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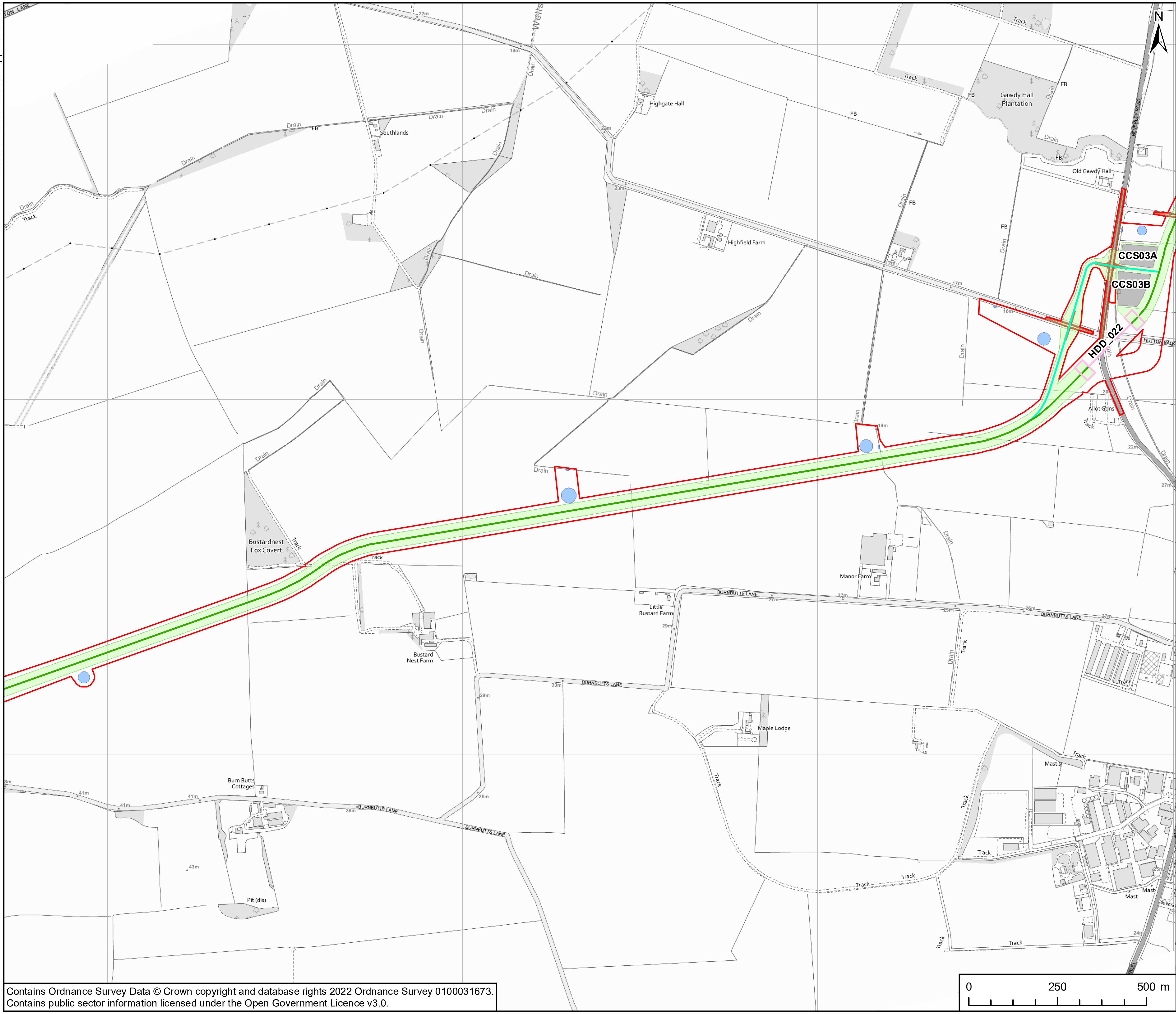


Coordinate System: British National Grid

Scale @ A3 1:10,000

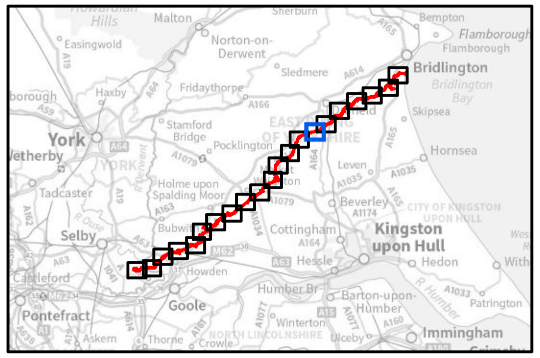
nationalgrid

PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay



TITLE

Figure 3-5
Underground DC Cable Route Details

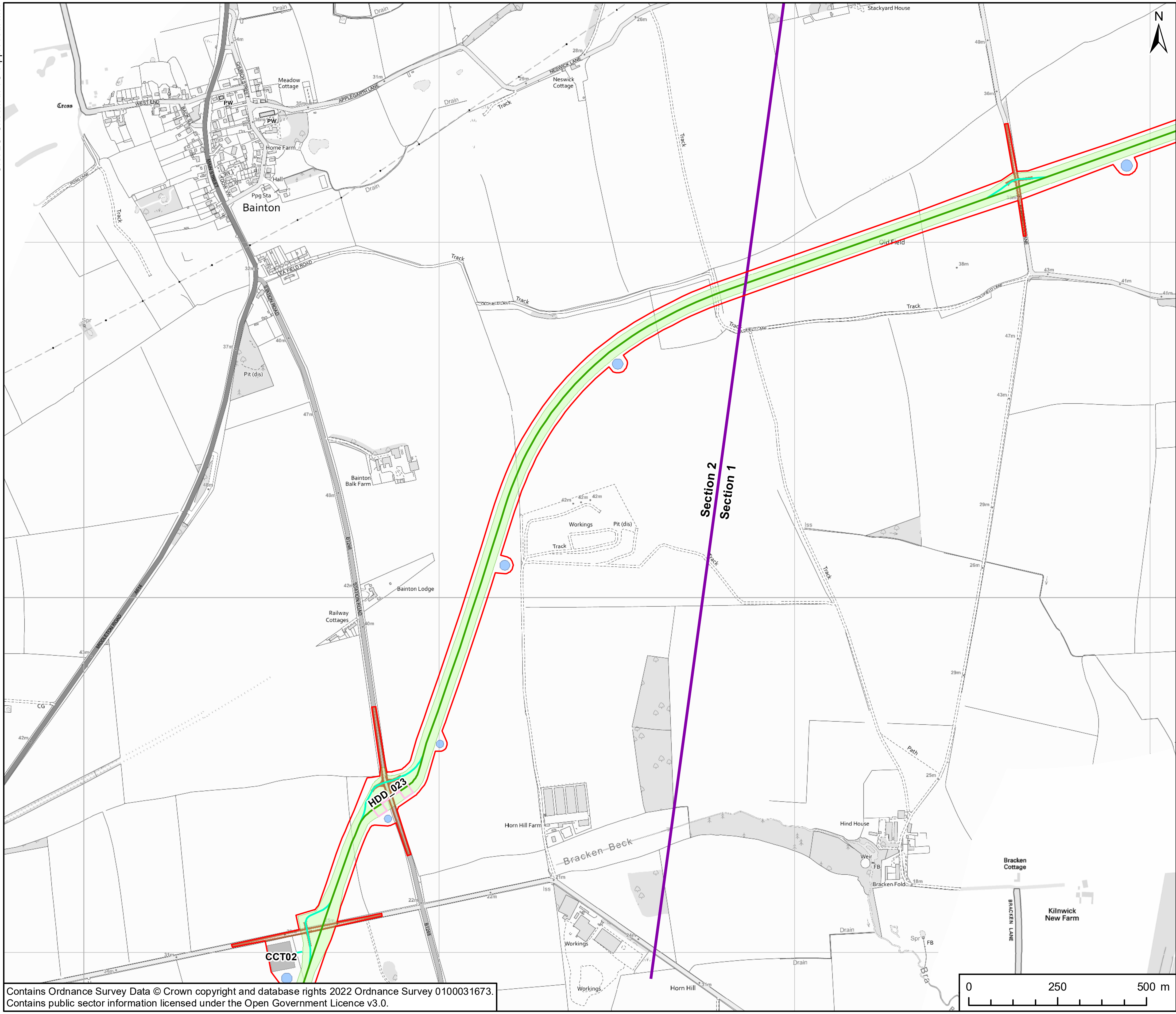
REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER: 7 of 21

DATE: 30/05/2022

GIS: LC Checked: TC Approved: MW



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nationalgrid

PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- Route Section Break
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay

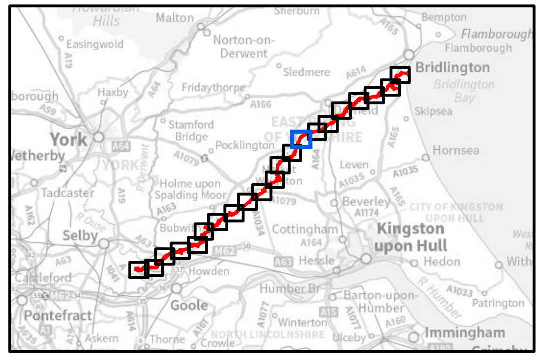

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Figure 3-5
Underground DC Cable Route Details

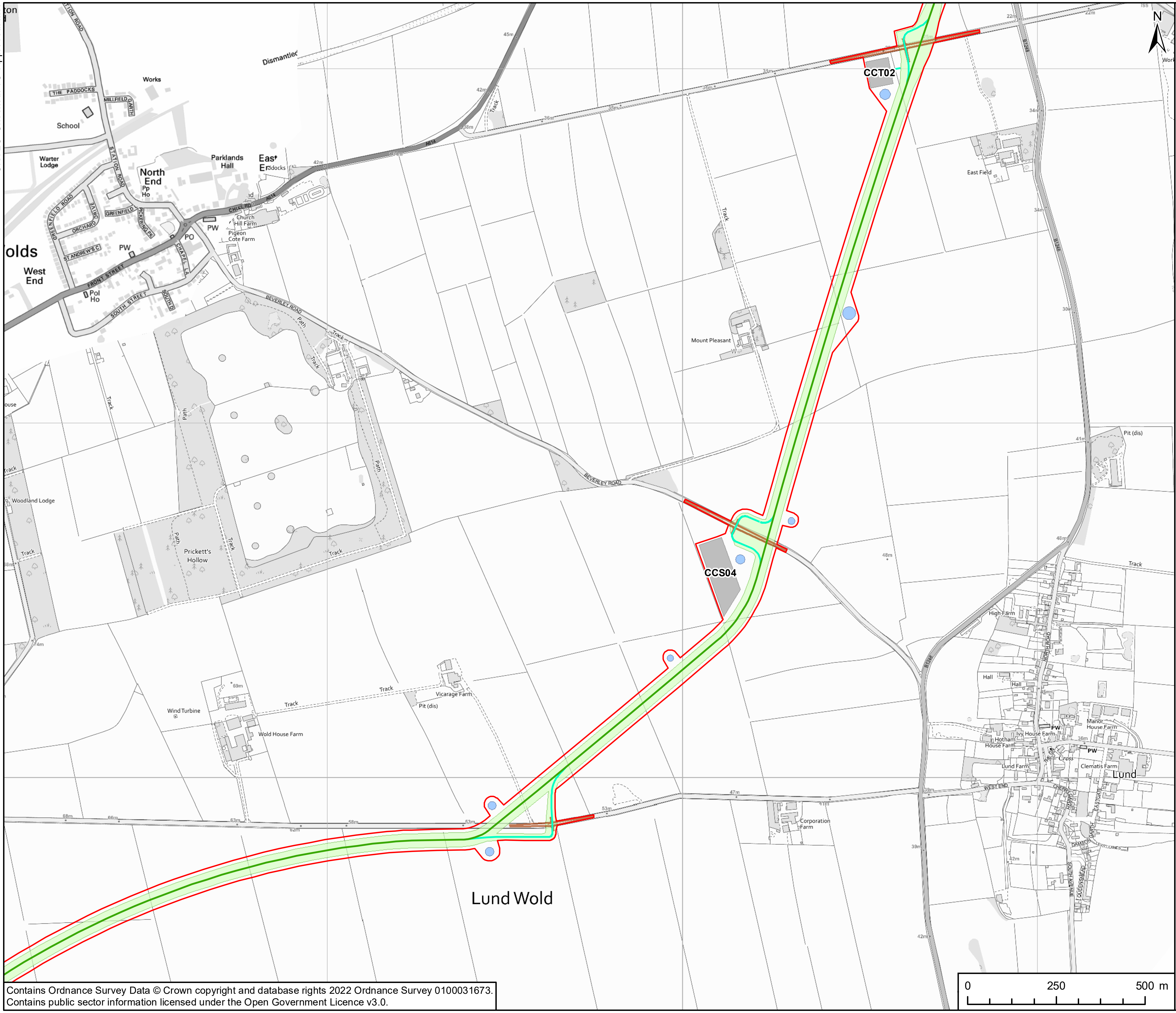
REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER: 8 of 21

DATE: 30/05/2022

GIS: LC Checked: TC Approved: MW



Coordinate System: British National Grid

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Scale @ A3 1:10,000

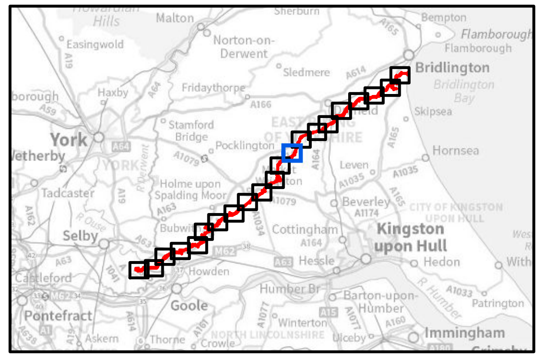
nationalgrid

PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay



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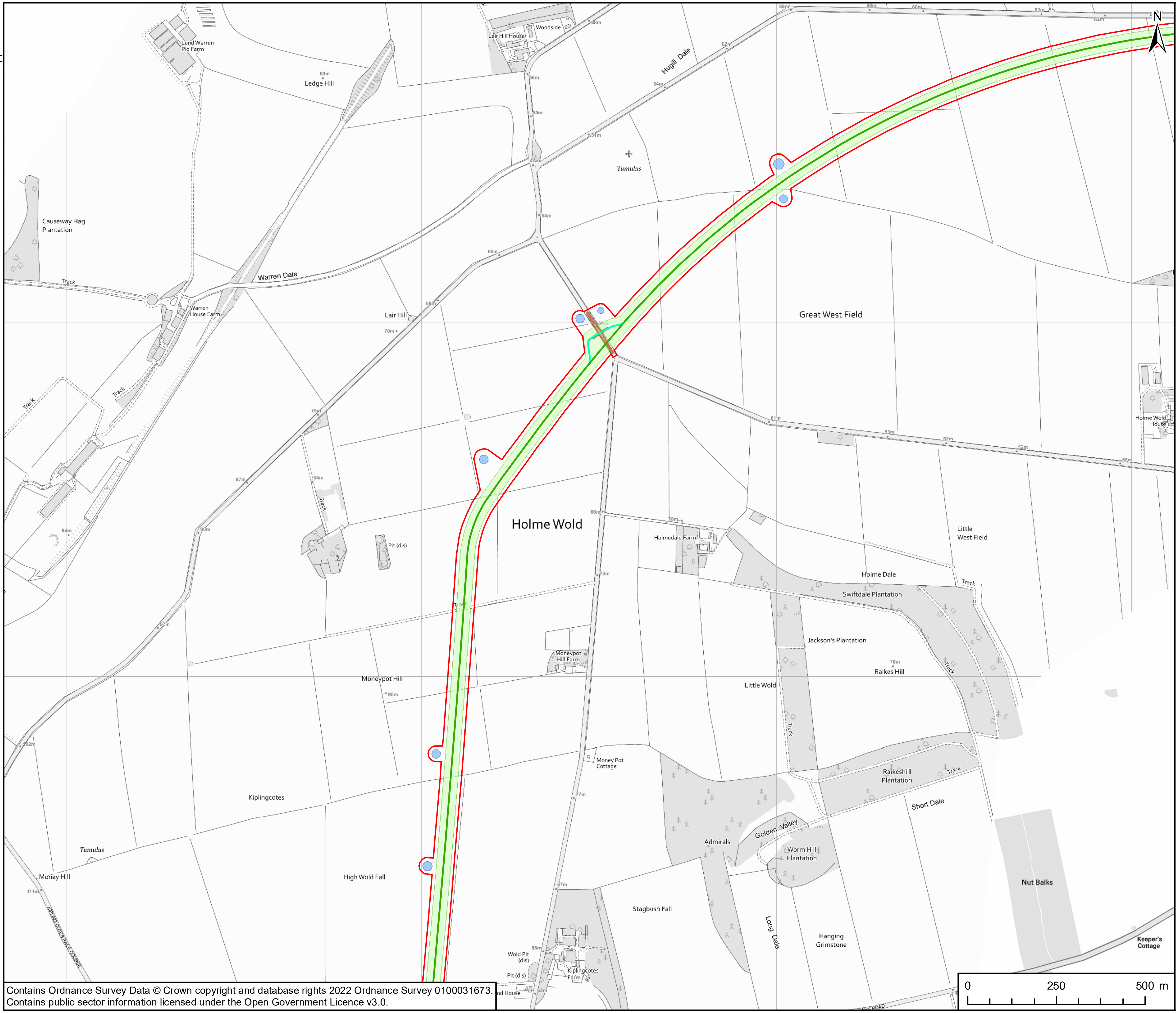
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER 9 of 21

