Introducing the

Scotland to England Green Link - SEGL2

Spring 2021

nationalgrid

Project Background Document

Contents

The document has been produced as part of our consultation on the Project and is structured as follows:

Introduction

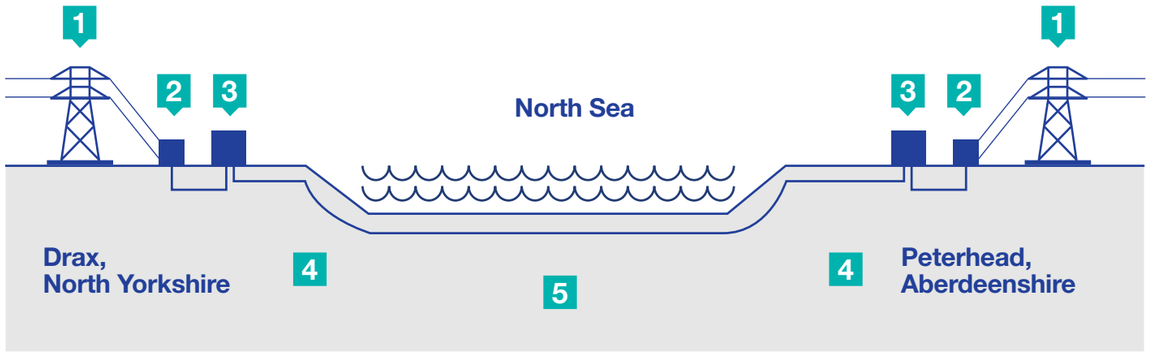
This Project Background Document explains our proposals to construct a High Voltage Direct Current (HVDC) Link from Peterhead in Aberdeenshire to Drax in North Yorkshire.

The purpose of the project is to scale up the capability of our network to deliver greener electricity generated in Scotland to the rest of the UK. If approved, it will carry enough green electricity to power 2 million homes across the UK.

The Project is made up of a number of parts, however, this document has been prepared to support the consultation process regarding the onshore parts of the project. This includes approximately 65 km of underground DC cable from a landfall at Wilsthorpe to a converter station at Drax, North Yorkshire. The converter station connect to our existing substation using less than 1 km of underground cable.

The following illustration shows the main components of the project, which will be covered in more detail in this document.

How SEGL2 will work



HVAC = High Voltage Alternating Current
HVAC = High Voltage Direct Current

1. Existing network
2. Substation
3. Converter station
4. Underground cable
5. Submarine cable

National Grid

Who we are, and how we work

National Grid Electricity Transmission owns and maintains the high voltage electricity transmission network in England and Wales.

The transmission network is operated in Great Britain by National Grid Electricity System Operator (National Grid ESO). Since April 2019, National Grid ESO has been an entirely separate legal entity.

National Grid ESO manages power flows on the network, ensuring the right amount of energy is where it is needed, providing the local electricity supply networks known as Distribution Network Operators (DNOs). National Grid Ventures (NGV) is the competitive division of National Grid, investing in energy projects, technologies, and partnerships to accelerate the development of our clean energy future.

The high voltage electricity transmission system in England and Wales, which operates at 275,000 volts (275kV) and 400,000 volts (400kV), comprises some 7,000 route kilometres of overhead lines, over 600km of underground cable and over 320 substations. At the substations generation is connected to the system and the primary transmission voltage of 400kV or 275kV is transformed to lower voltages. Regional electricity companies take this lower voltage electricity and supply it to homes and businesses across the UK.

We are regulated by Ofgem, the electricity and gas markets regulator, to ensure value for money for consumers and we must satisfy our various statutory duties. We are required under the Electricity Act 1989 to "develop and maintain an efficient, coordinated and economical electricity transmission system, and to facilitate competition in the supply and generation of electricity".

Our project partners

We are developing these proposals in partnership with Scottish and Southern Electricity Networks (SSEN) which is the Transmission Owner for Northern Scotland and responsible for the onshore and offshore aspects of this project in Scotland.

nationalgrid Group PLC

Electricity Transmission

Owns and manages the high voltage electricity transmission system in England and Wales

Electricity System Operator

Ensures that Great Britain has the essential energy it needs by making sure supply meets demand every second of every day

National Grid Ventures

Operates a mix of energy assets and businesses to help accelerate the development of our clean energy future (eg, undersea electricity interconnectors with other countries and European transmission partners)

Delivering Net Zero

Why is this link needed?

As part their commitments to tackling climate change the UK and Scottish Governments have set legally binding targets to reach net zero in their greenhouse gas emissions by 2050 in England and Wales and by 2045 in Scotland.

As the UK shifts away from traditional forms of energy generation to heat homes, charge vehicles and power businesses, there will be a greater need for cleaner, greener energy. Offshore wind will play a key part in helping the country achieve these targets.

The UK is already a world leader in offshore wind energy, with around 10 gigawatts (GW) in operation today. To support its climate change commitments, the Government has set a target to deploy 40GW of offshore wind by 2030 – a fourfold increase on what we produce today and enough to power every home in the UK. In addition, the Climate Change Committee predicts that the UK will need 75GW of offshore wind to meet net zero by 2050.

To transmit this increasing amount of green energy from where it is generated, to where it is needed, we need to increase the capability of our transmission network between Scotland and England.

How does National Grid identify the need for extra network capacity?

A network boundary is used to represent areas of high-power flow between different parts of the electricity network. When flows across a network boundary, such as the boundaries between Scotland and England, are forecast to be above the capability of the network then energy generation needs to be managed to ensure that the capability of network is not exceeded.

Managing shortfalls in network capability across boundaries results in additional costs, referred to as 'constraint costs' to operate the network.

Some level of constraint is expected as part of the economic operation of the network, however, where excessive constraints occur then investment in new infrastructure may be needed to provide additional network capability.

Network capability requirements are reviewed annually as part of a process led by National Grid ESO. This includes the following key activities and publications:

- **Future Energy Scenarios (FES)[1]** – these are developed annually by National Grid ESO with input from industry and other stakeholders. The FES represent a range of different, credible ways in which the energy system could evolve taking account of policy and legislation, including net zero targets.
- **Electricity Ten Year Statement (ETYS)[2]** – using data from the FES, National Grid ESO undertakes and annual assessment to identify points on the transmission system where more network capability is needed to ensure that energy is delivered efficiently and reliably to where it is needed.
- **Network Options Assessment (NOA)[3]** – the Transmission Owners and other stakeholders respond to ETYS with solutions to address network capability requirements. These are assessed by National Grid ESO so that the most economic and efficient solutions are recommended to proceed, and others told to hold or stop.

Due to the substantial quantities of green energy in Scotland, in particular onshore and offshore wind, as well as interconnectors in the north of England there is a need to increase the cross-border capability of electricity transmission network. This has been identified and assessed through activities and publications outlined above.

The need for this increased cross-border transmission capability is well-established. In the first NOA published in 2015/16 an Eastern Link was given a 'proceed' signal. The need for reinforcement has continued to strengthen as the amount of renewable energy generation connecting to, or forecast to connect to, this part of the network has continued to increase.

The most recent NOA publications in 2019/20 and 2020/21 have given 'proceed' signals to two cross-border reinforcements, the first between Torness and Hawthorn Pit (known as SEGL1), and the second between Peterhead and Drax (known as SEGL2). Further information setting out how and why these locations were selected is contained in subsequent sections.

[1] FES (July 2020) https://www.nationalgrideso.com/document/173821/download
[2] ETYS (November 2020) https://www.nationalgrideso.com/document/181711/download
[3] NOA (January 2021) https://www.nationalgrideso.com/document/185881/download

How we develop our projects

When developing our network, under the Electricity Act 1989, we must do so in a way that is efficient, coordinated and economical, whilst maintaining impacts on people and places.

To achieve this, we consider a range of engineering, economic, environmental and social factors consistent with our statutory duties. We consult with stakeholders and members of the public at key stages of the process. We are committed to being open and transparent with information about the judgements we make.

Further information about our approach including how we set out to meet our environmental responsibilities and our commitments relating to engagement and consultation about proposals is explained in our Stakeholder, Community and Amenity Policy.

[4]https://www.nationalgrid.com/uk/electricity-transmission/document/81026/download

Strategic proposal

Our projects start with a detailed consideration of the infrastructure requirements. This sets out clearly what is needed and why. That could be a connection to new generation sources, to create more capacity where needed in the existing network, or for some other purpose.

We always see if the existing network can accommodate the customer or capacity needs economically and efficiently before we would consider building any new infrastructure. We consider alternatives including modifying how we operate the network or investing in equipment that can optimise the use of the existing network to reduce or avoid the need for major investment. This is usually more sustainable, less expensive and less disruptive.

