UK Onshore Scheme

Environmental Statement

Volume 2 Document ES-2-B.04

Chapter 08

Water Resources & Hydrology (Proposed Underground DC Cable)

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Environmental Statement Volume 2			
ES Reference	Chapter	Chapter Title	
ES-2-A.01	Ch01	Introduction	
ES-2-A.02	Ch02	Development of the UK Onshore Scheme	
ES-2-A.03	Ch03	The UK Onshore Scheme	
ES-2-A.04	Ch04	Environmental Impact Assessment Methods	
ES-2-B.01	Ch05	The Proposed Underground DC Cable	
ES-2-B.02	Ch06	Intertidal Zone	
ES-2-B.03	Ch07	Geology & Hydrogeology	
ES-2-B.04	**Ch08**	**Water Resources & Hydrology**	
ES-2-B.05	Ch09	Agriculture & Soils	
ES-2-B.06	Ch10	Ecology	
ES-2-B.07	Ch11	Landscape & Visual Amenity	
ES-2-B.08	Ch12	Archaeology & Cultural Heritage	
ES-2-B.09	Ch13	Socio-economics & Tourism	
ES-2-B.10	Ch14	Traffic & Transport	
ES-2-B.11	Ch15	Noise & Vibration	
ES-2-B.12	Ch16	Register of Mitigation	
ES-2-C.01	Ch17	The Proposed Converter Station	
ES-2-C.02	Ch18	Geology & Hydrogeology	
ES-2-C.03	Ch19	Water Resources & Hydrology	
ES-2-C.04	Ch20	Agriculture & Soils	
ES-2-C.05	Ch21	Ecology	
ES-2-C.06	Ch22	Landscape & Visual Amenity	
ES-2-C.07	Ch23	Archaeology & Cultural Heritage	
ES-2-C.08	Ch24	Socio-economics & Tourism	
ES-2-C.09	Ch25	Traffic & Transport	
ES-2-C.10	Ch26	Noise & Vibration	
ES-2-C.11	Ch27	Register of Mitigation	
ES-2-D.01	Ch28	Cumulative Effects	
ES-2-D.02	Ch29	Summary of Assessment & Conclusions	

Contents

List of Tables

List of Figures

The following figures are referenced within this chapter and can be found in Volume 3 Part B Figures (ES-3-B.01).

Glossary & Abbreviations

Glossary of Terms	
Term	**Meaning**
base scheme design	The design of the UK Onshore Scheme for the purposes of the planning application.
the Contractor	Party or parties responsible for the detailed design and construction UK Onshore Scheme.
converter station	Facility containing specialist equipment (some indoors and some potentially outdoors) for the purposes of converting electricity from AC to DC or DC to AC.
detailed scheme design	The design of the Scheme developed by the Contractor within the Limits of Deviation (AC and DC cables) and Rochdale Envelope (converter station).
Direct Current (DC)	Electric power transmission in which the voltage is continuous. This is most commonly used for long distance point to point transmission.
joint bay	Buried concrete pit where adjacent sections of onshore cables are physically jointed together.
landfall	The area between Mean Low Water Springs and Mean High Water Springs where the Onshore and Offshore Schemes meet.
Limits of Deviation	These define the maximum extents of the corridor for which planning permission is sought and within which proposed DC and AC cable routes may be installed.
Open cut methods	Cable installation methods which require the excavation of a trench into which ducts or cables can be directly laid.
the Project	Viking Link, from the connection point at Revsing Substation in Denmark to the connection Bicker Fen Substation in Great Britain).
Rochdale Envelope	This defines the parameters of the proposed converter station for which planning permission is sought including its location, layout and dimensions.
the Scheme	UK Onshore Scheme from MLWS to the connection point comprising underground AC and DC cables, converter station and access road.
Temporary Construction Compound	Compound used by the Contractor for siting of offices, welfare facilities, storage and laydown.
Temporary Construction Facilities	All areas used for temporary construction requirements including compounds, working areas.
Temporary Works Area	Larger working area located on or adjacent to the working width used where construction activities requires a larger area for example at trenchless crossings.
Transition Joint Pit	Buried concrete pit where onshore and submarine cables are physically jointed together.

Glossary of Terms	
Term	**Meaning**
trenchless methods	Cable installation methods used to cross obstacles such as roads or watercourses and ensure less disturbance at the ground surface.
working width	The 30 m wide working corridor required for the installation of underground DC cables.

List of Abbreviation	
Abbreviation	**Meaning**
AGL	Above Ground Level
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BBC	Boston Borough Council
bgl	below ground level
BGS	British Geological Society
BS	British Standard
CBS	Cement Bound Sand
CEMP	Construction Environmental Management Plan
CFMP	Catchment Flood Management Plan
DC	Direct Current
DCLG	Department for Communities and Local Government
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
ELDC	East Lindsey District Council
EU	European Union
FAWMA	Flood and Water Management Act 2010
FRA	Flood Risk Assessment
GLNP	Greater Lincolnshire Nature Partnership
ha	Hectare
HDD	Horizontal Directional Drilling
IDB	Internal Drainage Board
JB	Joint Bay

List of Abbreviation	
Abbreviation	Meaning
km	Kilometre
kV	Kilovolt
LCC	Lincolnshire County Council
LDA	Land Drainage Act 1991
LLFA	Lead Local Flood Authority
LoD	Limit of Deviation
LPA	Local Planning Authority
m	Metres
m^2	Square metre
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MW	Megawatt
NGET	National Grid Electricity Transmission plc
NGIHL	National Grid Interconnector Holdings Limited
NGVL	National Grid Viking Link Limited
NKDC	North Kesteven District Council
NPPF	National Planning Policy Framework
NPS	National Policy Statement
SFRA	Strategic Flood Risk Assessment
SHDC	South Holland District Council
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TBM	Tunnel Boring Machine
TCA	Temporary Construction Area
TCC	Temporary Construction Compound
TCPA	Towna and Country Planning Act 1990
TJP	Transition Joint Pit
TPL	Target Priority Location
UK	United Kingdom
WAR	Water Resources Act 1991
ZoI	Zone of Influence

1 Introduction

1.1 Introduction

1.1.1 This chapter has been prepared by RPS. It reports the results of baseline studies and the assessment of the potential impacts of the proposed Direct Current (DC) cable route on water resources and hydrology.

1.1.2 Table 8.1 below sets out the structure of the Environmental Statement (ES) with respect to water resources and hydrology.

1.1.3 Impacts on water resources and hydrology are interrelated with impacts on Geology and Hydrogeology (ES-2-B.03, Chapter 07), Agriculture and Soil (ES-2-B.05, Chapter 09) and Ecology (ES-2-B.06 Chapter 10), with detailed analysis of cumulative effects outlined in ES-2-D.01 Chapter 28 Cumulative Effects.

Table 8.1 Environmental Statement: Water Resources and Hydrology

ES Reference	ES Volume	ES Chapter	Content
ES-2-B.04	**2**	**08**	**Main Report: Proposed Underground Cable**
ES-2-C.03	2	19	Main Report: Proposed Converter Station
ES-3-B.04	3	08	Figures: Proposed Underground Cable
ES-3-C.03	3	19	Figures: Proposed Converter Station
ES-4-B.04	4	08	Technical Appendices: Proposed Underground Cable
ES-4-C.03	4	19	Technical Appendices: Proposed Converter Station

1.2 Chapter Structure

1.2.1 The remainder of this chapter is structured as follows:

- Section 2. Approach to Assessment. Sets out the water resources and hydrology specific approach to the assessment in line with relevant guidance.
- Section 3. Basis of Assessment. Sets out the key assumptions which have been made in undertaking the impact assessment.
- Section 4. Planning Policy and Legislative Considerations. Summarises the key planning policies and legislations which have been considered as part of the assessment.
- Section 5. Baseline Conditions. Reports the results of desktop and field studies undertaken to establish existing conditions.

- Section 6. Potential Impacts. Identifies the potential impacts on water resources and hydrology which may occur as a result of temporary, operational, longer term and decommissioning impacts.
- Section 7. Mitigation. Identifies the mitigation which is proposed including measures which are incorporated into the siting, design and construction of the underground cable.
- Section 8. Residual Effects. Reports the residual effects which remain, taking into account proposed mitigation and identifies whether these are significant or not.
- Section 9. Cumulative Effects. Identifies the inter-project cumulative effects which may occur in combination with other developments.
- Section 10. Summary of Assessment. Provides a summary of the key findings of the impact assessment.
- Section 11. References.

2 Approach to Assessment

2.1 Introduction

2.1.1 This section describes the approach to the identification and assessment of impacts resulting from the construction and operation of the proposed DC cable route on water resources and hydrology.

2.2 Summary of Consultation

Scoping Opinion Review

2.2.1 Table 8.2 summarises the issues raised in the scoping opinion in relation to water resources and hydrology and outlines how these have been addressed.

Table 8.2 Scoping opinion (Water Resources and Hydrology)

Consultee	Summary of Comment	How and where addressed
Boston Borough Council (BBC)	BBC recommends that likely construction and operation effects of the development (including effects on land drainage) be acknowledged and appropriate mitigation measures including measures for groundwater are adopted.	The likely effects of the construction and operational phase of the Scheme will be assessed within the EIA. Mitigation measures have been presented within Volume 2, Part B confirming that land drainage will be restored to an equivalent level as they were prior to construction following the construction phase. Storm water management systems will also be put into place during construction to minimise the risk posed to receiving surface water features. All large tidal defences and embanked watercourses will be crossed by trenchless techniques to minimise the potential impacts. Crossing techniques will be discussed and agreed with the relevant Local Planning Authority (LPA), Internal Drainage Board (IDB) and the Environment Agency (EA).