DATE 30/05/2022



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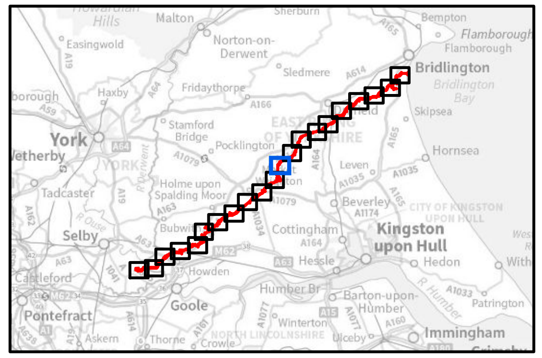
PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Bellmouth and Visibility Splay



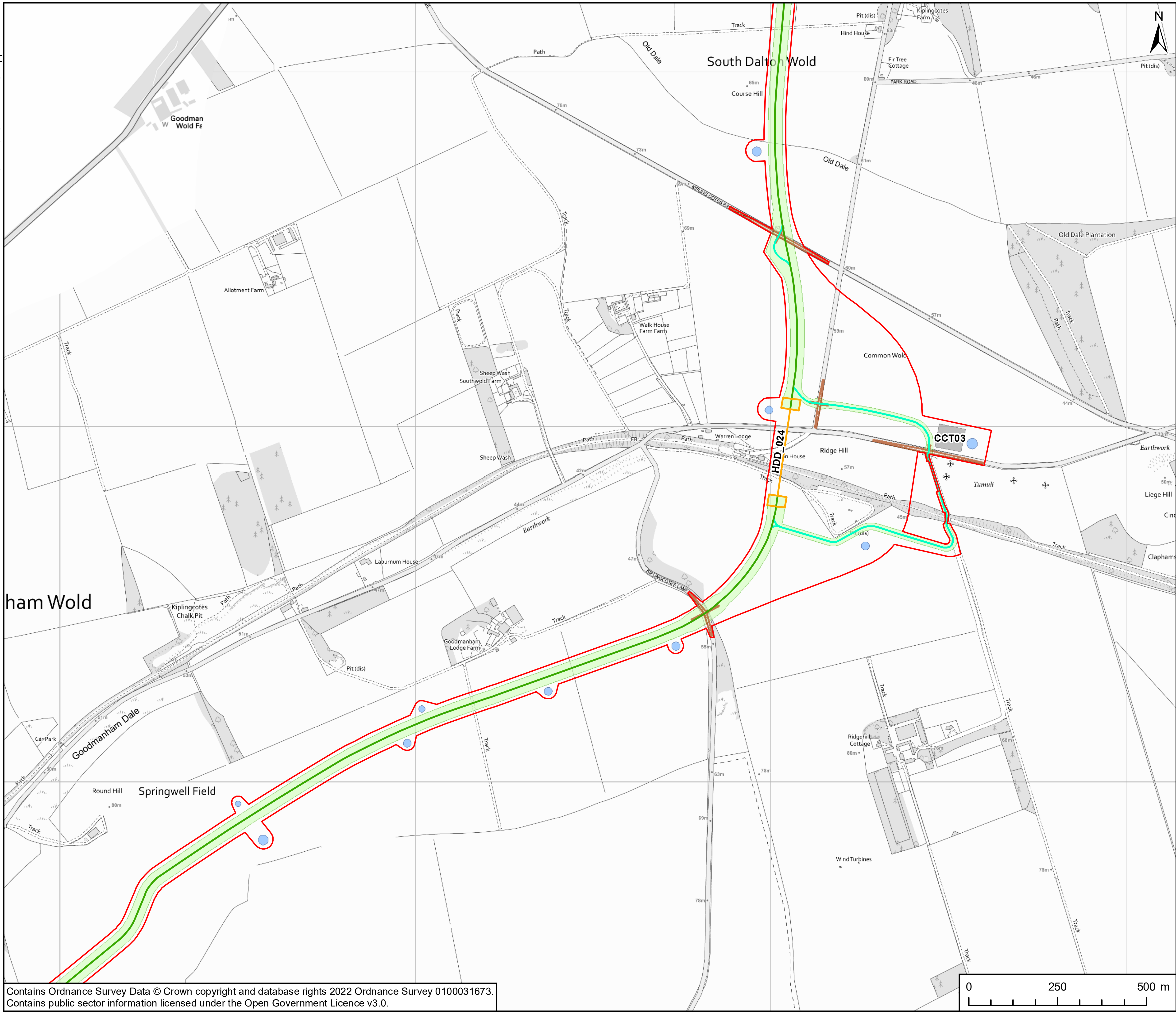
TITLE

Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER	DATE
10 of 21	30/05/2022



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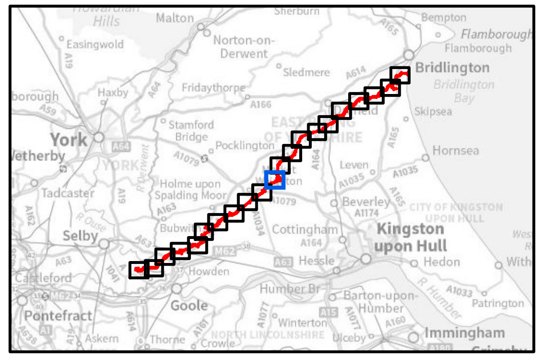
PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Proposed
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay



TITLE

Figure 3-5
Underground DC Cable Route Details

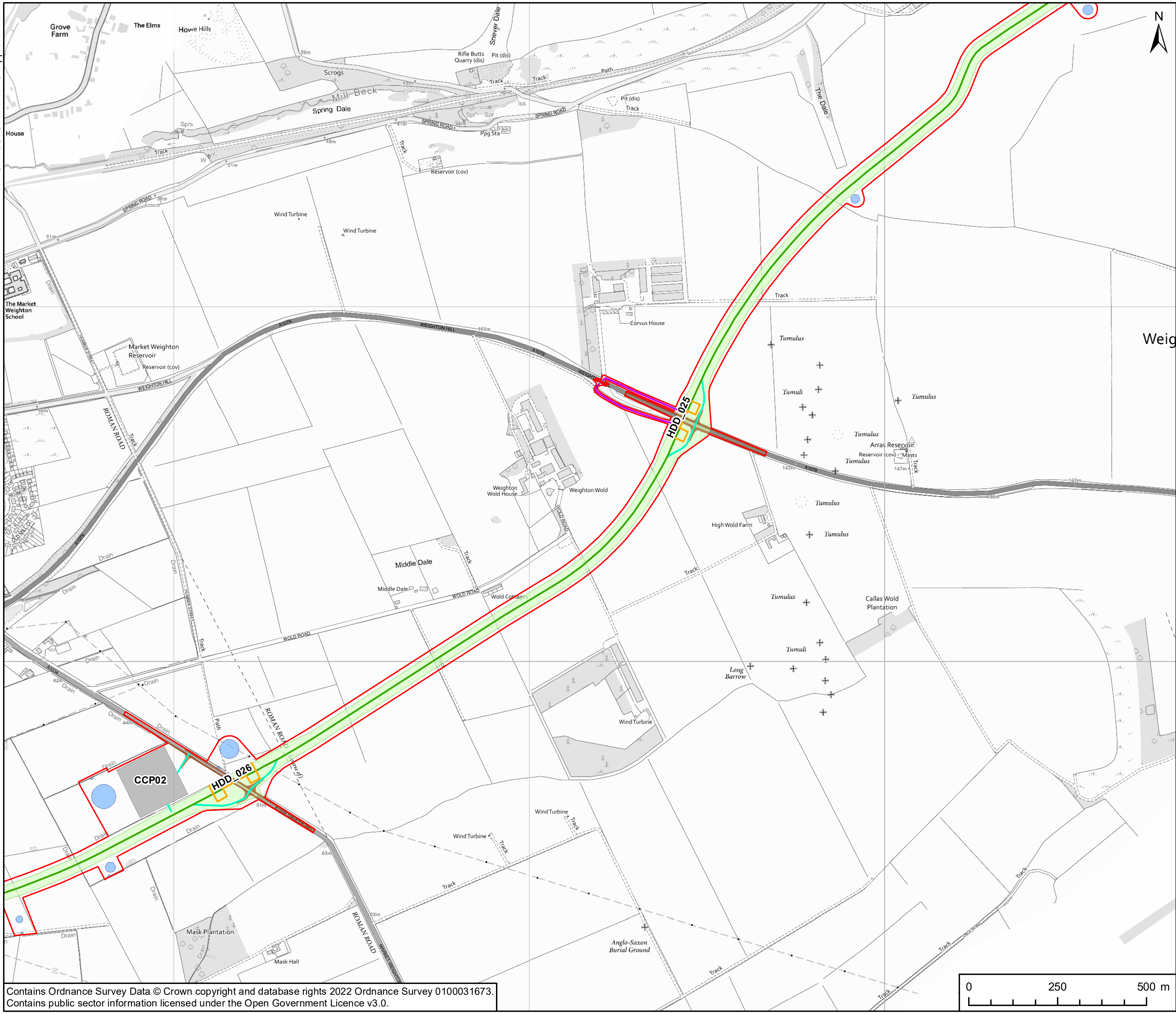
REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER: 11 of 21

DATE: 30/05/2022

GIS: LC Checked: TC Approved: MW



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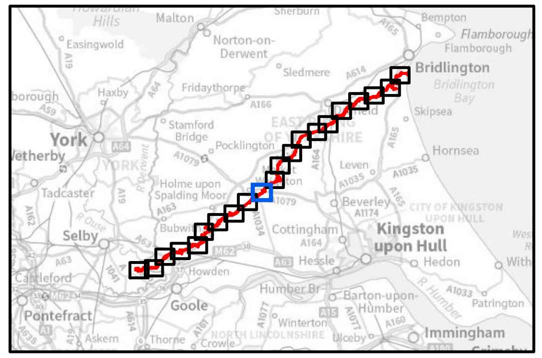
PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Proposed
- DC Cable Alignment – Open Cut
- Advanced HDD Access Route
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay



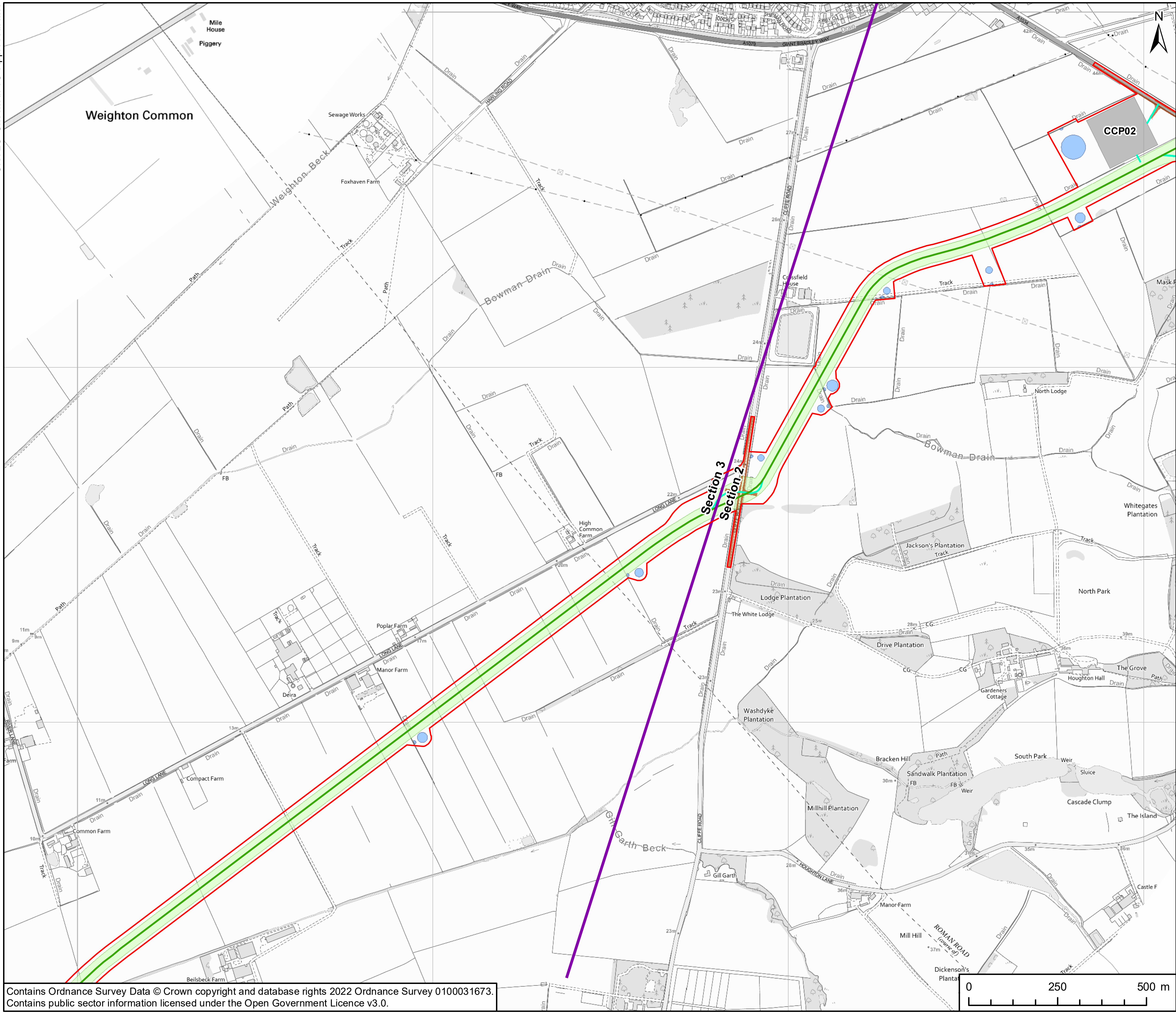
TITLE

Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER	DATE
12 of 21	30/05/2022



Coordinate System: British National Grid

Scale @ A3 1:10,000

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PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- Route Section Break
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay

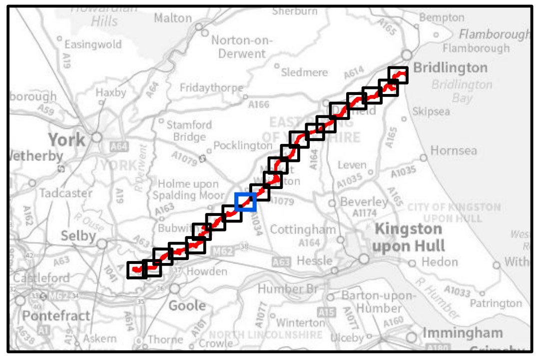

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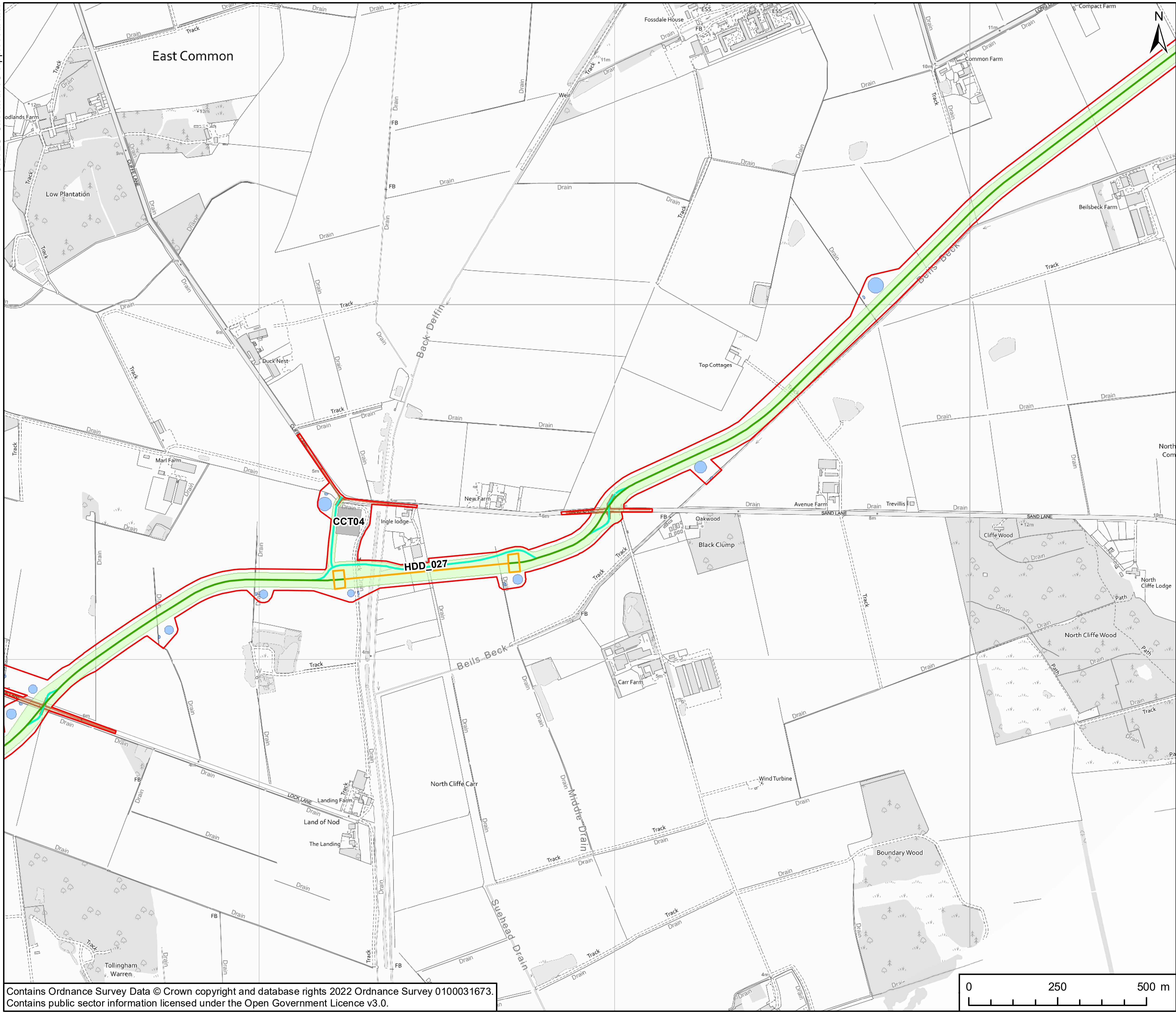
Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER	DATE
13 of 21	30/05/2022

