, Surfleet, Crossgate, Pinchbeck and Northgate adjacent to the draft Order Limits. There are a number of water bodies in this Section including the River Welland (which is navigable and tidal), Vernatt's Drain, River Glen (which is navigable), and numerous unnamed ordinary watercourses. The 2km stretch from Cowbit Drove to South Forty Foot Drain is located within Source Protection Zone (SPZ) 2 (Outer Protection Zone) and SPZ 3 (Total Catchment) which share the same boundaries. The westernmost part of the Section lies between two discrete areas of SPZ 1 (Inner Protection Zone). The majority of the Section falls within Flood Zone 2, with a few instances of overlap with Flood Zone 3. The above-mentioned features are presented on **Figure 10.1 Surface Water Receptors and their Attributes**. Principal transport links present include the A16 Spalding Road, B1356 Surfleet Road, and the Peterborough to Lincoln railway line. Within the Section there are several footpaths, bridleways and local access roads

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				that provide links between rural dwellings and villages as shown on **Figure 13.1 Overall Context Map** and **Figure 13.3 Existing Public Rights of Way**. The closest site designated for nature conservation is Surfleet Lows Site of Special Scientific Interest (SSSI) located 630 m north of the Section as shown on **Figure 8.2 Statutory Nationally Designated Sites for Nature Conservation**. The closest internationally designated sites are The Wash Ramsar and Special Protection Area (SPA) and The Wash and North Norfolk Coast Special Area of Conservation (SAC), located 6.3 km north east of the Section and hydrologically connected via the River Welland and Vernatt's Drain, as shown on **Figure 8.1 Statutory Internationally Designated Sites for Nature Conservation**. Designated heritage assets located within the Section include the Grade I Listed 'The Wykeham Chapel: a moated monastic grange and retreat house' and Grade II Listed 'Chapel Farmhouse'. Assets located within 1 km of the Section include Grade II Listed Cottage Farmhouse located 130 m south, 'Moated site of monastic grange with adjacent earthworks at Rigbolt House' scheduled monument and Grade II Listed Rigbolt House are located 130 m north, and 'Moated site of Newhall Grange' scheduled monument 410 m south, as shown on **Figure 9.1 Designated Heritage Assets**.
Section 2	South Kesteven	Lincolnshire	The infrastructure within this Section includes new overhead line from South Forty Foot Drain to the new WMEL-A 400 kV	As shown in **Figure 1.2 Draft Order Limits** Sheet 2 this Section runs in a predominately westerly direction from the South Forty Foot Drain to the proposed WMEL-A Substation, then onward to the Melton/South Kesteven boundary (approximately 250 m east of The Drift road) and is approximately 31 km long. The east of the Section falls within The Fens NCA before transitioning into the Kesteven Uplands NCA, which are broadly characterised by

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
			Substation, then new overhead line onward to The Drift road south of Sewstern. The approximate length of this section is 31 km.	an undulating large-scale agricultural landscape. The topography is variable consisting of a series of low, broadly north–south ridges and valleys, rising towards the west. See **Figures 6.1** to **6.4** for more information on the baseline landscape. The closest town is Bourne, with the villages of Dunsby, Haconby, Stainfield, and Corby Glen adjacent to the Section. There are a number of water bodies that cross this Section including South Forty Foot Drain, Car Dyke, East Glen River, West Glen River, River Witham and numerous unnamed ordinary watercourses. The majority of the Section is located in SPZ 3 – Total Catchment. SPZ 2 covers all the area east of Swayfield (overlapping with SPZ 3). As per Section 1, there are two areas of SPZ 1 adjacent to the easternmost part of Section 2, in the area east of Haconby. The majority of the Section is located within Flood Zone 1, with Flood Zones 2 and 3 in areas associated with the above-mentioned water bodies. The easternmost part of the Section is located in an area of Flood Zones 2 and 3; this is also in the area east of Haconby. The above-mentioned features are presented on **Figure 10.1 Surface Water Receptors and their Attributes**. Principal highways crossed in this Section include the A15 Folkingham Road, A151 Station Road and A1 Great North Road. Other roads include the B1176 Corby Road. The East Coast Main Line railway is also crossed approximately 1.3 km west of Corby Glen. Within this Section there are several footpaths, bridleways and local access roads that provide links between rural dwellings and villages as shown on **Figure 13.1 Overall Context Map** and **Figure 13.3 Existing Public Rights of Way**.

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				The closest site designated for nature conservation to this Section is Dunsby Wood SSSI and Ancient Woodland located immediately adjacent to the north and the Hermitage SSSI located 900 m to the north, as shown on **Figure 8.2 Statutory Nationally Designated Sites for Nature Conservation**. The closest internationally designated site is the Baston Fen SAC located 8.1 km south as shown on **Figure 8.1 Statutory Internationally Designated Sites for Nature Conservation**. There are 19 ancient woodlands in total within 1 km of the Section, with Dunsby Wood, Breaches Wood, Norwood/West Wood, Great Osgrove Wood, Little Osgrove Wood and Herricho Wood all located within this Section. Designated heritage assets located within the Section include the 'Remains of Knights Templar preceptory, watermill and fishponds' scheduled monument which is located immediately adjacent to the draft Order Limits. Heritage assets within 1 km of the Section include 'Settlement between Rippingale Running Dike and Long Drove' scheduled monument located 400 m north, 'The Hermitage moated site, 400m north east of Corby Pasture Farm' scheduled monument located 900 m north east, and 'Corby moated mound' scheduled monument located 220 m south. There is one Registered Park and Garden (RPG) within 1 km of the Section which is Grade I Listed Grimsthorpe Castle located 50 m south. Conservation areas located within the Section include Corby Glen. Conservation areas located within 1 km of the Section include Dunsby located 630 m north, Morton located 990 m south/east, and Burton-le-Coggles located 60 m north. Multiple listed buildings are located within 1 km of the Section. The above listed assets are shown on **Figure 9.1 Designated Heritage Assets**.

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
Section 3	Melton and Charnwood	Leicestershire	The infrastructure within this Section comprises approximately 20 km of new overhead line from east of The Drift road to WMEL-B 400 kV Substation, the new WMEL-B Substation, and reconductoring of approximately 14 km of the existing 400 kV ZA overhead line from WMEL-B to an area near the B6047 south of Twyford.	As shown in **Figure 1.2 Draft Order Limits** Sheet 3 this Section runs in a predominately westerly direction from east of The Drift road to WMEL-B Substation, and then a southerly direction to an area near the B6047 Thimble Hall Road south of Twyford and is approximately 34 km long. The east of the Section falls within the Kesteven Uplands NCA before transitioning to the Leicestershire and Nottinghamshire Wolds NCA in the west. The Leicestershire and Nottinghamshire Wolds are characterised by undulating agricultural land with a variable sense of scale, openness and enclosure, influenced by topography, tree cover and field pattern. The southern extent of the Section falls within the High Leicestershire NCA and is characterised by rolling topography forming broad ridges and shallow valleys. This is a predominantly agricultural landscape with pasture on higher, sloping land and arable fields on lower, flatter areas. Tree cover is variable and largely confined to field boundaries and small woodlands. There is a variable sense of scale, largely related to the underlying field pattern. See **Figures 6.1** to **6.4** for more information on the baseline landscape. The closest town is Melton Mowbray, with the villages of Sewstern, Garthorpe, Coston, Potters Hill, Wartnaby, Saxelby, Asfordby, Frisby on the Wreake, Ashby Folville, and Twyford adjacent to the Section. There are a number of water bodies that cross this Section including the River Wreake, and Gaddesby Brook and numerous unnamed ordinary watercourses. The majority of the Section is located within Flood Zone 1, with Flood Zones 2 and 3 in areas associated with the above-mentioned water bodies. These water bodies are presented on **Figure 10.1 Surface Water Receptors and their Attributes**. Principal highways crossed in this Section include the A607 Melton Road, A606 Nottingham Road, and A6006 Loughborough Road. Other

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				roads include the B676 Buckminster Road, and B6047 Thimble Hall Road. The Birmingham to Peterborough Line, and Old Dalby Test Track Line are also present in this Section. Within the Section there are several footpaths, bridleways and local access roads that provide links between rural dwellings and villages. National Cycle Network routes 48 and 64 cross the Section. For further information see **Figure 13.1 Overall Context Map** and **Figure 13.3 Existing Public Rights of Way**. The closest site designated for nature conservation is Frisby Marsh SSSI located 1.4 km west of the Section as shown on **Figure 8.2 Statutory Nationally Designated Sites for Nature Conservation**. The closest internationally designated site is Rutland Water SSSI, SPA and Ramsar site,11.5 km south of the Section as shown on **Figure 8.1 Statutory Internationally Designated Sites for Nature Conservation**. Ancient woodlands within 1 km of the Section include Freeby Wood, located 50 m south, and Stonepit Spinnery located 350 m north, as shown on **Figure 8.3 Non-Statutory Designated Sites for Nature Conservation**. Designated heritage assets within 1 km of the Section include ‘Moated grange at Spinney Farm, Melton Mowbray’ scheduled monument located 250 m south, ‘Sysonby Grange, 100m west of Sysonby Farm’ scheduled monument located 450 m south, and ‘Moated site at Ab Kettleby’ scheduled monument located 510 m north. Conservation areas within 1 km of the Section include Ab Kettleby located 520 m north, Wartnaby located 25 m east, Saxelbye which is directly west of the existing ZA overhead line, Asfordby located directly east, Frisby on the Wreak located directly west, and Ashby Folville located 70 m west.

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				Multiple listed buildings are located within 1 km of the Section. The above listed assets are shown on **Figure 9.1 Designated Heritage Assets**. Section 3 also encompasses a small area of offsite highway works along the A46 Lincoln Relief Road in Charnwood Borough. Details of the types of highway works proposed to be undertaken are provided in Section 4.6.27.
Section 4	Harborough	Leicestershire	The infrastructure within this Section comprises approximately 19 km of reconductoring of the existing 400 kV ZA overhead line from an area near the B6047 south of Twyford to the confluence of Langton Brook and the River Welland, south west of Welham.	As shown in **Figure 1.2 Draft Order Limits** Sheet 4 this Section runs in a predominately southerly direction from an area near the B6047 Thimble Hall Road south of Twyford to the confluence of Langton Brook and the River Welland, south west of Welham, and is approximately 19 km long. The Section predominately falls within the High Leicestershire NCA. The closest town is Market Harborough with the villages of Marefield, Lowesby, Cold Newton, Tilton on the Hill, Halstead, Skeffington, Tugby, Rolleston, Noseley, Goadby, Glooston, Stonton Wyville, Cranoe, Slawston, Thorpe Langton, Welham, Great Bowden, and Little Bowden within or adjacent to the Section. See **Figures 6.1** to **6.4** for more information on the baseline landscape. There are a number of water bodies that cross this Section including the Langton Brook, Stonton Brook, River Welland and numerous unnamed ordinary watercourses with Flood Zones 2 and 3 in areas associated with the above-mentioned water bodies. These water bodies are presented on **Figure 10.1 Surface Water Receptors and their Attributes**. Principal highways crossed in this Section include the A47 Uppingham Road and the A6 Harborough Road. The Midland Main Line is a railway route connecting London, Birmingham, Leicester, Nottingham and Sheffield and passes through the southern end of this Section

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				near Market Harborough. Within the Section there are several footpaths, bridleways and local access roads that provide links between rural dwellings and villages as shown on **Figure 13.1 Overall Context Map** and **Figure 13.3 Existing Public Rights of Way**. The closest site designated for nature conservation is Leighfield Forest SSSI and Ancient Woodland located 650 m east of the Section as shown on **Figure 8.2 Statutory Nationally Designated Sites for Nature Conservation**. There are numerous other parcels of ancient woodland within 1 km of the Section, including Rolleston Wood, Noseley Wood, Stonton Wood, and Glooston Wood as shown on **Figure 8.3 Non-Statutory Designated Sites for Nature Conservation**. The closest internationally designated site is Rutland Water SSSI, SPA and Ramsar site located 14 km south of the Section as shown on **Figure 8.1 Statutory Internationally Designated Sites for Nature Conservation**. Designated heritage assets within 1 km of the Section include 'Lowesby deserted medieval village with three fishponds' scheduled monument located 370 m west, 'Roman villa 200m south of Station Cottages' scheduled monument located 160 m east, 'Mound 220yds (200m) NNW of church' scheduled monument located 570 m east, 'Churchyard cross, Moated site at Tilton' scheduled monument located 580 m east, and 'Medieval village earthworks, fishponds and mill leat at Stonton' scheduled monument located 620 m west. There is one RPG within 1 km of the Section which is the Grade II Lowesby Hall RPG located 370 m west. Conservation areas within 1 km of the Section include: Lowesby located 450 m west, Tilton on the Hill located 200 m east, Skeffington

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				located 250 m west, Tugby located 1 km east, and Rolleston located 900 m west. Multiple listed buildings are located within 1 km of the Section. The above listed assets are shown on **Figure 9.1 Designated Heritage Assets**.
Section 5	North Northamptonshire and West Northamptonshire	North Northamptonshire and West Northamptonshire	The infrastructure within this Section includes reconductoring of approximately 34 km of the existing 400 kV ZA overhead line from the confluence of Langton Brook and the River Welland, south west of Welham to the existing Grendon 400 kV Substation.	As shown in **Figure 1.2 Draft Order Limits** Sheet 5 this Section runs in a predominately southerly direction from the confluence of Langton Brook and the River Welland, south west of Welham to the existing Grendon 400 kV Substation, and is approximately 34 km long. The Section falls within the Northamptonshire Vales NCA, an open landscape of gently undulating clay ridges and valleys with occasional steep scarp slopes. There is an overall visual uniformity to the landscape and settlement pattern, with diverse levels of tranquillity, from busy urban areas to some deeply rural parts. The landscape is characterised by a mixed agricultural regime of arable and pasture, with arable land tending to be on the broader, flat river terraces and smaller pastures on the slopes of many minor valleys and on more undulating ground. There is relatively little woodland cover but with a timbered character derived largely from spinneys and copses on the ridges and more undulating land, and from waterside and hedgerow trees and hedgerows. The field pattern is strong, with distinctive river valleys of the Welland and the Nene. See **Figures 6.1** to **6.4** for more information on the baseline landscape. The closest towns are Market Harborough and Wellingborough with the villages Weston by Welland, Sutton Basset, Dingley Braybrooke, Harrington, Orton, Loddington, Mawsley, Great Cransley, Broughton, Pytchley, Orlingbury, Little Harrowden, Hardwick, Mears Ashby, Wilby, Great Doddington, Earls Barton, Castle Ashby and Grendon adjacent to the Section.