Options identification and assessment

Where network reinforcements are required, we carry out routeing studies to identify broad potential corridors for the new transmission route within the strategic proposal, and to identify suitable locations for infrastructure, such as substations or converter stations.

This helps us to identify any constraints that could impact our proposals. For example, for sub-sea cables, constraints that could affect the landfall point include eroding shorelines or sensitive sand dune systems, or marine constraints such as shipping lanes, fisheries, major ports and harbours, and ecological constraints.

When routeing underground cables, we may be restricted by built development, topography, soil type or existing land use. There may also be valuable habitats or cultural heritage sites that would be affected by ground disturbance. In these cases, we try to find a route corridor that avoids these constraints altogether.

Assessment and land rights

Throughout the development of our projects undertake environmental and other surveys, which help us to refine our designs help us to develop any required mitigation. We use the survey results to develop our assessments and produce environmental reports such as a Construction Environmental Management Plan, Traffic Management Plan etc.

We work closely with landowners to agree access for surveys, and to agree land rights for our temporary and permanent works.

Application and decision

We hold a public consultation on our draft proposals to help us prepare our application for submission to the relevant consenting authority.

We will normally produce a Consultation Report which sets out the feedback we have received throughout the consultation process and how we have responded to it. This allows all stakeholders who have contributed to see how their comments have been taken into account.

Having carried out detailed assessments and consultation with the public and key stakeholders we prepare all of the documents necessary for our proposed application.

Construction

Once planning is approved, we will procure and our Main Works Contractor and develop detailed designs. We discharge planning conditions and obtain any licences required for pre-commencement works and the phased delivery of the project.

Before we start our main works we may need to undertake early enabling works, such as site establishment and access works. We then undertake the main construction work, and once completed we test and commission our new equipment. During this period we also undertake reinstatement works, implement mitigation measures and commence any ongoing monitoring, establishment, bellmouths, accesses etc.

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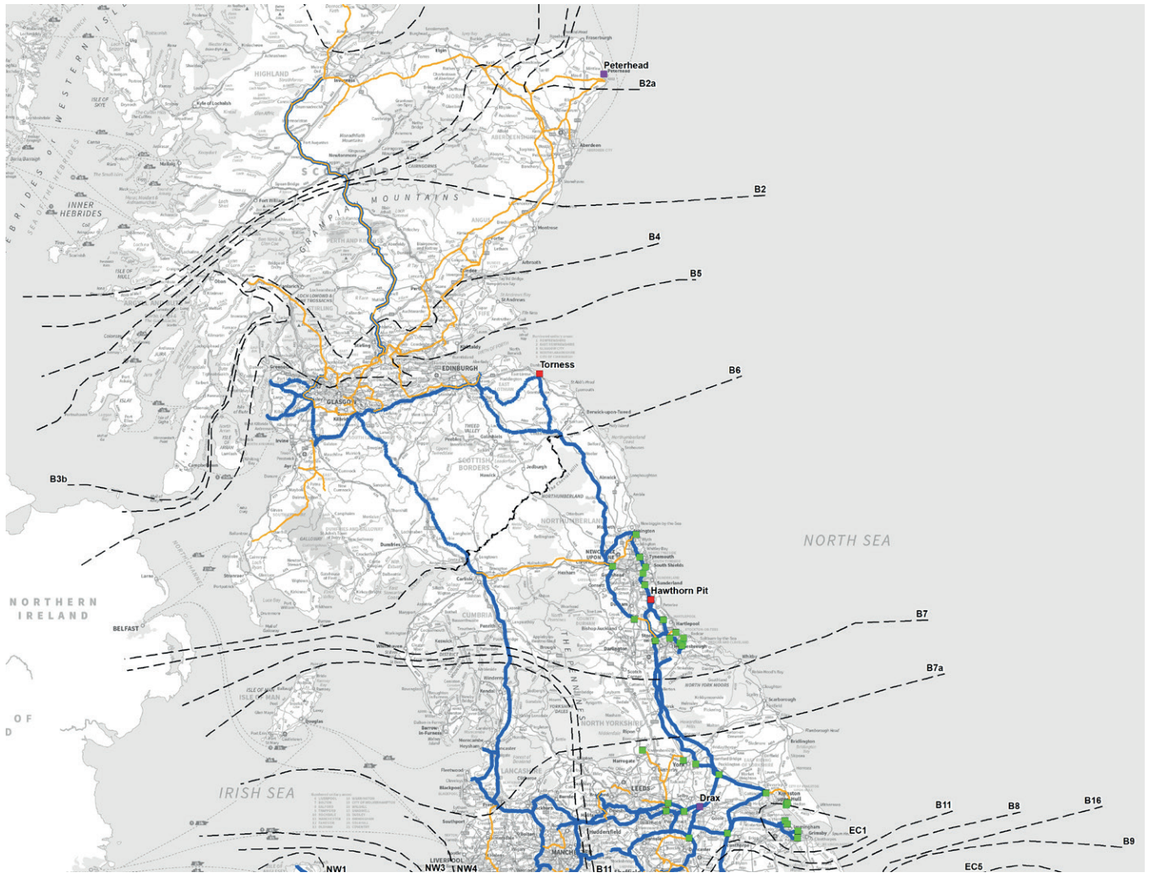
SEGL2 - Our strategic proposal

In response to the need for additional network capability between Scotland and England we assessed a number of strategic options. A key part of this was considering the scale of reinforcement which would be required. Due to the amount of green generation connecting to, or forecast to connect to, the network in the coming years, two reinforcements will be needed to provide the amount of network capability required.

As a result, the strategic options which we assessed comprised fixed 'start' points on the network in Scotland at Peterhead in Aberdeenshire and at Torness in East Lothian, which were identified by SSEN and SPT respectively. These two start points had a number of alternative 'end' points at substations on our network in England, in an area from Blyth in Northumberland as far south as Spalding in Lincolnshire, both on the coast and inland.



KEY

- Substation Location - SEGL 1 Project
- Substation Location - SEGL 2 Project
- Substation Location - Considered at SO Stage
- Network Transmission Boundary

Transmission Network

- 275 kV
- 400 kV

The objective of the strategic options appraisal was to identify the two preferred Strategic Proposals which would best meet the need case by providing additional network capability when it is needed while also taking account of our statutory and licence obligations.

For each strategic option different factors were assessed including:

- **Network Capability and Technical Considerations:** this included different transmission technologies, the additional network capability it would provide as well as factors influencing construction and operation.
- **Environmental and Socio-economic Impacts:** this included high-level consideration of the potential impacts of different options on the environment and peopleand included a range of onshore and offshore considerations such as biodiversity, archaeology and other land/sea users.
- **Programme and Cost Implications:** this included consideration of how much different options might cost and how long it would take to develop, consent and construct them taking into account when network capability will be needed in order to prevent constraints.

At a strategic level, a key factor influencing all of the options considered was the distance between the 'start' and 'end' points. A shorter reinforcement would cross fewer network boundaries and provide less network capability but could be delivered more quickly alleviating potential constraints in the short term.

Conversely a longer reinforcement would cross more network boundaries and provide greater network capability but would take longer to deliver increasing the risk of constraints in the short term.

Considering when additional network capability a combination of shorter and longer reinforcements would best meet the need in the short and long term.

Why Drax?

Longer reinforcements to substations in the east of England cross more network boundaries so provide greater amounts of additional network capability. Consideration was given to a number of potential 'end' points on the east coast including Drax in North Yorkshire, Cottam in Nottinghamshire and Bicker Fen in Lincolnshire.

All of these substations are located some way inland and would require longer onshore cable routes, however, these presented stronger points on the network which could accommodate the reinforcement. Drax was identified as our preferred 'Strategic Proposal' because it could deliver similar amounts of additional network capability more quickly while avoiding the need to cross a number of additional protected sites offshore and onshore.

An indicative image of our Drax converter station

Route and site selection

Options identification and selection

Following identification of Drax as our preferred Strategic Proposal we began to develop more detailed routeing and siting options.