GIS: LC Checked: TC Approved: MW



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Coordinate System: British National Grid

Scale @ A3 1:10,000

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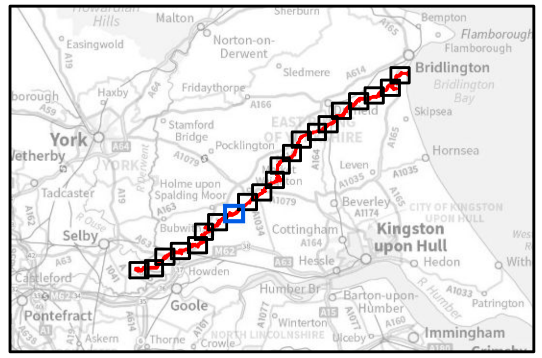
PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Proposed
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay



TITLE

Figure 3-5
Underground DC Cable Route Details

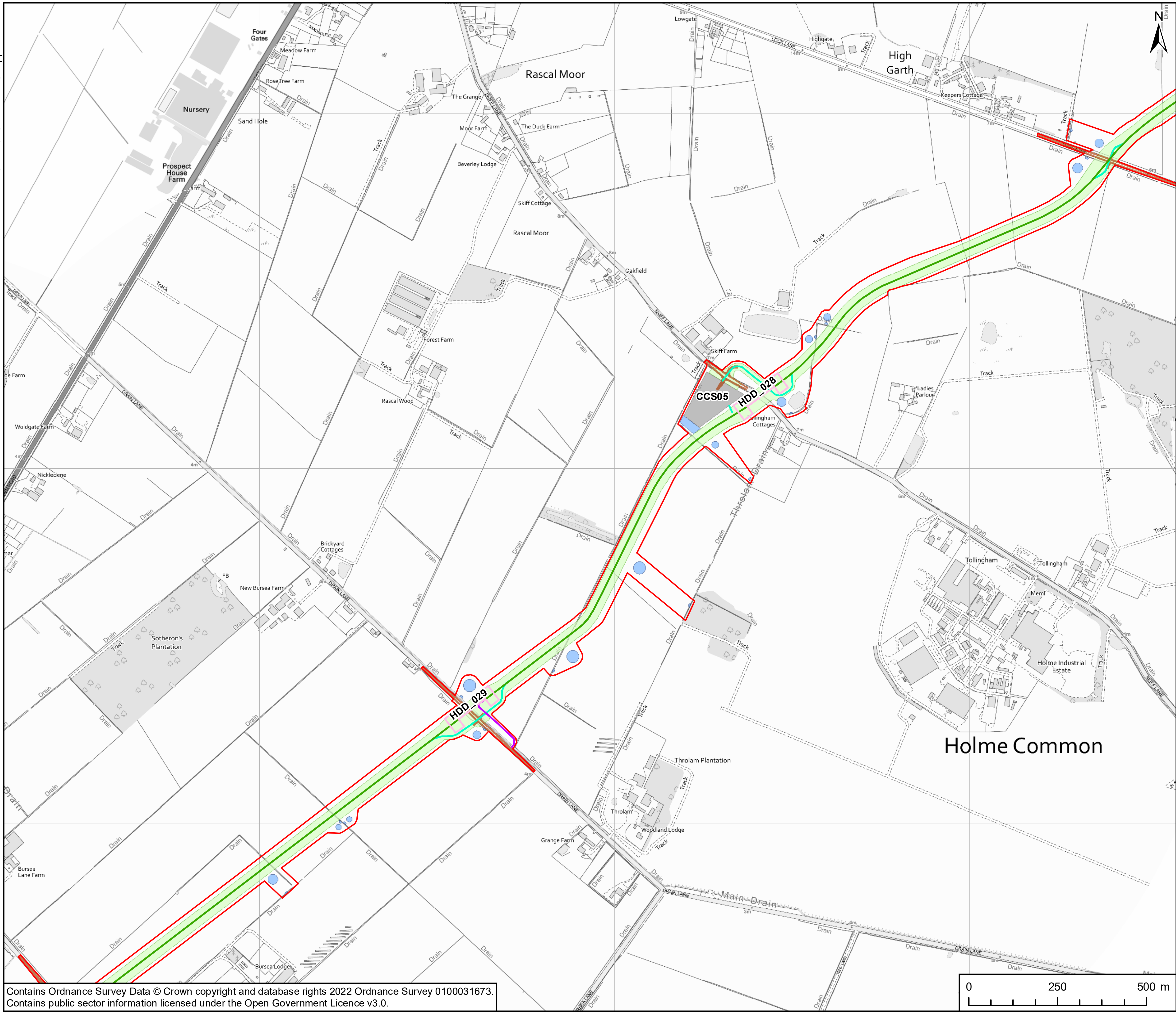
REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER: 14 of 21

DATE: 30/05/2022

GIS: LC Checked: TC Approved: MW



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Scale @ A3 1:10,000

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PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Advanced HDD Access Route
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay

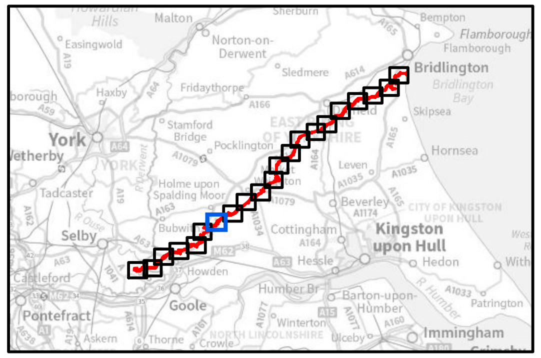

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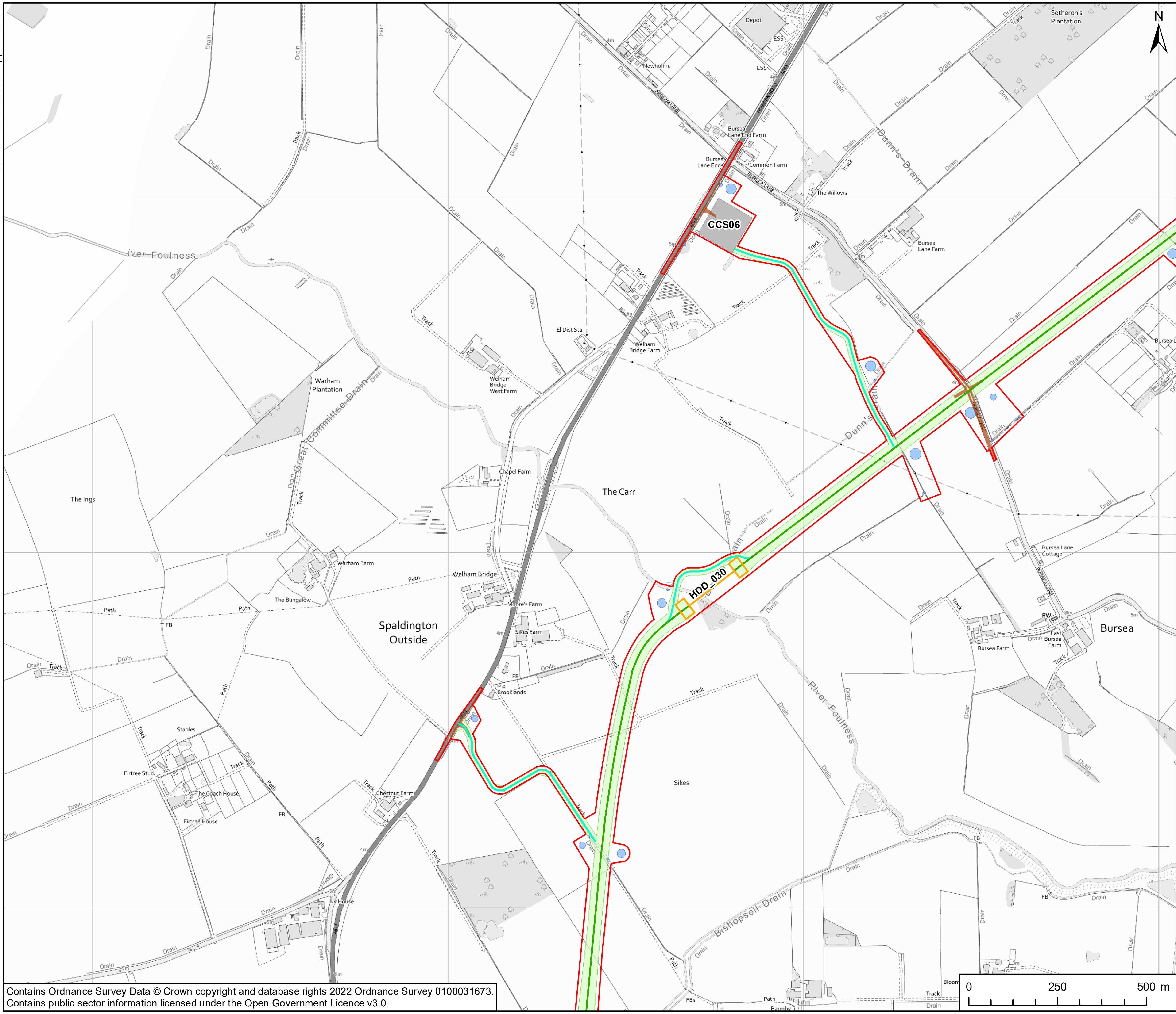
Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER 15 of 21

DATE 30/05/2022



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PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Proposed
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay

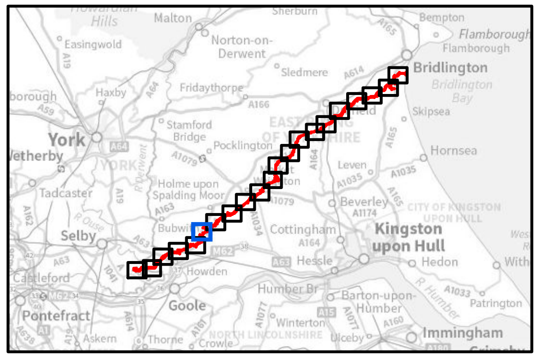

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Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER	DATE
16 of 21	30/05/2022

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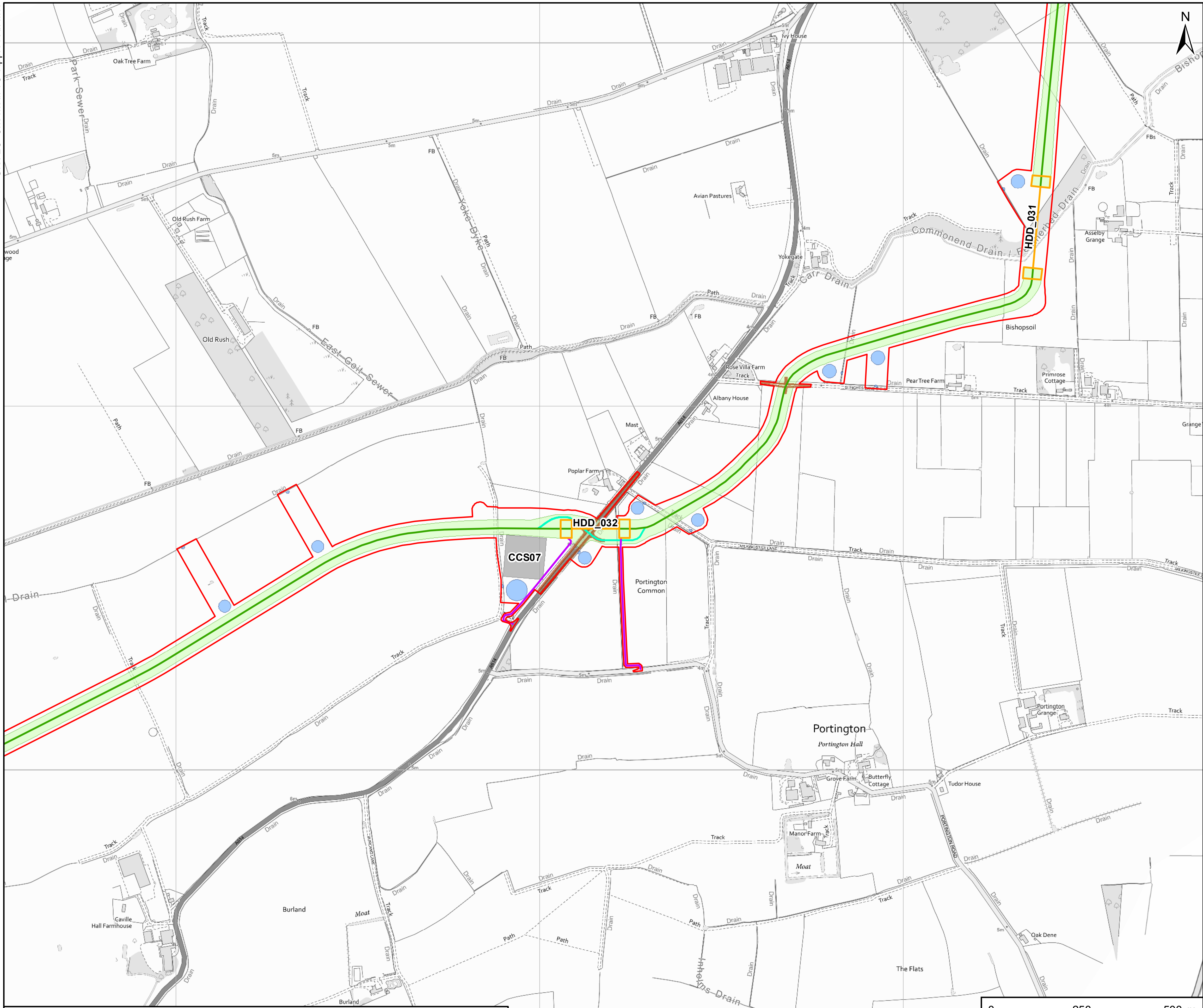

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Scale @ A3 1:10,000

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PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Proposed
- DC Cable Alignment – Open Cut
- Advanced HDD Access Route
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay