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				There are a number of water bodies in this Section including the River Welland, River Jordan, River Ise, Swanspool Brook, River Nene and numerous unnamed ordinary watercourses, with Flood Zones 2 and 3 in areas associated with the above-mentioned water bodies. These water bodies are presented on **Figure 10.1 Surface Water Receptors and their Attributes**. Principal highways crossed in this Section include the A427 Corby Road, A6 Harborough Road, A14 Kettering Road, A43 Kettering Road, A4500 Main Road and A45 Nene Valley Way. The Midland Main Line is also present. Within the Section there are several footpaths, bridleways and local access roads that provide links between rural dwellings and villages as shown on **Figure 13.1 Overall Context Map** and **Figure 13.3 Existing Public Rights of Way**. The closest sites designated for nature conservation include Birch Spinney and Mawsley Marsh SSSI, and the Upper Nene Valley Gravel Pits SSSI, SPA and Ramsar site which the existing ZA overhead line passes directly through as shown on **Figure 8.2 Statutory Nationally Designated Sites for Nature Conservation** and **Figure 8.3 Non-Statutory Designated Sites for Nature Conservation**. There are numerous parcels of ancient woodland within 1 km, including Faxton Corner, and Cransley Wood, as shown on **Figure 8.3 Non-Statutory Designated Sites for Nature Conservation**. Designated heritage assets within 1 km of the Section include ‘Braybrooke Bridge’ scheduled monument and Grade II Listed building located 550 m east, ‘Braybrooke Castle: the remains of a medieval moated manor and medieval settlement remains’ scheduled monument located 600 m east, ‘Site of manor house’ scheduled monument located 850 m west, and ‘Roman villa 200m W of Doddington Mill’ located 430 m east.

Section Name	Local Authority	County Authority	Project Proposals and Approximate Section Length	Description of Principal Features Within or Within 1 km of the Section (All Measurements Approximate)
				RPGs within 1 km include Grade II* Listed Harrington RPG located 850 m west, and Grade I Listed Castle Ashby RPG located 150 m south of the Section. Conservation areas within 1 km of the Section include Braybrooke located 240 m east, Harrington located 450 m west, Cransley located 1 km east, Broughton located 1 km east, Orlingbury located 430 m east and Hardwick located 750 m west. Multiple listed buildings are also located within 1 km of the Section. The above listed assets are shown on **Figure 9.1 Designated Heritage Assets**.

4.3 Project Design Approach

Planning Policy and 'Good Design'

4.3.1 **Chapter 2 Regulatory and Planning Policy Context** sets out the overarching policy relevant to the Project, including the National Policy Statements (NPSs), which are EN-1 (Ref 4.1), the Overarching National Policy Statement for Energy and EN-5 (Ref 4.3), the National Policy Statement for Electricity Networks Infrastructure. Paragraphs 4.7.1 and 4.72 of NPS EN-1 state:

'The visual appearance of a building, structure, or piece of infrastructure, and how it relates to the landscape it sits within, is sometimes considered to be the most important factor in good design. But high quality and inclusive design goes far beyond aesthetic considerations. The functionality of an object – be it a building or other type of infrastructure – including fitness for purpose and sustainability, is equally important.

Applying good design to energy projects should produce sustainable infrastructure sensitive to place, including impacts on heritage, efficient in the use of natural resources, including land-use, and energy used in their construction and operation, matched by an appearance that demonstrates good aesthetic as far as possible. It is acknowledged, however that the nature of energy infrastructure development will often limit the extent to which it can contribute to the enhancement of the quality of the area.'

4.3.2 Paragraphs 2.4.2 and 2.4.3 of NPS EN-5 (Ref 4.3) state that the design principles set out in EN-1 should be considered by the Applicant; '*however, the Secretary of State should bear in mind that electricity networks infrastructure must in the first instance be safe and secure, and that the functional design constraints of safety and security may limit an applicant's ability to influence the aesthetic appearance of that infrastructure*.'

Good Design Principles

4.3.3 Good Design will be followed to ensure the Project achieves excellent functionality, supports sustainability objectives, enables positive placemaking for the benefit of local communities and is resilient.

4.3.4 Design decisions will be guided by a process that ensures balance is given to environmental, economic and social factors achieving multiple beneficial outcomes. As detailed below, this process will be guided by programme wide and Project specific Design Principles, formed specifically in response to the local landscape, environment and community needs.

4.3.5 Applying design principles helps to ensure that the Project meets the criteria in the relevant NPS EN-1 and EN-5.

4.3.6 Design principles are under development, informed by National Infrastructure Commission guidance (Ref 4.4) and the Planning Inspectorate advice on Good Design (Ref 4.5) to inform the development of the Project design, both during its construction and for its operation. Design principles set desirable design outcomes which the Project should endeavour to achieve, as far as is reasonably practicable, and facilitate an integrated design approach which draws together engineering, environment, sustainability and social value design considerations. Design principles ensure that these aspects are robustly addressed during the design, assurance and environmental assessment of the Project. The overarching principles set and implemented on the Project to date are summarised below.

4.3.7 The new section of the Project is currently being designed as an overhead line using the guidance provided in paragraph 2.9.21 in NPS EN-5 (Ref 4.3): '*overhead lines should be the strong starting presumption for electricity networks developments in general, 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)*.' As the Project does not cross any part of a nationally designated landscape there is a presumption for overhead electricity lines.

4.3.8 The Project will be designed, constructed, maintained, and operated in accordance with applicable health and safety legislation and regulations. The Project will comply with relevant design safety standards including the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS) (Ref 4.6) which sets out the criteria and methodology for planning and operating the National Electricity Transmission System. National Grid policies and processes, which contain details on design standards required to be met when designing, constructing, maintaining, and operating assets such as those proposed on the Project, will be adhered to.

4.3.9 The Project is being designed in accordance with the Holford Rules (Ref 4.7) which are described in paragraphs 2.9.16 and 2.9.17 of NPS EN-5 (Ref 4.3), as well as the Horlock Rules (Ref 4.8) which are also described in NPS EN-5 in paragraphs 2.9.18 and 2.9.19.

Design Principles

4.3.10 The National Infrastructure Commission Design Group has engaged widely with a range of bodies to identify a set of four key design principles for national infrastructure (Ref 4.4). The four key design principles are:

- Climate: Mitigate greenhouse gas emissions and adapt to climate change;
- People: Reflect what society wants and share benefits widely;
- Places: Provide a sense of identify and improve our environment; and
- Value: Achieve multiple benefits and solve problems as well.

4.3.11 The four key design principles are intended to be applied to the design of new infrastructure from the start and throughout the project development. In applying the design principles, applicants should: appreciate the wider context, engage meaningfully, and continually measure and improve design.

Electricity Transmission Design Principles

4.3.12 The Electricity Transmission Design Principles (ETDP), published by the National Energy System Operator (NESO) (Ref 4.9), provide a national set of principles for the planning and design of electricity transmission infrastructure across Great Britain. The ETDP aim to improve consistency, transparency and efficiency in transmission project development by setting out strategic, network planning and project development principles for transmission assets.

4.3.13 The ETDP are guidance rather than legislation and do not create new statutory requirements. Their purpose is to support decision-making within existing regulatory and planning frameworks, including the Planning Act 2008 regime for Nationally Significant Infrastructure Projects and the National Policy Statement for Electricity Networks Infrastructure (EN-1 and EN-5). The principles are intended to be embedded within NESO's strategic network planning activities and are expected to be taken into account by transmission owners, developers, regulators and planning authorities when developing and assessing new transmission infrastructure proposals.

The Holford Rules

4.3.14 Paragraph 2.9.16 of the existing NPS EN-5 (Ref 4.3) makes clear '*The Holford Rules (guidelines for the routing of new overhead lines) were originally set out in 1959. These guidelines, intended as a common-sense approach to overhead line route design, were reviewed and updated by the industry in the 1990s, and they should be embodied in the applicants' proposals for new overhead lines*'.

4.3.15 Whilst the guidelines were initially developed in 1959, they have been reviewed on a number of occasions by National Grid and by the other UK transmission licence holders. One of the reviews was against the Electricity Act 1989. The guidelines have stood the test of time and have become accepted industry best practice in overhead line routeing.

The Horlock Rules

4.3.16 The Horlock Rules (Ref 4.8) predominately apply to the siting of substations and line approaches. The general principles underlying the Horlock Rules are the avoidance of areas of high amenity and apply equally to the siting of Sealing End Compounds, although the balance of impacts and constraints will often be different.

4.3.17 As detailed above, NPS EN-5 (Ref 4.3) in paragraph 2.9.18 confirms that the Horlock Rules *'should be embodied in applicants' proposals for the infrastructure associated with new overhead lines'*.

Other Design Considerations

Approach to materials and waste

4.3.18 Delivery of the Project requires sourcing of materials for construction. These fall into the following broad categories:

- new materials required for the Project, such as galvanised steel for towers, reinforced concrete for the foundations, insulator sets (typically glass, porcelain or polymeric) and aluminium/copper conductors;
- recycled materials (including reused aggregate and treated excavated materials, where suitable for use in access tracks, compounds and other temporary works); and
- temporary materials, such as aggregate and bituminous materials for access routes and site compounds, works cabins and security fencing would be required during construction. Where practicable temporary materials would be sourced from other construction projects within the region and reused at other construction projects after completion of the Project.

4.3.19 An Outline Materials and Waste Management Plan (MWMP) will be prepared to support the Environmental Statement (ES); a draft is provided as **Appendix 4B Draft Outline Material and Waste Management Plan**. The Outline MWMP will include information regarding the anticipated quantities and types of waste that will be produced during construction and operation, and the measures proposed to minimise and manage them. This information will only be used to inform those assessments that consider waste generation and material consumption in their assessment methodology, for example, greenhouse gas calculations or vehicle trips used in traffic and transport do not warrant separate assessment of waste generated or waste infrastructure capacity or material supply chains, for the reasons set out below.

4.3.20 The material sources are unlikely to be identified until the detailed design stage of the Project, which would typically happen post consent. The nature of the Project means that it is difficult to use secondary sources during construction of the Project, as this can affect the operation and the design life of the Project. However, National Grid has existing processes in place to source materials from sustainable sources and to use recycled materials where these do not compromise the required design standards and operational life of the Project.

4.3.21 Waste materials would be produced by the Project. The contractor would be required to produce a Site Waste Management Plan prior to construction (commitment GG23 in **Appendix 4A Draft Outline Code of Construction Practice**) and this does not form part of this Stage 2 Consultation. This would set out the measures to reduce the generation of waste in the first place and appropriate measures to reuse and recycle materials where practicable. It would also identify appropriate waste facilities to dispose of materials.

4.3.22 Where practicable, all soil would be reused on-site. Soil may need to be removed from site in certain circumstances, such as where the soil was found to be contaminated, in which case, the soils would be managed in an appropriate manner, as set out in the good practice measures within **Appendix 4A Draft Outline Code of Construction Practice** and **Appendix 4B Draft Outline Material and Waste Management Plan**.

4.3.23 Where the Project crosses through mineral safeguarding areas, a standalone Minerals Assessment Report will be provided with the application for development consent to ensure compliance with policy on this matter. This will identify all safeguarded minerals and provide an appraisal of the effects of the Project against relevant minerals policy. However, the limited presence of minerals and nature of the Project, i.e. the small permanent footprint of towers (which can be micro sited with approximately 300 m to 350 m between them) means that any impacts on mineral safeguarding are not likely to result in significant effects in EIA terms.

4.3.24 If an assessment of material and waste effects from a project of this type were to be carried out, it would be undertaken following Institute of Sustainability and Environmental Professionals (ISEP) (formally Institute of Environmental Management and Assessment (IEMA)) Guidance (Ref 4.9) and consider the potential material use against known supply chain availability, and the amount of waste produced against the likely impact on landfill void capacity. However, given the limited amounts of waste produced and measures to reduce and manage it, and the landfill capacity across the counties and region over which the Project will be delivered, any assessment is not likely to identify significant effects. Material supplies are typically readily available and/or planned well in advance across the Great Grid Upgrade, meaning that any assessment is not likely to identify significant effects on the availability of materials.

4.3.25 As agreed through the Planning Inspectorate's Scoping Opinion (**Appendix 5B**) an assessment of waste and materials is **scoped out** and will not be considered further in the ES. The Outline MWMP provided in the ES will, however, include information regarding the anticipated quantities and types of waste that will be produced during construction and operation.

Approach to energy consumption

4.3.26 The Project aims to support the UK's transition to Net Zero emissions by 2050. As outlined in **Chapter 3 Main Alternatives Considered**, National Grid has a statutory duty to develop and maintain an efficient, coordinated, and economical electricity transmission system. Therefore, the Project would contribute to supporting the UK's Net Zero transition. Notwithstanding the role of the Project in achieving the UK's Net Zero transition, it will result in energy consumption during construction.