Table 8.2 Scoping opinion (Water Resources and Hydrology)		
Consultee	Summary of Comment	How and where addressed
Environment Agency (EA)	Open cut watercourse crossings may be suitable for smaller watercourses, however this method would not be permitted for crossing EA Main Rivers. The EA note that the mitigation measures proposed specifically the pollution incident reaction plan, should also include mitigation for groundwater risks as well as surface water. The EA agreed that the project should have a negligible impact on the affected waterbodies, provided that pollution prevention and control measures are applied at the construction stage and that SUDS are used to mitigate the permanent increase of surface water run-off.	All water crossing techniques will be agreed with the appropriate authority and outlined in the crossing schedule in Chapter 5 The Proposed DC Cable Route. Mitigation measures have been presented within this Chapter and compiled in ES-2-B.12 Chapter 16 Register of Mitigation. Sustainable Drainage Systems (SuDS) have been incorporated within the base scheme design – these are presented in ES-2-C.03 Chapter 19 and the associated Flood Risk Assessment undertaken for the proposed converter station, where this is of relevance.
Lincolnshire County Council (LCC)	LCC advised that a detailed assessment of existing land drainage should be undertaken and that temporary (during construction) and permanent (during operation) mitigation is agreed. This includes any temporary working areas, or where site has a potential impact on neighbouring land uses.	Mitigation measures are presented within this Chapter and compiled in ES-2-B.12 Chapter 16 Register of Mitigation. This confirms that land drainage will be restored following the construction phase. Storm water management systems will also be put into place during construction to minimise the risk posed to receiving surface water features.
Natural England	Natural England suggests that the MAGIC map should be utilised and referenced accordingly to ensure that all possible sites with the potential to be affected by water resources and hydrology have been identified.	The MAGIC map has been utilised within the ES to assess water resources and hydrology within the study area.

2.3 Scope of Assessment

Aspects to be Assessed

2.3.1 The effects considered in this chapter include those on surface water resources and hydrology that occur as a result of the UK Onshore Scheme. The following types of effects are assessed in this chapter:

- Effects on flood risk and flood defences;
- Effects on surface water resources; and
- Effects on drainage infrastructure.

Spatial Scope

2.3.2 The assessment has considered the potential direct and indirect impact associated with the Scheme within the Limits of Deviation (LoD). The study area is based on the extent to which the UK Onshore Scheme may have an impact on water resources and hydrology, also referred to as the Zone of Influence (ZoI). For the proposed DC cable route this is determined to include a 250 m buffer from the LoD.

2.3.3 The ZoI is illustrated on Figures 8.1 – 8.4 EA Flood Maps for Planners.

Temporal Scope

2.3.4 In assessing the effects, the likely duration of effect has been considered as either:

- Temporary impacts – construction phase comprising the groundworks for the DC cable installation; and
- Longer term, operational and permanent impacts – operational phase and beyond.

2.4 Assessment Guidance

2.4.1 There is no specific guidance in relation to assessing the impact of interconnectors on water recourses and hydrology, therefore Design Manual for Roads and Bridges (DMRB) has been used as it is considered to be the most appropriate methodology for assessing the effects of linear schemes. The assessment methodology is based on guidance provided in the DMRB, Volume 11, Part 10 (Ref: 8.2).

2.4.2 The assessment of potential effects on water resources takes account the impacts from the proposed DC cable route, landfall and Temporary Construction Compounds (TCC) on the prevailing hydrological, surface water drainage, flooding and water quality environments.

2.4.3 The list below sets out the main documents used, where appropriate, to inform the impact assessment including the identification of sensitivity or value of receptors and the magnitude of impacts.

European

- Water Framework Directive (Ref: 8.3) (Directive 2000/60/EC of the European Parliament and of the Council of 23, October 2000); and

National

- National Planning Policy Framework (NPPF) (2012) (Ref: 8.4);

- Planning Practice Guidance ID:7 Flood Risk and Coastal Change, online (http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/) (Ref: 8.5); and
- Water Environment (Water Framework Directive) (England and Wales) Regulations (2017), which transport the Water Directive 200/60/EC into UK law (Ref: 8.6).

Guidance

- Environment Agency (EA) (February 2016) Guidance Flood risk assessments: climate change allowances (Ref: 8.7);
- National SuDS Working Group, Interim Code of Practice for Sustainable Drainage Systems, 2004 (Ref: 8.8);
- CIRIA C532 Control of Water Pollution from Construction Sites (Ref: 8.9);
- CIRIA C649 Control of water pollution from linear construction projects: site guide. Construction Industries Research Association (Ref: 8.10);
- CIRIA C648 Control of water pollution from linear construction projects: technical guidance. Construction Industries Research Association (Ref: 8.11);
- CIRIA 753 The SUDS Manual, 2015 (Ref: 8.12); and
- CIRIA Report C741 Environmental Good Practice on Site (Ref: 8.13).

2.5 Assessment Criteria

Sensitivity of Receptors

2.5.1 The sensitivity of a hydrological receptor or attribute is largely determined by its quality, rarity and scale. The determination of sensitivity takes into account the scale at which the attribute is important. This can be defined as being at a local level (e.g. on the Scheme site or immediately adjacent); district level (beyond the Scheme boundary but within the district); county level (e.g. Lincolnshire); regional level (e.g. East Midlands); national (e.g. England) or international level (e.g. Europe).

2.5.2 Table 8.3 below has been followed in the consideration of sensitivity for the proposed DC cable route. This table takes into account guidance provided in section 2.1 and A4.3 of the DMRB and the author's professional judgement.

Table 8.3 Sensitivity Criteria (Water Resources and Hydrology)		
Sensitivity	**Descriptions**	**Examples**
Very high	The receptor has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance. Receptor is of high value or of critical importance to local, regional or national economy. Receptor is highly vulnerable to impacts that may arise from the proposed DC cable route and recoverability is long term or not possible.	Surface water: Water Framework Directive (WFD) Current Overall Status of High. Flood risk: Land within Flood Zone 3b/3a or more than one hundred residential properties protected from flooding by flood defence infrastructure or natural floodplain storage.
High	The receptor has low capacity to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance. Receptor is of moderate value with reasonable contribution to local, regional or national economy. Receptor is generally vulnerable to impacts that may arise from the proposed DC cable route and recoverability is slow and/or costly.	Surface water: WFD Current Overall Status of Good. Flood risk: Land within Flood Zone 3a or between one and one hundred residential properties or industrial premises protected from flooding by flood defence infrastructure or by natural floodplain storage.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance. Receptor is of minor value with small levels of contribution to local, regional or national economy. Receptor is somewhat vulnerable to impacts that may arise from the proposed DC cable route and has moderate to high levels of recoverability.	Surface water: WFD Current Overall Status of Moderate. Flood risk: Floodplain within Flood Zone 3a and/or 2 or limited constraints and a low to medium probability of flooding of residential and industrial properties.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance. Receptor is of low value with little contribution to local, regional or national economy. Receptor is not generally vulnerable to impacts that may arise from the proposed DC cable route and/or has high recoverability.	Surface water: WFD Current Overall Status of Poor. Flood risk: Flood Plan within Flood Zone 2 and/or 1 or limited constraints and a low to very low probability of flooding of residential and industrial properties.

Table 8.3 Sensitivity Criteria (Water Resources and Hydrology)		
Sensitivity	**Descriptions**	**Examples**
Negligible	The receptor is resistant to change and is of little environmental value. Receptor is of negligible value with no contribution to local, regional or national economy. Receptor is not vulnerable to impacts that may arise from the proposed DC cable route and/or has high recoverability.	Surface water: WFD Current Overall Status of Bad. Flood risk: Areas outside flood plain (Flood Zone 1) or flood plain with very low probability of flooding industrial properties.

Magnitude of Impacts

2.5.3 The magnitude of any predicted impact is dependent on its size, duration, timing (e.g. seasonality) and frequency (permanent, seasonal etc.). A qualitative appraisal of the likely magnitude of the predicted impact is provided within this assessment, taking into account the measures proposed to be adopted as part of the proposed DC cable route to control such impacts. The magnitude of the predicted impact has been described using the criteria outlined in Table 8.4 below. This table takes into account guidance provided in section 2.1 and A4.4 of DMRB and the author's professional judgement.

Table 8.4: Impact Magnitude Criteria (Water Resources and Hydrology)		
Magnitude	**Description**	**Examples**
High	Total loss or major alternation to key elements/features of the baseline conditions such that post development character/composition of baseline condition will be fundamentally changed.	Total loss of flood plain storage and/or local drainage networks causing an increase in flood risk. Large scale contamination event discharging into a designated area of protection Causing significant observable degradation in water resource quality.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition of the baseline condition will be materially changed.	Partial loss of flood plain storage causing an increase in surface water runoff in turn causing an increase in flood risk. Contamination event occurring which causes a change in the local baseline condition and an observable degradation in water resource quality.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying	Disruption of drainage networks causing a local, short term increase in flood risk. Unmitigated maintenance works

Table 8.4: Impact Magnitude Criteria (Water Resources and Hydrology)		
Magnitude	**Description**	**Examples**
	character/composition of the baseline condition will be similar to the pre-development situation.	leading to an increase in flood risk. A short term contamination event with a short term impact on baseline, causing short term degradation in water resource quality.
Negligible	Very little to no observable change from baseline conditions. Change is barely distinguishable, approximating to a "no change" situation.	A disruption of on-site drainage networks occurring after mitigation and on-site management strategies are in place and therefore no observable increase in flood risk. Small, localised contamination event causing no change to baseline and therefore no degradation in water resource quality.

Assessing the Significance of Effects

2.5.4 The significance of potential effects has been determined taking into account the sensitivity of the receptor and the magnitude of each impact. Table 8.5 below is used to inform the evaluation of the significance of effects. This table is based on guidance provided for linear schemes within the DMRB.