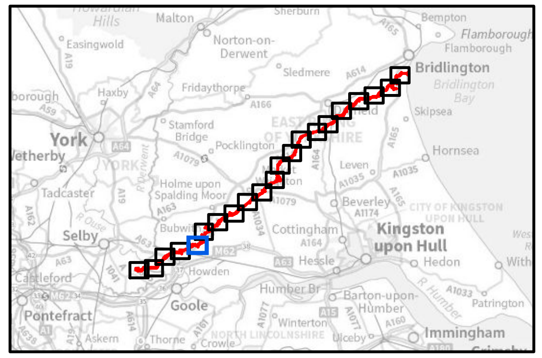

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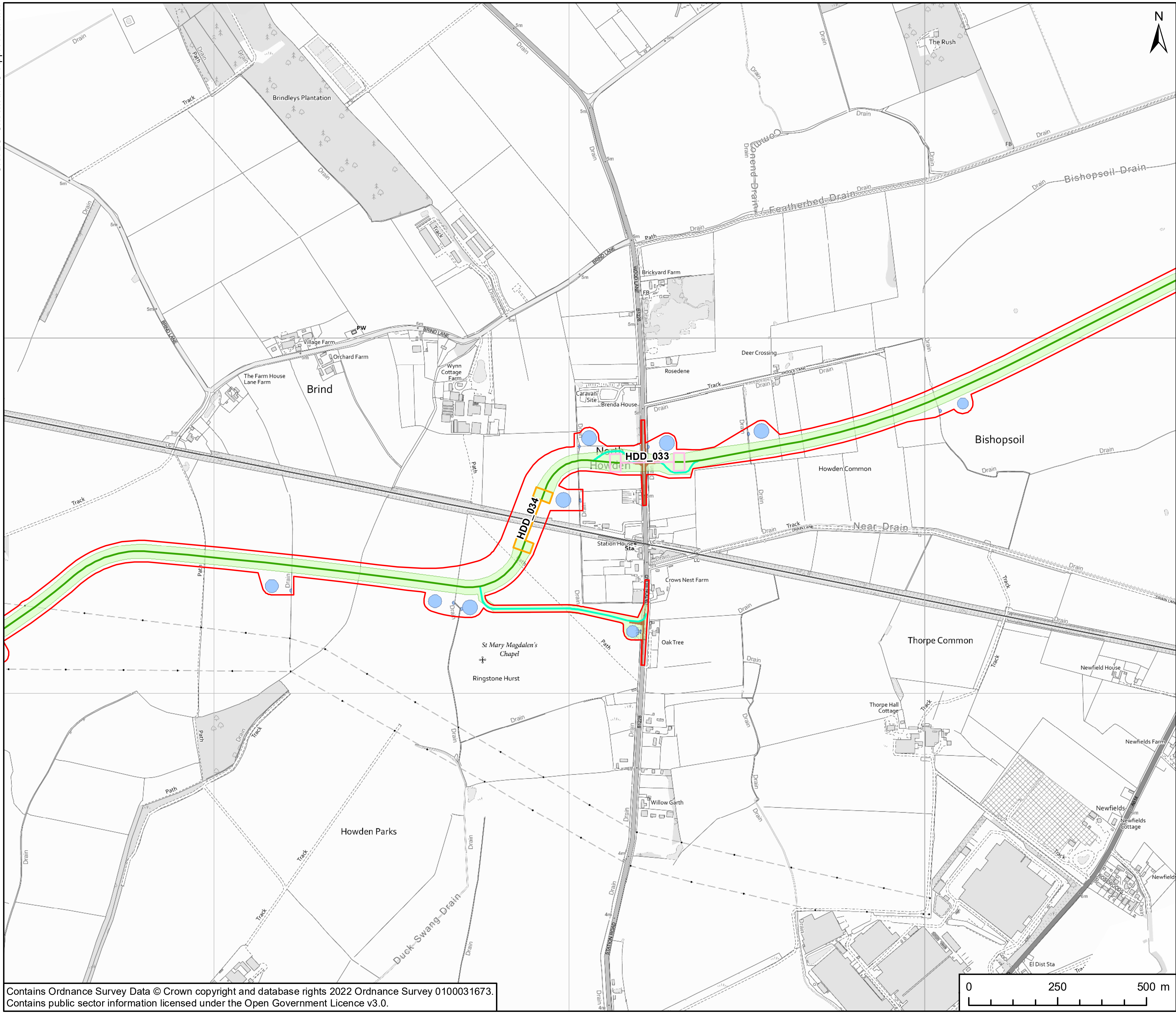
Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER 17 of 21

DATE 30/05/2022



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Scale @ A3 1:10,000

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PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Proposed
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Bellmouth and Visibility Splay

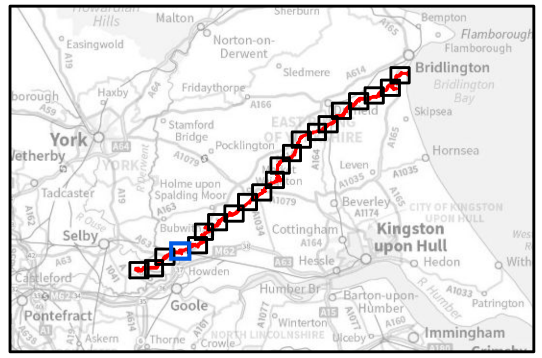

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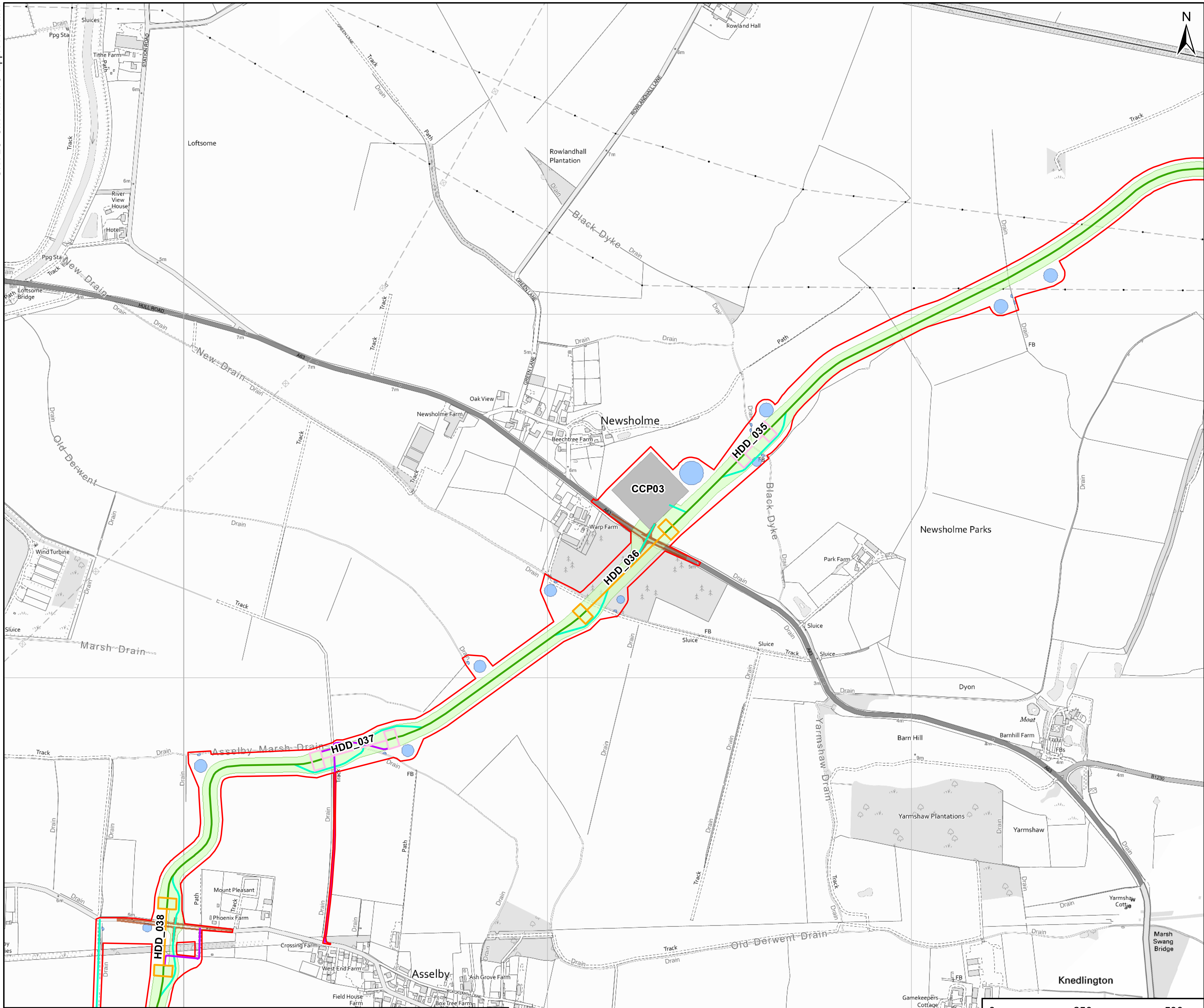
Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER 18 of 21

DATE 30/05/2022



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Scale @ A3 1:10,000

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PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Proposed
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Advanced HDD Access Route
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Temporary Bellmouth and Visibility Splay

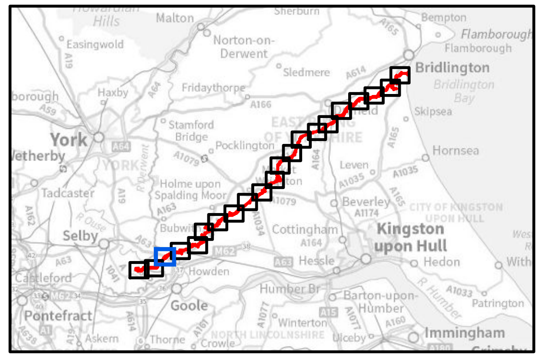

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Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER: 19 of 21

DATE: 30/05/2022

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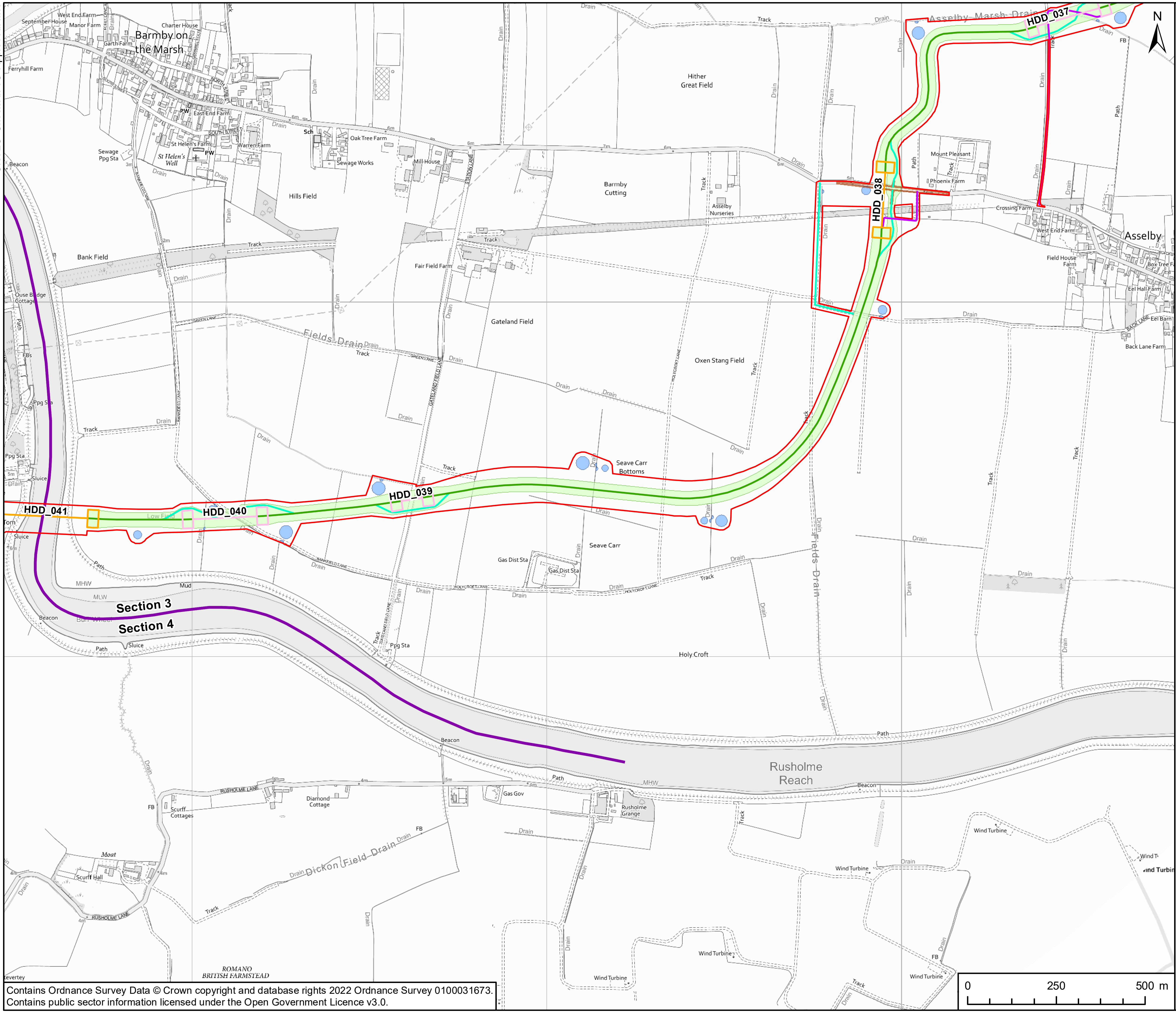

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PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- Route Section Break
- HDD - Proposed
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Advanced HDD Access Route
- Haul Road where Alignment Differs from HVDC Cables
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Bellmouth and Visibility Splay

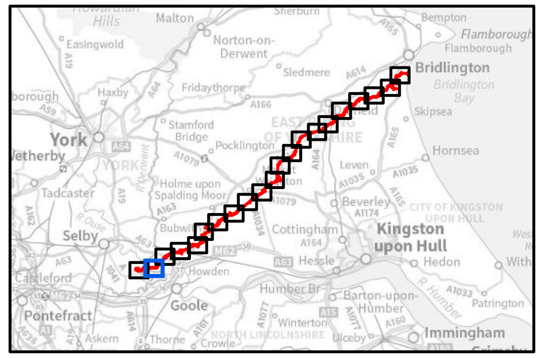

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Figure 3-5
Underground DC Cable Route Details

REFERENCE

SEGL2_T_ES_3-5_v4_20220530

SHEET NUMBER	DATE
20 of 21	30/05/2022

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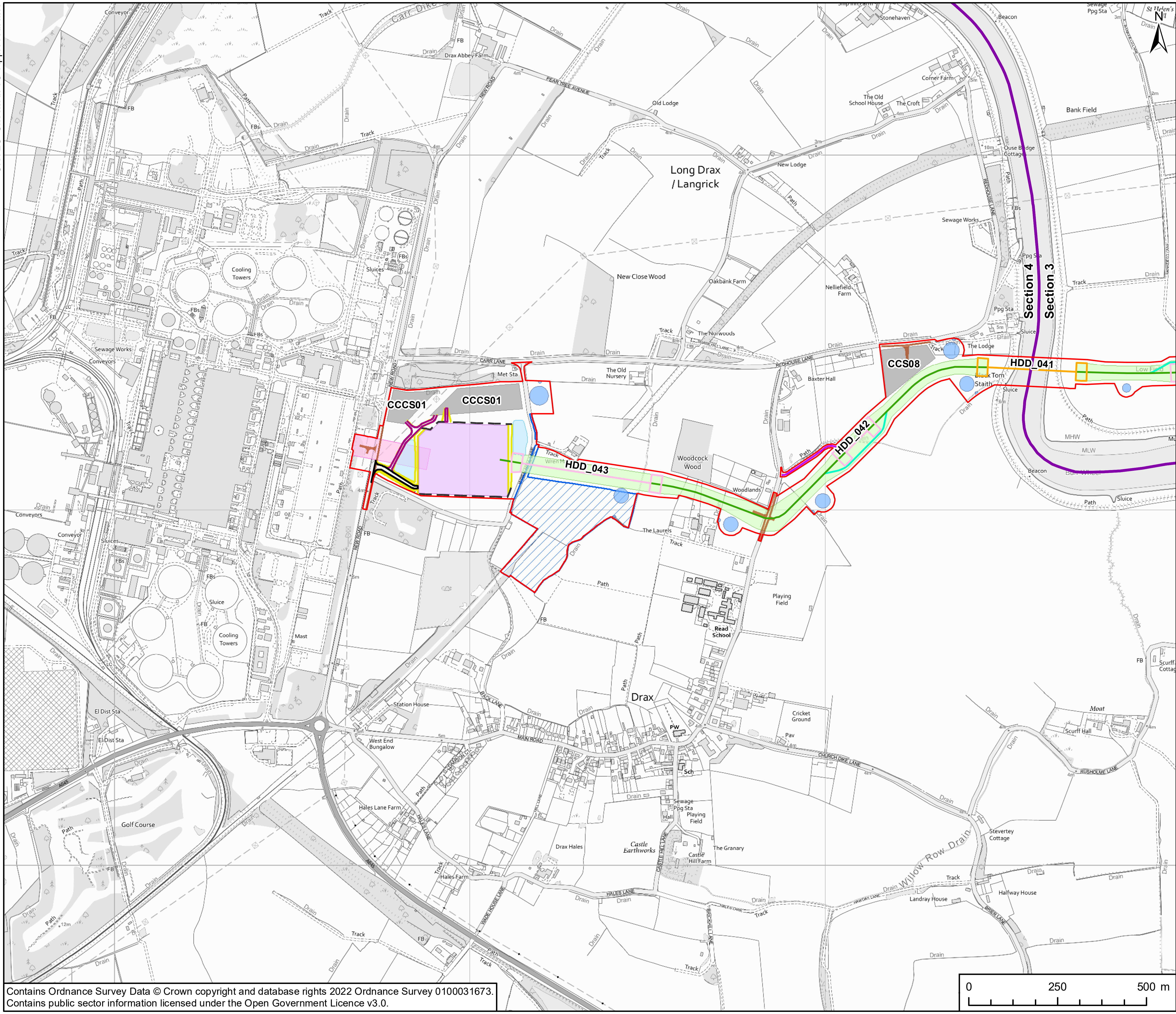
PROJECT
Scotland England Green Link 2

KEY
- Planning Application Boundary
- Route Section Break
- HDD - Proposed
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Advanced HDD Access Route
- Haul Road where Alignment Differs from HVDC Cables
- Converter Station Access - Permanent
- Converter Station Access - Temporary
- Converter Station Earthworks
- Converter Station Retaining Wall
- AC Cable Route Working Width (60m)
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Permanent Attenuation Pond
- Converter Station Area
- Temporary Bellmouth and Visibility Splay
- Area of Committed Biodiversity Net Gain Offsetting