4.3.27 The Project would consume energy during manufacture and construction. The Project will consider a range of measures to reduce energy consumption during construction, such as the use of energy efficient plant and tools. The Project will aim to use local grid connections for temporary site power, where viable. Where not viable an alternative sustainable option should be used, such as appropriately sized alternatively fuelled or hybrid generators, where practicable.

4.3.28 Measures to reduce journeys, and hence the energy consumption from those journeys, such as car sharing and using public transport where practicable are outlined in **Appendix 13D Draft Outline Construction Traffic Management Plan**. Also, plant and construction vehicles will conform to relevant applicable standards for the vehicle types (see commitment GG14 in **Appendix 4A Draft Outline Code of Construction Practice**).

4.3.29 Energy consumption during maintenance and operation would be limited to the energy required to maintain and operate the Project and transmission losses. National Grid also has existing processes in place to monitor its energy consumption across the network. If consented, the operational energy requirements would be managed as part of the wider network operation.

4.3.30 The measures outlined above would reduce the energy consumption of the Project during both construction and operation in line with the good design principles.

Design resilience to climate change

4.3.31 The Project is needed to support the UK's Net Zero target by reinforcing the electricity transmission network along the East Coast and facilitating the connection of planned offshore wind generation, interconnectors with other countries and other sources of electricity, allowing clean green energy to be carried on the network. Therefore, the Project would contribute to supporting the UK's Net Zero transition. The need for the Project is further outlined in **Chapter 1 Introduction**.

4.3.32 In terms of vulnerability of the Project to climate change, overhead lines are designed to withstand extreme weather conditions. The resilience of National Grid infrastructure to the effects of climate change is under continuous review and where relevant will result in appropriate updates to policy, procedure and design standards. The vulnerability of the Project (all permanent assets) to future flooding will be considered as part of the Flood Risk Assessment accompanying the ES.

4.3.33 The project description chapter within the ES will detail likely construction materials. This will be supported by an estimate of the greenhouse gas emissions associated with the construction phase of the Project, comparing this against UK emissions to determine if the Project is likely to have a material impact on the ability of the government to meet its carbon reduction targets. The assessment would also look to identify potential opportunities to save carbon.

Approach to electric and magnetic fields

4.3.34 The Project would be designed to comply with existing National Grid standards and relevant external guidelines and policies relating to electric and magnetic fields (EMFs) as stated in NPS EN-5 (Ref 4.3), including the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for reducing effects in relation to EMFs (Ref 4.11). Compliance with these guidelines and policies mean that the Project will already have designed out potential effects from EMFs to a level appropriate to meet health and safety standards, including precautionary measures.

4.3.35 An EMF report will be produced to demonstrate compliance of the project with the requirements of NPS EN-5 (Ref 4.3), including the exposure limits and precautionary measures. A summary of this report will be included in the ES.

Design, standard and additional mitigation measures

4.3.36 Three types of mitigation have been assumed to be incorporated into the Project and have been taken into account in the conclusions presented in the DES. These are design measures, standard measures for the control and management of impacts and additional mitigation measures. They are described in relevant technical chapters, in **Appendix 4A Draft Outline Code of Construction Practice** and supporting management plans, of this DES.

4.3.37 Environmental appraisal has been an integral part of the Project design process since conception, which has meant that the Project has sought to avoid environmentally sensitive features as far as reasonably possible, as described above and further detailed in **Chapter 3 Main Alternatives Considered**.

4.3.38 Design mitigation measures have therefore been identified and incorporated into the Project, to avoid or reduce significant effects that may otherwise be experienced during construction and operation of the Project. **Table 4.2** outlines the design mitigation measures that have been incorporated into the Project to date.

Table 4.2 Design mitigation measures

Design Measure	Benefits
Sensitive Routeing and Siting to develop the draft overhead line alignment, siting of substations and draft Order Limits	Avoids and reduces, as far as practicable, impacts on identified receptors, in line with NPS EN-1 (Section 5.10) (Ref 4.1) and EN-5 (Section 2.10) (Ref 4.3) as well as the Holford Rules (Rule 1 and 2) (Ref 4.7) and the Horlock Rules (Section III) (Ref 4.8).
The Project will be designed to comply with existing National Grid standards and relevant external guidelines and policies relating to EMFs, as stated in NPS EN-5 (Ref 4.3), including the ICNIRP guidelines for reducing effects in relation to EMFs (Ref 4.11)	Compliance with these guidelines and policies mean that the Project will already have designed out potential effects from EMFs to a level appropriate to meet health and safety standards, including precautionary measures.
The Project will be designed to comply with design safety standards including NETS SQSS	Existing National Grid policies and processes identify potential safety risks during construction and operation

Design Measure	Benefits
(Ref 4.6) and the suite of National Grid policies and processes which contains details on design standards required to be met when designing, constructing and operating its projects	(and maintenance) which are designed out at each stage of Project development.
Tower fittings	Tower fittings, such as insulators, dampers, spacers and clamps, are designed and procured in accordance with a series of National Grid Technical Specifications and must be type registered (rigorously tested) to ensure the fitting conforms to the specification. These processes reduce the potential for audible noise and tones to occur from all types of fittings, including insulators. Where noise does occur, it is likely to be localised and of short duration. If this is due to a fault, action can be taken to rectify it. Where noise from fittings is reported and results in a complaint, appropriate action can be taken to seek to remedy the cause of the noise, usually through cleaning or replacing the relevant fitting.
The design includes strategically located temporary haul roads along the Project alignment to support construction of the Project	Reduce the effects of construction traffic movements by avoiding receptors and sensitive routes on local roads.
Utilising existing watercourse crossing points as far as practicable	Where reasonably practicable the design of the temporary haul roads has sought to utilise existing bridges and culverts.
Large or sensitive watercourses, for example those designated as main river, and those with Water Environment Regulations (WER) status, would be crossed by the temporary haul road using temporary clear span bridges	Reduce the effects on watercourses, their banks, and water quality as a result of removing works from within the watercourse.
Siting of the proposed infrastructure within the draft Order Limits to minimise potential impacts on sensitive receptors	Individual towers and temporary haul roads have been designed to avoid direct and indirect impacts on sensitive receptors (including residential properties, businesses, designated sites and heritage assets) as far as reasonably practicable.
Application of stand-off distances	Appropriate stand-off distances, where practicable, have been applied to sensitive receptors (including designated sites, priority habitats, hedgerows, heritage assets, residential properties and watercourse) to avoid direct effects where practicable.

Design Measure	Benefits
Vegetation clearance	Vegetation clearance will be limited to the minimum within the draft Order Limits required to undertake the works, and focussed on the areas described in Chapter 4 Description of the Project paragraphs 4.7.35 to 4.7.41.
Micro-siting of towers	Micro-siting of towers would take into account the swing of the overhead line to avoid or minimise loss from notable habitats, including woodland and trees; and
Temporary habitat loss	Areas of temporary habitat loss would be reinstated, where practicable, following the completion of construction in each section. Where possible, reinstatement would be back to type of habitat affected or improved/enhanced.

4.3.39 The design of the Project will be continually reviewed in line with assessment work and consultation feedback as it progresses to the detailed design. The environmental assessment will continue to influence the design and mitigation measures may be embedded into the design to help avoid and reduce significant effects arising from the Project. **Table 4.2** will be updated in the ES to document any further measures that have been developed and embedded into the design.

4.3.40 A range of standard measures for the Project will be adopted throughout the duration of the construction phase. A Draft CoCP is provided in **Appendix 4A Draft Outline Code of Construction Practice**.

4.3.41 Additional mitigation measures are those identified through assessment to reduce likely significant adverse environmental effects which may still occur despite the inclusion of the embedded design and standard measures described above.

4.4 Flexibility and Uncertainty

4.4.1 The Planning Inspectorate's guidance: Nationally Significant Infrastructure Projects: Pre-Application Advice on Environmental Impact Assessment (27 July 2026) (Ref 4.12) provides guidance regarding the degree of flexibility that may be considered appropriate within an application for development consent under the Planning Act 2008. The guidance acknowledges that there may be parameters of a project's design that are not yet fixed and, therefore, it may be necessary for the ES to assess the likely worst-case scenario to ensure that the likely significant effects of the project have been assessed.

4.4.2 Where design flexibility has the potential to influence assessment outcomes, the relevant alternative scenarios outlined in **Table 4.3** have been assessed within the relevant environmental topic chapters.

Application of the Rochdale Envelope

4.4.3 The description of the Project in this chapter reflects what is currently known, at the time of Stage 2 Consultation. However, as the Project evolves, sufficient flexibility within the design is allowed for potential changes identified at later stages of design and delivery to be accommodated within the likely footprint, and environmental effects assessed and reported at planning consent stages.

4.4.4 As such, the Project design presented in the ES and the accompanying assessment, will reflect both the need for this flexibility and the requirements of the Planning Inspectorate's Pre-Application Advice on EIA (Ref 4.12) to ensure that the likely significant effects of the Project are assessed on the basis of a worst-case scenario.

4.4.5 The preliminary assessment of likely significant effects in this DES is based on the description of the design, construction, operation (and maintenance) of the Project presented in this chapter. Consideration has been given in relevant assessments to the potential for variation in some individual components of the Project.

4.4.6 Horizontal and vertical Limits of Deviation (LoD) for the substations have not yet been defined. The preliminary assessment of these works is based on a worst-case scenario, which is allowed for in the draft Order Limits as shown on **Figure 1.2 Draft Order Limits**, i.e. 'the Rochdale Envelope'.

Draft Order Limits and Limits of Deviation

4.4.7 The draft Order Limits are defined as the maximum extent of land within which the works required for the Project, as defined within this DES, may be undertaken. They include both permanent and temporary land required to construct, operate and maintain the Project. The draft Order Limits are illustrated on **Figure 1.2 Draft Order Limits**.

4.4.8 As recognised by the government's guidance (Ref 4.12), a necessary and proportionate degree of flexibility needs to be incorporated into the design of development so that unforeseen issues encountered after a development has been consented can be addressed. For example: previously unidentified poor ground conditions, or the identification of significant unrecorded archaeological remains which may require a tower to be re-sited. Therefore, to allow for this necessary and proportionate degree of flexibility, the LoD have been developed for the Project components which will ultimately be detailed in the development consent order (DCO). The LoD will provide a maximum distance or measurement of variation for permanent linear infrastructure.

4.4.9 In respect of a new 400 kV overhead line, the LOD will be applied horizontally and vertically, as follows.

Horizontal

4.4.10 The horizontal LoD for straight sections of new overhead line at this stage is in general 75 m either side of the centreline, giving a total width of 150 m. This is wider where additional space is required for construction works and access, or in certain locations reduced to avoid direct impact or oversailing a particular receptor. This width may reduce further following surveys, design development and stakeholder engagement. As this information is still being collected at this stage, flexibility is required to allow this to be confirmed at later design stages. The minimum LoD is typically 100 m allowing for the extent of movement of any tower (50 m either side of the centreline) limited by the span length and conductor swing. At a maximum span length, the centre of the tower could move approximately 20 m either side of the centreline subject to topography and local conditions, therefore flexibility is required at this stage.

4.4.11 There is no fixed limit on the movement of a tower along the centreline of the proposed route, i.e. towers can move up and down the centreline (longitudinal LoD). While there is no fixed limit, in practical terms the movement of towers along the centreline is constrained by a combination of the span distance between adjacent towers and maintaining the necessary ground clearances without exceeding the vertical LoD described below.

Vertical

4.4.12 The upwards vertical LoD for a typical standard lattice tower is approximately 6 m which would allow for two extension panels (typically 3 m per extension panel but this varies between tower types). This is to provide design flexibility to ensure that vertical clearance distances can be maintained. Crossings of Statutory Main Rivers and/or Network Rail infrastructure may require bespoke towers due to the increased clearance requirements and therefore require a larger vertical LoD to maintain an appropriate level of design flexibility to ensure clearance requirements are achieved. The vertical LoD for these crossings will be confirmed in the ES.

4.4.13 There is no limit placed on the maximum depth of below ground works. Whilst a standard below ground LoD is not proposed, the Project would never go deeper than necessary for technical or environmental reasons as this would add engineering operational complexity and cost.

Known Uncertainty

4.4.14 There are some elements of the Project which have not been fully determined at Stage 2 Consultation or alternatives scenarios that may need to be considered. To ensure a reasonable worst case is considered, a preliminary assessment of the potential changes to the conclusions reported in each technical aspect of this assessment has been undertaken for two alternative scenarios and reported at the end of the assessment section of each aspect chapter. The elements and/or scenarios considered are described in **Table 4.3**.

Table 4.3 Alternative scenarios considered in the assessment

Scenario	How Elements Not Yet Fixed at Stage 2 Consultation Have Been Assessed
1. No or reduced haul roads	The current design, construction information and approach considered in the assessment is based on haul roads being installed over the length of the new overhead line. This would enable 250 tonne cranes and construction traffic to travel along the haul road length rather than the local highway network. Alternative equipment and installation techniques are under consideration which could change the access strategy and haul road construction method. One alternative, where practicable, is to employ agricultural equipment and derricks to construct towers and use existing agricultural access points and temporary trackway. This would avoid the need to install temporary haul roads (as trackway could be laid down on the surface) and reduce the size of plant required on-site, such as cranes. If used, this could change the number and type of vehicles required on the highway network, and the roads used to access the site.

Scenario	How Elements Not Yet Fixed at Stage 2 Consultation Have Been Assessed
2. Off-site construction compound near Melton Mowbray	The Project currently considers the use of several construction compounds located along the proposed new overhead line as described in **Table 4.6**. An alternative option is under consideration whereby a centralised main compound would be established off-site. A potential suitable location for the off-site construction compound has been identified on a business park to the north west of Melton Mowbray. This is shown on **Figure 4.1 Proposed Project Design**. The use of an off-site construction compound would result in different construction traffic distribution on the network and introduce construction activities in proximity to different potential receptors.