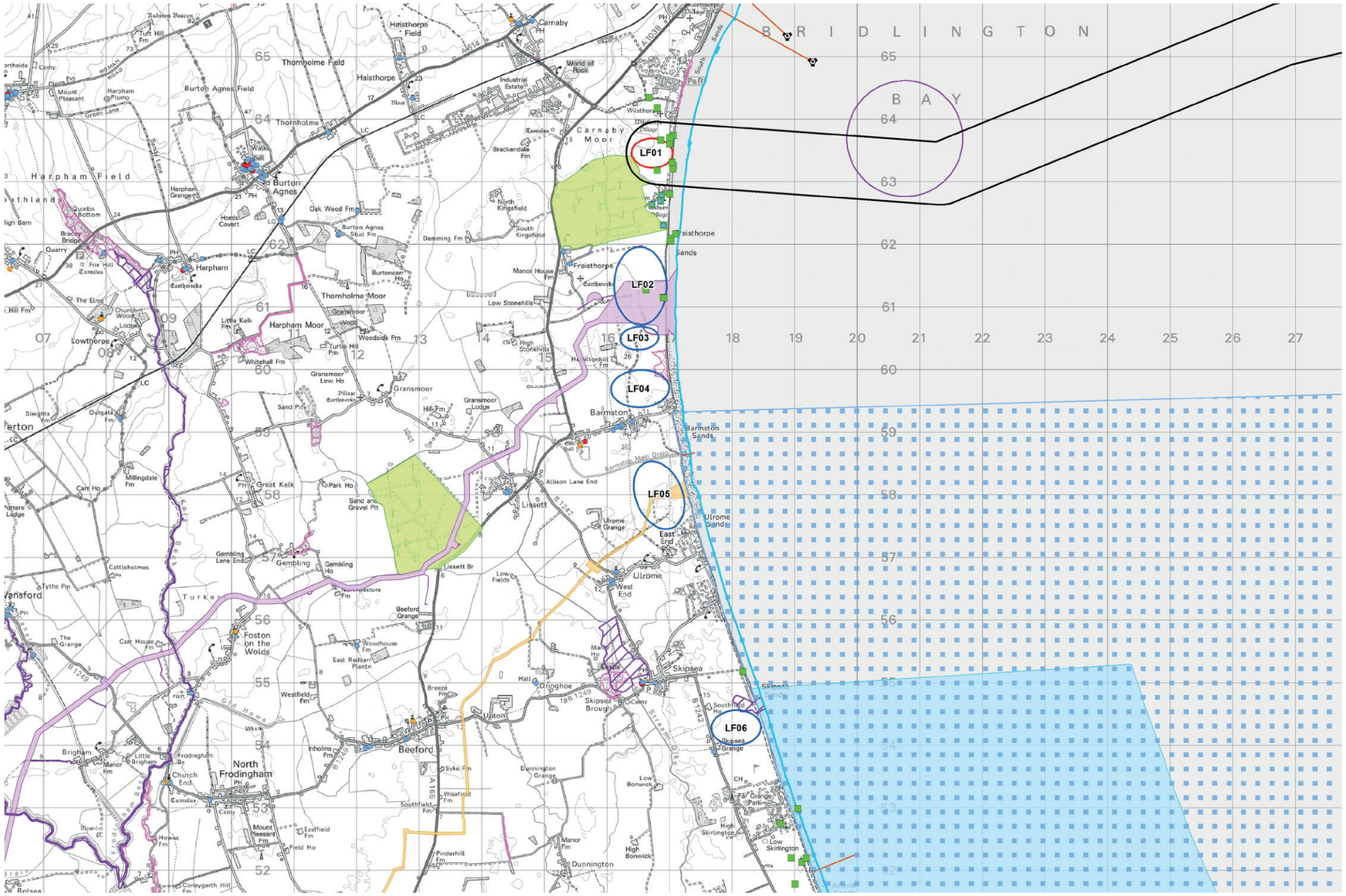
The objective of this stage has been to identify proposed landfall and converter station sites, as well as proposed cable route corridor and preliminary cable route alignment within it. To do this we have considered a range of engineering, environmental and socio-economic factors in line with our statutory and licence obligations.

Landfall site selection

The landfall is the interface between the onshore and offshore components of the Project. It is where the subsea cables come ashore and are joined to the underground cables at a buried Transition Joint Pit (TJP). The landfall could be constructed by excavating a trench through the beach and installing the cable within, or by Horizontal Directional Drilling (HDD) which involves drilling seawards and installing ducts through which the subsea cables are pulled ashore. Once the works to install the landfall are completed, land would be reinstated with no permanent above ground infrastructure left in place.

As shown in the plan we assessed a number of potential landfall locations along the coastline from Bridlington to Hornsea. This considered a range of constraints including proximity to settlements, accessibility, designated sites including Flamborough Head Special Area of Conservation (SAC) and Holderness Marine Conservation Zone (MCZ), as well as offshore wind farm export cables which come ashore in the area.

Our proposed landfall is located to the north of Fraisthorpe Wind Farm. This located on agricultural land away from more sensitive features including Wilsthorpe village. It also limits interaction with the proposed export cable route and landfall proposed as part of Hornsea 4 Offshore Wind Farm which means our proposed route does not cross theirs, either offshore or onshore.



Cable route selection

The cable route will be buried underground for its entire length from the landfall to the converter station. In order to install the cable route, we will establish a temporary working width up to 40 m wide. This will contain a trench, typically 1.5 m wide by 1.5 m deep, in which we will lay a pair of High Voltage Direct Current (HVDC) cables. It will also include a haul road for access during construction as well as areas for soil storage and drainage.

At key locations along the route we will need to establish temporary accesses and construction compounds. At some locations where we need to cross obstacles such as roads, railway lines or watercourses we will use Horizontal Directional Drilling (HDD) to bore a route below the obstacle through which ducts will be pulled and cables installed.

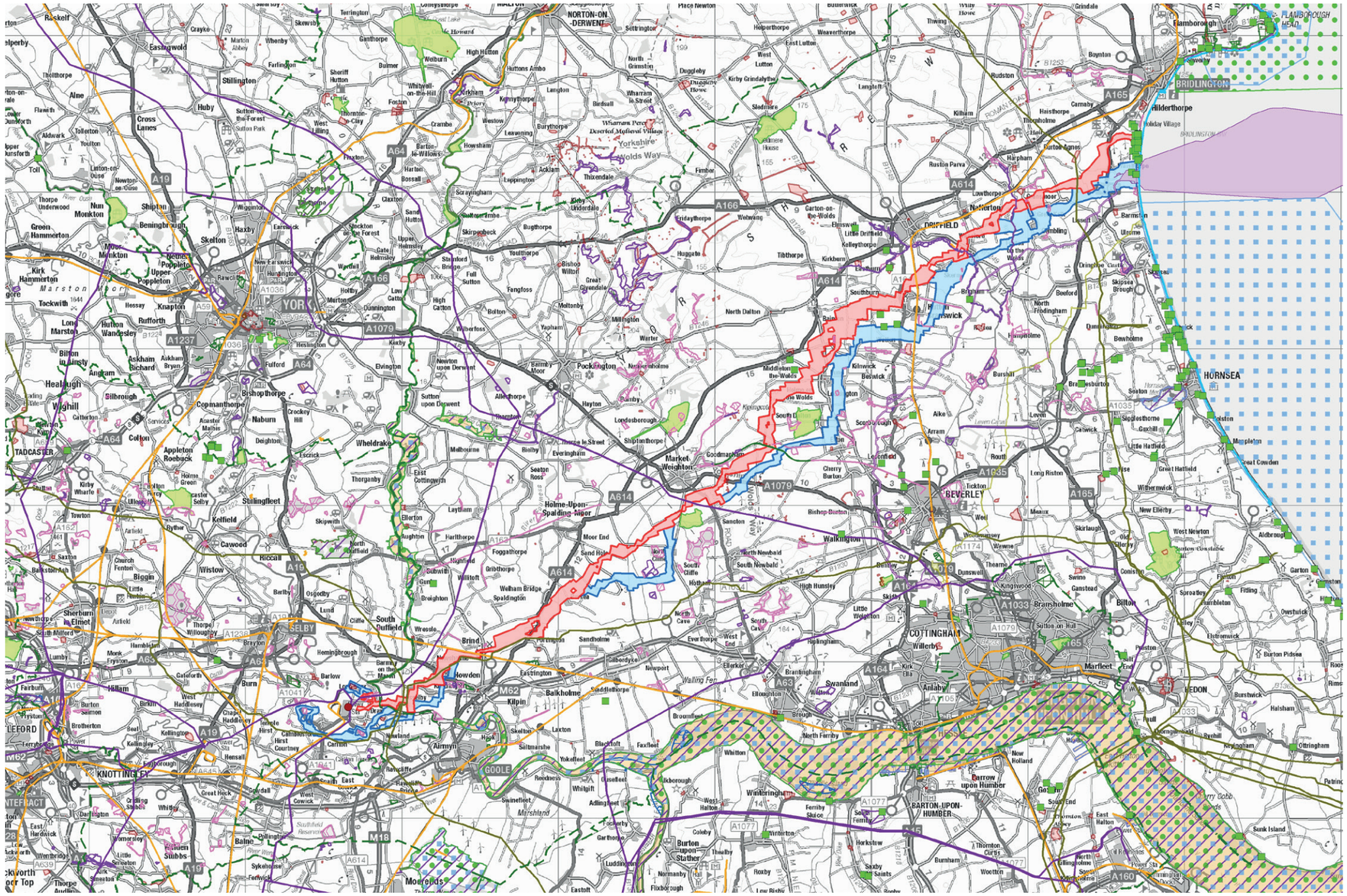
Initially we identified broad route corridors from the coast to the Drax area. This took account of the alternative landfall and converter stations which were being considered as well as key constraints within the wider area such as towns and villages, designated sites and other natural and built features such as woodland, rivers and road. Within these corridors we have identified and assessed potential route alignments taking account of their potential impacts and constructability.