Coordinate System: British National Grid

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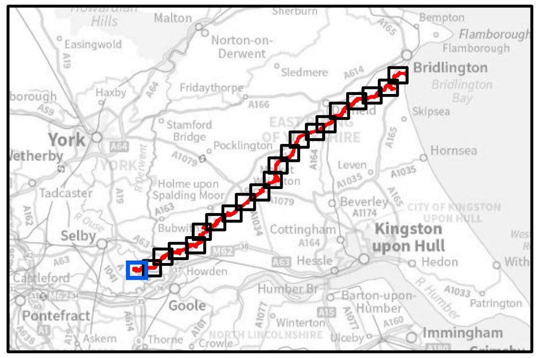
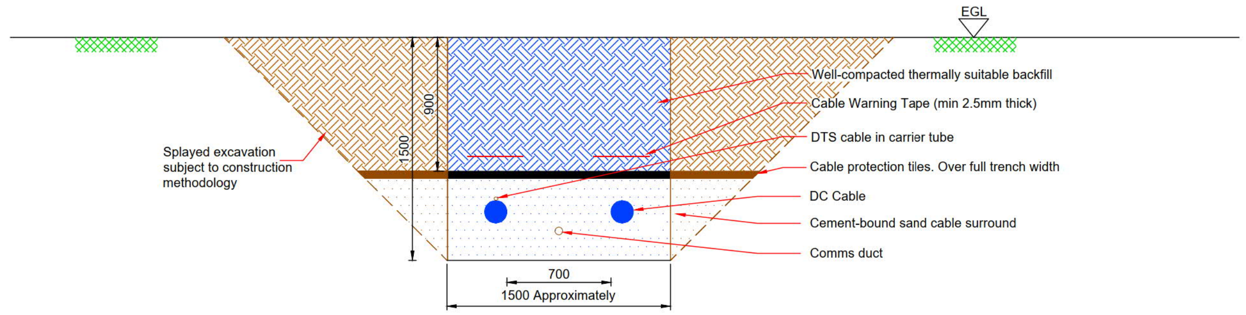


TITLE
Figure 3-5
Underground DC Cable Route Details

REFERENCE
SEGL2_T_ES_3-5_v4_20220530

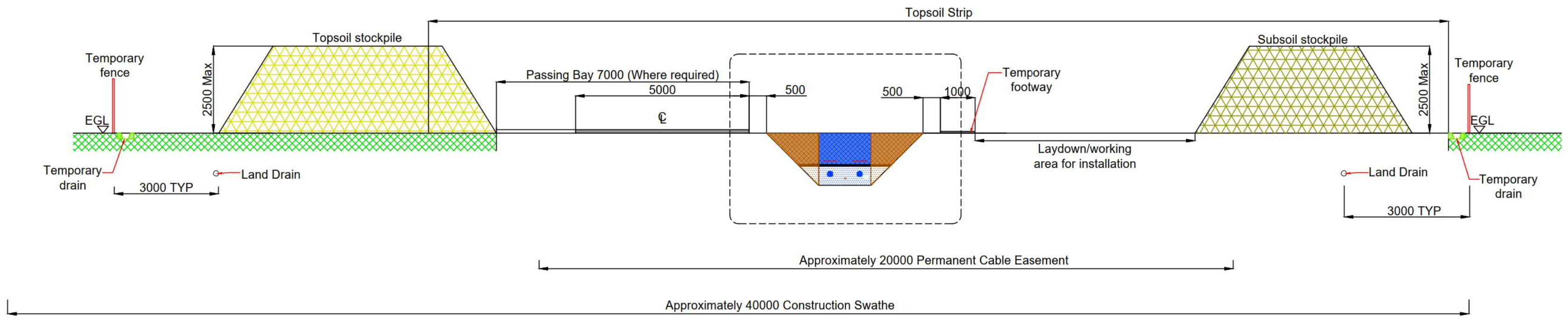
SHEET NUMBER
21 of 21

DATE
30/05/2022



Direct Buried Cable Cross Sections - One Trench

Scale 1:25



Typical HVDC Construction Easement - One Trench

Scale 1:100

Notes

1. This drawing is for development purposes only and should not be used for construction.
2. All dimensions are in millimetres unless otherwise stated.
3. Do not scale any items or information from this drawing.
4. Drawing is showing typical indicative cable installation arrangement. Dimensions and spacings may vary following the detailed design. No cable design has been undertaken at this stage of the project.
5. Cables installation is shown as one trench arrangement. Alternative arrangement may be required which would involve installing cables in individual cable trenches 1.5m apart.
6. Cable construction swathe may reduce in width subject to site constraints. At these locations, associated topsoil and subsoil will be stored elsewhere along the route.
7. Haul road and temporary footway dimensions and depths are subject to vehicle requirements and ground conditions.
8. Land drainage shown indicatively, requirements subject to field and stakeholder requirements.
9. Drainage ditches shown indicatively, requirements subject to site conditions and construction methodology.
10. Topsoil/Subsoil bund sizes and requirements may vary subject to site location. Particularly in flood zone areas where gaps within bunds may be required.
11. Cable construction swathe and permanent cable easement widths may increase at crossing locations such as horizontal directional drill sites.
12. Comms cable/duct currently shown indicatively in trench. Exact location to be agreed a later stage of design.

Key

- Well-compacted thermally suitable backfill
- Well-compacted thermally suitable backfill (Splayed Excavation)
- Cement-bound sand cable surround
- Cement-bound sand cable surround (Splayed Excavation)
- Cable protection tiles
- Cable protection tiles (Splayed Excavation)
- Cable warning tape
- Topsoil stockpile
- Subsoil stockpile
- Existing Ground
- Haul Road/ Temporary Footway

Rev	Description	Cre'd	Chk'd	App'd	Date
P02	Updated following receipt of comments	LS	JW	PM	01/03/21
P01	First Issue	KL	PM	JW	22/01/21

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Master Scheme No: | Sub-Scheme No: | Site:

Scheme Name:

Document Title:
Eastern Link 2
Typical Direct Buried Cable Cross Section and Construction Easement

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
K.Lee	30/11/2020	P.McLoughlin	20/01/2021	J.Weeks	20/01/2021

Investment Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
A.Ahmed	DWG	As Shown	A1	-	P02

National Grid Document Number:
PDD-100822-LAY-030

FEED Document Number:
421631-MMD-00-XX-DR-C-0030

SCALE BAR (METRES)
1:25 0 1.250m 2.5m
1:100 0 5m 10m

In addition to the working width, cable installation will require temporary construction facilities to be established at various locations along the route. These may result in a wider route corridor in some sections or require temporary land take 'off" the route corridor. This includes temporary access to the working width, drainage and temporary compounds for storage, lay-down and site offices. Further information on proposed construction compounds is provided in section 3.3.3.10.

The DC cable will be laid in sections approximately 800 m to 1.5 km in length. These cable sections will be connected at buried joint bays. The exact number of joint bays will depend on the appointed Contractor's final design, but it has been determined that approximately 72 will be required. Joint bays are described further in section 3.3.3.7.5 and the indicative location of these shown in **Figure 3-2**.

There will be no above ground infrastructure required along the proposed route with the exception of small marker posts. These may be installed at field boundaries, crossings, and other locations as appropriate to highlight the presence of the underground DC cable to landowners, asset owners and those undertaking works within the vicinity.

3.3.3.7 Cable Installation Methods

The proposed route will be installed by a combination of open cut and trenchless methods. Open cut methods will be utilised more commonly along the route as this is the most efficient installation method in open agricultural land. Trenchless methods may be utilised where obstacles are encountered, such as, A and B roads, railways, main rivers, and environmentally designated sites require to be crossed. A list of potential HDD crossings are provided in **Table 3-5**, and a schedule of all crossings and the crossing installation method is provided in **Appendix 3A**.

In sections installed by open cut, the cables could be laid in one of two ways; they could either be directly laid into the trench, or a duct could be laid into the trench after which cables will then be pulled through the pre-laid duct. In sections installed using trenchless methods a duct will be installed (one duct per cable), through which the cable will be then pulled.

3.3.3.7.1 Open Cut Installation (Direct Burial)

Open cut direct burial is where a trench is excavated by a mechanical excavator and the underground DC cables laid directly into a single trench with a minimum depth of 900 mm to the cable warning tape (placed above the cables and thermally stable backfill material). Cable depths may vary depending on ground conditions or constraints dictate otherwise (for example due to other utilities or field drainage). The trench will then be backfilled using a combination of excavated soils and a thermally suitable material (such as CBS or an alternative) and the land reinstated. An outline of the likely activities involved in open cut installation is noted below:

- Topsoil stripped from entire working width and stockpiled;
- Trench dug utilising hydraulic excavators (or by hand in areas of known buried utilities). Excavated sub-soil and topsoil will be stockpiled separately;
- Install base layer of thermally suitable material. Trench is left open for cable pulling;
- Cables laid in trench by 'pulling' from cable drum, with the aid of rollers placed within the trench;
- Joint bay locations are excavated along the route (800 m to 1,500 m, dependent on the Contractor's design), which will act as pulling locations for the cable;
- Cables are bedded in with thermally suitable material;
- Protective tiles are placed on top of the cable along the width of the trench;
- Trench is back filled with excavated sub-soil or thermally suitable material where required (to avoid the alteration of local environmental temperatures around the cables); and
- Warning tapes will be place approximately 100 mm above the protective tiles vertically in line with the cables.

Topsoil will be reinstated to the original soil profile and land re-seeded or released to the farmer for cultivation as it was prior to construction.

For the purposes of the EIA, where open cut installation is proposed, it has been assumed that open cut direct burial would be the installation method adopted. This assumes the reasonable worst-case scenario has been assessed (in comparison to open cut ducted installation) as the time between excavation and reinstatement for direct burial installation is typically longer.

3.3.3.7.2 Open Cut Installation (Ducted Solution)

Open cut ducted installation is largely the same as per the process for direct burial, the main difference is that ducts are laid in the trench and the cables are then pulled through the ducts. A key benefit in this process is that the ducts can be laid and the majority of the trench reinstated without the cable being present. The joint bays will need to remain open until cable delivery as these locations will be utilised to pull the cable through the pre-installed ducts and join the sections of cable together. An outline of the likely activities involved in open cut installation is noted below:

- Topsoil stripped from entire working width and stockpiled.
- Trench dug utilising hydraulic excavators (or by hand in areas of known buried utilities). Excavated sub-soil and topsoil will be stockpiled separately.
- Ducts are bedded in with thermally suitable material.
- Protective tiles are placed on top of the cable along the width of the trench.
- Trench is back filled with excavated sub-soil or thermally suitable material where required (to avoid the alteration of local environmental temperatures around the cables).
- Warning tapes will be place approximately above the protective tiles vertically along the cables.
- Topsoil will be reinstated to the original soil profile and land re-seeded or released to the farmer for cultivation as it was prior to construction.
- Joint bay locations are excavated along the route (800 m to 1,500 m, dependent on the Contractor's design), which will act as pulling locations for the cable.
- Cables are installed in the duct by 'pulling' from the cable drum between joint bays.
- Small inspections/lubrication pits may be excavated between the joint bays to aid with the pulling activity.

As noted above, a ducted solution is regarded to result in less environmentally effects as the majority of the cable trench can be reinstated as soon as the duct is laid, with the exception of the joint bays for cable pulling and jointing. The final method of installation is subject to the appointed Contractor and therefore for the purpose of the EIA where open cut installation is proposed it is assumed that this will be by direct burial.

3.3.3.7.3 HDD Installation

HDD are typically used where the proposed route to crosses an obstacle or feature. It involves the use of a drill to bore a route below the ground through which ducts will be pulled and cables installed. The depth of the drill will be dependent on the feature being crossed and will typically be agreed in advance with the relevant party (i.e. Network Rail, the Highways Authority, Environment Agency or Internal Drainage Board (IDB)).

An outline of the likely activities involved in HDD installation is noted below:

- HDD rig and associated equipment set up at launch site. This includes a temporary electricity supply, drill mud filter, control unit and welfare facilities;
- Drilling utilises drill bit, drill head and drilling fluid. Drilling fluid assists the drilling process, as well as lubricating and cooling the drill head;
- A pilot hole is typically drilled first, followed by a series of increasing size bores until the final drill diameter is achieved. The final bore diameter will be determined based on the cable diameter plus additional space required to pull the cable accounting for bends in the alignment;
- Location and direction of drilling can be monitored using the HDD locating system to ensure drilling follows the pre-planned path;
- Ducting is pulled back through the drilled hole towards the HDD rig;

- One cable duct is required for each cable. Spare ducts may be installed to allow for ease of replacement should any faults be identified in future. Ducts can be capped to ensure no attenuation of water or sediment or prevent use by animals if left prior to cable pulling;
- The launch site would be reinstated on completion. Topsoil will be reinstated to original soil profile and land re-seeded or released to the farmer for cultivation as it was found.

3.3.3.7.4 Cable Crossings

Many factors are considered when proposing a crossing solution. These factors include, engineering constraints, ground conditions, access, constructability, environment impact and stakeholders' requirements.

In order to provide some flexibility in developing the detailed design three classifications of crossing have been identified as summarised below and set out in **Table 3-5**. These are:

- HDD (proposed) – these are locations where HDD will be used either because open cut is not feasible or because it is more advantageous in engineering or environmental terms.
- HDD (proposed unless otherwise agreed to be open cut) – these are locations where HDD or open cut could be used subject to the agreement of the relevant asset owner or regulatory authority.
- Open cut (proposed) – these are locations where open cut will be used because it provides the most efficient option and environmental impacts can be appropriately mitigated.

An outline of the typical activities required to complete an open cut crossing of a watercourse and a road are noted below.

Construction sequencing for open cut installation across a watercourse

- Dam (sheet pile) up and down stream of the proposed crossing point;
- Install pumping plant to over-pump from upstream of the crossing point, to downstream to ensure no interruption to flow downstream of the works;
- Excavate the crossing point, and install concrete duct block;
- Reinstate watercourse banks and re-profile; and
- Remove the dam, make good and reinstate subsoil and topsoil.

Construction sequencing for open cut installation across a road

- Close one lane of the highway under temporary traffic management (e.g. temporary traffic lights). One lane would remain open to allow one-way flow;
- Excavate the highway and install concrete duct block;
- Reinstate carriageway to exiting/agreed specification (in consultation with the Local Highway Authority);
- Switch the temp traffic management measures (e.g. temporary traffic lights) to the opposite lane;
- Repeat process, linking the two duct blocks and reinstating the carriageway to the exiting/agree specification; and
- Remove all temporary traffic measures.

For the purposes of the EIA the reasonable worst-case scenario has been assessed for crossing methods where there is optionality pending agreement with the asset owner/maintainer. For crossings that are HDD (proposed unless otherwise agreed to be open cut) (see **Table 3-5** and **Appendix 3A**) the assessment has assumed open cut installation as this is the reasonable worst case scenario.

Table 3-5: Schedule of Underground DC Cable HDD Crossings

Ref.	Committed/ Potentially Open Cut	Basis of Assessment for EIA	Asset	Haul Road
Landfall	HDD (proposed)	• HDD installation	• Fraisthorpe Beach	• N/A
			• Fraisthorpe Beach (deleted Local Wildlife Site (LWS))	• N/A
HDD_001	HDD (proposed)	• HDD installation	• Auburn Beck	• Culvert (within 40 m working width)
HDD_002	HDD (proposed)	• HDD installation	• A165	• public highway
			• ditch	• public highway - no new crossing
HDD_003	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• The Earl's Dike (IDB maintained)	• Culvert (within 40 m working width)
HDD_004	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Burton Drain (IDB maintained)	• Culvert (within 40 m working width)
HDD_005	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• minor road	• at grade crossing
HDD_006	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Gransmoor Drain (IDB maintained)	• Culvert (within 40 m working width)
			• Quarry access track	• at grade crossing
			• small ditch	• at grade crossing
HDD_007	HDD (proposed)	• HDD installation	• Main Street (Great Kelk)	• public highway
			• Woodland strip	• public highway
HDD_008	HDD (proposed)	• HDD installation	• Kelk Beck (EA Main River; River Hull Headwaters SSSI)	• Temporary bridge
HDD_009	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Out Gates	• at grade crossing
			• Way of the Roses & Yorkshire Wolds National Cycle Network (NCN)	• Culvert (within 40 m working width)
			• Warren Hill Drain (IDB maintained)	• Culvert (within 40 m working width)
			• Unnamed drain (IDB maintained)	• Culvert (within 40 m working width)

Ref.	Committed/ Potentially Open Cut	Basis of Assessment for EIA	Asset	Haul Road
HDD_010	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• White Dike Branch (IDB maintained)	• Culvert (within 40 m working width)
			• White Dike (IDB maintained)	• Culvert (within 40 m working width)
HDD_011	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Unnamed drain	• Culvert (within 40 m working width)
HDD_012	HDD (proposed)	• HDD installation	• Nafferton Drain (EA Main River)	• Temporary bridge
HDD_013	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Carr Lane	• At grade crossing
			• Unnamed drain	• Culvert (within 40 m working width)
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_014	HDD (proposed)	• HDD installation	• Nafferton Beck (EA Main River)	• Temporary bridge
			• Skerne & Wansford Footpath No.10 (PRoW)	• Culvert (within 40 m working width)
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_015	HDD (proposed)	• HDD installation	• Driffield Canal (EA Main River)	• N/A – haul road stopped up
			• River Hull (EA Main River; River Hull Headwaters SSSI)	• N/A – haul road stopped up
			• B1249	• N/A – haul road stopped up
			• Unnamed drain	• N/A – haul road stopped up
			• Unnamed drain	• N/A – haul road stopped up
			• Unnamed drain	• N/A – haul road stopped up
			• Skerne & Wansford Footpath No.6 (PRoW)	• public highway - no new crossing
HDD_016	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Unnamed drain	• Culvert (within 40 m working width)
HDD_017	HDD (proposed)	• HDD installation	• Driffield Road	• at grade crossing
			• Way of the Roses & Yorkshire Wolds NCN	• at grade crossing