4.5 Proposed Infrastructure

4.5.1 The location of each aspect of the Project described in this chapter is shown on **Figure 4.1 Proposed Project Design**.

New Overhead Line

4.5.2 The new overhead line would comprise conductors (the wires) supported by towers. A typical tower operating at 400 kV is approximately 50 m in height; however, the proposed height of each tower would depend on the specifics of each location such as topography, land use and crossings (e.g. including other electricity networks, watercourses and other obstacles). Indicative tower heights, including gantries, in each Section are provided in **Table 4.4**; these will be confirmed within the ES and will be limited by a vertical LoD to be defined through the development of the Project. A typical span distance between towers is approximately 350 m. In broad terms there are typically three towers for every kilometre of overhead line.

Table 4.4 Range of tower heights in each Section

Route Section	Total Number of Towers	Average Height Above Ground Level (m)	Minimum Height (up to) (m)	Maximum Height[1] Above Ground Level (up to) (m) (Including LoD)
Section 1	36	52	12	63
Section 2	101	50	12	63
Section 3	70	51	12	63

4.5.3 Towers are in general either: suspension towers, from which the conductor is simply suspended, or tension towers, which are more robust structures that hold conductors in tension where the alignment of an overhead line changes direction or to maintain tension in long straight sections of the route. An example of a suspension tower and a tension tower is shown in **Image 4.2**. In some locations, such as on the overhead line entries to the proposed substations, terminal towers are required.

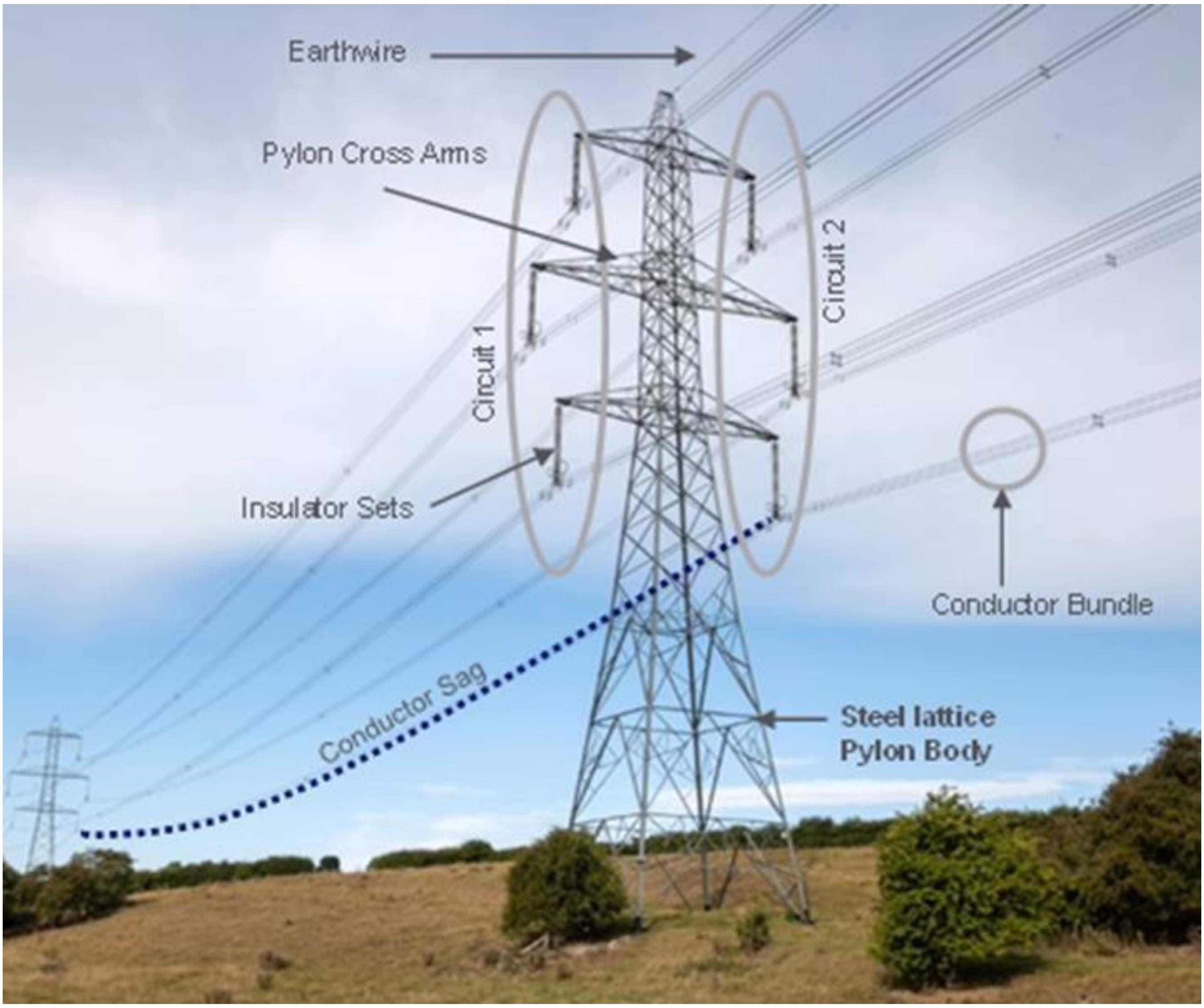
[1] This is the maximum height of custom towers within each Section including the LoD.

4.5.4 The tallest structures within the substation compound would be the overhead line gantries, which are typically steel or concrete structures used as a connection point for the downleads which connect between the terminal towers of overhead lines and equipment within the substation. They are approximately 15 m high.

4.5.5 The conductors are connected to the tower by an insulator assembly consisting of a set of insulators (components made from a material with a high resistance to the flow of electric current such as glass or polymeric), steel fittings, and conductor clamps. Additional fittings, such as spacers and vibration dampers, would be fitted to the conductors. Spacers prevent the conductors from touching each other and vibration dampers prevent oscillations from the conductors from reaching the insulator fittings and minimise effects of fatigue loading. Arcing horns would also be required to protect insulators from damage due to dangerous electrical conditions, such as over-voltages due to electrical faults or lightning strikes.

4.5.6 The main components of an overhead line are shown in **Image 4.1**, which shows a typical steel lattice suspension tower.

Image 4.1 Components of a typical transmission connection (towers are synonymous with ‘pylons’ in this image’)



4.5.7 Where the route of the overhead line changes, tension towers are used. Tension towers have slightly wider bases and differing alignments between the insulators and conductors, as they take the strain of the sideways forces created by the change in direction. A tension tower is shown in **Image 4.2**.

Image 4.2 Suspension tower (left) and tension tower (right)

Proposed towers

4.5.8 The proposed towers for the Project would comprise of steel lattice with three crossarms on either side of a central body.

4.5.9 Alternative tower designs such as low height steel lattice towers may also be considered, where mitigation (e.g. for landscape and visual effects) is required, and have been considered as part of the design evolution of the Project. The main tower designs considered in this assessment are illustrated in **Image 4.3** and described in **Table 4.5**.

Image 4.3 Main and alternative tower types (towers are synonymous with 'pylons' in this image')

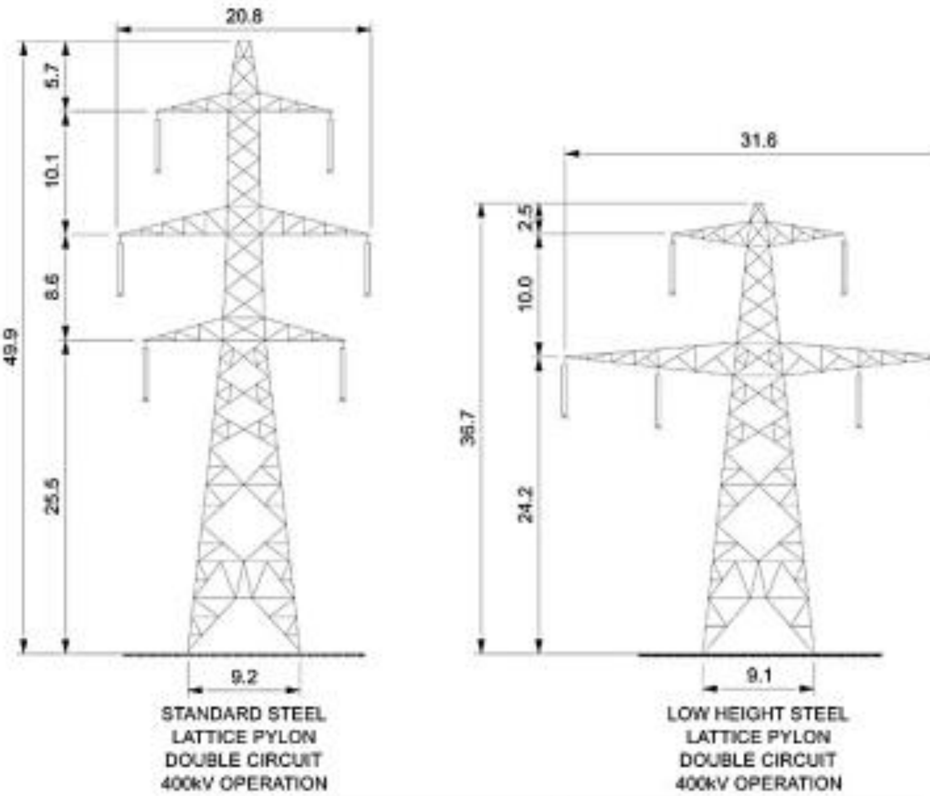


Table 4.5 Main and alternative tower dimensions

Characteristic	Standard Lattice Tower	Low Height Lattice Tower
Standard Height	49.9 m	36.7 m
Standard Tower Design Width	20.8 m	31.6 m
Standard Base Dimensions	9.2 m square	9.1 m square
Min and Max Tower Heights	43.9 m to 67.9 m	32.2 m to 45.7 m
Min and Max Tower Base Widths	8.0 m to 13.3 m square	7.9 m to 11.3 m square

Proposed conductors and insulators

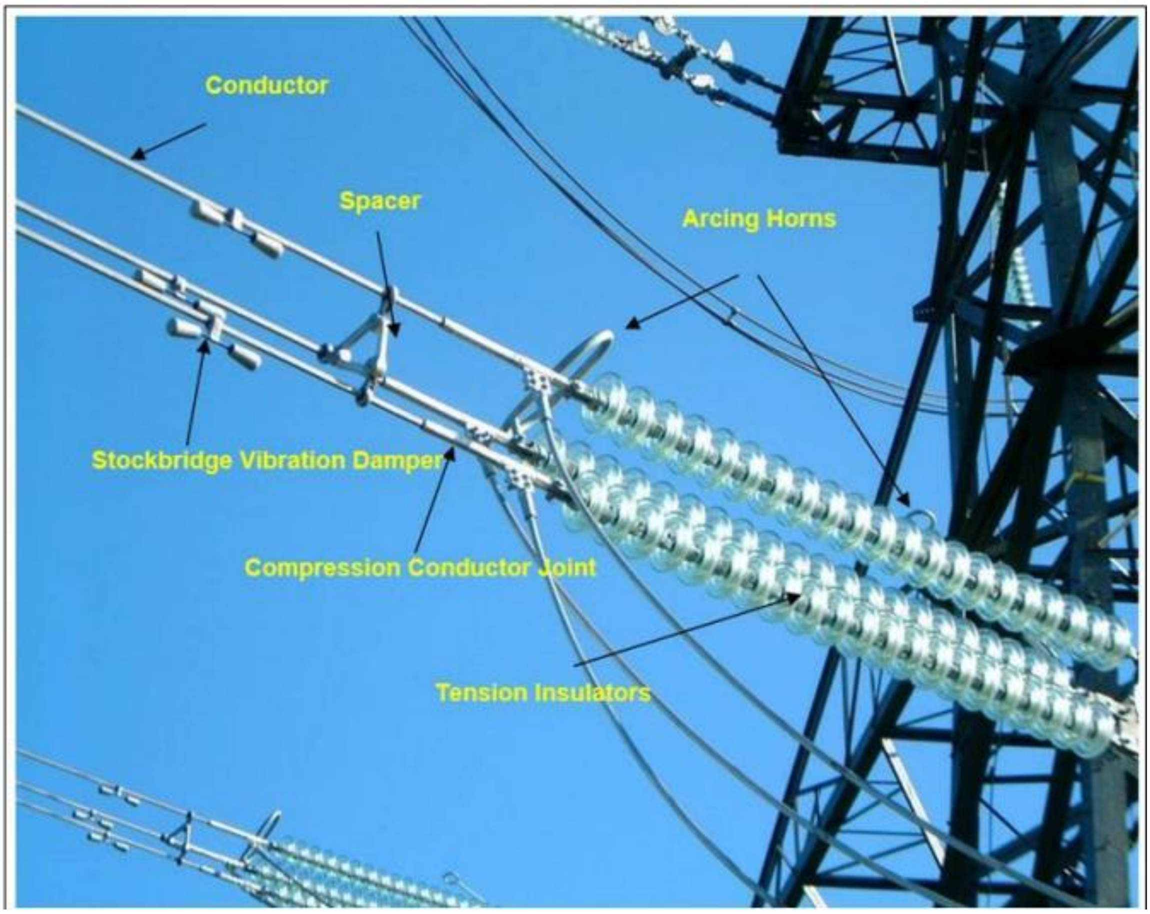
4.5.10 The conductor type is expected to be triple Araucaria comprising three conductors per bundle, and a total of 18 conductors per tower which carry the electrical current along the overhead line route. Triple Araucaria is considered a 'low noise' conductor system, reducing the effects of line crackle (corona discharge), and would reduce the generation of noise from the overhead line during operation.

4.5.11 The overhead line would also be installed with an earthwire, typically consisting of a smaller single conductor which runs along the peaks of the towers. The earthwire provides an electrical connection between the towers to provide protection against lightning and distribution of fault currents. The earthwire also contains a fibre optic cable which allows for telecommunication signals to be communicated along the overhead line route.