Table 8.5: Assessment of Significance (Water Resources and Hydrology)					
Magnitude of Impact	**Sensitivity of Receptor**				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

2.5.5 For the purposes of this assessment any effect that is major or moderate is considered to be significant. Any effect that is minor or negligible is not significant.

2.6 Assumptions or Limitations

2.6.1 The baseline hydrological characterisation and, consequently the hydrological and water resources assessment is based on publicly available data obtained from the EA, Lincolnshire County Council (LCC), East Lindsey District Council (ELDC), North Kesteven District Council

(NKDC), Boston Borough Council (BBC), South Holland District Council (SHDC), Internal Drainage Boards (IDB) (Lindsey Marsh, Witham Fourth and Black Sluice) and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages.

3 Basis of Assessment

3.1 Overview

3.1.1 The base scheme design establishes a realistic worst case on which the assessment of the proposed DC cable route is based. This section identifies the key elements of the proposed DC route. The assessment considers a realistic worst case based on the maximum scale of the elements and as a result no effects greater than those assessed are likely.

3.2 The Proposed Underground Cable

3.2.1 The base scheme design for the proposed DC cable route had been developed in order to provide sufficient information upon which a realistic worst case scenario can be presented. It is proposed that there will be no above ground infrastructure required along the proposed DC cable route with the exception of small marker posts. Table 8.6 sets out the key considerations which form the basis of the assessment.

Table 8.6: Proposed DC Cable Route Engineering Design Assumptions

Base Scheme Design	Dimensions/Realistic Worst Case Scenario
Proposed DC Cable Route	
High voltage DC cable.	2 No. (approximate diameter 150 mm)
Fibre optic cables installed to monitor cable temperature.	Up to 3 No.
Cable Trench	
Single trench.	Containing 2 No. high voltage DC cables and up to 3 No. fibre optic cables.
Typical trench Dimensions.	1.5 m wide. 1.5 m deep (subject to local ground conditions and obstacles).
Minimum depth to top of protective cover over power cable.	Agricultural land – typically 0.9 m (900 mm). Watercourses – typically 2.0 m (2000 mm)*. Roads – typically 0.75 m (750 mm). Railways – typically 5 m (5000 mm). Footpaths and non-agricultural verges – typically 0.6 m (600 mm).
Cable bedding.	Soil and Cement Bound Sand (CBS) or other thermally suitable material.

Table 8.6: Proposed DC Cable Route Engineering Design Assumptions	
Base Scheme Design	Dimensions/Realistic Worst Case Scenario
Cable Ducting.	May be required either along the proposed route and/or at watercourse crossings etc. to limit duration of open excavations.
Joint Bays	
Buried concrete pad over which temporary cabins or enclosures will be placed. Cables laid on concrete pad after jointing, laid on CBS and covered with selective sand and protective tiles, no inspection chamber is required for DC cables.	
Joint Bays.	Up to No. 84 (Subject to detailed design)
Jointing bay working width.	Increased width may be required at joint bays to accommodate cable pull directly from the cable drum trailer during trenchless techniques (see description above).
Buried concrete pad.	Requiring an excavation (Dimensions subject to detailed design).
Jointing and testing.	May require 24-hour working.
Joint bays.	Up to 800 – 1,500 m intervals.
Working Width	
High voltage DC cable.	30 m working width. Wider for trenchless crossings and where engineering constraints are present.
Construction Programme	
Cable installation.	Installation installed over maximum 3 years (depending on installation method(s), access and available resource)
Construction restrictions.	Construction could be undertaken throughout the year yet observing seasonal restrictions
Decommissioning	
DC cable decommissioning	Assume removal of all or part of DC cable

* The proposed DC cables will be installed at a minimum of 2 m below the hard bed of IDB controlled watercourses (as determined through consultation), plus a safety distance as would be required for the cables. The safety buffer is nominally 500mm but will be risk assessed on a case by case basis.

3.3 Crossing Techniques

The DC Route crossing techniques

3.3.1 Details of crossing methods which have informed the assessment are outlined within Table 8.7 below:

Table 8.7: Proposed DC Cable Route Engineering Design Assumptions	
"Open Cut" construction technique realistic worst case scenarios	
Top soil 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 top soil will be stockpiled separately.	
Install base layer of CBS. Trench is left open for duct laying.	
Ducts are bedded in with CBS.	
Protective tiles are placed along the width of the cable trench.	
Trench is back filled with excavated sub-soil or thermally suitable material where required	
Topsoil will be reinstated to original soil profile and land re-seeded or released to the farmer for cultivation as it was found.	
Joint bay locations are excavated along the route (800 m to 1,500 m, dependent on detailed design), which will act as pulling locations for the cable.	
Cables are installed in the duct/trench by 'pulling' from cable drum between joint bays.	
Small inspections/lubrication pits may be excavated between the joint bays to aid with the pulling activity.	
Open cut trench and direct burial.	Approximately 30 days per km.
Open cut trench and ducting.	Approximately 20 days per km.
"Non-open cut" construction technique realistic worst case scenarios	
Trenchless installation methods.	7 to 20 days per crossing depending on exact trenchless method utilised.
Horizontal Directional Drill	
Launch and reception compounds (Size to be determined following detailed design).	
Drilling fluid (typically bentonite slurry) used in the drilling process.	
One bore with a cable duct of an approximate inner diameter of 254 mm would be required for each cable. Larger diameters may be used for trenchless techniques at greater depths.	
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.	
Pipe Jacking (Auger bore)	
Require excavation of launch pits (size and depth of the launch pit is dependent upon the depth of the cable) on either side of crossing.	
One bore tunnel is required for each cable.	
A cable duct of an approximate inner diameter of 254 mm would be installed in the tunnel pipe to take the cable. Larger diameters may be used for trenchless techniques at greater depths.	
The launch pit and reception pit would be backfilled on completion of the crossing and the area reinstated.	
Topsoil will be reinstated to original soil profile and land re-seeded or released to the farmer for	

Table 8.7: Proposed DC Cable Route Engineering Design Assumptions	
cultivation as it was found.	
Trenchless Method (Micro Boring)	
This method is similar to pipe jacking, however utilises a steerable Tunnel Boring Machine (TBM).	
Lengths of pipe are inserted behind the TBM as it progresses and a hydraulic jack is used to drive the pipe forward.	
Water or mud mix is utilised to fluidise excavated material which is pumped to the launch pit.	
Launch pit and reception pit require concrete bases to ensure a clean working environment and prevent water entering the working area. Launch pit also requires a concrete back wall for the hydraulic jack to work against.	
The launch pit and reception pit would be backfilled on completion of the crossing and the area reinstated.	
Temporary Construction Compounds	
Main (Primary) TCC.	Area up to 4.24 ha. Full descriptions of TCC can be found within ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable.
Smaller (Secondary and tertiary) satellite compounds.	Smaller satellite compounds will be required along the cable route as well as temporary compounds located at land fall, joint bays and where trenchless installation methods are to be used. Full descriptions of TCC can be found within ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable.

3.4 Water Resources and Hydrology

3.4.1 For the purpose of this ES, 'flood risk' is defined as the permanent removal of or increase in low permeability surfacing leading to an alteration in pre-development surface water run-off rates, a derogation of floodplain storage or the disruption of main rivers/field drains increasing the chance of flood defence failure. 'Temporary' flood risk is the temporary removal or alteration in permeable surfacing leading to a temporary increase in surface water run-off or derogation of floodplain storage increasing the chance of flood defence failure due to temporary conditions (for example during construction).

3.5 Design Mitigation

3.5.1 Potential impacts to the water environment will be avoided where practicable through careful consideration of the construction drainage design, construction techniques and operational best practices of the DC cable route. The EA, Lead Local Flood Authority (LLFA) and IDB will be consulted through the construction works planning process to ensure all appropriate permits and consents are in place. All design mitigation and construction mitigation measures are outlined below and featured in the Construction Environmental Managment Plan (CEMP).

3.5.2 Design mitigation measures are incorporated into the base scheme design of the proposed DC cable route to reduce potential impact where the impact would be moderate or major adverse. Effects are re-assed post construction mitigation (Residual Effects) with the aim that all impacts are reduced to become not significant.

3.5.3 As part of the design process, a number of design mitigation measures have been proposed to reduce the potential for impacts on water resources and hydrology. These measures are considered standard industry practice for this type of development and therefore have been incorporated in the base scheme design as assessed within the potential impacts (Section 6 of this chapter).

Table 8.8 Design mitigation measures adopted as part of the proposal with respect to water resources and hydrology

Measures adopted as part of the proposal.	Justification
Construction	
Flood Defences · The landfall and coastal features (flood defences) will be crossed utilising a trenchless technique which will not directly impact on flood defences and therefore will not affect flood risk. · The trenchless technique excavation on the landward site will be undertaken during low tide, with the works sealed before the next high tide. The structure will be designed in consultation with the regulators (including the LLFA, IDB's and EA). · Following installation of the ducts, the ducts will be sealed with an appropriate water proofing material to maintain the integrity of the sea defences and to mitigate flood risk. · The ducts will always be capped to prevent sea water passing through them at high tide. The only exception will be when the cables are being pulled into the ducts and the caps must be removed.	Concerns raised by the EA regarding impact on structural integrity of flood defences following cable installation.