Ref.	Committed/ Potentially Open Cut	Basis of Assessment for EIA	Asset	Haul Road
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_018	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Unnamed drain	• Culvert (within 40 m working width)
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_019	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Knorka Dike (IDB maintained)	• Culvert (within 40 m working width)
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_020	HDD (proposed)	• HDD installation	• Railway line	• N/A – haul road stopped up
HDD_021	HDD (proposed)	• HDD installation	• Northfield Beck	• Culvert (within 40 m working width)
HDD_022	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• A164	• at grade crossing
			• Hutton Balk	• Not applicable
			• minor road	• at grade crossing
			• Unnamed drain	• Culvert (outside 40 m working width)
			• Unnamed drain	• at grade - existing crossing
HDD_023	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• B1248 (Station Road)	• at grade crossing
HDD_024	HDD (proposed)	• HDD installation	• Spring Road	• public highway
			• Access track	• public highway
			• Wilberforce Way/Etton Bridleway No.5	• public highway
			• Etton - Gardham Disused Railway LWS	• Public highway
HDD_025	HDD (proposed)	• HDD installation	• A1079 (Weighton Hill)	• at grade crossing
HDD_026	HDD (proposed)	• HDD installation	• A1034 (Sancton Road/Gaufer Hill)	• at grade crossing
HDD_027	HDD (proposed)	• HDD installation	• Market Weighton Canal (EA Main River)	• Temporary bridge
			• Back Delfin (IDB maintained)	• Culvert (within 40 m working width)
			• Egremont Drain (IDB maintained)	• Culvert (within 40 m working width)
			• Unnamed drain	• Culvert (within 40 m working width)

Ref.	Committed/ Potentially Open Cut	Basis of Assessment for EIA	Asset	Haul Road
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_028	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Skiff Lane	• at grade crossing
HDD_029	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Drain Lane	• at grade crossing
			• Main Drain	• Culvert (within 40 m working width)
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_030	HDD (proposed)	• HDD installation	• River Foulness (IDB maintained)	• Temporary bridge
			• Unnamed drain	• Culvert (outside 40 m working width)
HDD_031	HDD (proposed)	• HDD installation	• Bishopsoil Drain/ Featherbed Drain (IDB maintained)	• N/A – haul road stopped up
HDD_032	HDD (proposed)	• HDD installation	• A614	• at grade crossing
			• Unnamed drain	• at grade - existing crossing
HDD_033	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• B1228 (Wood Lane)	• at grade crossing
HDD_034	HDD (proposed)	• HDD installation	• Railway line	• N/A – haul road stopped up
HDD_035	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Black Dyke (IDB maintained)	• Culvert (within 40 m working width)
HDD_036	HDD (proposed)	• HDD installation	• A63	• at grade crossing
			• New Drain (IDB maintained)	• Culvert (outside 40 m working width)
			• Newsholme Christmas Tree Farm	• at grade - existing crossing
HDD_037	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Asselby Marsh Drain (IDB maintained)	• Culvert (within 40 m working width)
			• Asselby Marsh Lane Drain (IDB maintained)	• Culvert (within 40 m working width)
			• Asselby Footpath No.2 (PRoW)	• at grade crossing
		• HDD installation	• minor road (west of Asselby)	• at grade crossing

Ref.	Committed/ Potentially Open Cut	Basis of Assessment for EIA	Asset	Haul Road
HDD_038	HDD (proposed)		• Transpennine Trail NCN •	• at grade crossing •
HDD_039	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Lowfield Drain (IDB maintained)	• Culvert (within 40 m working width)
			• Gateland Field Lane	• at grade crossing
HDD_040	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Bankfield Lane	• at grade crossing
			• Bankfield Lane Drain (IDB Maintained)	• Culvert (within 40 m working width)
			• Unnamed drain	• Culvert (within 40 m working width)
HDD_041	HDD (proposed)	• HDD installation	• River Ouse (EA Main River)	• N/A – haul road stopped up
			• Ouse Towpath/Barmby on the Marsh Footpath (PRoW)	• N/A – haul road stopped up
			• 35.47/5/2 (PRoW)	• N/A – haul road stopped up
HDD_042	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• Black Tom Drain	• Culvert (within 40 m working width)
			• 35.47/5/2 (PRoW)	• N/A (however PRoW to be temporarily diverted)
HDD_043	HDD (proposed unless otherwise agreed to be open cut)	• Open cut installation	• 35.26/6/1 (PRoW)	• N/A – haul road stopped up (FEED to confirm)
			• Back Lane Drain (IDB maintained)	• N/A – haul road stopped up
			• 35.26/5/1 (PRoW)	• N/A – haul road stopped up
			• Wren Hall Lane	• N/A – haul road stopped up

3.3.3.7.5 Joint Bays

The underground DC cables will be installed in sections, which will be pulled off cable drums into the trenches (and/or pulled through ducts). Adjacent sections will be joined together at joint bays. These are buried concrete pads (or similar) in the base of the trenches approximately 12 m long by 5 m wide by 1.5 m deep, the exact sizes are subject to the appointed Contractor's final design. The construction areas for joint bays will be accommodated for within the working width (as described in **Table 3-4**).

The underground DC cable sections are typically between 800 m and 1.5 km long. The exact length of a given section takes into account a range of factors including cable pulling requirements. It is estimated that 72 joint bays will be required along the proposed route (approximately one every 950 m). The indicative locations for joint bays are shown on **Figure 3-2** however the number of joint bays required and their location is subject to the appointed Contractors final design.

Cable jointing needs to be undertaken in a clean controlled environment. The joint bay provides a clean base over which temporary cabins or enclosures are installed for the duration of the jointing process. These require a temporary power supply, air conditioning and temporary lighting. Due to the precise nature of jointing operations it may require continuous 24 hour working for short periods whilst the jointing works are completed, and may remain open for several weeks to allow for trench and joint bay excavation, cable pulling, jointing and reinstatement.

3.3.3.8 Reinstatement of the Working Width

All topsoil and sub-soil excavated during the installation of the proposed route will be stored and managed as per the requirements of a Soil Management Plan (SMP). Topsoil and sub-soil will be stockpiled separately with measures put in place to prevent erosion or degradation of the soil including seeding, dampening and monitoring. These procedures will be implemented to minimise adverse impacts on the quality of soil resources during construction.

Following completion of cable installation, excavated trenches will be filled in with the excavated sub-soil, the temporary haul road will be removed and topsoil re-distributed over disturbed areas. Land will then be reinstated to its former use and agricultural areas returned to the landowner for cultivation during the first available planting season following completion of construction.

Any hedgerows removed to facilitate construction activities will be replanted with an objective to enhance the boundary features where possible. The replanting would consist of a variety of native species, typical of those found within the local area. Where possible and subject to agreement, existing hedgerows may be removed, stored and replanted.

Other vegetation along the proposed route and in areas temporarily disturbed by construction would also be reinstated. Pasture, road verges and other areas temporarily affected will be seeded with a species rich wildflower or grass seed mix.

3.3.3.9 Access During Construction

3.3.3.9.1 Construction Access Routes and Points

An assessment has been carried out of the existing public road network to identify which roads are suitable for access by HGVs and cable delivery vehicles which would be classed as AILs. The assessment has taken into account various factors including the size and condition of the roads, railway level crossings, bridges, traffic restrictions (vehicle weight, height, width or length), gradients, settlements (proximity of buildings, residential properties and community facilities) and other factors such as overhead lines (electricity and telecommunications); as well as accident records. As an outcome of this various access points have been identified along the route. Principal routes to get to the proposed route are the M62 and A614, as well as the other A-roads crossed by the Project (A165, A164, 1079, 1034 and A63). The exact method of cable delivery and the need for/frequency of AILs will depend on the appointed Contractor's final design. Cable delivery vehicles will only use approved delivery routes (as agreed with ERYC and North Yorkshire Council highway authorities) and/or the temporary haul road within the working width.

Access to/from the highway direct to the working width will be managed with temporary traffic management proportionate to the road and frequency of use of the access, and in agreement with the relevant Highway Authority. In some locations, such as the A-roads, this may include a reduced speed limit on the existing network for safe operations of the access. New bellmouths will be required to be created in most of these locations (unless an existing access is available for modifying). Visibility splays and temporary off-road accesses have been included within the planning application boundary, and design drawings provided in the Planning Drawings.

3.3.3.9.2 Mobilisation Access Routes

Some “off-highway” access routes may be required to accommodate the mobilisation of construction activities, to provide temporary access to areas that are otherwise bound by watercourses. These will allow for survey works and the construction of culvert or bridge crossings, enabling construction traffic to access the area for the main works via a separate temporary haul road. Some accesses are to enable early HDD installation of ducts in advance of the cable trench. In many instances existing field accesses, tracks and field margins are proposed to be utilised to minimise the extent of any disruption to existing land uses. It is envisaged that any works to the off-highway access routes would be minor in nature, comprising trimming back of vegetation where essential and minor surface repairs (e.g. topping up unbound tracks with further stone). These locations are shown in

Figure 3-5.

A temporary haul road will be maintained along the length of the working width, to minimise the use of local public roads as much as possible, only stopping up at crossing locations where it is not feasible to maintain connectivity (such as railway crossings). The temporary haul road will be approximately 5m wide, with passing places extending the width to 7m to allow for two-way movements. The temporary haul road will include stripping and stockpiling topsoil and laying stone. In some areas alternative methods for temporary haul road construction may be utilised depending on ground conditions, these may include laying a geotextile membrane, or the injection of a soil stabiliser, as opposed to topsoil stripping. For the purpose of the EIA the reasonable worst-case scenario has been assumed, and an assessment of soil stripping, storage and stone laying and for the temporary haul road to be in place for the duration of construction. Where necessary (typically where the temporary haul road will be built up) piping will be installed to ensure natural drainage pathways are maintained across the temporary haul road.

3.3.3.9.3 Temporary Haul Road Crossings

The crossing schedule outlined in **Table 3-5** includes for the temporary haul road. Whilst the cables may be installed beneath some obstacles or features using HDD installation, in the majority of instances the temporary haul road will continue across ‘at grade’. Where necessary other alternatives have been utilised, such as the existing highway network or local access routes, however new junctions and additional construction vehicle movements on the local network has been avoided where possible.

For watercourse crossings which require to be crossed, the temporary haul road will be maintained on a culverted or temporary bridge structure (such as a Bailey bridge). The design of the crossing type will be subject to agreement with the relevant IDB, Lead Local Flood Authority (LLFA) and/or the Environment Agency. Temporary bridge solutions are likely only to be utilised on main river crossings.

3.3.3.10 Construction Compounds

In order to install the underground DC cables there will be a requirement to establish temporary construction facilities along the proposed route.

These temporary construction compounds are typically utilised for the storage of plant and machinery and stockpiling materials, as well as the provision of site management offices, welfare facilities for staff (kitchen facilities, storerooms, toilet facilities), parking, and plant and material storage. Three categories of construction compounds have been identified – primary, secondary and tertiary. These classifications relate mainly to the size of the compound footprints but the activities will largely be the same although with greater activity levels and movements to/from the larger compounds. The landfall will have its own construction compound which has not been included within the categories established for the rest of the proposed route as it will likely only be utilised for landfall-specific activities. Drawings of the typical layout of construction compounds, including for the TJP and HDDs, are submitted in support of the planning applications. It is noted that due to spacing constraints along the underground cable routes to avoid any impact to field boundaries or sensitive features, in some location the dimensions of these compounds are irregular. A summary of the proposed temporary construction compounds is provided below:

- Landfall – specific compound (measuring approximately 1 ha (100 m x 100 m)) provided for HDD installation across the intertidal area. This area will also accommodate the Transition Joint Pit (TJP) to join marine and terrestrial cables together.
- Primary (main compound) –major cable compounds at either end of the scheme and one central location. These are approximately 2.25 ha (22,500 m^2). There are three primary compound locations on the proposed route:
  - A165 (Fraisthorpe);
  - A1034 (Market Weighton); and
  - A63 (Newsholme).
- Secondary (strategic location with good access). These are approximately 1.3 ha (13,000 m^2). There are 10 secondary compound locations on the proposed route:
  - B1249 (Wandsford);
  - Driffield Road (Skerne) (1 of 2);
  - Driffield Road (Skerne) (2 of 2);
  - A164 (Hutton) (1 of 2);
  - A164 (Hutton) (2 of 2);
  - Beverley Road (Lund);
  - Skiff Lane (Tollingham);
  - A614 east (Bursea);
  - A614 west (Portington); and
  - Redhouse Lane (Drax).
- Tertiary (satellite compound accessed from the haul road). Sized at approximately 0.5 ha (5,000 m^2) and generally located where there is flat ground and otherwise a large gap between compounds. There are four tertiary compound locations along the DC cable route:
  - Gransmoor Lane (Gransmoor Quarry);
  - Cliffe Lane (North Cliffe);
  - Unnamed road (east of Middleton on the Wolds); and
  - Unnamed road (Kiplingcotes, South Dalton).

The location of the proposed temporary construction compounds is shown on **Figure 3-2**. Construction compounds are assumed to be in place for the duration of the construction programme for the purpose of the EIA.

3.3.3.11 Land Drainage and Water Management

An outline drainage strategy has been developed considering each component of the working width and associated working areas for cable installation (namely construction compounds, soil-stripped working area, haul road and access points). The strategy has been developed adopting the principles of the drainage hierarchy to promote the use of sustainable drainage systems (SuDS) as follows:

- Discharge into the ground via infiltration;
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain or other drainage system; and
- Discharge to a combined sewer.

The drainage strategy has been developed to best align with current hydraulic regimes across the underground DC cable route based on existing catchments, and seeks to catch and filter runoff from working areas to prevent the sedimentation and potential pollution of surrounding watercourses.

3.3.3.11.1 Header and Filter Drains

Header drains will be used along the working width to intercept the clean surface water runoff coming from the upslope of the working width. These drains prevent the water from crossing the haul road or areas of stripped soil (such as construction compounds) and becoming silty. They will run parallel to the working width and discharge into the nearest watercourse, or to a 'clean' pond (that receives water that does not runoff a working area).

Filter drains will be used on the opposite side of the haul road to the header drains. They collect dirty runoff from the haul road and discharge into various 'dirty' ponds along the route. All filter drains, and header drains which are within source protection zones will have an impermeable liner.

3.3.3.11.2 Attenuation

Attenuation storage will be via ponds. This includes for attenuation from the construction compounds, however alternative solutions such as sub-base storage (via infiltration) could be utilised for storage. The assessment has considered the worst case scenario in regards to space required and is therefore based on the use of attenuation ponds for construction compound drainage. The drainage systems on site will be designed to meet the water quality design criteria and good practice pollution control measures as outlined in the CIRIA SuDS manual (Ref 3-2).

Attenuation ponds will be discharged to the nearest watercourse. Due to the existing topography along the underground DC cable route in some locations the works and associated attenuation ponds may be raised above existing ground level to create a fall to the outfall. This would prevent the need to pump to the watercourse.

In areas with no watercourses in the immediate locality of the working width (or construction compounds), generally through the Yorkshire Wolds, direct infiltration basins will likely be used to dispose of surface water as per the existing regime.

Discharge rates to receiving watercourses will be agreed prior to construction, with design rates based on consultation with the Internal Drainage Boards and the Environment Agency. Further detail is provided in Chapter 11: Hydrology and Land Drainage. Consents in accordance with the relevant authority are to be obtained before any works to pass beneath, through or over any watercourse commences.

3.3.3.11.3 Field Drainage Management

Where field drains are severed by working areas (such as the establishment of construction compounds, bellmouths or the cable trench) they will be diverted rather than truncated to avoid water backing up the system and flooding upstream areas. Land drains will be sealed, upslope and downslope, where they are crossed by the English Onshore Scheme and care taken to ensure that the land upslope will not become waterlogged or flood as a result.

Where new field drains, or sections of field drains are installed, these will be done so in line with good construction practice (Ref 3-3), and in consultation with the landowner. It is proposed that attenuation/sediment control ponds are installed on the line of the diversion, upstream of the receiving watercourse, to balance run-off rates and mitigate the risk of pollutants entering the watercourse.

Any diverted field drainage will be reinstated back to existing after construction has finished.

3.3.3.11.4 Foul Water Management

Construction compounds will have independently managed foul drainage systems to contain waste produced from welfare and toilet facilities. It is expected that the foul water will be contained on site and regularly pumped, emptied, and transported off site. There is therefore no requirement for any formal piped foul drainage on site or any offsite connection.

3.3.3.12 Underground DC Cable Installation Schedule

Cable installation and commissioning for the proposed route is scheduled to take approximately five years. The installation programme assumes a start date for installation activities in late 2024 and for the cable to be commissioned prior to the end of 2029.

Typical work activity phasing for the installation of the DC cables would include:

- Pre construction surveys and/or implementation of environmental mitigation as necessary;
- Bellmouth creation and amending existing access routes (where necessary);
- Establishing the construction compounds to facilitate delivery of plant and material to start installation activities;
- Creation of haul road/working width;
- Cable trench excavation and HDD of sensitive crossing;
- Establishing joint bays;
- Cable laying/ pulling through ducts; and
- Cable trench backfilling and reinstatement.