Through this work we have identified a proposed route corridor and preliminary route alignment (the preferred route). The preliminary route alignment is mainly routed in a north east to south west direction for approximately 65 km ensuring as direct a route as possible. We have developed the preliminary route alignment so that it avoids settlements as well as nationally and locally designated sites, however, some parts of the route may be in close proximity to settlements or individual properties.

There are also some constraints, for example the River Hull Headwaters that we cannot avoid and therefore we propose to cross it using HDD to reduce potential impacts as far as possible. While the route is mainly located within agricultural land and we recognise the temporary impact cable installation may have so we are engaging with farm owners and tenants.

KEY

- Proposed Route Corridor
- Potential DC Route Corridor
- Mean Low Water Springs
- District Borough Unitary Boundary
- Drax Substation
- Military Remains
- National Grid Gas Pipeline
- National Grid Overhead Line
- Railway Track
- Special Area of Conservation
- Special Protection Area
- Site of Special Scientific Interest
- Local Nature Reserve
- Local Wildlife Site / Site of Importance for Nature Conservation
- RSPB Nature Reserve
- Scheduled Monument
- Registered Park and Garden
- Ramsar
- Hornsea4 DCO Order Limits
- Dogger Bank Onshore Order Limits



Converter station site selection

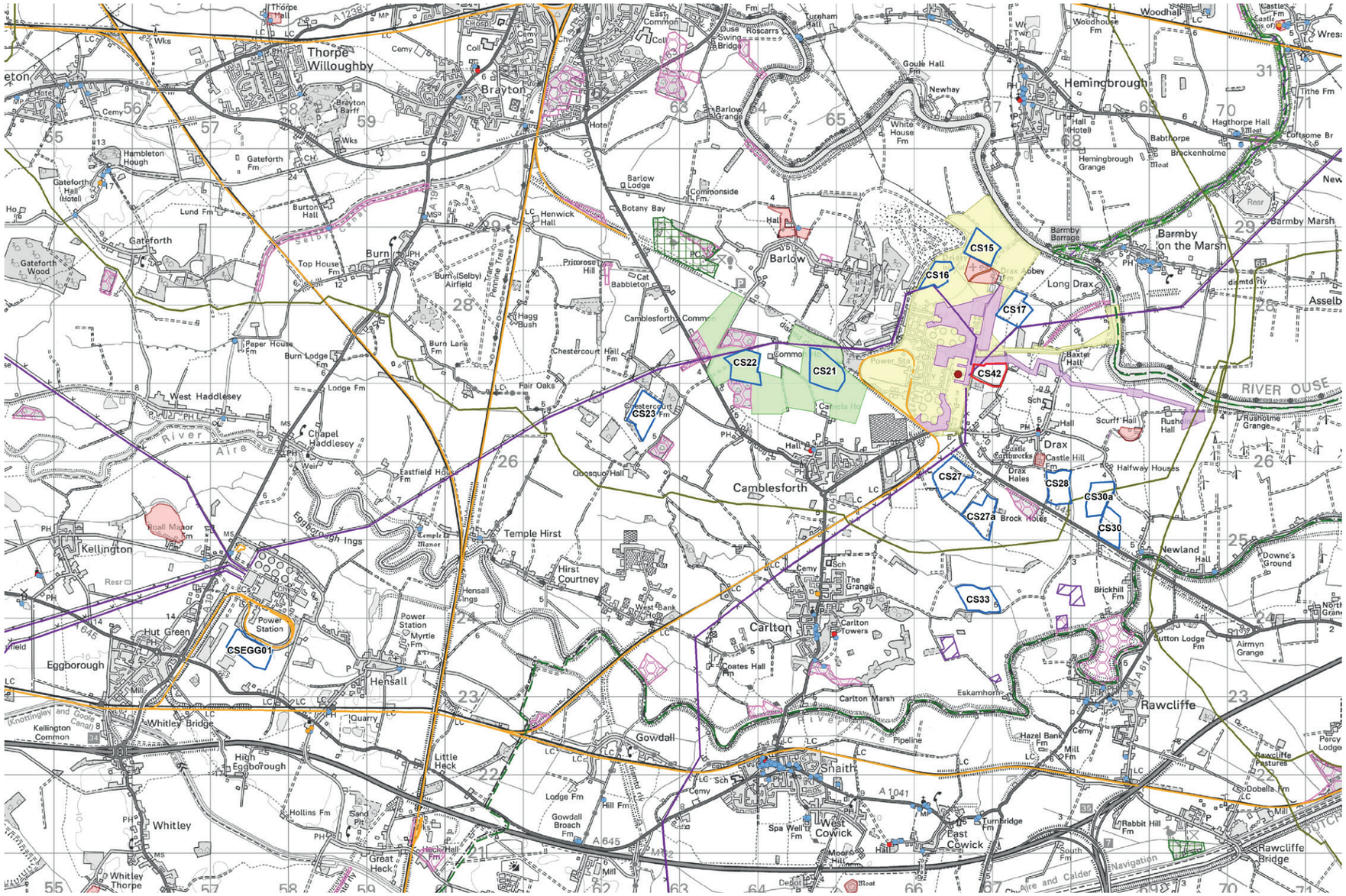
Converter stations are the key components of a HVDC links. They enable electricity to be converted from AC to DC or vice versa depending on the direction of operation. Converter stations contain specialist electrical equipment, some of this must be located indoors in buildings potentially up to 30 m tall, while some could be located outdoors or in smaller buildings. The total footprint of the converter station is approximately 6 hectares (ha) but additional land will be needed during construction.

We assessed a number of potential converter stations sites within the vicinity of the existing Drax Substation. The assessment considered engineering and environmental factors for each site including the proximity to Drax Substation, access from the road network as well as potential impacts on landscape, visual amenity, ecology and cultural heritage. Given the presence of Drax Power Station and the need to install underground cables from the converter station to the substation it is preferable to be located as close as possible to Drax.

While larger sites which provide more flexibility were identified further away from Drax, these would introduce industrial-type development into more rural areas. As result we propose to locate the converter station on a field adjacent to the existing substation. By locating it closer to Drax it will provide opportunities to integrate the converter station more effectively into its surroundings and reduce the length of underground cable required to connect to Drax Substation.

KEY

- Short-listed Converter Station site
- Proposed Converter Station Site
- District Borough Unitary Boundary
- Drax Substation
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- National Grid Gas Pipeline
- National Grid Overhead Line
- Railway Track
- Special Area of Conservation
- Site of Special Scientific Interest
- Local Nature Reserve
- Local Wildlife Site / Site of Importance for Nature Conservation
- Scheduled Monument
- Proposed Solar Farm
- Drax Re-power Boundary
- Drax BioEnergy Boundary



Our proposed option

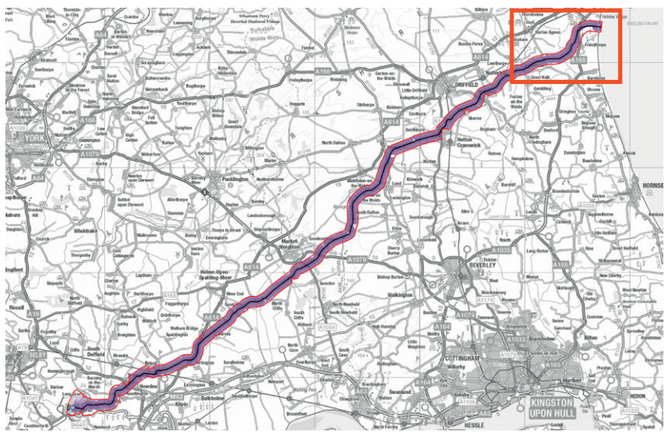
Our proposed option is comprised of a 65 km long underground cable, which will run from a landfall at Wilsthorpe to a converter station adjacent to Drax Substation.