Table 8.8 Design mitigation measures adopted as part of the proposal with respect to water resources and hydrology	
Proposed DC Cable Route · Cable trenching and construction site access road widening across surface water courses will require measures to ensure that the water quality and flow rates are unaffected either directly or indirectly. · The cable route corridor and the construction site access roads have been designed to minimise land take and to avoid, where possible, impacts on existing drainage networks and features. · Where the cable route corridor crosses land drains and surface watercourses (with size of watercourses to be decided by engineering assumptions), the construction site access road will be installed over a pre-installed culvert of suitable size to accommodate the water volumes and flows necessary or a temporary bridge will be installed through agreement with the landowner, LLFA, relevant IDB or EA. · Temporary construction site access roads will be removed at the end of the construction programme. Where the construction site access road crosses existing underground services the use of temporary access roads or other suitable measures may be employed to distribute heavy loads and protect the underlying services. · Surface water flowing into the trenches, TCC and TCA's during the construction period will be pumped via settling tanks or ponds to remove sediment and potential contaminants, before being discharged into local ditches or drains via temporary interceptor drains (to be agreed with EA/IDB's). · In areas where watercourses are not present, temporary drainage systems would incorporate infiltration techniques in order to mitigate against any increase in surface runoff. · Where gradients on site are significant, cable trenches will include a hydraulic brake (bentonite or natural clay seals) to reduce flow along trenches and hence reduce local erosion. · Any field drainage or pre-construction land drainage intercepted during the cable installation could either be reinstated following the installation of the cable, diverted to a secondary channel or re-draining of fields (with the most appropriate method to be proposed for each field). Any works undertaken will be in agreement with the appropriate stakeholders. · The proposed engineering methods for the landfall, temporary construction compounds and construction site accesses will comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard.	To prevent pollution of watercourses and address stakeholder concerns for the cable route installation.

Table 8.8 Design mitigation measures adopted as part of the proposal with respect to water resources and hydrology	
<u>Pollution prevention measures</u> Refuelling of vehicles, machinery and equipment will be undertaken within designated areas where spillages can be easily contained. Machinery will be routinely checked to ensure it is in good working condition. Any tanks and associated pipe work containing oils and fuels will be double skinned. The following specific mitigation measures for the protection of surface water during construction activities will be implemented: · Management of construction works to comply with the necessary standards and consent conditions as identified by the EA; · A briefing highlighting the importance of water quality, the location of watercourses and pollution prevention included within the site induction; · Areas with prevalent run-off to be identified and drainage actively managed, e.g. through bunding and/or temporary drainage; · Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) to be bunded or otherwise isolated and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses. · Additionally the bunded or isolated areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage. Bunds used to store fuel, oil and other pollutants to have a 110% capacity; · Disturbance to areas close to watercourses reduced to the minimum necessary for the work; · Excavated material to be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses; · All plant machinery and vehicles to be maintained in a good condition to reduce the risk of fuel leaks; · Drainage works to be constructed to relevant statutory guidance and approved via the LLFA prior to the commencement of construction; and · Consultation with the EA to be ongoing throughout the construction period to promote best practice and to implement proposed mitigation measures.	To prevent pollution of water courses and address stakeholder concerns for the construction of the DC cable route.

Table 8.8 Design mitigation measures adopted as part of the proposal with respect to water resources and hydrology	
Best practice measures: All construction work will be undertaken in accordance with the Outline CEMP, and good practice guidance including, but not limited to (Ref: 8.14): · EA, Pollution Prevention Guidance Note 6 (PPG6): Pollution Prevention Guidelines – Working at Construction and Demolition Sites (EA, 2012); · EA, Pollution Prevention Guidance Note 5 (PPG5):– Working in, near or liable to affect watercourses (EA, 2007); · EA guidance for discharges to surface water and groundwater: environmental permits (Ref: 8.15); · *EA guidance for oil storage regulations for businesses (Ref:* 8.16); · Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C532); · CIRIA – SuDS Manual (CIRIA, 2015) (Ref: 8.17); · *EA guidance for work on a river, flood defence or sea defence (Ref:* 8.18); · Prevent surface water being affected during earthwork operations. No discharge to surface watercourses will occur without permission from the EA (SuDS Manual); · Wheel washers and dust suppression measures to be used as appropriate to prevent the migration of pollutants (SuDS Manual); · Regular cleaning of the permanent access road and temporary accesses of any construction waste and dirt to be carried out (SuDS Manual); and · A construction method statement to be submitted for approval by the responsible authority (SuDS Manual).	To accord with guidance and best practice guidelines for constructional works.
Operation / Maintenance	
Operational practices to incorporate measures to prevent pollution and increased flood risk, to include emergency spill response procedures, clean up and remediation of contaminated water run-off.	To reduce the risk of surface water pollution based on current guidance.

4 Planning Policy and Legislative Considerations

4.1 Key National Planning Policy

4.1.1 NGVL and their appointed contractors will comply with planning policy associated with the construction of the DC cable route. An outline of the relevant planning policy specific to water resources and hydrology is provided below.

National Planning Policy Framework (2012)

4.1.2 The National Planning Policy Framework (NPPF) (Ref: 8.4) is a material consideration in determining planning applications. Paragraphs 99 to 108 of the NPPF outline the development requirements in terms of flood risk, water quality and resources and the impact of climate change, stipulating that a site specific Flood Risk Assessment (FRA) is required for all proposals for new developments in Flood Zones 2 and 3 and for any proposal for developments on 1 ha or greater in Flood Zone 1.

4.1.3 On 6th March 2014 the Department for Communities and Local Government (DCLG) launched Planning Practice Guidance ID7 as a web-based resource. The Planning Practice Guidance ID7 (DCLG, 2014) for Flood Risk and Coastal Change (Ref: 8.5) provides additional guidance for the implementation of the NPPF in relation to development and flood risk.

4.2 Local Planning Policy

Boston Borough Council Local Plan (Adopted April 1999, saved policies)

4.2.1 The BBC Local Plan (1999) (Ref: 8.19) is the development plan for the borough. The Local Plan consists of a series of documents which set out the spatial vision for BBC, the strategy for delivery of this vision and detailed policies and guidance for managing development in the borough and development sites where change are anticipated.

4.2.2 The policies with particular reference to water resources and hydrology are as follows:

- Policy G4 Safeguarding the Water Environment states that: "*Planning permission will not be granted for developments which will have an adverse effect on the water environment, or the quality of surface or groundwater*".
- Policy G5 Flood Protection states that "*Planning permission will not be granted for development which threaten the effectiveness of land drainage systems or river or sea defences, unless mitigating measures are undertaken as part of the development*".

South Holland District Council Local Plan 2006

4.2.3 The SHDC Local Plan (Ref: 8.20) sets out the planning policies which will guide and control new development in the District until 2021.

4.2.4 Following the direction by the Secretary of State, as of 18th July 2009, the policy regarding Development and Flood Risk is no longer valid.

4.2.5 The policies relevant to SuDS and pollution and contamination have been outlined below.

Policy SG11: Sustainable Urban Drainage System (SUDS)

4.2.6 Development generating surface water run-off, likely to result in increased flood risk, will be permitted provided that:

- The development's surface water management system accords with sustainable development principles and has been designed as part of the development layout; and
- The system will effectively control and adequately mitigate or attenuate any adverse effects from surface water run-off on people, habitats of acknowledged importance and property; and
- Developers can ensure long term maintenance of the drainage systems, where necessary through planning obligations.

4.2.7 Where this is not possible the developer will be required to implement an alternative method of surface water disposal that is to the Council's satisfaction.

Policy SG13: Pollution and Contamination

4.2.8 Planning permission will only be permitted for development proposals which:

- do not cause unacceptable levels of pollution of the surrounding area by noise, light, toxic or offensive odour, airborne pollutants or by the release of waste products;
- provide, as necessary, appropriate treatment of land to clean up pollution and contamination.

Saved policies of the adopted East Lindsey District Local Plan 2007

4.2.9 ELDC adopted the East Lindsey Local Plan (Ref: 8.21) in 1995 and the policies and text were updated in 1999 via a formal amendment. As a result, some of the policies were saved and some deleted in 2007. The saved policies comprise the current development plan for the area and there are two policies of relevance to water resources and hydrology:

- Policy ENV3, Foul and Surface Water Disposal states that "*Development will be permitted where it can be shown that foul sewers, sewage treatment and surface water drainage of adequate capacity and design are available or that these can be provided in time to serve the development.*

  Small scale development served by alternative means of sewage treatment and surface water disposal will be permitted where ground conditions are satisfactory and the plot is of sufficient size to provide an adequate subsoil drainage system".
- Policy ENV21, River Corridors states that: "*Development will be permitted where it can be shown that it will not harm the open character, nature conservation importance or recreational importance of the river corridors of the Rivers Witham, Steeping, Bain, Lud, Waring and Lymn and of the Louth Navigation Canal, Great Eau and Wold Grift Drains*".

Emerging East Lindsey Local Plan

4.2.10 ELDC are in the process of preparing a new Local Plan (Ref: 8.22) which will guide growth and development in East Lindsey up to 2028. The Local Plan will be made up of a Core Strategy and Settlement Proposals and, once adopted, will comprise the statutory development plan for ELDC, replacing the 2007 Local Plan. The emerging Core Strategy has progressed to draft stage and as such, can only be given limited weight as a material consideration due to its early stage of preparation.

4.2.11 The polices relevant to water resources and hydrology are as follows:

- Strategic Policy 10 (SP10), Design states that: "*The Council will support well-designed sustainable development, which maintains and enhances the character of the District's towns, villages and countryside by:*

  … 7. Development around water sources will only be supported if it contains adequate protection preventing pollution from entering into the water source".
- Strategic Policy 16 (SP16), Inland Flood Risk states that "*The Council will support development for business, leisure and commercial uses in areas of inland flood risk providing it incorporates flood mitigation measures in its design.*

  The Council will not support development in identified flood storage areas.

  All new development must show how it proposes to provide adequate surface and foul water disposal including avoiding impacting on surface water flow routes or ordinary watercourses. The Council will expect this to involve the use of Sustainable Urban Drainage Systems along with other appropriate design features, including the retention of any existing water features on a site.

  The Council will support development that demonstrates an integrated approach to sustainable drainage that has positive gains to the natural environment.

  The Council will support improvements to the existing flood defences, the creation of new flood defences, infrastructure associated with emergency planning, washlands and flood storage areas.