4.5.12 Insulators can be made of different types of material, but the most common industry standard is either glass or polymeric.

4.5.13 Suspension towers would typically have a single insulator string hanging vertically downwards from each crossarm end to carry the conductor bundle, giving six sets of suspensions insulators on each suspension tower. A tension tower would typically have one insulator string per conductor in each conductor bundle attached to the end of each cross arm (i.e. three insulator strings for a conductor bundle consisting of three conductors). For one circuit on one side of the tower, this gives a total of 18 sets of tension insulators (nine sets facing along one direction of the overhead line route, and nine sets facing the opposite direction). Across both circuits there would be a total of 36 sets of tension insulators per tension tower. Tension insulators are oriented roughly horizontally outwards from the crossarm ends and accommodate the longitudinal force of the tension of the conductors. Conductor fittings are shown in **Image 4.4**.

Image 4.4 Indicative conductor fittings



Foundations

4.5.14 It is envisaged that different foundation types will be required for the new overhead line towers to suit the site-specific ground conditions. Whilst the most appropriate form of foundation will be confirmed by the designers following completion of site-specific ground investigation and detailed design, it is envisaged that a range of foundation types will be required which may potentially include pad and column, straight shafted bored piles, and micropiles amongst other potential solutions.

4.5.15 Foundation improvements may be required to existing reconductored overhead line towers subject to design development, site-specific risk assessment and associated intrusive ground investigation.

Watercourse crossings

4.5.16 The Project would require approximately 198 watercourse crossings (including drains and ditches) during construction. It is currently anticipated that 187 of these would be by pipe/culvert and 11 would be by single span bridge. The method of crossing a watercourse would depend upon several factors. For example, large or important watercourses, and those with WER status require clear span bridges; whereas smaller watercourses would likely use culverts. Detail of proposed watercourse crossings will be presented in the ES.

4.5.17 The Project crosses three navigable waterways; however, no structures (bridges or culverts) are proposed over the River Welland or the River Glen. A suitable temporary bridge would be required over the South Forty Foot Drain, part of the Black Sluice Navigation. The Statutory Main River crossings within this area include the following:

- River Welland;
- River Glen;
- South Forty Foot Drain;
- Car Dyke;
- East Glen River;
- West Glen River; and
- River Witham.

Highway crossings

4.5.18 The Project will cross over the following principal highways:

- A16 Spalding Road;
- A15 Folkingham Road;
- A151 Station Road;
- A1 Great North Road;
- A607 Melton Road; and
- A606 Nottingham Road.

Railway crossings

4.5.19 The Project will cross over two railway lines. No permanent structures are proposed over these railway lines. These are:

- Peterborough to Lincoln line; and
- East Coast Main Line.

Third party (statutory undertakers) works

4.5.20 Prior to the commencement of construction works for the Project, several existing overhead and underground third-party services would need to be diverted, removed, undergrounded, or protected. This is largely where they interface with the Project, for example, with proposed new overhead line crossings, along Primary Access Routes or at site access point locations.

4.5.21 Where open trench diversions of third-party services are not feasible, for example, where the proposed route crosses a watercourse, trenchless installation may be required, an example of which is Horizontal Directional Drilling. This would reduce ecological effects compared to open-cut construction, particularly on the aquatic biodiversity receptors.

4.5.22 The required mitigation methods, and duration (i.e. permanent, or temporary mitigation) need to be confirmed with the asset owners prior to any works being carried out.

4.5.23 The Project route will cross the following major existing utility infrastructure:

- three 132 kV overhead lines;
- one 33 kV overhead line;
- ten 11 kV overhead lines;
- seven 11 kV underground cables; and
- two Gas Main – Intermediate[2].

Substations

4.5.24 The Project includes two new 400 kV substations. For the purpose of the preliminary environmental assessment in this DES, it has been assumed that both substations would be air insulated switchgear (AIS) substations. AIS substations use air as the insultation medium for electrical equipment meaning that equipment is predominantly located outdoors. A typical AIS substation is shown in **Image 4.5**.

Image 4.5 Illustrative example of a typical AIS substation

[2] An intermediate-pressure gas main is part of the gas distribution network that carries natural gas at pressures higher than low-pressure mains, but lower than the national transmission system.

4.5.25 The two new 400 kV substations are referred to as:

- WMEL-A Substation (Section 2); and
- WMEL-B Substation (Section 3).

4.5.26 The two new substations (WMEL-A and WMEL-B) are required to connect the new 400 kV overhead line to the existing 400 kV 4VK (Cottam – Eaton Socon – Wymondley) overhead line and 400 kV ZA (Cottam – Grendon – Staythorpe) overhead line.

4.5.27 The two new substations are currently assumed to be located within the emerging preferred Siting Areas shown in **Figure 3.8 WMEL-A Substation Graduated Swathe** and **Figure 3.9 WMEL-B Substation Graduated Swathe**. These locations are within the draft Order Limits considered in this DES and shown on **Figure 4.1 Proposed Project Design**.

4.5.28 The precise location, orientation and layout of the substation infrastructure will be confirmed through further design, assessment, and consideration of stakeholder feedback. The functional footprint of the substations will also be confirmed.

4.5.29 At the eastern end of the Project the new overhead line would tie into gantries associated with and provided as part of the new Weston Marsh substation infrastructure, to be delivered by the Grimsby to Walpole Project.

New Weston Marsh substation infrastructure

4.5.30 The new Weston Marsh substation infrastructure is located at the eastern end of the draft Order Limits, to the north east of Spalding, and will be delivered by the Grimsby to Walpole Project.

4.5.31 The infrastructure comprises two new substations which will connect to the existing 400 kV 4ZM transmission line that runs south east of Sleaford towards King's Lynn, and the existing 400 kV 2WS transmission line that runs east of Spalding towards a Tee-Point with the 400 kV 4ZM transmission line between Sleaford and King's Lynn.

New WMEL-A Substation

4.5.32 The new WMEL-A Substation will be located within Section 2, approximately 1.2 km west of Corby Glen and 1.5 km north west of Swayfield.

4.5.33 The total footprint of the proposed WMEL-A Substation is approximately 16.4 ha, with sixteen to eighteen bays, encompassing the main compound and an area near the entrance for ancillary equipment and car parking. The existing 4VK overhead line would be reconfigured to connect to the WMEL-A Substation. The maximum height for high voltage (HV) plant and buildings within the substation is 12.5 m and the maximum height for gantries, which connect the new overhead line, is assumed to be 17 m.

4.5.34 WMEL-A would be accessed via a new road approximately 270 m long from the A151 Station Road to the south of the substation.

4.5.35 A 30,000 m^3 balancing pond is proposed to the south west of the substation to provide permanent surface water attenuation. A drainage outfall to an unnamed ordinary watercourse is proposed to the north of the pond.

4.5.36 The detailed design of the substation, including fencing, landscaping, lighting and layout, will be confirmed and reported in the ES.

New WMEL-B Substation

4.5.37 The new WMEL-B Substation will be located within Section 3 approximately 0.4 km south west of Wartnaby and 0.6 km north of Saxelbye.

4.5.38 The total footprint of the proposed WMEL-B Substation would be approximately 12.6 ha, with twelve to fourteen bays, encompassing the main compound and an area near the entrance for ancillary equipment and car parking. The existing ZA overhead line would be reconfigured to connect to the WMEL-B Substation. The maximum height for HV plant and buildings within the substation is 12.5 m and the maximum height for gantries, which connect the new overhead line, is assumed to be 17 m.

4.5.39 WMEL-B would be accessed via a new road approximately 1 km long from the Six Hills Lane to the north of the substation.

4.5.40 A 20,000 m^3 balancing pond is proposed to the east of the substation to provide permanent surface water attenuation. A drainage outfall to an unnamed ordinary watercourse is proposed to the east of the pond.

4.5.41 The detailed design of the substation, including fencing, landscaping, lighting and layout, will be confirmed and reported in the ES.

Reconductoring

4.5.42 Reconductoring involves upgrading existing electricity transmission lines by replacing old conductors with new, more efficient ones that can transfer higher electrical loads. This process is crucial for enhancing the capacity and reliability of the existing ZA overhead line to which the Project will connect. Reconductoring aims to increase the amount of electricity that can be transmitted over existing lines by using efficient conductors that generally operate at higher temperatures and carry more power.

4.5.43 The process would require the replacement of pieces of steelwork and fittings, although the tower itself would remain in place (except potentially in limited circumstances where tower replacement is required, as detailed below). The cross arms would also need to be upgraded on some of the towers prior to the installation of the new conductor system. New crossarm steelwork would be delivered to site, assembled, the existing crossarms and conductors removed and new crossarms lifted into place using a mobile telescopic crane. This will require careful planning and coordination to minimise disruptions to the power supply. However, as the works replace existing conductors, there is no horizontal, and only limited vertical realignment proposed, resulting in limited operational impact and as such, no potential for significant operational effects. These include landscape and visual impacts, or impacts to the setting of heritage assets. This is due to the fact that the electricity transmission lines already exist in the environment.

4.5.44 The reconductoring is part of a broader project to modernise the 4VA overhead line (known as ‘SGRE’) to ensure it is capable of meeting future energy demands and supporting the transition to a cleaner energy system. The Strategic Options Report assessed additional reconductoring of existing transmission lines alongside new transmission connections (Ref 4.13). The reconductoring of the existing ZA overhead line in this Project would extend from the WMEL-B Substation to the existing Grendon Substation near Northampton, as shown in **Figure 1.2 Draft Order Limits**.

The works would comprise replacement of existing conductors and associated fittings, and possibly strengthening of tower steelwork. Structural surveys have not yet been undertaken; however, one side of the conductors was replaced around 12 years ago and it is anticipated that strengthening works would likely be required, rather than tower replacement. It is expected that condition surveys will only identify a limited number of towers which may need replacing. Any replacement towers would be in similar locations in close proximity to existing towers and of similar heights and appearance to the towers that they would replace and, if required, will be considered in the ES.

4.5.45 The existing ZA overhead line requiring reconductoring is located in Section 3, Section 4 and Section 5, in the local authorities of Melton, Harborough, West Northamptonshire and North Northamptonshire.

4.6 Construction

4.6.1 This section describes how the infrastructure described above would typically be constructed and installed. A range of standard measures for the Project will be adopted throughout the duration of the construction phase. A Draft Outline CoCP has been produced and is included in **Appendix 4A Draft Outline Code of Construction Practice**. The aspect chapters (**Chapters 6 to 19**) have taken account of these standard control and management measures, as set out in the Draft Outline CoCP, when undertaking the preliminary assessment. The Outline CoCP will be developed following further design, assessment, and stakeholder engagement, and provided with the ES.

Construction Programme

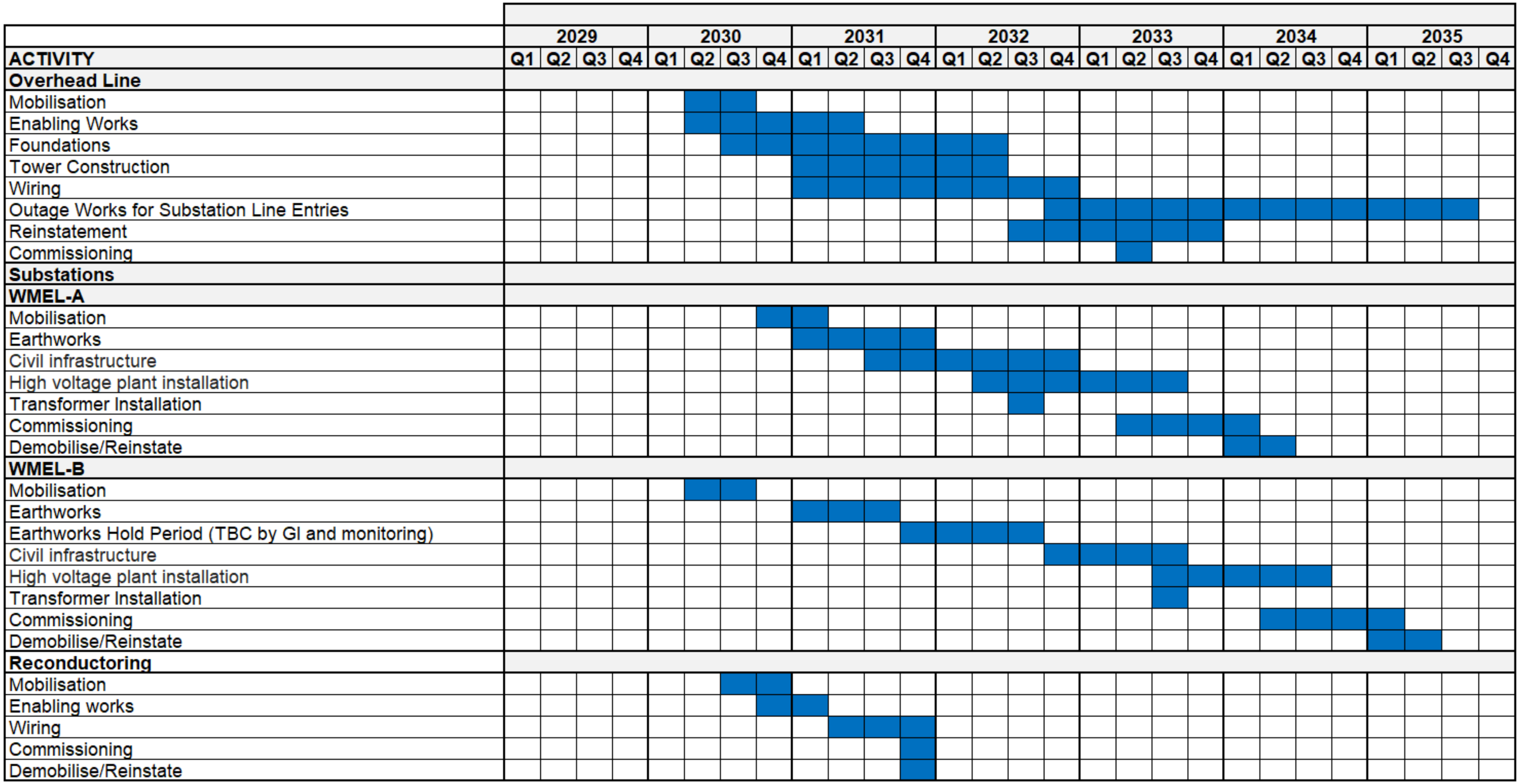
4.6.2 Subject to gaining development consent, assumed to be granted in 2029 following an application in 2028, it is anticipated that access and construction of the Project would commence in mid-2030. This would start with enabling works including site clearance activities, the installation of construction compounds and temporary access tracks/haul roads. It is expected the main construction works (construction of the new 400 kV overhead line, the new substations, and the reconductoring) would continue through to 2035, including any reinstatement required.