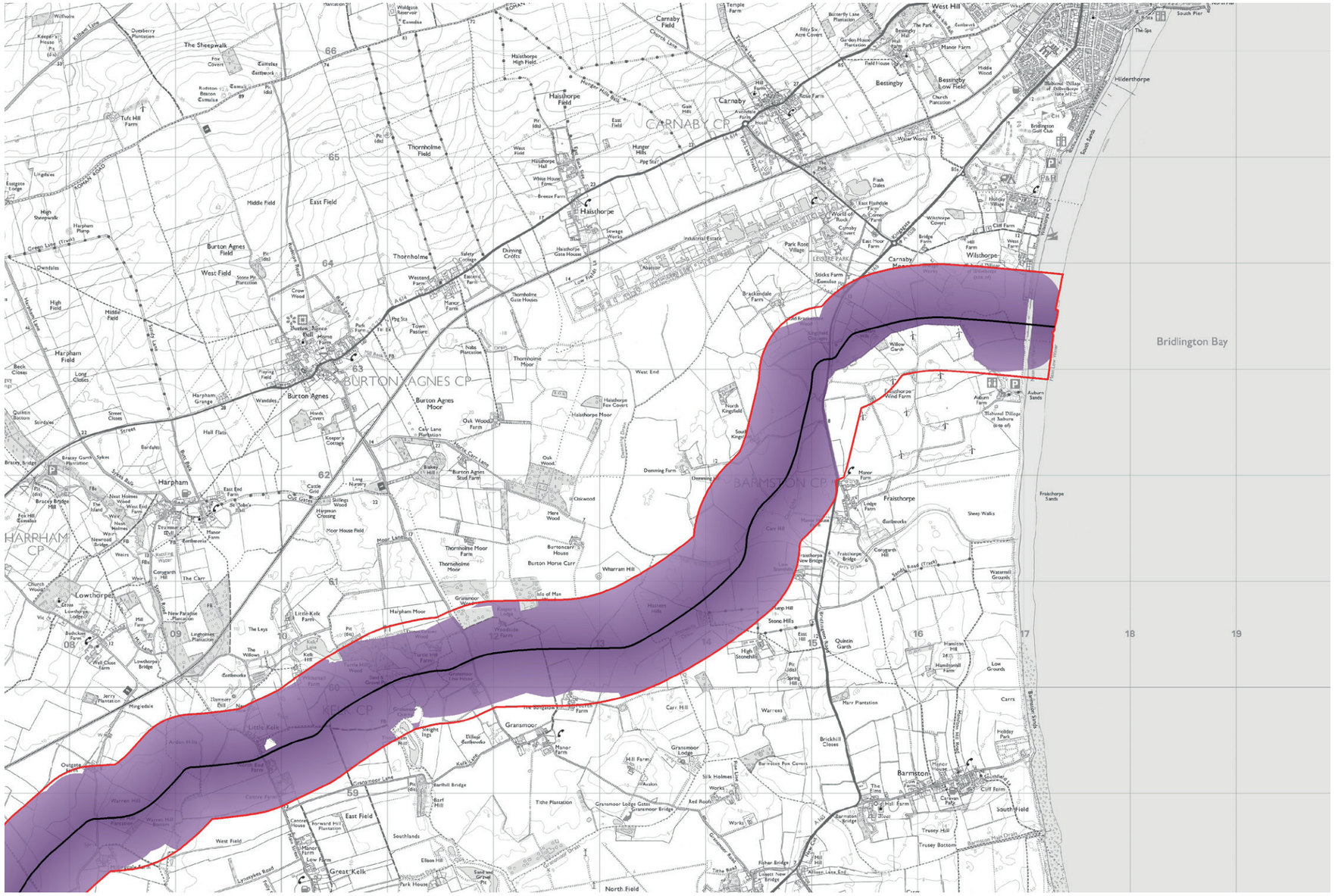
The following maps show our proposed route. The shaded area shows the broad corridor that we identified for the cable route. The dark line shows our preferred route (the preliminary route).

As we develop our proposals ahead of making a planning application in 2022, it is important that we hear the views of local people and we will be speaking to local communities, elected members and interested groups to explain our plans and ask for feedback.

Knowing what matters to local residents and other key stakeholders matters to us, so that we can see if we can take that into account when developing our proposals.