Cable installation is not required to be undertaken sequentially; as a result, installation could occur in multiple sections along the length of the proposed route in parallel and therefore installation is unlikely to be completed in a linear fashion. This will limit the extent and duration of construction activity at any given location including the length of time that land remains disturbed for. The exact programme will depend on a number of factors including the underlying ground conditions and installation methods used.

Table 3-6 sets out the timeframes associated with cable installation activities per location to provide context for duration of works within any given location. Typically, the installation of a 1 km length of cable will take approximately 4 to 9 months dependent on the complexity of the installation. This timeframe includes for the pre-construction site set up as well as the reinstatement of the land following completion of installation. This assumes that the season after cable burial is completed is suitable for undertaking reinstatement. The exact programme and phasing of works is subject to the final design prepared by the Contractor.

Table 3-6: Duration of Likely Installation Methods – Cabling Works

Likely Installation Method	Approximate Duration
Open cut trench and direct burial	30 days per km
Open cut trench and ducting	20 days per km
Open cut crossings:	
• Road	10 days per crossing
• Watercourse	10 days per crossing
Trenchless methods:	7 to 20 days per crossing
• <100 m in length	25 days per crossing
• >100 m in length	30 days per crossing
• Landfall	40 days
Joint bays	25 days per joint bay
Cable jointing	15 days per joint bay

**trenchless methods assumes HDD installation and excludes cable pulling*.

The majority of works activities would be completed under normal working hours/restrictions as follows, however some deliveries and works activities may need to occur out of these hours/ times due to activities requiring to be undertaken continuously (such as HDD and cable jointing). Where work outside of times is necessary prior notification will be provided to the LPA.

- Mon-Fri: 07.00-19.00;
- Sat: 08.00-17.00; and
- No working on Sundays, or Bank Holidays unless by prior agreement with the LPA.

3.3.3.13 Operation of Underground DC Cables

Once operational the Project will form an integral part of the electricity transmission network. The anticipated operational life of the Project is approximately 40 years. Activity along the proposed route would generally be limited to non-intrusive inspections and cable repairs or maintenance. The latter would only be required in the unlikely event of a cable fault. Should a fault occur, the location of the fault would be identified, and the faulty section of cable replaced. The activities involved in cable repair would be similar to those outlined above for installation, albeit over a much smaller section.

3.3.3.14 Decommissioning of Underground DC Cables

During the 40-year operational lifetime of the Project, it is likely that refurbishment and plant replacement will extend the life of the Project (including the components of the English Onshore Scheme) rather than decommissioning. As a result, the impacts of decommissioning have not been assessed in the Environmental Statement.

In the event that the Project ceases operation, the proposed route could be decommissioned. Dependent on specific requirements the redundant cables could either be left in-situ (which would have the least environmental effect), or all or parts of the cable could be removed for recycling. Where recycling is not possible removed cables would be disposed of in accordance with the relevant waste disposal regulations at the time of decommissioning.

3.3.4 The Converter Station and Underground AC Cable Route

Converter stations are required at each 'end' of the Project. Converter stations are key components of the DC electricity transmission system, converting electricity from AC to DC and vice versa. The Project will utilise self-commutated voltage source conversion (VSC) technology, which allows for greater control over reactive and active power and also allows for a more compact converter station layout reducing the operational land take required.

The following sections provide a description of the proposed converter station at Drax, including its design, construction and operation.

3.3.4.1 Site Description

The proposed converter station site is located to the immediate east of the existing Drax Power Station, North Yorkshire, within an agricultural field as illustrated on **Figure 3-7**. The site is approximately 8.5 ha and is bounded by New Road to the west, and Wren Hall Lane to the south and east. This location provides direct access to the A645 via New Road and its proximity to the existing Drax 400 kV substation allows for the shortest AC connection possible.

3.3.4.2 Physical Description of the Converter Station

Converter stations comprise a range of specialist equipment which converts electricity from AC to DC (or vice versa depending on the direction of power flow). Some of this equipment must be located indoors in a series of large buildings. An indicative visualisation of the potential broad massing and scale of buildings that form a converter station are presented on the proposed converter station site in **Figure 3-7**.

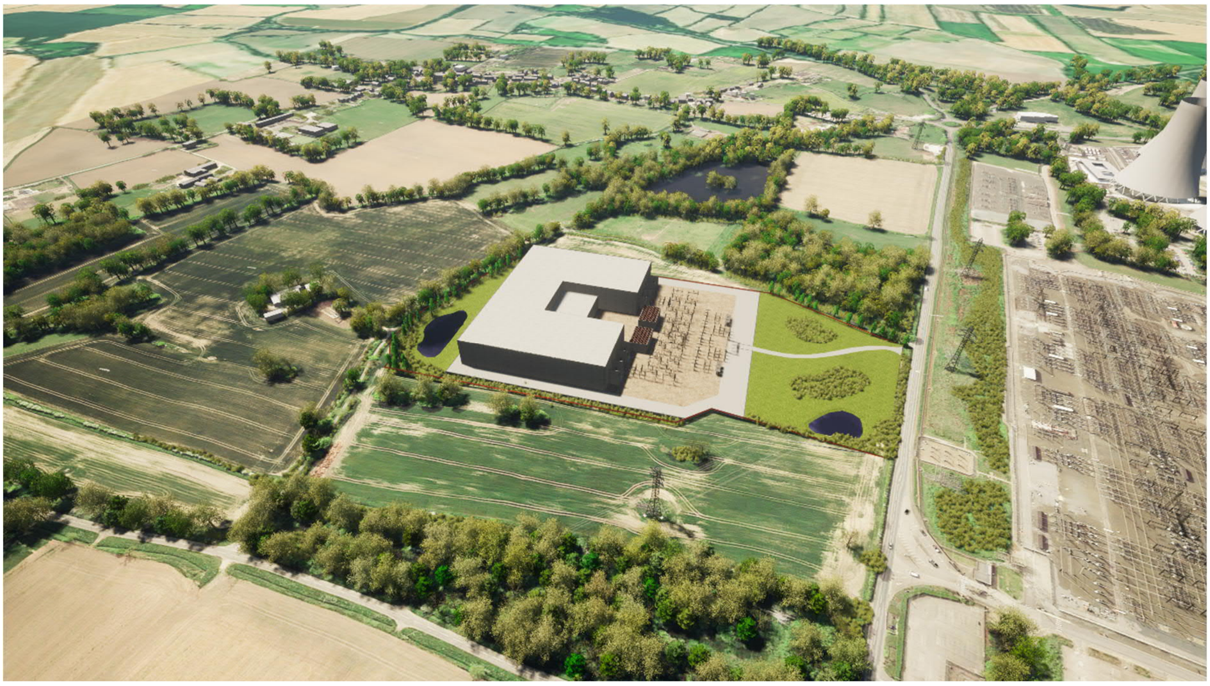


Figure 3-7: Indicative Converter Station at the Proposed Converter Station Site

The converter station will comprise the following components within a secure fenced compound. The parameters as set out below set the maximum parameters within which the detailed design will be developed:

- *DC Hall* - the underground DC cables terminate here. The switch hall also contains DC switchgear to connect to power electronics. This equipment will be enclosed in a building up to 30 m height. This includes the height of any lightning rods that may be required for safety;
- *Valve Halls and AC Inductors* – contain high voltage power electronics equipment that converts electricity from DC to AC and vice-versa. This equipment must be located indoors in buildings up to 30 m height within a controlled environment;

- *Control Building* – contains control panels and associated operator stations, protection and communication equipment, offices and welfare facilities and other auxiliary systems all located within an enclosed building up to 15 m high;
- *Transformer bays* – these change the AC voltage to an appropriate level for transmission via the AC system/ or prior to conversion to DC. The transformers are normally sited outdoors and separated by concrete fire protection walls. Typical dimensions are 15 m long by 15 m wide by 16 m high. Cooling fans are also provided on transformers. Noise enclosures can be fitted around the transformers if required;
- *AC Switch gear and filters ("switch yard")* – connects the converter station to the AC transmission system. It includes a range of electrical equipment including harmonic filtration and reactive compensation equipment, circuit breakers, transformers, busbars and insulators. The main function is to allow the effective integration of the DC system into the AC system. Commonly the AC switchyard and associated equipment is located outdoors although this equipment can be enclosed in a building or series of buildings, and will be the subject of detailed design;
- *Diesel Backup Generator* – the converter station requires its own power typically provided at 11 kV, the diesel back-up generator will be used to provide back-up electricity supply in the event of a failure of the low voltage electricity supply; and
- *Spares Building* – a building to house spare parts and components; this will be supplemented by hardstanding areas provided for storage of a spare transformer and spare cable drums.

Note that these components could be arranged differently subject to the ongoing design process taking into account engineering, environmental and other requirements.

The converter station site will be within a fenced compound with restricted access. An approximately 2 m high palisade fence will be erected around the site, this will be established at the start of construction and retained for operation. The site will also be monitored by CCTV and security gates will be in place for restricted/controlled access.

Lighting of the converter station during operation will be required for safe movement around the compound. This will be minimised wherever possible and will be directional to prevent/reduce light spill. External lighting will be off as a default during the hours of darkness unless otherwise needed. The detailed design of the lighting scheme for the converter station is subject to detailed design.

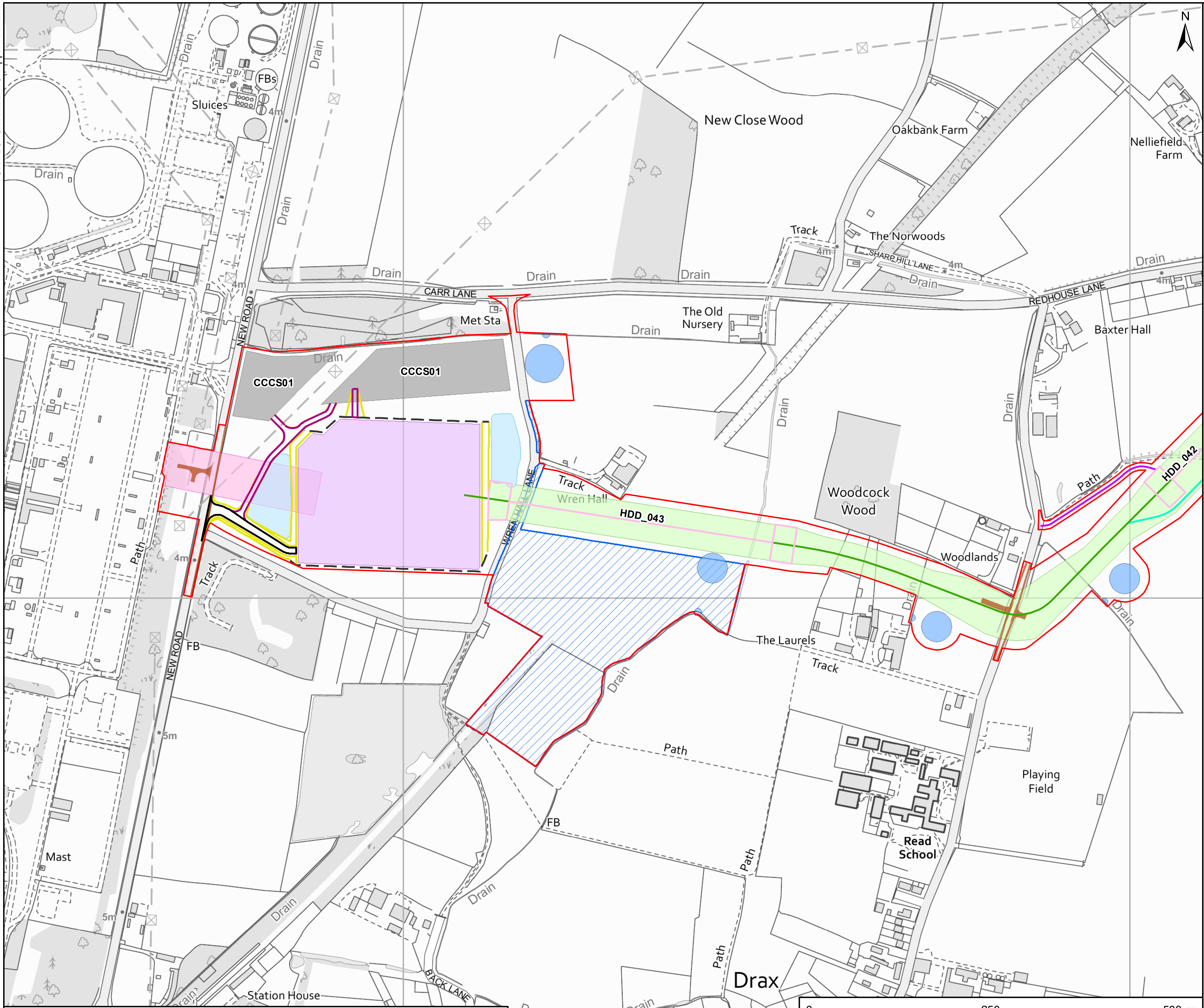
A summary of the key characteristics of the converter station are outlined in **Table 3-7**.

Table 3-7: Converter Station – Summary of Key Characteristics

Factor	Details
Location	Agricultural field immediately adjacent (east) of Drax Power Station.
Purpose and technology	• Purpose: Converter stations comprise a range of specialist equipment which converts electricity from AC to DC (or vice versa depending on the direction of power flow). • Technology: 525 kV VSC (voltage source conversion, self-commutated).
Footprint	Approximate footprint: • Converter station platform: 5 ha (excluding permanent access road and platform batter/earthworks) The permanent building footprint within the converter station site will be approximately 2.5 ha. The remaining converter station platform will be utilised for internal roads and outdoor electrical equipment).
Additional temporary land take	Construction compound location: North of the proposed converter station, within the same agricultural field as the proposed converter station. Area: up to 2.5 ha.
Converter station elements	Building type/ function and max. height of buildings: • indoor/housed electrical equipment. Maximum building height up to 30 m. • outdoor electrical equipment. Maximum height subject to detailed design but less than 30m.

Factor	Details
	Note that the outdoor electrical equipment may be located on either the eastern or the western side of the converter station platform.
Finished floor level and converter station earthworks	As essential infrastructure, the converter station will be built to 6.48 m Above Ordnance Datum (AOD), between 1.8-3 m higher than existing ground level to avoid inundation in 1:1,000 year event plus an allowance for climate change. To facilitate the development of the platform approximately 212,000m^3 of fill material will need to be delivered to site. This will require approximately 27,000 HGV movements to deliver the material to site. Alternative construction options may be available to build the converter station platform above the flood zone without requiring large volumes of material. These opportunities will be considered during detailed design. Earthworks: • Retaining walls will likely be necessary to the north and south of the converter station to limit the land take required for earthworks embankments and allow the existing vegetation to be retained. • Embankments will likely be utilised on the eastern and western edges of the converter station platform.
Access	Temporary: • The M62 and A645 are the principal routes to be utilised to access the converter station site off New Road. Permanent: • Access will be taken direct from New Road to the converter station site (as per construction).