4.6.3 The construction schedule will be developed as the Project progresses and will take account of seasonal constraints such as protected species breeding or hibernation seasons; reducing impacts associated with working within flood zones; and network outage availability.

4.6.4 The nature of the Project is such that construction activities at each of the substations would occur for much of the five-year period albeit with peaks in traffic movements anticipated during construction of the substation platforms. An indicative one-year earthworks hold period is illustrated in **Image 4.6** for the WMEL-B Substation to allow for ground settlement, subject to further review following ground investigation and monitoring. Activities involved in overhead line construction are transient in nature and would move along the length of the overhead line over time. Therefore, the works in any given area along the overhead line route would be of much shorter duration than those for the substations which largely set the overall construction programme.

4.6.5 An indicative construction programme for the Project is presented in **Image 4.6**. Further details on the phasing of the Project programme will be set out in the ES.

Image 4.6 Indicative construction programme



Construction Workforce

4.6.6 It is anticipated the peak construction workforce for the Project would be approximately 50 in 2030/31 for enabling works, 320 in 2031 for overhead line works, 380 in 2031/32 for substation works and 180 in 2031 for reconductoring works. The number of workers will be reviewed as part of the ongoing design work and any final updates will be presented in the ES.

Construction Working Hours

4.6.7 The proposed core construction working hours are:

- Monday to Friday 07:00 – 19:00; and
- Saturdays, Sundays, Bank Holidays and other Public Holidays 07:00 – 17:00.

4.6.8 The core construction working hours would exclude start up and close down activities which would take up to one hour before or after the core construction working hours.

4.6.9 Some construction activities may take place outside of the proposed core working hours referred to above, to minimise disruption to the public. Examples of these works, may include, but are not limited to the following:

- the jointing of underground cables for third-party services, with the exception of cable cutting which would only take place during the core working hours;
- the installation and removal of conductors, pilot wires and associated protection across highways, railway lines, existing overhead lines or watercourses;
- the continuation of operations commenced during the core working hours to a point at which they can be safely paused;
- any highway works requested by the relevant highway authority as necessary to be undertaken outside of core working hours (where possible);
- oil processing of transformers or reactors in substation sites;
- the testing or commissioning of any electrical plant installed as part of the authorised development;
- the completion of works delayed or held up by severe weather conditions which disrupted or interrupted normal construction activities;
- security monitoring and surveys;
- trenchless crossing operations;
- deliveries of Abnormal Indivisible Loads (AILs), for example the cable drums which may be outside the core working hours; and
- large concrete pours that cannot be reasonably completed within the core working hours.

Construction Compounds

4.6.10 There would be an element of preparatory works in anticipation of construction at all temporary construction sites. The working areas would be demarcated and secured by temporary fencing appropriate to the location, for example, provision of stockproof fencing in grazing areas. Gated entrances would be installed at the entrance to the working areas, to secure the site. Once secured, the working area, site compounds and proposed cable sections would generally be stripped of the upper layers of soil which would be stored appropriately.

4.6.11 Construction compounds would be established early in the construction programme. Site cabins (standard modular units) may be up to double storey and may be raised to take account of potential flood risk.

4.6.12 The following types of compounds are proposed to facilitate construction of the Project:

- Primary compounds – eight proposed – with approximate dimensions of 155 m x 155 m. These would allow for deliveries, materials storage, fuel storage, office space, meeting facilities, welfare facilities and crane platforms for unloading cable drums. They would be typically surfaced with stone chippings over geogrid.
- Secondary compounds – seven proposed – with approximate dimensions of 100 m x 100 m. These would allow for deliveries, materials storage, fuel storage, office space, meeting facilities, welfare facilities and crane platforms for unloading cable drums. They would be typically surfaced with stone chippings over geogrid.
- Tertiary compounds – two proposed – with approximate dimensions of 72 m x 55 m. These would allow for deliveries, materials storage, fuel storage, office space, meeting facilities, welfare facilities and crane platforms for unloading cable drums. They would be typically surfaced with stone chippings over geogrid.
- Substation compounds – two proposed – these would be appropriately positioned at substation locations. The dimensions for substation compounds are typically 2.25 ha, specific dimensions being defined within the ES. They would be typically surfaced with stone chippings over geogrid.
- Laydown areas – sixteen proposed – these would be appropriately positioned site access points. These areas have been identified to, in part, facilitate the construction of the haul road and materials storage. These laydown areas have been selected to avoid sensitive environmental features and would likely store material to a maximum of 4 m in height at any one time.

4.6.13 The location of the proposed construction compounds (to the nearest town or to the nearest Project infrastructure) are shown on **Figure 4.1 Proposed Project Design** and described in **Table 4.6**.

Table 4.6 Proposed construction compounds

Compound No.	Compound Location (to Nearest Town/Nearest Project infrastructure)	Route Section	Compound Type
1	Pinchbeck East (WMELA-TC-01)	1	Tertiary Compound
2	Crossgate (WMELA-LD-01)	1	Laydown Area
3	Pinchbeck North (WMELA-SC-01)	1	Secondary Compound
4	Northgate 1 (WMELA-LD-02)	1	Laydown Area
5	Northgate 2 (WMELA-SC-02)	1	Secondary Compound
6	Northgate 3 (WMELA-LD-03)	1	Laydown Area

Compound No.	Compound Location (to Nearest Town/Nearest Project infrastructure)	Route Section	Compound Type
7	Dunsby (WMELA-SC-03)	2	Secondary Compound
8	Haconby East (WMELA-LD-04)	2	Laydown Area
9	Haconby West 1 (WMELA-PC-01)	2	Primary Compound
10	Haconby West 2 (WMELA-LD-05)	2	Laydown Area
11	Stainfield (WMELA-PC-02)	2	Primary Compound
12	Grimsthorpe (WMELA-LD-06)	2	Laydown Area
13	Elsthorpe (WMELA-SC-04)	2	Secondary Compound
14	Swinstead (WMELA-PC-03)	2	Primary Compound
15	Corby Glen (WMELA-PC-04)	2	Primary Compound
16	Swayfield North 1 (WMELA-LD-07)	2	Laydown Area
17	Swayfield North 2 (WMELA-SSC-01)	2	Substation Compound
18	Birkholme (WMELB-TC-01)	2	Tertiary Compound
19	Colsterworth (WMELB-PC-01)	2	Primary Compound
20	North Witham East 1 (WMELB-LD-01)	2	Laydown Area
21	North Witham East 2 (WMELB-LD-02)	2	Laydown Area
22	Sewstern East (WMELB-LD-03)	3	Laydown Area
23	North Witham South (WMELB-PC-02)	3	Primary Compound
24	Sewstern West 1 (WMELB-LD-04)	3	Laydown Area
25	Sewstern West 2 (WMELB-PC-03)	3	Primary Compound
26	Wymondham (WMELB-LD-05)	3	Laydown Area
27	Garthorpe East (WMELB-SC-01)	3	Secondary Compound
28	Garthorpe West (WMELB-LD-06)	3	Laydown Area
29	Waltham-on-the-wolds (WMELB-SC-02)	3	Secondary Compound
30	Melton (WMELB-PC-04)	3	Primary Compound
31	Ab Kettleby East (WMELB-LD-07)	3	Laydown Area
32	Ab Kettleby South (WMELB-SC-03)	3	Secondary Compound
33	Ab Kettleby West (WMELB-LD-08)	3	Laydown Area
34	Saxelbye North 1 (WMELB-SSC-01)	3	Substation Compound
35	Saxelbye North 2 (WMELB-LD-09)	3	Laydown Area

Construction Access

Construction traffic

4.6.14 Construction traffic will access the Project site using the existing highway network. ‘Construction traffic routes’ is the term used to describe the public roads upon which construction vehicles will travel to site, having left the Strategic Road Network. The proposed construction traffic routes for the Project are shown on **Figure 5.3 Construction Traffic Routes**.

4.6.15 The estimated flows/volumes of construction vehicles anticipated during construction on each identified construction traffic access route are provided in **Appendix 13B Preliminary Construction Information**, of this DES.

4.6.16 As this stage of the Project, it has been assumed that materials will be transported to/from the site via the highway network. Subject to detailed design, the use of water or rail transport has not been identified as a suitable alternative at this time.

4.6.17 For the purposes of the preliminary assessments reported within this DES, the use of road transport is considered a reasonable worst-case scenario. Should alternative modes of transport be adopted by the Project, these will be subject to robust appraisal of their potential environmental impacts.

4.6.18 The assessments reported within the ES will be based upon refined construction and logistics information and will be based upon the reasonable worst-case scenario regarding the environmental effects of transport of staff and materials to/from the site.

Haul roads

4.6.19 Dedicated internal access tracks, referred to as haul roads, will be established within the draft Order Limits to facilitate movement of vehicles and plant during construction. Access points (junctions) from the existing highway network will facilitate access to construction compounds and on-site haul roads; these are referred to as bellmouths. The current proposed haul roads and preliminary access locations have been incorporated into the design of the Project and are shown in **Figure 4.1 Proposed Project Design**.

4.6.20 The precise extent, width and configuration of haul roads and bellmouths will depend on detailed design, land agreements and construction sequencing; these details will be refined and confirmed by the contractor through detailed design. The current assumed configuration provides a feasible approach that allows a reasonable worst case to be considered and assessed.

4.6.21 As ground conditions are yet to be confirmed through investigation, it is currently assumed that temporary haul roads would be installed using traditional aggregate based techniques which represent a reasonable worst case when considering vehicle movements, footprint, access requirements, material consumption, and reinstatement. However, in addition to the alternative scenario described in **Table 4.3** that would remove the need for haul roads, there are several other techniques which could be employed if haul roads are required where conditions allow, such as:

- ground stabilisation – chemical;
- ground stabilisation – mechanical (geogrid reinforcement);

- Microbial Ground Improvement; and
- aggregate replacement.

4.6.22 The technique to be employed at different locations is not likely to be determined during the assessment stage of the Project and the flexibility to use the most appropriate method needs to be retained. Therefore, this assessment considers the worst case so that the Project can be delivered using the most appropriate combination of these techniques within the environmental envelope assessed and reported.

Installation of bellmouths and the creation of visibility splays

4.6.23 Bellmouths will consist of either new or existing access junctions. Widening of existing accesses from the public highway may be required. There are currently 85 temporary bellmouths proposed to provide access to construction works including cross over points, where construction traffic would cross the public road, but would not be used for general access/egress of the site. WMEL-B Substation will have a permanent bellmouth access on to Six Hills Lane. WMEL-A will have a permanent bellmouth access on to the A151 Station Road. The locations of the proposed bellmouths are shown on **Figure 4.1 Proposed Project Design**.

4.6.24 The installation of bellmouths may require realignment or protection of existing underground services and the creation of visibility splays to create a line of sight for the safe use of the bellmouth. Within the visibility splay, vegetation would need to be cut to a specified height and street furniture or visual obstacles relocated or removed depending on local conditions, the speed rating of the road and whether traffic management was in place.

Highway works

4.6.25 In certain locations works to the public highway may be required to install passing places, potential surfaces upgrades or carriageway widening. Preliminary areas of off-site highway works identified so far are shown on **Figure 4.1 Proposed Project Design**.

4.6.26 Further information on baseline traffic flows collected by survey in 2026 and refinement of estimated construction traffic flows will inform design development, assessment, and engagement with relevant highway authorities to confirm required highway works to be incorporated into the design and considered in the ES.

Public Rights of Way

4.6.27 The Project would require 54 Public Rights of Way (PRoWs) crossings, a number of which would be affected by construction of the Project; the existing PRoW network intersecting the Project can be seen on **Figure 13.3 Existing Public Rights of Way**.

4.6.28 Discussions with PRoW officers in relevant planning authorities are ongoing to develop the preferred method for managing, diverting or temporary closure of PRoWs. The proposed outline approach to managing impacts on the PRoW network during construction is provided in **Appendix 16A Draft Outline Public Rights of Way Management Plan**.

Topsoil Stripping

4.6.29 Topsoil may be required to be stripped from the bellmouths, access tracks/haul roads, site compounds, and substation and tower working areas. The topsoil would be stored carefully, in bunds on-site for later reinstatement in the same area (usually removed, stored, and reinstated in the same land parcel to avoid any cross contamination). Soils will be managed as described in **Appendix 12A Draft Outline Soil Management Plan** to maintain their usefulness as value and resource.

4.6.30 Where practicable, all excavated soils would be retained and reused on-site. If topsoil is unsuitable for reuse, then it would be taken off-site and disposal would be in accordance with the measures as set out in **Appendix 4B Draft Outline Material and Waste Management Plan**. Temporary drainage would be installed as required, with environmental protection measures (such as silt fences or seeding of the storage bunds) installed where necessary.