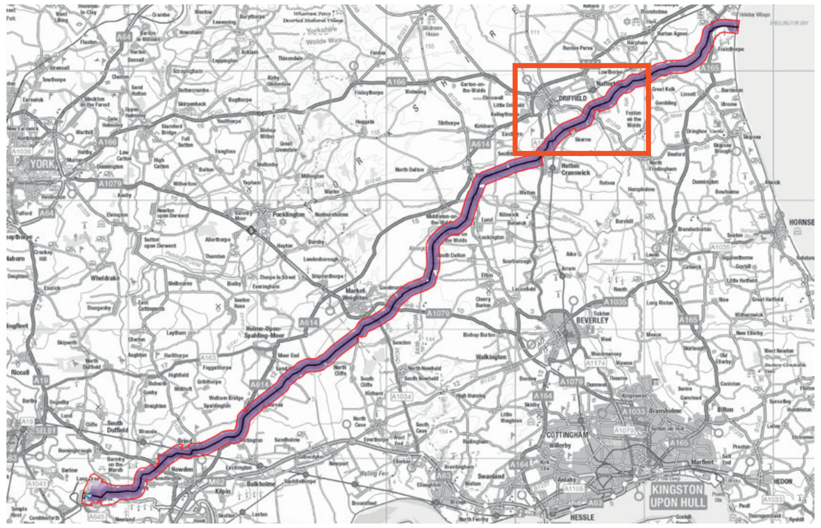
Proposed cable route
Section 1 of 7

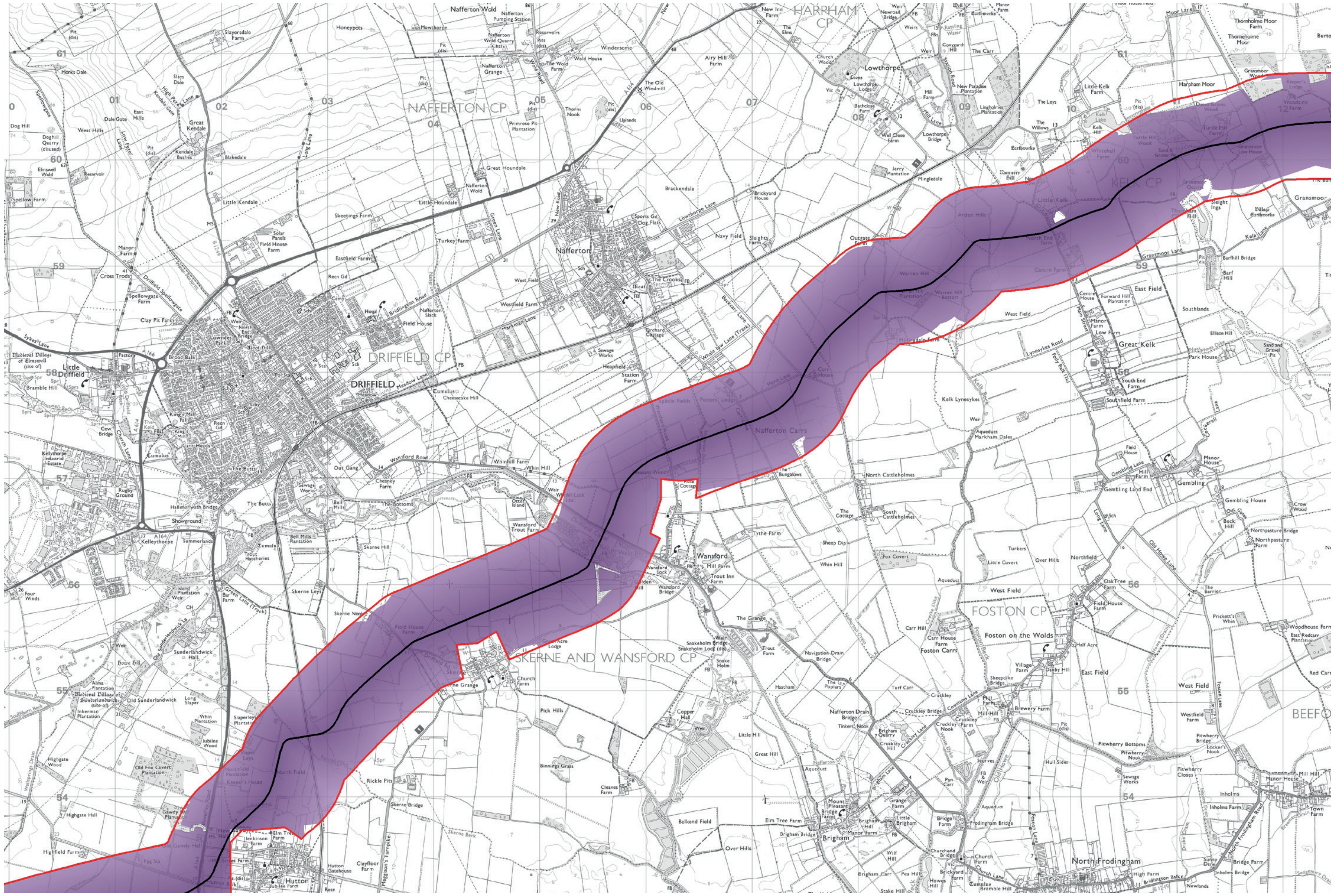




Proposed cable route

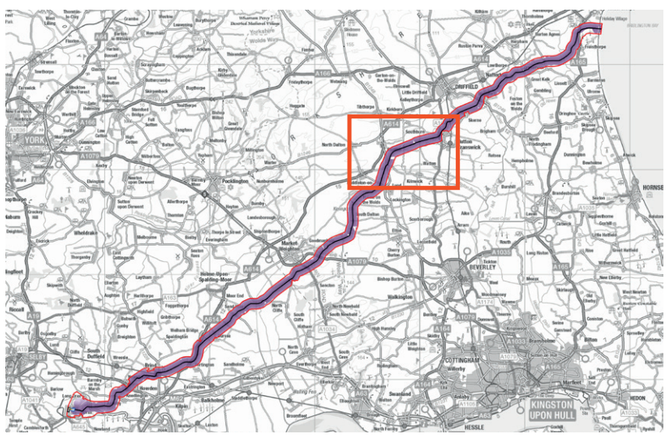
Section 2 of 7

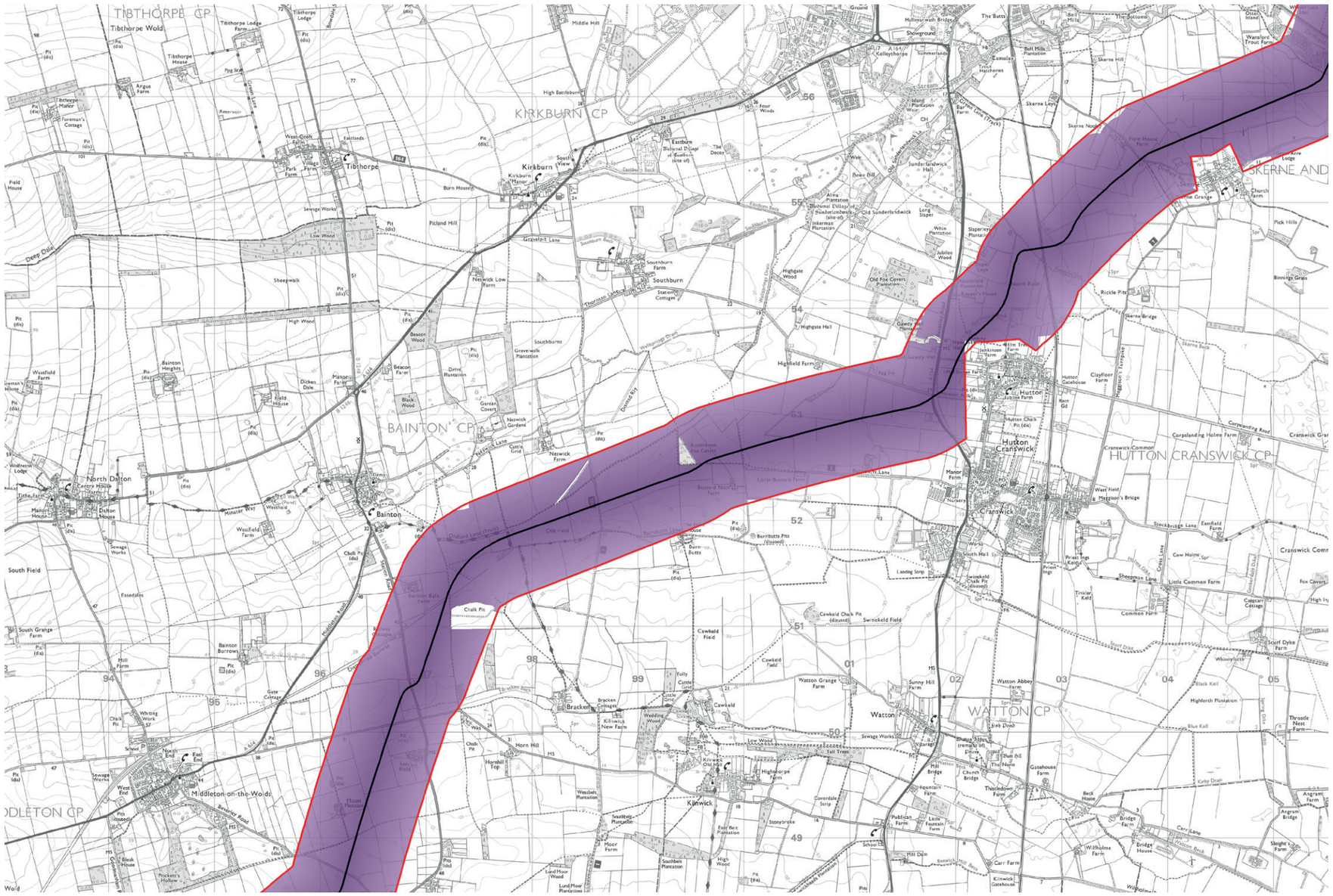




Proposed cable route

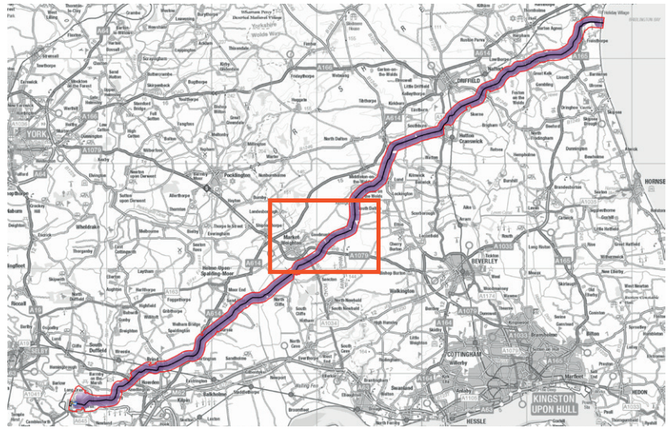
Section 3 of 7

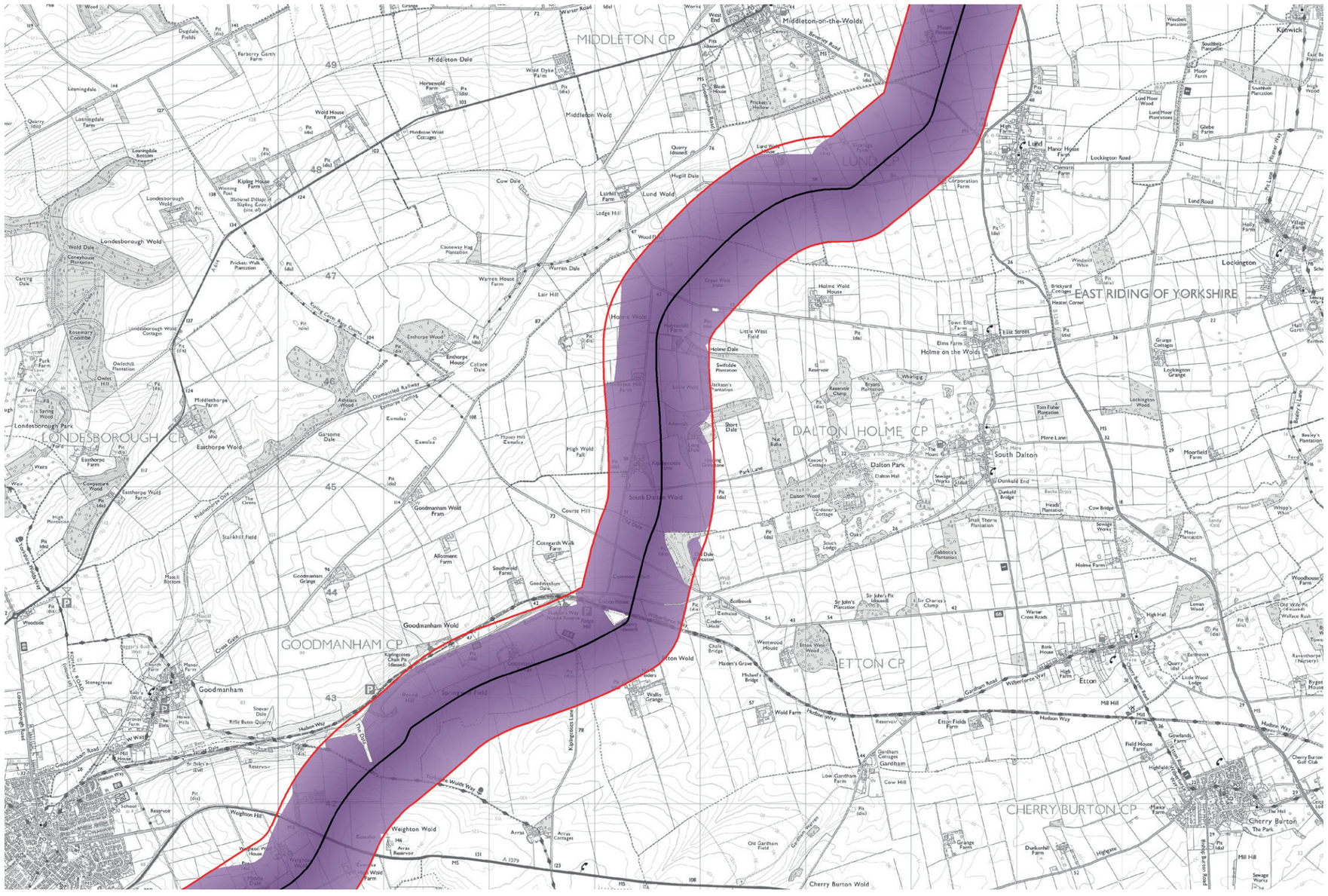




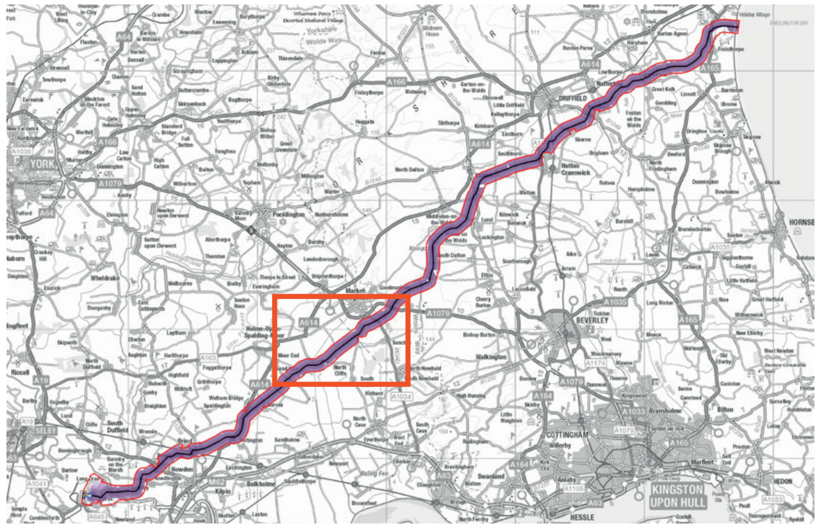
Proposed cable route

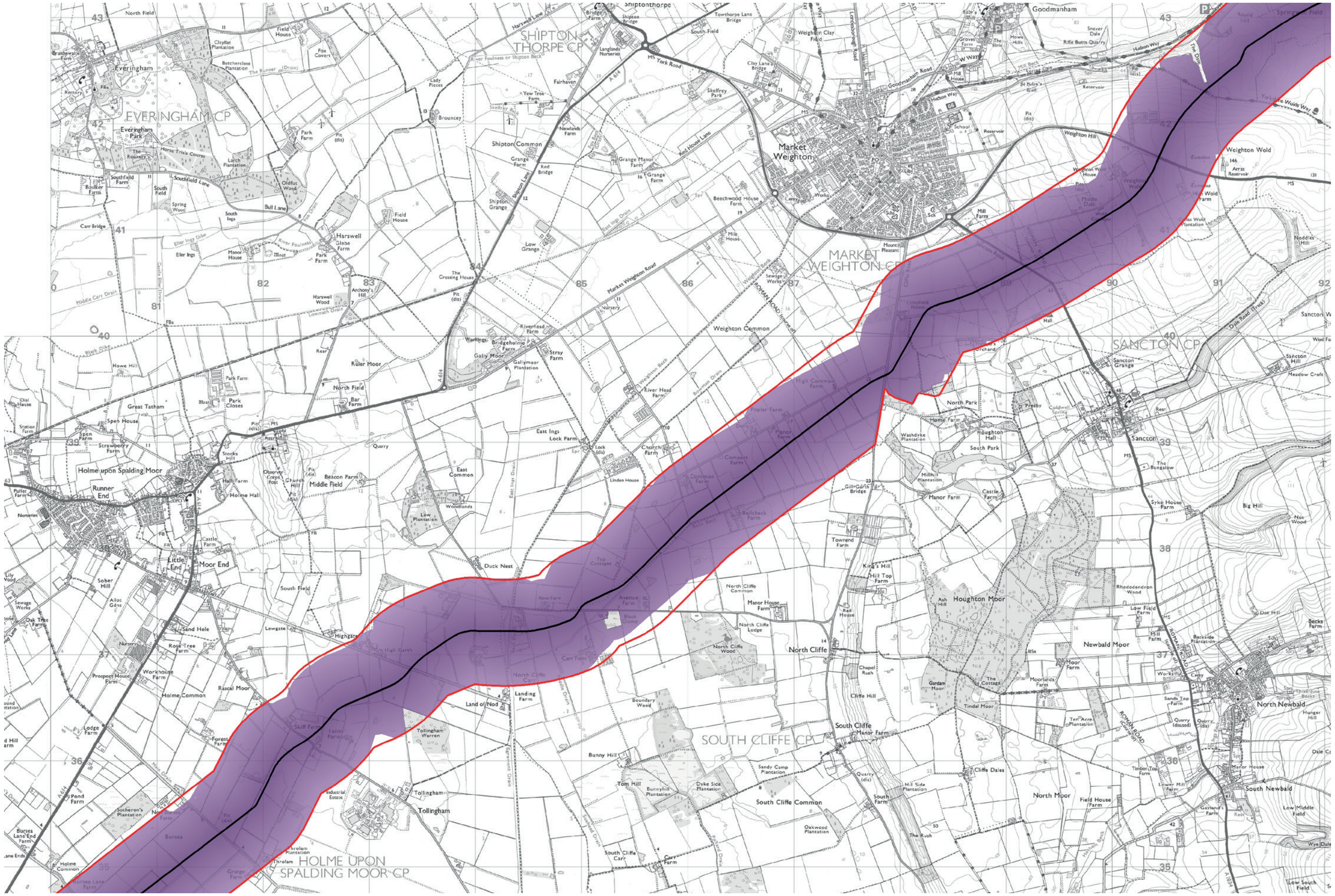
Section 4 of 7





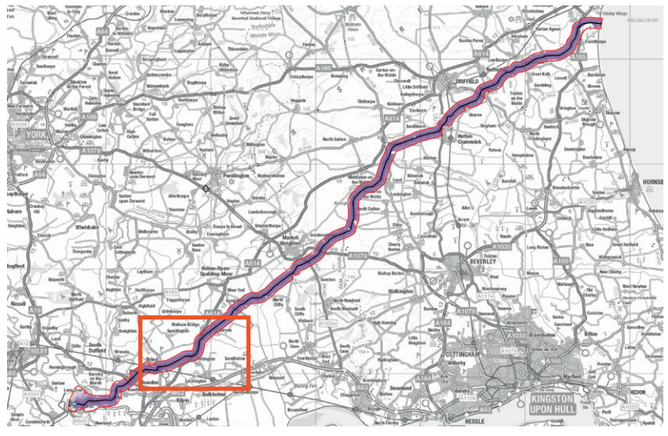
Proposed cable route
Section 5 of 7

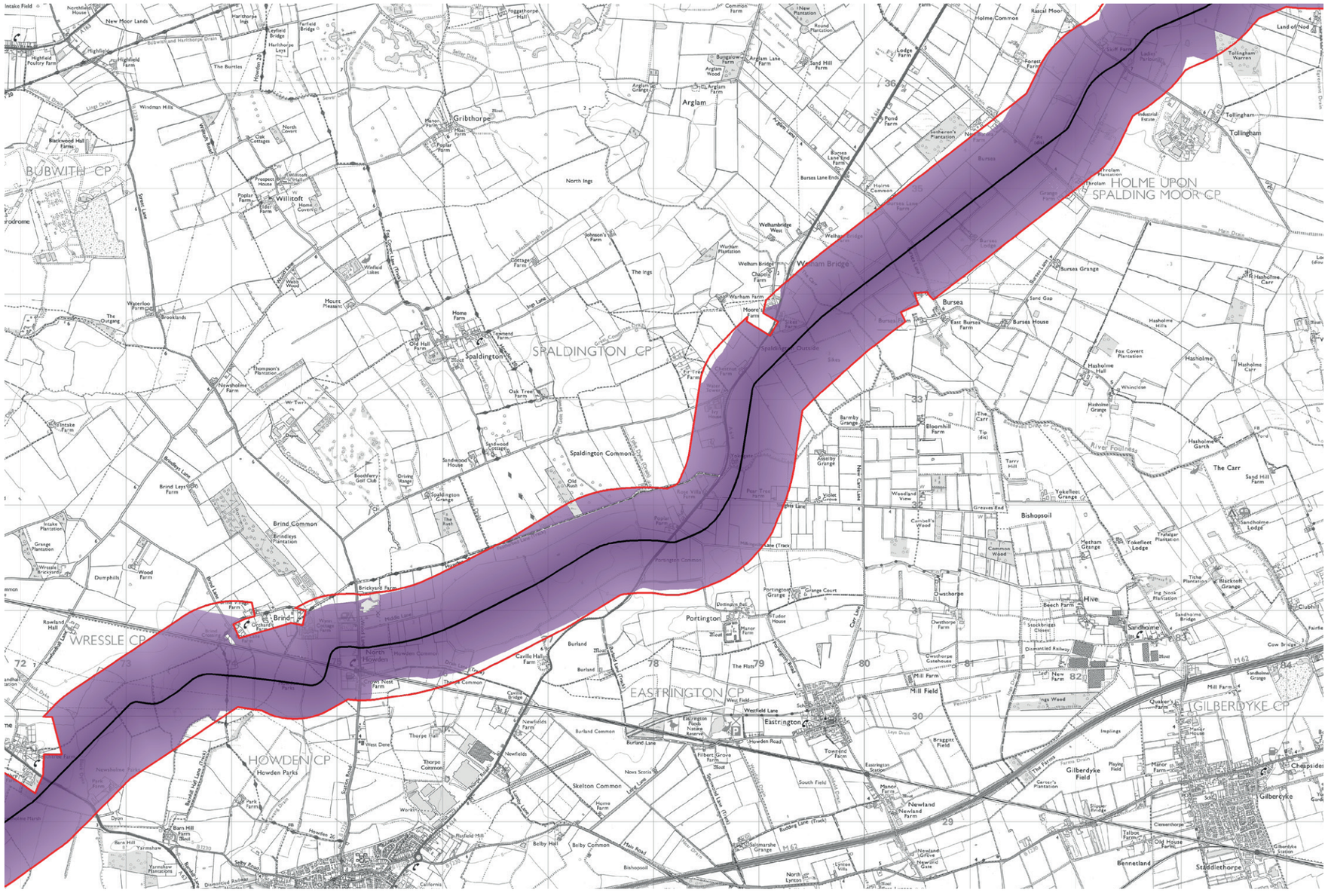




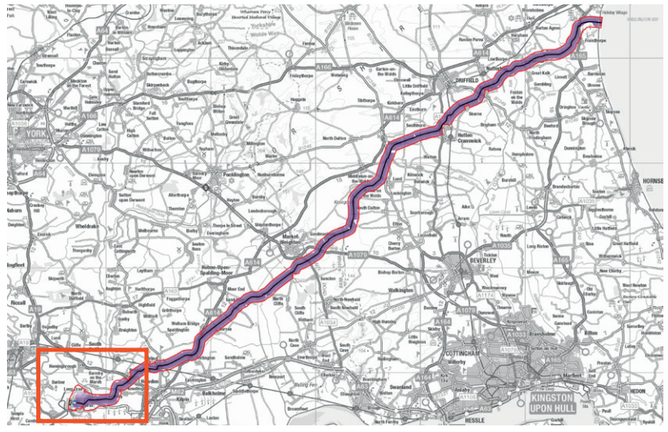
Proposed cable route

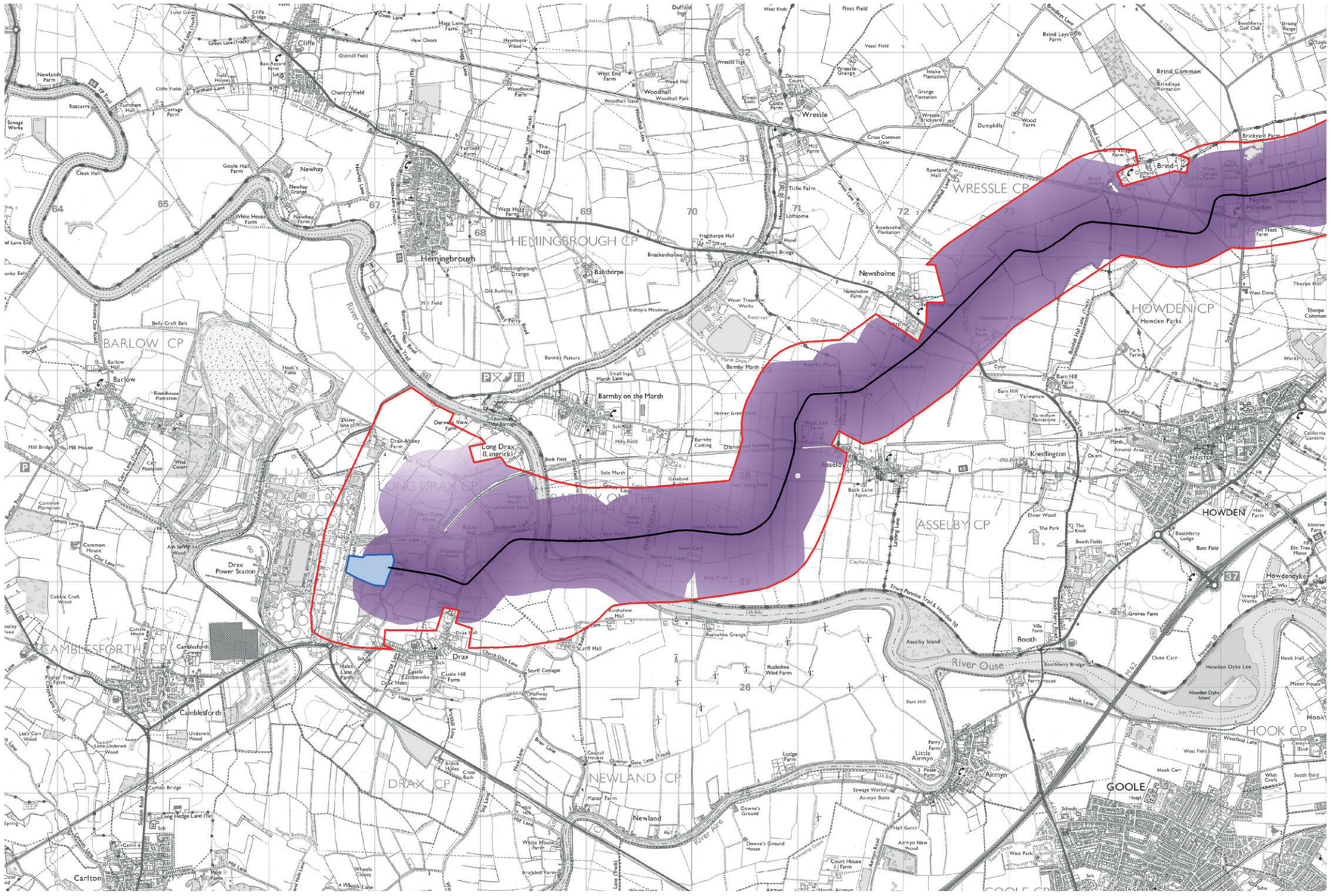
Section 6 of 7





Proposed cable route
Section 7 of 7





Project Timeline

Feedback from our first stage of consultation in Spring 2021 will inform our plans as we continue to develop the detailed designs, progress our environmental impact assessment works and prepare planning and marine licence applications.