GIS: LC Checked: TC Approved: MW



Coordinate System: British National Grid

Scale @ A3 1:5,000

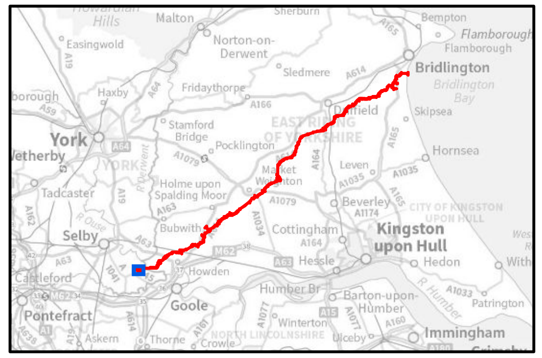
nationalgrid

PROJECT

Scotland England Green Link 2

KEY

- Planning Application Boundary
- HDD - Unless Otherwise Agreed to be Open Cut
- DC Cable Alignment – Open Cut
- Advanced HDD Access Route
- Haul Road where Alignment Differs from HVDC Cables
- Converter Station Access - Permanent
- Converter Station Access - Temporary
- Converter Station Earthworks
- Converter Station Retaining Wall
- AC Cable Route Working Width (60m)
- DC Cable Route Working Width (40m)
- Temporary Attenuation Pond and Outfall
- Temporary Construction Compound
- Permanent Attenuation Pond
- Converter Station Area
- Temporary Bellmouth and Visibility Splay
- Area of Committed Biodiversity Net Gain Offsetting



TITLE

Figure 3-8
Proposed Converter Station Site

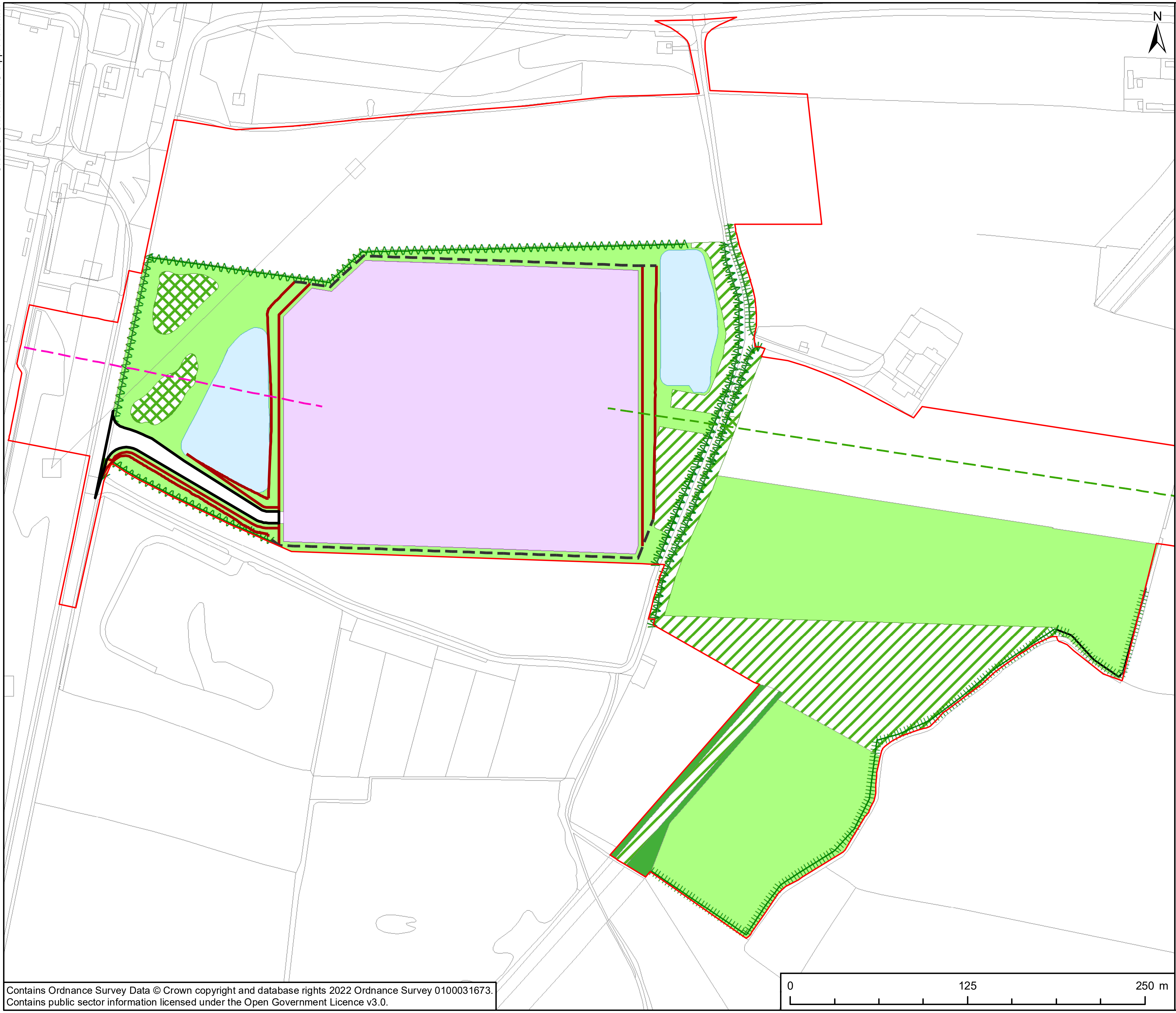
REFERENCE

SEGL2_T_ES_3-8_v4_20220531

SHEET NUMBER: 1 of 1

DATE: 31/05/2022

GIS: LC Checked: TC Approved: MW



Coordinate System: British National Grid

Scale @ A3 1:2,500

nationalgrid

PROJECT

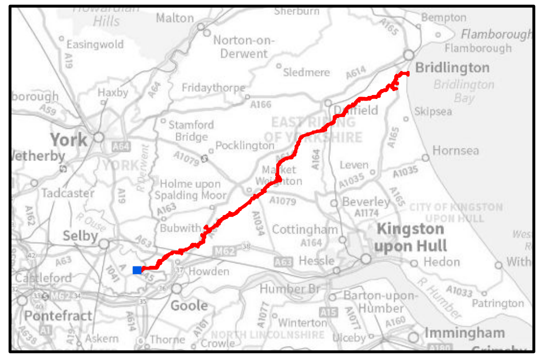
Scotland England Green Link 2

KEY

- Planning Application Boundary
- AC Cable Alignment
- DC Cable Alignment
- Converter Station Access Road
- Converter Station Earthworks
- Converter Station Retaining Wall
- Permanent Attenuation Pond
- Converter Station Area

Habitat / Landscape planting

- Native hedgerow
- Native hedgerow with trees
- Native hedgerow with trees - associated with bank or ditch
- Native species rich hedgerow
- Native species rich hedgerow with trees
- Cropland - cereal crops
- Grassland - modified grassland
- Grassland -other neutral grassland
- Heathland and shrub - mixed scrub
- Woodland and forest - lowland mixed deciduous woodland
- Woodland and forest - other woodland; broadleaved



TITLE

Figure 3-9
Converter Station Permanent Footprint, Landscaping Design and Biodiversity Net Gain Offsetting Areas

REFERENCE

SEGL2_T_ES_3-9_v1_20220531

SHEET NUMBER	DATE
1 of 1	31/05/2022

3.3.4.3 Drainage and Attenuation

The drainage of the converter station site will be subject to the final design of the appointed Contractor. The principles will include two systems: one for collecting water from locations of potential contaminants which will include separators to remove potential contaminants; the other for 'clean' runoff from hardstanding areas to either of two attenuation ponds.

The attenuation ponds have been sized assuming a worst case scenario based on the maximum extent of the proposed converter station platform and assuming it is entirely impermeable. The attenuation ponds will drain to the unnamed drain to the north of the site, maintained by the Selby Area Internal Drainage Board (IDB) at a flow rate to be agreed with the IDB.

3.3.4.4 Physical Description of the Underground AC Cable Route

The underground AC cables will connect the converter station to the existing 400 kV Drax substation. Six underground AC cables (two sets of three cables) will be installed utilising open cut installation methods (as described in section 3.3.3.7). The AC connection will be up to 500 m in length across New Road and into the proposed converter station site.

Table 3-8 provides a summary of the key physical characteristics of the proposed underground AC cable route. The exact configuration of the proposed underground AC cable route is subject to the appointed Contractors final design; however, the general characteristics below set the maximum parameters upon which the EIA has been based and within which the detailed design will be developed. The alignment and working width for the proposed underground AC cable route is shown in **Figure 3-8**.

Table 3-8: Underground AC Cable Route – Summary of Key Characteristics

Factor	Details
Length	Up to 500 m
Working width	Up to 60 m wide subject to final design
Cable installation method	HVAC cables will be installed via open cut method due to the presence of a number of existing services along New Road. Installation across New Road will be phased to ensure that vehicles can pass while works are undertaken under traffic management. The installation approach will be the same as described for the HVDC cables above, however a minimum of six ducts will be needed, one per cable.
Cable number and dimensions	Subject to the final design six or twelve cables. Each cable will have an approximate diameter of 12 cm.
Joint Bays	Not required due to route length.
Construction compounds	The HVAC installation contractor will share the converter station construction compound for laydown and welfare facilities.
Installation duration	Cable installation is likely to approximately 2 months.
Permanent Infrastructure	Cable markers may be installed at crossing points either side of New Road to identify the presence of the cables. No other necessary permanent infrastructure associated with the underground AC cable.

3.3.4.5 Landscaping and Reinstatement

A landscape plan illustrating the location and extent of proposed landscape planting is contained in **Figure 3-9**. The landscape mitigation has been developed jointly as part of the ecological and landscape and visual impact assessment, to develop a plan that enhances opportunities for greater biodiversity as well as mitigating any visual impacts, and aligning to the surrounding environment. The landscaping plan is predominantly made up of a focus of woodland planting on the eastern boundary of the proposed converter station site along Wren Hall Lane, to enhance this existing green corridor and screens and filters views of the converter station from properties to the east in Drax around the perimeter of the proposed site. The remaining areas of the site will be a combination of species rich grassland, scrub and marginal planting around the attenuation basins in an otherwise constrained area around the access track, over the proposed underground AC cable route and beneath the existing overhead electricity line.

The area within the converter station site that will not be required for built infrastructure (i.e. outside the security fence) will be utilised for improved grassland and scrubs, and marginal habitat utilised around the two large attenuation ponds. The existing larger hedgerows and trees on the western boundary of the site along Wren Hall Lane will be further enhanced to create a denser green corridor and will support the foraging and commuting behaviours of bats recorded here during pre-application surveys. The existing hedgerow on the eastern boundary with be enhanced as a species rich native hedgerow to further support diversity in the local flora and fauna.

3.3.4.6 Biodiversity Enhancement

NGET have committed to achieving a minimum 10% Biodiversity Net Gain (BNG) as part of the English Onshore Scheme, and the development of the mitigation and offsetting strategy to achieve BNG has been interrelated with the ecology and landscape and visual disciplines. The proposed landscaping plan at the converter station site, as described above, makes a contribution to this target, however it is noted that this is part of a wider offsetting strategy proposed to be delivered by the Applicant as set out in the Biodiversity Net Gain Strategy Report submitted in support of the planning application(s).

The selection of species within the landscape strategy at the converter station, the enhancement of existing boundaries in the west and east have been designed to improve the habitat structure and enhance biodiversity within the area, whilst also ensuring that the proposals align with the existing planting structure within the near vicinity.

In addition to the landscaping around the converter station, an area of biodiversity enhancement has been identified to the immediate east of the converter station site, south of Wren Hall. This area includes a mix of habitats where some are proposed to be created, and others where it is proposed to enhance the existing habitat to improve the biodiversity. In summary these proposals include:

- Creation/enhancement of approximately 70 m x 5 m (0.04 ha) broadleaved woodland boundary planting to the east of Wren Hall Lane, north of the access to Wren Hall on the boundary arable land.
- Creation/enhancement of approximately 210 m x 10 m (0.21 ha) broadleaved woodland boundary planting to the east of Wren Hall Lane, south of the access to Wren Hall on the boundary arable land.
- Approximately 2.6 ha of existing arable land proposed to be replaced with semi-improved natural grassland.
- Approximately 1.23 ha of existing arable land proposed to be replaced with native broadleaved woodland. This would also include a hedgerow along the northern boundary as a delineating feature to the retained arable land to the north.
- Approximately 1.48 ha of existing pasture grassland is proposed to be ‘improved’ (this would include reduced availability for grazing).
- Approximately 0.3 ha of existing broadleaved woodland is proposed to be enhanced.

The existing public right of way that extends through the arable field in this area is proposed to be realigned through the proposed woodland to the south of the existing route before connecting back up to Wren Hall Lane.

3.3.4.7 Access to the Converter Station

Access to the proposed converter station site will be provided by a new approximately 200 m long permanent access road from the existing highway network, off New Road as shown on **Figure 3-8**. The proposed permanent access road will form a new bellmouth junction to New Road. The access road will be 8 m wide, wider at bends to accommodate the turning circles of vehicles likely required to enter the site. This will be constructed at the beginning of the works in order that it can be used by all construction traffic and also forms part of the temporary access road to the construction compound during the construction phase (i.e. access will be taken through the converter station site to the construction compound. Specific traffic management measures to facilitate right-turning vehicles into the site during construction of the converter station, minimising disruption to other vehicles utilising New Road, will be discussed and agreed with the Local Highways Authority prior to construction.

3.3.4.8 Construction of the Converter Station

Construction of the proposed converter station will be undertaken by the appointed Contractor. It is anticipated that construction activities will comprise:

- *Preliminary works*: This will include further site investigation and preconstruction surveys required to be undertaken in advance of construction. This will also include utilities diversions as necessary;
- *Site establishment*: This includes vegetation clearance, soil removal and establishment of all temporary facilities including site offices, lay down and storage areas and welfare facilities, development of electricity and water supplies, erection of security fencing or hoarding and implementation of external lighting for security;
- *Earthworks*: This will include land re-profiling in order to establish the level platform on which the proposed converter station will be constructed. The site level will be raised to a level of 6.48 mAOD to protect the electrical equipment housed on site from a 1:1,000 year flood event (including future climate change prediction). This will entail the need to build up the current ground level by between 1.8-3 m. Therefore approximately 27,000 m^3 of fill material will need to be imported to site during this phase of works;
- *Civil engineering works*: This will include construction of building foundations, development of the platforms' permanent drainage system and construction of internal roads and car parking arrangements;
- *Building works*: This will include the construction of building units including erection of steel frames and cladding;
- *Cable installation*: This will include the installation of the proposed underground DC cables entering the proposed converter station as well as proposed underground AC cables between the proposed converter station and the existing substation;
- *Provision/ installation of permanent services*: This will include water supplies, foul drainage, low voltage electricity supply and telecommunications;
- *Mechanical and electrical works*: This will include installation of high voltage AC and DC electrical equipment and transformers within the proposed converter station;
- *Commissioning*: Following completion of all construction works there will be a period of commissioning and testing; and
- *Site Reinstatement & Landscape Works*: This will include removal of site offices and temporary facilities, land reinstatement and landscape works.

3.3.4.8.1 Construction Site Layout

The exact layout of the site will depend on the Contractor(s) appointed to design and construct the proposed converter station. A temporary construction compound which will be specific for the converter station and AC cable installation works will be established immediately to the north of the converter station platform and accessed off New Road at the same location as the proposed permanent converter station access. This will be approximately 2.5 ha and will be utilised as the primary construction compound.

The temporary construction compound will include provision for:

- Site offices and meeting rooms;
- Staff welfare facilities including portable chemical toilets, kitchen and mess room;
- Storage areas for construction vehicles, plant, equipment and other materials;
- Appropriately bunded areas to be used for the storage of oils and other fuels;
- Wheel washing to be used by construction vehicles and plant;
- Segregated waste management and storage areas; and

- Car parking for construction staff and site visitors.

It is noted that whilst this area is identified as the primary location for plant, equipment and material laydown, the converter station site itself will also include for material storage and laydown the requirements of which will vary throughout the construction phases and evolving development of the site.

3.3.4.8.2 Converter Station Construction Schedule

Construction and commissioning of the proposed converter station is scheduled to take approximately five years.

The majority of works activities as outlined in section 0 would be completed under normal working hours/restrictions as follows, however some works activities may need to occur out of these hours and times due to activities not being able to be paused (such as concrete pouring and delivery of abnormal loads):

- Mon-Fri: 07.00-19.00,
- Sat: 08.00-17.00,
- No working on Sundays, or Bank Holidays.

The exact phasing of some activities will depend on the Contractor and detailed design, but the scheduling of the main construction activities are outlined in the programme in **Table 3-9**.

Table 3-9: Indicative Converter Station Construction Programme

Construction Phase	Year 1				Year 2				Year 3				Year 4				Year 5			
Preliminary works	■																			
Site establishment	■	■																		
Earthworks		■	■	■	■	■	■	■	■	■										
Civil engineering works								■	■	■	■									
Building works											■	■	■	■	■					
Cable installation																■	■	■		
Installation of services												■	■	■	■	■				
Mechanical and electrical works														■	■	■	■			
Commissioning																	■	■	■	
Reinstatement and landscaping																		■	■	■

3.3.4.9 Operation of the Converter Station

Following a period of commissioning and testing, the proposed converter station will operate continuously throughout the year. The proposed converter station will be operated by a small team based on site with a minimum of two operators present at all times. During normal operation there will be approximately six personnel on site, divided between three shifts over a 24-hour period.

During maintenance (planned and unplanned) the number of personnel present on site would increase with the number of staff proportionate to the nature of the maintenance works being undertaken. The frequency of maintenance activities is dependent on the specifications/requirements of the Contractor that provides/installs the equipment. Irregular and/or emergency maintenance activities may also require HGV and/or AIL vehicle movements. These scenarios will be infrequent and the timing and duration is unknown. Where necessary the highways authority will be informed and agreement reached for any abnormal movements likely to disrupt the local network.

The anticipated operational life of the proposed converter station is approximately 40 years however it is likely that plant and equipment will be refurbished to extend the operational phase further.

3.3.4.9.1 Electric and Magnetic Fields

All equipment that generates, distributes or uses electricity produces Electric and Magnetic Fields (EMFs). Exposure limits for EMFs in the UK are set by the Government on advice from Public Health England, and the electricity industry strictly adheres to these limits. The exposure limits for both DC and AC cables originate from the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines, published in 1994 and 1998 respectively and recently updated in March 2020. **Appendix 3B** sets out the predicted EMFs likely to be generated during the operation of the English Onshore Scheme and stating the compliance with the guidelines for exposure to EMFs.

3.3.4.10 Decommissioning of the Converter Station and Underground AC Cable Route

During the 40-year operational lifetime of the English Onshore Scheme, it is likely that refurbishment and plant replacement will extend the life of the English Onshore Scheme rather than decommissioning. As a result, the effects of decommissioning have not been assessed.

In the event that the Project ceases operation the proposed converter station would be decommissioned. The main components would be dismantled and removed for recycling wherever possible. Where this is not possible disposal would be undertaken in accordance with the relevant waste disposal regulations at the time of decommissioning.

3.4 References

Ref 3-1: R. v Rochdale MBC ex parte Milne (No. 1) and R. v Rochdale MBC ex parte Tew [1999]; and R. v Rochdale MBC ex parte Milne (No. 2) [2000].

Ref 3-2: The SuDS Manual (C753); CIRIA (2015).

Ref 3-3: Control of Water Pollution from Linear Construction Projects (648); CIRIA (2006).