  All development must be accompanied by a site-specific flood risk assessment in line with national policy."

Central Lincolnshire Local Plan - Adopted April 2017

4.2.12 The Central Lincolnshire Local Plan (Ref: 8.23) was adopted by the Central Lincolnshire Joint Strategic Planning Committee on 24th April 2017 and it now replaces the Local Plans of the City of Lincoln, West Lindsey and North Kesteven District Councils. It contains planning policies and allocations for the growth and regeneration of Central Lincolnshire up to 2036. The policy with particular reference to water resources and hydrology are:

- Policy LP14, managing water resources and flood risk states "*All development proposals will be considered against the NPPF, including application of the sequential and, if necessary, the* *exception test. Through appropriate consultation and option appraisal, development proposals should demonstrate:*

i. *that they are informed by and take account of the best available information from all sources of flood risk and by site specific flood risk assessments where appropriate;*

ii. *that there is no unacceptable increased risk of flooding to the development site or to existing properties;*

iii. *that the development will be safe during its lifetime, does not affect the integrity of existing flood defences and any necessary flood mitigation measures have been agreed with the relevant bodies;*

iv. *that the adoption, ongoing maintenance and management of any mitigation measures have been considered and any necessary agreements are in place;*

v. *how proposals have taken a positive approach to reducing overall flood risk and have considered the potential to contribute towards solutions for the wider area; and*

vi. *that they have incorporated Sustainable Drainage Systems (SuDS) in to the proposals unless they can be shown to be impractical.*

· *Development proposals that are likely to impact on surface or ground water should consider the requirements of the Water Framework Directive. Development proposals should demonstrate:*

vii. *that development contributes positively to the water environment and its ecology where possible and does not adversely affect surface and ground water quality in line with the requirements of the Water Framework Directive;*

viii. *how Sustainable Drainage Systems (SuDS) to deliver improvements to water quality, the water environment and where possible to improve amenity and biodiversity have been incorporated into the proposal unless they can be shown to be impractical;*

ix. *that suitable access is safeguarded for the maintenance of water resources, flood defences and drainage infrastructure;*

x. *that adequate provision is made to safeguard the future maintenance of water bodies to which surface water is discharged, preferably by an appropriate authority (e.g. Environment Agency, Internal Drainage Board, Water Company, the Canal and River Trust or local council).*"

4.3 Key National Legislation

4.3.1 NGVL and their appointed contractors will comply with all legislation associated with the construction of the DC cable route. An outline of the relevant legislation specific to water resources and hydrology are provided below.

Flood and Water Management Act 2010

4.3.2 The Flood and Water Management Act (FAWMA) 2010 (Ref: 8.24) implements the recommendations from Sir Michel Pitt's Review of the floods in 2007 and places a series of responsibilities on councils. The main aim of the Act is to improve flood risk management.

4.3.3 The Act designates councils as a LLFA with a 'lead' role in managing flood risk from surface water, groundwater and ordinary watercourses across their jurisdictional area. This involves closely working with partners involved in flood and water management, namely the EA and Internal Drainage Boards (IDBs).

Land Drainage Act 1991

4.3.4 Under Section 23 of the Land Drainage Act 1991 (LDA 1991) (Ref: 8.25) consent is required from the relevant DB for any works likely to obstruct, or affect the flow of, a watercourse. The relevant drainage authorities in respect of the proposed DC cable route are the EA, SHDC, BBC, ELDC, NKDC, BBC, Lindsey March IDB, Witham Fourth IDB, Black Sluice IDB and LCC as the relevant LLFA. Section 66 of the LDA 1991 makes provisions for the creation of byelaws considered necessary for securing the efficient working of the drainage system. Under the byelaws consent is required from the relevant drainage authority for any development within a particular distance of a drainage work. Within the Black Sluice IDB and Witham Fourth IDB no obstruction is permitted without prior consent for works within 9.0 metres of the edge of a watercourse. Within Lindsey March IDB no obstruction is permitted without prior consent for works within 8.0 metres of the edge of the watercourse.

Water Resources Act 1991

4.3.5 The Water Resources Act 1991 (WRA 1991) (Ref: 8.26) makes provision for the creation of byelaws by the EA. Paragraph 5 of Schedule 25 allows for the EA to create byelaws for flood defence and drainage purposes. Paragraph 6 allows for byelaws for purposes of fisheries functions to be made. Paragraph 6A makes provision for the creation of fisheries byelaws for marine or aquatic environmental purposes.

The Environmental Permitting (England and Wales) Regulations 2016

4.3.6 Schedule 25 of the Environmental Permitting (England and Wales) Regulation 2016 (Ref: 8.27) applies in relation to flood risk activity in, over or under a watercourse. Under the regulations, consent is required from the EA to undertake works or to erect structures within 8 m of a non-tidal water body (and 16 m of a tidal body).

5 Baseline Conditions

5.1 Study Area

5.1.1 This section reviews the water resources and hydrology for the proposed DC cable route, access and temporary compounds.

5.1.2 The proposed DC cable route length is up to 67.16 km passing through ELDC (51.60 km), BBC (9.78 km), NKDC (4.8 km) and SHDC (0.98 km) area. The route will cross a number of EA designated Main Rivers, IDB maintained drains, ordinary watercourses and drainage channels which form the foundation of the local hydrological environment. The study area over which data is presented for the specific impact assessment contained in this chapter is set out below.

5.1.3 The assessment commences landward of Mean High Water Springs (MHWS) and does not consider the intertidal zone (ES-2-B.02, Volume 2, Chapter 6: Intertidal Zone). For the proposed landfall (flood risk assessed within section 5.2 of this report) and either side of the proposed DC cable LoD a 250 m buffer for data collection was selected. A 250 m buffer is considered appropriate for data collection taking into account the nature of the development and likely Zone of Influence on hydrological receptors. Given the landscape surrounding the DC cable route and ongoing anthropogenic activities it will be difficult to ascertain the exact source of any impacts on water resources and hydrology beyond 250 m.

5.1.4 The proposed DC cable route components have been divided into the following route sections:

- Route Section 1 – Proposed Landfall to Well High Lane (up to 13.04 km);
- Route Section 2 – Well High Lane to A16/Keal Road (up to 16.85 km);
- Route Section 3 – A16/Keal Road to River Witham (up to 22.06 km); and
- Route Section 4 – River Witham to the Proposed Converter Station (up to 15.21 km).

5.1.5 All potential receptors which may be impacted by the proposed DC cable route have been assessed in detail within this chapter and presented below.

5.2 Route Section 1 Proposed Landfall to Well High Lane

Characterisation of Baseline Environment

5.2.1 Route Section 1, incorporating the proposed landfall and proposed DC cable route lies entirely within ELDC authority boundary, characterised by a rural relatively flat lying landscape primarily utilised for agricultural purposes. A significant proportion of the area is drained via a complex network of ordinary watercourses, drainage ditches and channels, which feed into Boygrift Drain and the Wold Grift Drain.

5.2.2 Route Section 1 of the proposed DC route is situated within the Steeping and Eaus Operational Catchment, which as stated encompasses Boygrift Drain, an artificially designated river managed by Lindsey March IDB and LCC acting as LLFA under the Water and Flood Management Act 2010 and LDA 1991.

5.2.3 A number of ordinary watercourse and smaller drains are present within the 250 m buffer of the DC route. These drains are managed by Lindsey Marsh IDB operating under the LDA 1991. The IDB is required to exercise general supervision over all matter relating to water level management of land within its district.

5.2.4 Further descriptions of the key water resource and hydrological characteristics within the defined study area for Route Section 1 of the proposed landfall and proposed DC route are set out below.

Flood Risk and Flood Defences

Fluvial and Tidal Flooding

5.2.5 EA Flood map for Planners (Figure 8.1) indicates that the majority of the proposed landfall and proposed DC cable route within Route Section 1 is located within undefended Flood Zone 3 'high probability', defined by the EA as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

5.2.6 The western extent of Route Section 1 of the DC route is located within Undefended Flood Zone 1 'low probability', defined by the EA as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). The EA flood map for planning (Rivers and Sea) indicates that the eastern coast line incorporates flood defences (Figure 8.1).

5.2.7 East Lindsey Strategic Flood Risk Assessment (SFRA) (Ref: 8.28) (March 2017) indicates the flood zone extents within Route Section 1 of the DC route are associated with modelled breaching of sea defences and inclusive of climate change to 2115 for a 1 in 200 year event. Existing flood risk is also associated with overtopping of flood defences of Main Wold Grift Drain during extreme storm events. Main Wold Grift Drain flows south through the centre of Alford and then eastwards towards the coast.

Flood Defences

5.2.8 EA flood defence data indicates that the Lincolnshire coastline is defended by recurved walls/flood wall with a design standard to provide protection against event up to the 1 in 200 year event.

5.2.9 The Wold Grift Drain is defended along its entire reach with upstream defence crest levels in close proximity of the DC cable route up to 4.01 m Above Ordnance Datum (AOD).

Flooding from rising/high groundwater

5.2.10 A detailed geological review of the proposed DC cable route is available in ES-2-B.03, Volume 2, Chapter 7: Geology and Hydrogeology. In summary, preliminary ground investigation (undertaken by AECOM 2017 *ES-4-B.03 Volume 4, Chapter 7 Geology and Hydrogeology*

Appendix 7.3) for the proposed landfall and proposed DC cable route indicates Route Section 1 of the DC cable route will pass through superficial deposits including:

Table 8.9 Superficial Deposits	
Superficial Deposits	**Lithological Description**
Blown Sand and Strom Beach Deposits	Yellow/brown locally gravelly sands
Salt Marsh and Tidal Creek Deposits	Variety of sandy silty clays, silty sands and clayey silts with rare pockets of organic material.
Till (Boulder Clay)	Stiff to very stiff slightly sandy, slightly gravelly silty clay.
Glaciofluvial Deposits	Sands and gravels.