We will hold a further Public Information event before we submit our planning application, expected in early 2022. Here we will be able to share further details of our proposals, including any changes we have made as a result of your feedback.

We intend to submit our planning applications in early 2022. The Local Planning Authorities will hold a 21-day consultation period where you have an opportunity to formally comment on the planning application. The Local Planning Authorities will then consider the application and a decision will be taken to grant planning permission or not.

A summary of the timeline to application can be found below:

Spring – Autumn 2021
Marine surveys

Spring – Autumn 2021
Environmental surveys

Spring 2021
Public consultation

Early 2022
Public information events

Early 2022
Submission of planning application

2024
Construction to begin, if planning consent secured

2029
Construction phase complete

Landowners

Throughout this process, we will continue to engage with landowners, and those with interest in land, who may be impacted by our proposed works. If your land is impacted by these proposals, then you should have been contacted by our land agents. If you wish to speak to a member of our land team you can use the details opposite.

Who to contact if you would like information or documents in an alternative format?

We are committed to making project information accessible to all users. If you need any information or documents in an alternative format such as large print, Braille or audio tape, get in touch using the contact details right.

Who to contact for a media enquiry

If you are a member of the media and wish to contact the National Grid team, please call **0808 1968 407** or email: **info@segl2.nationalgrid.com**

Our project website will be updated throughout the project's development, but if you have any questions in the meantime, please visit the contact us page of our website or get in touch using the details below.

info@segl2.nationalgrid.com

0808 1968 407

nationalgrid.com/segl2

National Grid plc
1-3 Strand
Charing Cross
London
WC2N 5EH
United Kingdom

nationalgrid.com