Drainage

4.6.31 Temporary drainage would be required during construction to manage rainfall runoff and water encountered during excavation, installation of working areas and installation of access tracks/haul roads and compounds, where appropriate. The construction drainage design will include a variety of potential measures to address silt runoff, reduce risk of contamination pathways and prevent the increase of flood on- and off-site. Construction Sustainable Drainage Systems would be used if necessary and where appropriate.

Vegetation Clearance Assumptions

4.6.32 Vegetation clearance may be undertaken prior to or during any of the activities identified above. This would be in accordance with any ecological requirements identified through the EIA and secured through a DCO requirement.

4.6.33 Vegetation clearance is required to ensure the Project can be safely constructed and operated. Vegetation clearance generally falls into three categories: managed, potentially affected, and not affected. These areas will be shown on plans submitted as part of the application for development consent and assessed within the relevant chapters of the ES. The final extent and timing of vegetation clearance will be refined by the appointed contractor following detailed design, and subject to measures identified in the ES.

4.6.34 For the purpose of this preliminary assessment the following assumptions have been applied.

Overhead line

- Any vegetation within 20 m either side of the overhead line centreline would have to be managed[3].
- Any vegetation between 20 m and 50 m of the overhead line centreline would be potentially affected.
- Any vegetation beyond 50 m of the overhead line centreline would not be affected (except for some temporary works areas)

[3] Management of vegetation for electrical clearances such as lopping or pruning.

Substations

4.6.35 Vegetation would be permanently cleared within the substation footprints for both WMEL-A and WMEL-B. The ES will identify any areas outside the permanent substation boundaries that would be reinstated following construction, including environmental mitigation measures, taking account of any restrictions on future planting and vegetation management.

Construction access and working areas

4.6.36 Vegetation would be temporarily removed in the span of the overhead line under the conductors (this would include an approximate 20 m strip either side of the overhead line alignment and temporary haul roads).

4.6.37 Vegetation could be temporarily or permanently removed from the following areas:

- access tracks, including culverts;
- bellmouths and visibility splays;
- highway widening;
- operational, maintenance and third-party accesses;

4.6.38 Vegetation would be temporarily removed from the following areas:

- construction compounds;
- tower working areas;
- crossing protection working areas;
- bridge working areas;
- trackway access and working areas;
- stringing areas and between crossing protection (for netting);
- proposed temporary drainage areas; and
- third-party works.

4.6.39 Vegetation would be affected and managed in the following areas:

- overhanging of accesses and bellmouths;
- trackway access and working areas;
- operational, maintenance and third-party accesses;
- stringing areas and between crossing protection (for netting);
- proposed temporary drainage areas; and
- temporary fibre optic diversions.

4.6.40 Unless otherwise stated it is assumed that vegetation within the draft Order Limits (but outside one of the areas listed above) could be potentially affected when taking account of the flexibility afforded.

Overhead Line Construction

4.6.41 The construction of the new 400 kV overhead line would generally follow the sequence outlined below as work progresses along the length of the overhead line:

- surveys including archaeological investigation;
- ground investigation;
- installation of bellmouths and creation of visibility splays;
- installation of stock proof fencing and gates or equivalent;
- topsoil stripping, temporary drainage installation where required;
- installation of access tracks (including culverts and bridges) and demarcated tower working areas;
- installation of tower foundations (pad and column, mini pile, tube pile or bespoke);
- working area and layout of steelwork in preparation for erection;
- assembly (painting if required) and erection of steelwork;
- installation of tower signage including safety notice plate and anti-climbing devices;
- installation of crossing protection prior to stringing of conductors, including scaffolding;
- installation of insulator assemblies on suspension towers;
- establishment of machine sites for conductor stringing;
- conductor and earthwire stringing;
- temporary earthing;
- installation of tension insulator assemblies on tension and terminal towers;
- removal of construction equipment and reinstatement of ground and restoration of soils;
- removal of access tracks and bellmouths; and
- removal of construction compounds and ground reinstatement.

4.6.42 Activities such as surveys, archaeological investigation, ground investigation, construction of bellmouths and access tracks could commence without the full construction compounds in place. Nominal office and welfare facilities would suffice for an initial period until the full construction compounds were available.

Installation of access tracks/haul roads (including culverts and bridges) and tower working areas

4.6.43 A two-way access track/haul road would typically be 20 m wide, and would include temporary access, soils storage, drainage and fencing. It would likely consist of stone laid on geotextile membrane. Other accesses may also be used comprising of interlocking panels, depending on ground conditions and the duration and type of use. Soil stabilisation is the process of altering the physical or chemical properties of soil to enhance its engineering performance and may be considered subject to local conditions.

4.6.44 The stone access tracks would be constructed using secondary or primary aggregates. The total amount of aggregate material that would be needed for the construction of the stone access tracks (including bellmouths) and tower working areas will be determined through the development of the Project and estimated in the ES. Following reinstatement, materials would be suitable for reuse in situ or would be taken to an appropriate facility which could include treatment, recycling, or onward use, for example as secondary aggregate in the construction industry.

4.6.45 Culvert installations would be required for temporary access tracks to cross ditches and watercourses. The size and depth of a culvert is dependent upon the dimensions of the crossing, sensitivity, and importance of the watercourse. To maintain the flow of a watercourse during installation of the culvert, a pump would be used on-site. The Project would require 198 temporary watercourse crossings (including drains and ditches); 187 of these would be by pipe/culvert and 11 would be by single span bridge.

4.6.46 Should culverts not be suitable for a particular crossing, due to either the sensitivity of the watercourse or engineering requirements, a temporary bridge would be installed.

4.6.47 Temporary bridges may need to accommodate a mobile crane or other construction plant. This would be subject to detailed design and would be assessed on a site-by-site basis. Most bridge crossings would be of a short span and flat deck construction; however, Bailey style bridges[4] may also be used. All bridges would be clear span, and the foundations would be placed clear of the main channel of the watercourse, where practicable.

4.6.48 Once the foundations are in place the temporary bridge would be fitted. Although the installation method is dependent on the type of bridge being installed, a typical bridge would be delivered in sections. Each bridge component would be assembled on-site and lifted into position by crane. With the bridge in position, decking panels would be lifted and fixed into position.

4.6.49 Tower working areas would typically be 60 m by 60 m for a suspension tower (for straight sections) and 70 m by 70 m for a tension tower. They would either be stone laid on a geotextile, or formed of interlocking panels, depending on ground conditions and the duration and type of use. Soil stabilisation techniques could be considered subject to local conditions. The locations of the tower working areas are shown on **Figure 4.1 Proposed Project Design**.

Installation of tower foundations (pad and column, mini pile or tube pile)

4.6.50 The foundations for the towers would be either pad and column, mini pile or tube pile (or bespoke if required). The selection of foundation type would depend upon the ground conditions encountered. A high-level description of the different types of foundation that could be used within the Project is provided below. Based on preliminary geotechnical design work and desk-based understanding of ground conditions, shallow foundations are anticipated to be suitable for the majority of the new towers. Piled foundations are anticipated to be required in the east of the new overhead line in areas of poor ground conditions, for example, associated with Tidal Flat Deposits, or where other geohazards are identified through the central area of the route.

[4] Bailey style bridges are a type of modular, pre-fabricated, truss bridge.

4.6.51 This has allowed a reasonable worst case to be considered in the preliminary assessment based on information available at this time.

4.6.52 Foundation designs will continue to be developed as ground investigations are undertaken during 2026 and 2027 and a refined schedule provided with the ES.

Standard pad and column foundations

4.6.53 For lattice suspension towers, pad and column foundations are typically used, although alternative solutions such as precast foundations may also be considered. For tension and terminal towers, larger and deeper foundations are typically required. The following works are required to install these foundations:

- Large excavations are required for each tower leg.
- Steel reinforcement is then installed within the excavation.
- Foundation formwork (mould) is then inserted and filled with concrete.
- The concrete is left to harden (set).
- The excavated hole is backfilled to ground level.
- Any remaining sub soil may be reused around the foundation legs, subject to engineering and regulatory approval.

Piled foundations – tube or bored mini-pile

4.6.54 In areas with poor ground conditions, ground conditions which make construction of shallow foundations impractical, or where significant structural loading is anticipated, piled foundations can be used. Where multiple piles are required at a tower leg then these piles will be connected by a pile cap at or below ground level.

4.6.55 Piled foundations can be constructed with numerous construction techniques and installation methodology. This includes piles that are bored using piling rigs or excavator mounted attachments, piles that are driven using a percussion hammer, and other methods of installation such as screw piling techniques. Piled foundations can be designed to reach significant depths below ground level subject to how deep the foundations need to be constructed to achieve the required capacity to support the overhead line towers.

Assembly and erection of steelwork

4.6.56 Following the installation of working areas and the appropriate foundations, tower steelwork can be assembled and erected. The individual steelwork components would be brought to each tower working area and components bolted together on the ground. The tower would be assembled in sections beginning from ground upwards, starting with bolting the legs to the foundation, and using a telehandler for the lower sections and a mobile crane for the upper sections.

Crossing protection prior to stringing of conductors

4.6.57 Temporary scaffolding and nets would be installed during construction where required as a safety measure to protect assets such as roads, railways, and distribution network overhead lines (where not already moved underground) and could, where necessary, include hedgerows which would be crossed by the proposed 400 kV overhead line. This is required to protect these features during conductor stringing from the accidental dropping of conductors and any of the associated equipment. Temporary closures of some affected assets, such as roads, may be required during these works to install the protective netting, or indeed may be used instead of installing scaffolding.

4.6.58 The scaffolding would be transported to site using a lorry or tractor and trailer and assembled either side of the feature being protected. Alternative methods may be utilised dependent on local site conditions/restrictions, such as aerial catenary support systems, where feasible. The proposed locations are shown on **Figure 4.1 Proposed Project Design.**

Installation of insulators

4.6.59 The insulators would be fastened to the cross arms of the towers, with running wheels hung from the end of the insulators to carry the pilot wires in preparation for installing the conductors.

Establishment of machine sites for conductor stringing

4.6.60 The conductors are usually installed from tension tower to tension tower along intermediate suspension towers, often termed a ‘section’, with machine sites required at either end of the section.

4.6.61 The machine sites for conductor stringing would normally be located within the tower conductor pulling positions, sited on earthed interlocking panels laid directly onto the ground surface reducing disturbance to the underlying soils.

4.6.62 A conductor pulling position would be established at each end of the section with a pulling machine (‘puller’) and empty steel reels to accept pilot wires. At the other end of the section the full conductor drums would be arranged in close proximity to the tensioning machine (‘tensioner’). The proposed locations are shown on **Figure 4.1 Proposed Project Design**.

Conductor stringing

4.6.63 The conductors would be delivered to pulling positions on large cable drums. Depending on the conductor type and length of section to be strung, a typical completed drum could weigh up to 8 tonnes, although larger and heavier drums are possible depending on the supplier and the length of conductor. The drums containing the conductors would typically be delivered to the construction compound, or satellite compound, first, and would be distributed from there.

4.6.64 Light pilot wires (sometimes referred to as pilot bonds) would be laid at ground level (and over temporary scaffolding protecting assets such as roads and railway lines) along the length of the section between the pulling positions. Some vegetation management, including removal as a worst case would be required. The pilot wires would be lifted and fed through running wheels on the cross arms of all the towers in the section, and then fed around the winch at the pulling position. The light pilot wires are used to pull through heavier, stronger pilot wires which are in turn used to pull conductors through from their drums. The tensioning machine would keep the wires off the ground and prevent the conductors running freely when the winch pulls the pilot wire. When the conductor is fully ‘run out’, it would be fastened at its finished tension and height above ground by linespersons working from platforms on the tension towers which are suspended beneath the crossarms. Additional fittings, such as spacers, vibration dampers and arcing horns would be fitted.

4.6.65 To counterbalance the out of balance loading at the tension towers at the end of a conductor stringing section, it is normal to install temporary backstays or concrete blocks for safety of installation. The temporary backstays or concrete blocks would be removed as the conductor stringing process starts on the next section. Temporary backstays may also be required at other locations such as connecting new conductor to existing conductor, temporary diversions, and temporary spans.

4.6.66 A drone/helicopter may be utilised in the construction of the overhead line, and/or transportation of equipment to the Project site.

Dismantling of existing towers

4.6.67 There is a requirement for the reconfiguration of existing 4VK and ZA overhead lines to connect to the new proposed WMEL-A and WMEL-B substations respectively. This would require the removal of existing towers and a temporary diversion involving new temporary masts. The exact number of towers to be dismantled and temporary diversions required will be defined as design develops but this is likely to be limited to single figures localised around each new substation.

4.6.68 Fittings such as dampers and spacers would be removed from the conductors. The conductors would be cut into manageable lengths or would be winched onto drums in a reverse process to that described for construction. The conductor, fittings and insulator assemblies would be removed from the towers and lowered to the ground.

4.6.69 Each tower would most likely be dismantled by crane, with sections unbolted and lowered to the ground for further dismantling and removal from site. Depending on the access and space available, it may be possible to cut the tower legs and then pull the tower to the ground using a tractor. The tower could be cut into sections on the ground. Unless there was a compelling need for removal of all the foundations, these would be removed to approximately 1.5 m deep, sufficient for safe agricultural use of the land, and subsoil and topsoil reinstated. All waste would be removed from site and recycled in line with the relevant waste regulatory framework at that time.