5.2.11 The bedrock underlying the superficial deposits comprises the Burnham, Welton and Ferriby Chalk Formations defined by AECOM ground investigation as structure less White Chalk with flint gravels and cobbles. The Chalk formations are classified as principal aquifers consisting of layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage.

5.2.12 Groundwater monitoring undertaken along the DC cable route by AECOM (2017) indicates that groundwater strikes were encountered within the Salt Marsh and Tidal Creek Deposits (Tidal Flats) (2.60 m below ground level (bgl) rising to 1.90 m bgl) and within the Till (Boulder Clay) (1.20 m bgl rising to 1.00 m bgl (BH027) and 1.65 m bgl rising to 1.40 m bgl (BH026)).

5.2.13 The British Geological Survey (BGS) Groundwater Flooding Susceptibility map provided in the Landmark Envirocheck® Report obtained indicates that there is limited potential for groundwater flooding to occur at the eastern extent of Route Section 1 (the proposed landfall). Moving west between the proposed landfall and Crawcroft Lane, south of the village of Hannah, no risk of groundwater flooding is mapped.

5.2.14 The central and western areas of Route Section 1 (between Hannah and Ailby) are generally mapped as having the potential for groundwater flooding to occur at the surface with localised potential for groundwater flooding of property situated below ground level. The western extent of Route Section 1 (near to the village of Haugh) is generally shown to have a limited potential for groundwater flooding to occur.

5.2.15 Based on the information outlined above the potential for groundwater flooding is considered to be medium.

Surface Watercourses

5.2.16 As stated above, Route Section 1 of the proposed DC cable route crosses a number of tributaries and drains that are located within the watershed of surface water catchments, namely; Boygrift

Drain, Huttoft Main Drain, Bilsby Tank Trap Drain and Wold Grift Drain. The aforementioned catchments fall within ELDC and LCC jurisdictional areas.

5.2.17 The Boygrift Drain flows in a generally easterly direction towards the Sandilands coastline, discharging into the North Sea.

5.2.18 The Lough Coastal Catchment Flood Management Plan (CFMP) (Ref: 8.29) indicates that the Scheme is located within an area designated as CFMP Policy Area 4 (Mablethorpe, Chapel St Leonards/Ingoldmells and Skegness) defined as…*'areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change'*.

5.2.19 Potential crossing types are described in the ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable: Section 3.

5.2.20 No surface water flow data has been provided by consultees for rivers and streams in the immediate vicinity of proposed landfall and Route Section 1 of the proposed DC cable route study area. The underground cable description (ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable Section 3) outlines that main rivers, those with significant flow rates and crossing where channel width and depth preclude the use of open-cut will be crossed via trenchless techniques and therefore, flow rates will not be affected. **Error! Reference source not found.** below indicates the majority of surface watercourses within Route Section 1 will be crossed by trenchless techniques. Two field drains (DX 2/5 and DX 2/6) will be crossed by open cut techniques.

5.2.21 Minor and ordinary watercourses, where practical, will be crossed via either open cut or trenchless techniques, which will be designed in line with the requirements of the EA, LLFA and where required the IDB and conditioned within the planning application. In accordance with the Environmental Permitting (England and Wales) Regulations 2016, no works within 8 m from the top of bank or toe of a flood defence will be undertaken on any watercourse without prior consent from the relevant stakeholder (i.e. the EA, IDB or LA) and subject to planning conditions.

5.2.22 Watercourses will be crossed via either open cut/culverting or trenchless techniques, which will be designed in line with the requirements of the EA, IDB's, LLFAs and conditioned within the planning application.

Table 8.10 Summary of surface water cable crossing locations and techniques within Route Section 1.

Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX1/1	553363	379814	Drain adjacent to Sea Bank/Roman Bank		Trenchless

Table 8.10 Summary of surface water cable crossing locations and techniques within Route Section 1.					
Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX1/2	552719	379608	Huttoft Main Drain	Lyndsey Marsh Drainage Board IDB	Trenchless
DX1/3	552212	379305			Trenchless
DX2/1	551902	379144			Trenchless
DX2/2	551890	379142			Trenchless
DX2/3	551455	379006			Trenchless
DX2/4	551318	378953	Crawcroft Lane Drain	Lyndsey Marsh Drainage Board IDB	Trenchless
DX2/5	550887	378783			Open cut
DX2/6	550789	378744			Open cut
DX3/1	550725	378619			Trenchless
DX3/2	550726	378609			Trenchless
DX3/3	550570	378471	Boygrift Drain	Lyndsey Marsh Drainage Board IDB, WFD Waterbody	Trenchless
DX3/4	550333	378419			Trenchless
DX4/1	550145	378375			Trenchless
DX4/2	548547	378200	Bilsby Tank Trap Drain Branch	Lyndsey Marsh Drainage Board IDB	Trenchless
DX5/1	548321	378190			Trenchless
DX5/2	547853	378237			Trenchless
RVX5/1	547581	378220	Wold Grift Drain	WFD Waterbody	Trenchless
DX5/3	547277	378234			Trenchless
DX5/4	546804	378270			Trenchless
DX5/5	546505	378214			Trenchless
DX5/6	545818	378042			Trenchless
RVX6/1	544667	377872	Wold Grift Drain	WFD Waterbody	Trenchless
DX6/1	543905	377337			Trenchless
DX7/1	543071	376884			Trenchless

Table 8.10 Summary of surface water cable crossing locations and techniques within Route Section 1.					
Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX7/2	542783	376621			Trenchless
DX7/3	542769	376358			Trenchless
DX7/4	542549	376086			Trenchless

Surface Water Quality

5.2.23 The EA has provided the most current (2012) Water Framework Directive (WFD) Current Overall Status classifications (Ref: 8.30) for a number of watercourses within the LoD along Route Section 1 of the proposed DC cable route. Table 8.11 below lists the water bodies and associated WFD classification grade along the DC cable route corridor.

Table 8.11 Route Section 1 Overall WFD water quality data		
Waterbody Name	Current Overall Status (2015)	Objective Status
Boygrift Drain	Moderate	Good (2027)
Wold Grift Drain	Moderate	Moderate (2015)

5.2.24 In summary, the WFD records show that the watercourses within the Route Section 1 have a current WFD status of Moderate which is defined as *"…moderate change from natural conditions as a result of human activity. There are some restrictions on the beneficial uses of the water body. No impact on amenity. Some impact on wildlife and fisheries."* The EA have designated that all lower status waterbodies have objectives to improve, with most aiming to achieve good status by 2027.

5.2.25 A full description of the WFD classification process and associated definitions are available at: https://www.gov.uk/government/consultations/river-basin-management-planning-ministerial-guidance-and-standards.

Chalk Streams

5.2.26 EA records indicate that no Chalk Streams are present within 250 m of Route Section 1 of the proposed DC cable route LoD.

Existing Drainage

5.2.27 The proposed DC cable route and construction site accesses cross a number of existing field drains, ditches and irrigation channels. The majority of the surface water channels crossed are privately owned and maintained. Several channels fall under the jurisdiction of the LMDB, LLFA or EA and therefore, fall under the requirements of the LDA 1991.

5.2.28 The majority of Route Section 1 is utilised as agricultural land, which is drained by a complex network of buried land drains. Full details of these networks are presently unknown.

5.2.29 Schedule 25 of the Environmental Permitting (England and Wales) Regulation 2016 stipulate that consent is required from the relevant authority for any works within 8 m of a non-tidal water body (8 m starts from the toe of any flood defence of raised embankment), 8 m for Lyndsey Marsh IDB watercourses and 16 m of a tidal body.

5.2.30 Asset management plans indicate that the proposed DC cable route corridor would cross Anglian Water-owned and maintained infrastructure at a number of locations.

5.2.31 The Lyndsey Marsh IDB Byelaws (February 2001) (Ref: 8.31) indicates that "*no person shall, without the previous consent of the Board, take any action, or knowingly permit or aid or abet any person to take any action to stop up any watercourse or divert or impede or alter the level of or direction of the flow of water in, into or out of any watercourse*".

5.2.32 The Byelaws also indicate that no obstructions should be placed within 8 m of the edge of the IDB watercourse. Consent will be sought from Lyndsey Marsh IDB for any obstruction which may need to be placed within the 8 m restriction of IDB watercourses.

Surface Water abstraction

5.2.33 EA (Ref: 8.32)/Landmark Envirocheck® Report (Ref: 8.33) records indicate that there are no surface water abstraction licences within 250 m of the proposed DC cable LoD within Route Section 1.

Discharge Consents

5.2.34 Landmark Envirocheck® Report records indicate that there is one active discharge consent to surface watercourses within 250m of the proposed DC cable route, summarised in Table 8.12 below:

Table 8.12 Summary of Discharge Consents within Route Section 1

Unique ID	Class	Receiving	Discharge Type	Operator	Discharge Environment	Effective Date
20357555	Sewage Discharge	Tributary of the Boygrift Drain	Sewage Discharges - Final/Treated Effluent - Not Water Company	Mr D G Anstiss	Freshwater Stream/River	05/08/2002

Pollution Incidents

5.2.35 No pollution incidents information has been provided. Landmark Envirocheck® Report records indicates that two pollution incidents to surface watercourses have occurred historically within Route Section 1 of the proposed DC cable route (Table 8.13), with one incident being significant affecting Wold Grift Drain.

Table 8.13 Summary of Pollution Incidents within Route Section 1

Unique ID	Class	Receiving	Cause	Pollutant	Incident Date	Severity
1917836	Pollution Incident: Oil Pollutants	Wold Grift Drain	Land Runoff	Oils - Diesel (Including Agricultural)	17/03/1995	Category 2 - Significant Incident
1920912	Pollution Incident: Miscellaneous Pollutants	Unnamed Freshwater Dyke	Unknown	Unknown	19/11/1992	Category 3 - Minor Incident

Private Water Supply

5.2.36 ELDC/Landmark Envirocheck® Report records indicate that no private water supplies are present within 250 m of the proposed DC cable LoD within Route Section 1.

Relevant Designated Sites

5.2.37 The Sandilands Pit which comprises a flooded clay pit supporting a variety of bird species is designated as a Site of Special Scientific Interest (SSSI) located within the 250 m of the proposed DC cable route

5.2.38 Two ancient woodlands (Rigsby Wood and Hornby/Mother Woods) are present within the LoD.

Current Land Use

5.2.39 The land use within Route Section 1 is currently agricultural land with a number of small farm holdings.

5.3 Route Section 2 Well High Lane to A16 (Keal Road)

Baseline environment

5.3.1 Route Section 2 of the proposed DC cable route lies entirely within ELDC authority boundary, characterised by a rural relatively flat lying landscape primarily utilised for agricultural purposes. A significant proportion of the area is drained via a complex network of ordinary watercourses, drainage ditches and channels, which feed into Langton Beck and River Lymn.

5.3.2 Route Section 2 of the proposed DC route is situated within the Steeping and Eaus/East and West Fens Operational Catchment which as stated encompasses River Lymn, a heavily modified river managed by Lyndsey Marsh IDB and LCC acting as LLFA under the FAWMA 2010 and LDA 1991.

5.3.3 A number of ordinary watercourse and smaller drains are present within the 250 m buffer of the proposed DC cable route. These drains are managed by the Lyndsey Marsh IDB operating under the LDA 1991. The IDB is required to exercise general supervision over all matter relating to water level management of land within its district.

5.3.4 Further descriptions of the key water resources and hydrological characteristics within the defined study area for Route Section 2 of the proposed DC cable route are set out below.

Flood Risk and Flood Defences

Fluvial and Tidal Flooding

5.3.5 EA Flood map for Planners (Figure 8.2) indicates that the majority of the proposed DC cable route within Route Section 2 is located within undefended Flood Zone 1 'low probability', defined by the EA as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

5.3.6 Localised sections along the DC route are defined as being within undefended Flood Zone 2 and 3 'high probability', defined by the EA as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year, associated with the River Lymn and its tributaries.

5.3.7 East Lindsey SFRA (March 2017) indicates the flood zone extents within Route Section 2 of the DC route are associated with fluvial flooding from Main River Lymn and ordinary watercourses.

Flood Defences

5.3.8 Flood defences are present within Route Section 2 associated with the River Lymn and an unnamed tributary of the River Lymn. The flood defences are outlined within Table 8.14 below.

Table 8.14 - Route Section 2 Flood Defence Data

Watercourse	Flood Defence Type	Upstream crest level (mAOD)	Down Stream crest level (mAOD)	Design standard
Unnamed tributary of the River Lymn	High ground	27.33	14.36	1,000
River Lymn	High ground	22.14	17.14	2

Flooding from rising/high groundwater

5.3.9 A detailed geological review of the proposed DC cable route is available in ES-2-B.03, Volume 2, Chapter 7: Geology and Hydrogeology. In summary, preliminary ground investigation (undertaken by AECOM 2017 ES-4-B.03 Volume 4, Chapter 7 Geology and Hydrogeology Appendix 7.3) and the BGS 1:50,000 online map (Ref 8.34) indicates the proposed DC cable route indicates Route Section 2 of the DC cable route will pass through superficial deposits including:

Table 8.15 Superficial Deposits

Superficial Deposits	Lithological Description
Till (Boulder Clay)	Stiff to very stiff slightly sandy, slightly gravelly silty clay.
Glacial Sand And Gravel	Sand and gravel with rare clay interbeds; often cross-bedded; of glacial origin.
Alluvium	Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel.

5.3.10 The bedrock underlying the superficial deposits comprises the White Chalk (Welton Chalk Formation, Ferriby Chalk and Hunstanton Formation and Carstone Formation), Spilsby Sandstone and Kimmeridge Clay Formation (Ancholme Group).

5.3.11 Within Route Section 2, groundwater is present within a number of formations that are designated Principal Aquifers. The Chalk and Spilsby Sandstone Formation represent significant aquifers that the proposed DC cable route will interact within given the extent to which they subcrop within Route Section 2. Within the Chalk, nearly all of the permeability is reported to be provided through its fracturing, which is enhanced through solution weathering.

5.3.12 Groundwater strikes encountered during the ground investigation within the boreholes along Route Section 2 show that groundwater was not recorded in Target Priority Location (TPL) 4 prior to water flush being used (prior to 3 m bgl) but was encountered at TPL 15 (BH013) within the possible Spilsby Sandstone. It was encountered at 1.20 m bgl rising to 1.00 m bgl.

5.3.13 The BGS Groundwater Flooding Susceptibility map provided in the Landmark Envirocheck® Report generally shows that for Route Section 2 there is limited potential for groundwater flooding to occur. A localised area in the vicinity of the River Lymn (central area of Route Section 2, southwest of Sausthorpe) is mapped as having the potential for groundwater flooding to occur at the surface.

5.3.14 Based on the information outlined above the potential for groundwater flooding is considered to be medium.

Surface Watercourses

5.3.15 As stated above, Route Section 2 of the proposed DC cable route crosses a number of tributaries and drains that are located within the watershed of surface water catchments, namely; Langton Beck and River Lymn. The aforementioned catchments fall within ELDC and LCC jurisdictional areas.

5.3.16 The River Lymn flows in a generally south-easterly direction and is a tributary of the Steeping River.

5.3.17 The Lough Coastal CFMP indicates that the Scheme is located within an area designated as CFMP Policy Area 4 (Mablethorpe, Chapel St Leonards/Ingoldmells and Skegness) defined as…*'areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change'*.

5.3.18 Potential crossing types are described in the project description (ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable).

5.3.19 No surface water flow data has been provided by consultees for rivers and streams in the immediate vicinity of Route Section 2 of the proposed DC cable route study area. The project description (*ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable Section 3*) outlines that main rivers; those with significant flow rates and crossings where channel width and depth preclude the use open-cut will be crossed via trenchless techniques and therefore, flow rates will not be affected.

5.3.20 Minor and ordinary watercourses, where practical, will be crossed via either open cut or trenchless techniques, which will be designed in line with the requirements of the EA, LLFA and where required the IDB and conditioned within the planning application. In accordance with the Environmental Permitting (England and Wales) Regulations 2016, no works within 8 m from the top of bank or toe of a flood defence will be undertaken on any watercourse without prior consent from the relevant stakeholder (i.e. the EA, IDB or LPA) and subject to planning conditions.

5.3.21 As presented within Table 8.16, trenchless techniques will be used to cross the majority of surface water location within Route Section 2. One drain (DX11/1) will be crossed by open cut techniques.

5.3.22 Watercourses will be crossed via trenchless techniques, which will be designed in line with the requirements of the EA, IDB's, LLFAs and conditioned within the planning application.

Table 8.16 Summary of surface water cable crossing locations and techniques within Route Section 2

Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX11/1	540257	369968			Open cut
DX11/2	540138	369746			Trenchless
RVX11/1	539527	369231		Chalk Stream, WFD Waterbody	Trenchless
DX11/3	539345	369028			Trenchless
DX12/1	538536	368540			Trenchless

Table 8.16 Summary of surface water cable crossing locations and techniques within Route Section 2					
Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
RVX12/1	537966	368471	River Lymn	Chalk Stream, WFD Waterbody	Trenchless

Surface Water Quality

5.3.23 The most current (2012) WFD Current Overall Status classifications have been obtained from the EA for the watercourse within the LoD along Route Section 2 of the DC route. Table 8.17 below lists the water body and associated WFD classification grade along the DC cable route corridor.

Table 8.17 Route Section 2 Overall WFD water quality data		
Waterbody Name	Current Overall Status (2015)	Objective Status
Lynm / Steeping	Moderate	Good (2027)

5.3.24 In summary, the WFD records show that the watercourses within Route Section 2 have a current WFD status of Moderate. The EA have designated that all lower status waterbodies have objectives to improve, with most aiming to achieve good status by 2027.

5.3.25 A full description of the WFD classification process and associated definitions are available at: https://www.gov.uk/government/consultations/river-basin-management-planning-ministerial-guidance-and-standards.

Chalk Streams

5.3.26 EA records indicate that there are two Chalk Streams (the River Lymn and an unnamed tributary), within 250 m of the proposed LoD for the DC cable route along Route Section 2.

Existing Drainage

5.3.27 The proposed DC cable route and construction site accesses cross a number of existing field drains, ditches and irrigation channels. The majority of the surface water channels crossed are privately owned and maintained. Several channels fall under the jurisdiction of the Lyndsey Marsh IDB B, LLFA or EA and therefore, fall under the requirements of the LDA 1991.

5.3.28 The majority of Route Section 2 is utilised as agricultural land, which is drained by a complex network of buried land drains. Full details of these networks are presently unknown.

5.3.29 Schedule 25 of the Environmental Permitting (England and Wales) Regulations 2016 stipulate that consent is required from the relevant authority for any works within 8 m of a non-tidal water body (8 m starts from the toe of any flood defence of raised embankment) and 16 m of a tidal body.

5.3.30 Asset management plans indicate that the DC cable route corridor would cross Anglian Water-owned and maintained infrastructure at a number of locations along Route Section 2.

5.3.31 The Lyndsey Marsh IDB Byelaws (February 2001) indicates that "*no person shall, without the previous consent of the Board, take any action, or knowingly permit or aid or abet any person to take any action to stop up any watercourse or divert or impede or alter the level of or direction of the flow of water in, into or out of any watercourse*".