Substation Construction

4.6.70 The construction of the AIS substations would generally follow the sequence outlined below:

- surveys;
- vegetation clearance and stripping of topsoil from the proposed permanent site area and any working areas (topsoil would be stored in bunds on-site, for reuse);
- set up of temporary access, construction compounds and temporary drainage (including temporary fencing, laying and compaction of granular material (and asphalt where required, proposed at the construction laydown areas), excavation of drainage attenuation features, installation of pipes);
- earthworks for construction of permanent site access and platform (including the forming of temporary soil bunds for storing excavated material); where practicable, temporary and permanent access would be combined;
- civil engineering works to include permanent fencing, access, drainage and foundations (which may include piling of larger structures and/or equipment that is sensitive to ground settlement);

- installation of structures (for e.g. gantries);
- installation of HV plant and cables;
- building works;
- overhead line conductor stringing works to install the downleads between terminal towers and gantries;
- testing of equipment;
- commissioning/energisation; and
- reinstatement of working areas outside the permanent substation boundary (including environmental mitigation).

Reconductoring

4.6.71 Construction activities during reconductoring would exclude those activities listed above that relate to towers and steel works; therefore, reconductoring would only include:

- surveys;
- ground investigation;
- installation of bellmouths and creation of visibility splays at highway accesses (if required);
- installation of stock proof fencing and gates or equivalent;
- topsoil stripping, temporary drainage installation where required;
- installation of access tracks typically comprising interlocking panels on existing ground (track matting) without the need for construction of stone access/haul roads due to short-term use and fewer materials, thereby minimising impact to the ground, and including culverts and bridges where required;
- installation of protection prior to stringing of conductors, including scaffolding;
- replacement of insulator assemblies on suspension towers;
- establishment of machine sites for conductor stringing;
- conductor stringing;
- temporary earthing;
- replacement of insulator assemblies on tension and terminal towers;
- removal of construction equipment and reinstatement of ground and restoration of soils;
- removal of access tracks and bellmouths; and
- removal of construction compounds and reinstatement of ground.

Underground Cable and Cable Sealing End Compounds

4.6.72 Currently, no new 400 kV underground cables are proposed as part of this Project.

4.6.73 Where overhead conductors transition to underground cables (and vice versa), a Cable Sealing End Compound (CSEC)[5] is required. This would comprise HV equipment, including Cable Sealing Ends and gantry structures to enable the transition between underground cables and overhead line conductors.

4.6.74 It is currently anticipated that no CSECs are required for the new 400 kV overhead line proposed as part of this Project. However, CSECs may be required at each interface between the new overhead line and existing lower voltage overhead lines that will need to be changed to underground cables as a result of the new 400 kV overhead line. The typical construction sequence to install a CSEC required for the Project would be similar to the construction sequence outlined for substations.

4.6.75 The requirement for, and location of, any undergrounding of existing lines and CSECs will be confirmed through a programme of ground investigation, design development, and ongoing engagement with the relevant asset owner/operator, and be considered in the ES.

Third-Party Services

4.6.76 To construct and operate the Project safely and efficiently, third-party services such as water, gas, electricity, oil, and telecommunications assets may require diversion, protection, assurance or removal. The specific mitigation methods for the modifications would need to be confirmed and agreed with the asset owner prior to any works being undertaken on their assets.

4.6.77 Examples of the typical mitigation works would include installation of protective crossings at interfaces with existing underground assets, modifications to cathodic protection system of existing pipelines where AC interface occurs and diversion of existing utility assets where required to facilitate the construction of the Project.

4.6.78 It is assumed that existing distribution network operator (DNO) and telecommunication overhead lines would be modified, by either diverting these underground or protecting them. Third-party mitigation works would most likely be undertaken by the asset owners prior to construction of the relevant section of the Project; however, the DCO would grant National Grid the power to undertake this work subject to agreement with the asset owner. Further details of the required third-party mitigation works will be included within the ES.

Removal of Construction Equipment, Reinstatement and Restoration of Soils

4.6.79 Once the 400 kV overhead line is constructed, the access tracks and working areas at the tower site would be removed and the ground reinstated where practicable to the previous condition (including Agricultural Land Classification grade). Where practicable other surfaces would be reinstated to their pre-construction condition and use, unless agreed otherwise with the local planning authority and/or landowner.

[5] A CSEC is an area where overhead power lines connect to underground cables. The compound houses equipment that safely connects the overhead lines to the underground cables protecting the connection from weather and other environmental factors. It is normally a small, fenced area with electrical equipment inside.

4.7 Operation

4.7.1 The operation of the Project includes the physical infrastructure as described in **Section 4.5**.

4.7.2 During operation the Project would reinforce the electricity transmission network in Lincolnshire, Leicestershire and Northamptonshire, and facilitate the connection of planned offshore wind generation, interconnectors with other countries, increased distribution network capacity, and subsea links to Scotland.

4.7.3 The Project would be operated remotely in the same way as National Grid operates the rest of the network.

4.8 Maintenance

Routine Maintenance

Overhead lines

4.8.1 The overhead line would be subject to annual inspection from the ground by foot patrol, small van, or by air using drone/helicopter to check for visible faults or signs of wear. The inspections would also indicate if plant/tree growth or third-party developments were at risk of affecting safety clearances. Inspections would provide input as to when refurbishment was required.

4.8.2 The overhead line would contain a fibre optic cable within the earthwire which allows for telecommunication signals to be communicated along the overhead line route. Access for the fibre optic cables would usually be at the joint box positions located just above anticlimbing devices on certain towers. The position and frequency of joint boxes would be subject to detailed design.

4.8.3 Access for vegetation management, telecommunications and fibre optic maintenance would be along operation and maintenance access routes as illustrated on **Figure 4.1 Proposed Project Design**. Temporary interlocking track mat panels may be required along these routes during maintenance activities.

4.8.4 Routine vegetation clearance would be required to ensure the Project can be safely operated. Details of the vegetation clearance assumptions are provided in Section 4.6.34.

Substations

4.8.5 The substations would typically be operated remotely. The substations would undergo regular visual checks. Regular maintenance of the substations would be undertaken and would involve electrical isolation of equipment before it is worked on. If the substation requires refurbishment or replacement works, vehicles would carry workers in and out of the site and suitable vehicles would be used to bring new materials and equipment to the site and to remove the old equipment.

4.8.6 During operation, lighting would be required at the substation sites to allow for safe movement and the operation of equipment. Security lighting would also be required. All lighting would be designed in accordance with the appropriate design standards and National Grid technical specifications. For the purpose of this DES, it is assumed that the security lighting would be event activated (i.e. would not be continuous) and would be designed to be environmentally sensitive (e.g. directional and low light not exceeding 50 lux). Further information regarding substation lighting design will be provided within the Project description within the ES.

Repair and Refurbishment

4.8.7 The overhead line would be made up of a variety of materials including concrete and steel for the foundations, steelwork for the tower structure, glass or polymer for the insulators, and aluminium for the conductors. All these materials have an expected lifespan which varies depending on how the overhead line is used and where it is located. Typically, tower steelwork and foundations have a life expectancy of approximately 80 years, the conductors have a life expectancy of approximately 40 to 60 years and the insulators and fittings have a life expectancy of approximately 25 to 40 years. The lifespan of the overhead line may be longer than the anticipated 80 years, depending on its condition, the environment to which it is exposed, refurbishments and transmission network requirements.

4.8.8 Minor repairs or modifications may be required from time to time for local earthwire damage, addition of jumper weights, local conductor damage, broken insulator units, damaged or broken spacers, broken or damaged vibration dampers, and damaged or broken anti climbing devices. Minor repairs would be programmed locally by a maintenance team using pickup trucks and vans to access the site along routes agreed with landowners. Access may require interlocking track mat panels.

4.8.9 Refurbishment work would be undertaken typically on one side of the tower at a time, so that the other side (supporting the other electrical circuit) could be kept 'live' or in use.

4.8.10 Refurbishment work could involve:

- replacement of towers;
- replacement of conductors and earth wires;
- replacement of insulators and steelwork that holds the conductors and insulators in place;
- insulator fittings, conductor fittings, tower signage;
- painting or replacement of the tower steelwork; and
- foundation repairs/upgrades.

4.8.11 Refurbishment would usually be undertaken in two stages because the overhead line has two circuits, one on each side of the tower. This means that work can be undertaken on one side only, so that the other side can be kept 'live'. Once all the work has been completed on the first side, the circuit would be re-energised, and the opposite side switched off, so that the work could be carried out on the other side.

4.8.12 The refurbishment works would require temporary access tracks, a small compound and potentially scaffolding to protect roads and other features during the work.

4.8.13 Vans are used to carry workers in and out of site and trucks are used to bring new materials and equipment to site and remove old equipment. Temporary works including installation of access tracks and installation of scaffolding to protect roads, railways and footpaths would be required as necessary for the overhead line refurbishment (similar to the initial construction requirements).

4.8.14 During the lifetime of the substations, there may be a requirement to replace or refurbish certain components or pieces of equipment. This will usually involve delivery of new equipment to site, typically via standard Heavy Goods Vehicles (HGVs) or low loader HGVs; however, some larger equipment may require specialised AIL delivery activities, which may require short-term road closures.

4.9 Decommissioning

4.9.1 NPS EN-1 (Ref 4.1) paragraph 4.3.5 states that the ES should cover the decommissioning of a project; however, decommissioning of electricity networks is not specifically covered in NPS EN-5 (Ref 4.3) which recognises that generally, nationally significant electricity networks are likely to have an ongoing function, but will be subject to maintenance, reinforcement works and for assets to be replaced when they come to the end of their lifespan. It is expected that the transmission of electricity would continue for as long as there is a business case for doing so and that any decommissioning activity would occur decades into the future. To date, relatively few transmission projects have been decommissioned since the main expansion of such infrastructure in the 1950s and 1960s. The cables and towers for overhead transmission lines are replaced periodically, typically under National Grid’s permitted development rights.

4.9.2 Decommissioning would only be undertaken if there were substantial changes to how electricity is transmitted around the country or significant changes to the sources of generation and areas of demand. If the Project, or any part of it, is to be decommissioned, a written scheme of decommissioning would be submitted for approval by the relevant planning authorities at least six months prior to any decommissioning works. The decommissioning works would follow National Grid processes at the time for assessing and avoiding or reducing any environmental impacts and risks.

4.9.3 There are currently no specific plans to decommission the Project. As such decommissioning has been **scoped out** of the assessment. The ES will, however, include a high level summary of potential effects and likely methods.

Overhead Line

4.9.4 If the Project is required to be decommissioned sections of overhead line between the new substations would be removed. Fittings such as dampers and spacers would be removed from the conductors. The conductors would be cut into manageable lengths or would be winched onto drums in a reverse process to that described for construction. The conductor, fittings and insulator assemblies would be removed from the towers and lowered to the ground.

4.9.5 Each tower would most likely be dismantled by crane, with sections cut and lowered to the ground for further dismantling and removal from site. Depending on the access and space available, it may be possible to cut the tower legs and then pull the tower to the ground using a tractor. The tower could be cut into sections on the ground.

4.9.6 Unless there was a compelling need for removal of all the foundations, these would be removed to approximately 1.5 m deep, sufficient for safe agricultural use of the land and subsoil and topsoil reinstated. All waste would be removed from site and recycled in line with the relevant waste regulatory framework at that time.

Substations

4.9.7 Typically, the above ground features of the substations would be removed (unless otherwise agreed). Any above ground buildings would be demolished and taken off-site for suitable disposal along with any other above ground features such as electrical equipment. Any temporary access tracks and working areas required would be removed and the site reinstated to an appropriate end use.

References

Ref 4.1 The Planning and Infrastructure Act (2025) [online] Available at: https://www.legislation.gov.uk/ukpga/2025/34/contents [Accessed 14 July 2026]

Ref 4.2 Department for Energy Security & Net Zero (2026). Overarching National Policy Statement for Energy (EN-1). [online]. Available at: https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf [Accessed: 9 January 2026].

Ref 4.3 Department of Energy Security & Net Zero (2026). National Policy Statement for Electricity Networks Infrastructure (EN-5). [online]. Available at: https://assets.publishing.service.gov.uk/media/64252f852fa848000cec0f53/NPS_EN-5.pdf [Accessed: 9 January 2026].

Ref 4.4 National Infrastructure Commission (2020). Design Principles for National Infrastructure. [online] Available at: https://majorprojects.org/wp-content/uploads/2024/10/NIC-Design-Principles.pdf. [Accessed: 9 January 2026].

Ref 4.5 Planning Inspectorate (2025). Nationally Significant Infrastructure Projects: Advice on Good Design. [online] Available at: https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-advice-on-good-design [Accessed: 9 January 2026].

Ref 4.6 National Electricity Transmission (2017). System Security and Quality of Supply Standard. [online]. Available at: https://www.nationalgrid.com/sites/default/files/documents/NETS%20SQSS%20V2.3.pdf [Accessed: 9 January 2026].

Ref 4.7 National Grid (n.d.). Holford Rules. [online] Available at https://www.nationalgrid.com/sites/default/files/documents/13795-The%20Holford%20Rules.pdf [Accessed: 9 January 2026].

Ref 4.8 National Grid (n.d.). Horlock Rules. [online] Available at: https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf [Accessed: 9 January 2026].

Ref 4.9 NESO. Electricity Transmission Design Principles. [online] Available at: https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf [Accessed: 30 July 2026].

Ref 4.10 IEMA (2020). IEMA guide to: Materials and Waste in Environmental Impact Assessment, Guidance for a proportionate approach. [online] Available at: https://www.isepglobal.org/media/0t5fwyhj/iema-materials-and-waste-in-eia-march-2020.pdf [Accessed: 9 January 2026].

Ref 4.11 International Commission on Non-Ionizing Radiation Protection (2020). ICNIPR Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz). [online]. Available at: https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf. [Accessed: 9 January 2026].

Ref 4.12 Planning Inspectorate (2026). Nationally Significant Infrastructure Projects –Pre-Application Advice on Environmental Impact Assessment. [online]. Available at: https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-pre-application-advice-on-environmental-impact-assessment [Accessed:30 July 2026].

Ref 4.13 National Grid (2025). Strategic Options Report. [online]. Available at: https://www.nationalgrid.com/document/561311/download [Accessed: 9 January 2026].

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