5.3.32 The Byelaws also indicate that no obstructions should be placed within 8 m of the edge of the IDB watercourses. Consent will be sought from Lyndsey Marsh IDB for any obstruction which may need to be placed within the 8 m restriction of IDB watercourses.

Surface Water Abstraction

5.3.33 EA/Landmark Envirocheck® Report records indicate that there are no surface water abstraction licences within 250 m of the proposed DC cable route LoD within Route Section 2.

Discharge Consents

5.3.34 Landmark Envirocheck® Report records indicate that there is one active discharge consent to surface watercourses within 250m of the Route Section 2, summarised in Table 8.18 below:

Table 8.18 Summary of Discharge Consents within Route Section 2

Unique ID	Class	Receiving	Discharge Type	Operator	Discharge Environment	Effective Date
22937192	Sewage Discharge	Tributary Of River Lymn	Sewage Discharges - Final/Treated Effluent - Not Water Company	Linx Homes	Freshwater Stream/River	29/06/2004

Pollution Incidents

Landmark Envirocheck® Report Records indicates that one pollution incident to surface watercourses has occurred historically within Route Section 2 of the proposed DC cable route (Table 8.19), affecting an unnamed freshwater dyke. No significant pollution incidents have occurred within Route Section 2.

Table 8.19 Summary of Pollution Incidents within Route Section 2						
Unique ID	Class	Receiving	Cause	Pollutant	Incident Date	Severity
1910948	Pollution Incident: Miscellaneous Pollutants	Unnamed Freshwater Dyke	Wrong Connection	Miscellaneous - Other	06/10/1998	Category 3 - Minor Incident

Private Water Supply

5.3.35 ELDC/Landmark Envirocheck® Report records indicate that no private water supplies are present within 250 m of the proposed DC cable corridor route within Route Section 2.

Relevant Designated Sites

5.3.36 The Mavis Enderby Valley and Keal Carr, which are dry acid grasslands and an area of woodland respectively, are designated as a SSSI located within 250 m of the LoD within Route Section 2.

5.3.37 Callow Carr, an ancient woodland is present within the 250 m of the LoD within Route Section 2.

Current Land Use

5.3.38 The land use within Route Section 2 is predominantly agricultural land with a number of small farm holdings.

5.4 Route Section 3 A16 (Keal Road) to River Witham

Baseline environment

5.4.1 Route Section 3 incorporating the proposed DC cable route lies entirely within the ELDC and BBC authority boundaries, characterised by a rural relatively flat lying landscape primarily utilised for agricultural purposes. A significant proportion of the area is drained via a complex network of ordinary watercourses, drainage ditches and channels, which feed into Hagnaby Beck, West Fen Catchwater and River Witham.

5.4.2 Route Section 3 of the proposed DC route is situated within the East and West Fens Operational Catchment which as stated encompasses East and West Fen Drains, which are artificial watercourses, managed by Witham Fourth IDB and LCC acting as LLFA under the Water and Flood Management Act 2010 and LDA 1991.

5.4.3 A number of ordinary watercourse and smaller drains are present within the 250 m buffer of the DC route. These drains are the responsibility of Witham Fourth IDB operating under the LDA 1991. The IDB is required to exercise general supervision over all matter relating to water level management of land within its district.

5.4.4 Further descriptions of the key water resource and hydrological characteristics within the defined study area for Route Section 3 of the proposed DC cable route are set out below.

Flood Risk and Flood Defences

Fluvial and Tidal Flooding

5.4.5 EA Flood map for Planners (Figure 8.3) indicates that the majority of the proposed DC cable route within Route Section 3 is located within undefended Flood Zone 2 and 3 'high probability', defined by the EA as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

5.4.6 The north east corner of Route Section 3 is located within Undefended Flood Zone 1 'low probability', defined by the EA as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) associated with the A16.

5.4.7 BBC SFRA (Ref: 8.35) relative probability of flooding map indicates that the southern extent of the DC route (Route Section 3) is at low relative probability of flooding from fluvial or tidal flooding.

Flood Defences

5.4.8 A number of flood defences are present within Route Section 3 associated with Main rivers and ordinary watercourses. The flood defences are outlined within Table 8.20 below.

Table 8.20 - Route Section 3 Flood Defence Data

Watercourse	Flood Defence Type	Upstream crest level (mAOD)	Down Stream crest level (mAOD)	Design standard
Drain Bank / Kirkby Bank	Embankment	4.32	3.01	1,000
River Witham	Embankment	4.73	4.73	1,000

Flooding from rising/high groundwater

5.4.9 A detailed geological review of the proposed DC cable route is available in *ES-2-B.03, Volume 2, Chapter 7: Geology and Hydrogeology*. In summary, the BGS 1:50,000 scale online map indicates the DC route will pass through superficial deposits including:

Table 8.21 Superficial Deposits

Superficial Deposits	Lithological Description
Till (Boulder Clay)	Stiff to very stiff slightly sandy, slightly gravelly silty clay.

Table 8.21 Superficial Deposits	
Superficial Deposits	**Lithological Description**
River Terrace Deposits	Sand and gravel, locally with lenses of silt, clay or peat.
Barroway Drove Beds	Soft grey clays and silty clays with frequent organic peat layers.
Glaciofluvial Deposits	Sand and Gravel.
Marine and Estuarine Deposits (Tidal Flats)	Silt, Sand and Gravels.

5.4.10 The bedrock underlying the superficial deposits comprises the West Walton Formation, Ampthill Clay Formation and Kimmeridge Clay Formation. The Bedrock is characterised as unproductive strata defined as…*´rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow`*.

5.4.11 Groundwater strikes encountered during the drilling of the boreholes as part of the preliminary ground investigation undertaken at the TPLs in Route Section 3 are recorded on the borehole log records which are included within the preliminary ground investigation report for the underground DC cable route. . The records show that groundwater was generally struck between 0.4 m bgl to 1.3 m bgl located within the Possible Head Deposits/Possible Till (Boulder Clay) (TPL 15), the Possible Marine and Estuarine Deposits (Tidal Flats) (TPL 16), the Barroway Drove Beds (Marine Deposits/Tidal Flats Deposits) (TPL 17, TPL 18) and the River Terrace Deposits (TPL 19).

5.4.12 Based on the first groundwater monitoring event (undertaken between 8th May 2017 and 23rd May 2017) of a one year long groundwater monitoring and sampling programme, the groundwater level within borehole monitoring wells at TPL 16 to TPL 18 and TPL 19 (north bank) was found to be resting between 0.90 m bgl (BH011, TPL 16) and 1.45 m bgl (BH10 (TPL17). Adjacent to the northern bank of the River Witham groundwater level was resting at 1.14 m bgl.

5.4.13 The BGS Groundwater Flooding Susceptibility map provided in the Landmark Envirocheck® Report shows that the Zone of Influence is not in an area at risk from groundwater flooding.

5.4.14 Based on the information outlined above the potential for groundwater flooding is considered to be low.

Surface Watercourses

5.4.15 As stated above, Route Section 3 of the proposed DC cable route LoD crosses a number of tributaries and drains that are located within the watershed of surface water catchments, namely Hagnaby Beck, West Fen Catchwater and River Witham. The aforementioned catchments are within ELDC, BBC and LCC jurisdictional areas.

5.4.16 The West Fen Catchwater and Hagnaby Beck flow in a generally southerly direction and are tributaries of The Haven.

5.4.17 The River Witham CFMP (Ref: 8.36) indicates that the Scheme is located within an area designated as CFMP Policy Area 4 (The Fens) defined as…*'areas of low, moderate or high flood* *risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change'*.

5.4.18 Potential crossing types are described in the project description (*ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable*).

5.4.19 No surface water flow data has been provided by consultees for rivers and streams in the immediate vicinity of Route Section 3 of the proposed DC cable route study area. The underground cable description (*ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable Section 3*) outlines that main rivers, those with significant flow rates and crossing where channel width and depth preclude the use of open-cut will be crossed via trenchless techniques and therefore, flow rates will not be affected. Table 8.22 below indicates that all surface watercourses within Route Section 3 will be crossed by trenchless techniques.

5.4.20 Minor and ordinary watercourses, where practical, will be crossed via either open cut or trenchless techniques, which will be designed in line with the requirements of the EA, LLFA and where required the IDB and conditioned within the planning application. In accordance with the Environmental Permitting (England and Wales) Regulations 2016, no works within 8 m from the top of bank or toe of a flood defence will be undertaken on any watercourse without prior consent from the relevant stakeholder (i.e. the EA, IDB or LA) and subject to planning conditions.

5.4.21 Watercourses will be crossed via open cut/culverting and trenchless techniques, which will be designed in line with the requirements of the EA, IDB's, LLFAs and conditioned within the planning application.

Table 8.22 Summary of surface water cable crossing locations and techniques within Route Section 3

Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX18/1	537272	363130			Trenchless
DX18/2	537025	362832			Trenchless
DX18/3	536849	362384			Trenchless
DX19/1	536825	362389			Trenchless
DX19/2	536202	362107			Trenchless
DX19/3	536022	361903			Trenchless
DX19/4	535929	361859			Trenchless
DX19/5	535616	361808			Trenchless
DX19/6	534934	361369			Trenchless
DX20/1	534922	361301			Trenchless
DX20/2	534919	361294			Trenchless
RVX20/1	534365	360497	Hagnaby Beck		Trenchless
DX21/1	534217	360449			Trenchless
DX22/1	533838	360251			Trenchless
RVX22/1	533822	360241	West Fen Catchwater Drain	WFD Waterbody	Trenchless

Table 8.22 Summary of surface water cable crossing locations and techniques within Route Section 3					
Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX22/2	532457	359691	Twenty foot and Ostlers	Witham Fourth District IDB	Trenchless
DX22/3	532356	358826	Mavis Enderby	Witham Fourth District IDB	Trenchless
DX22/4	532455	358393			Trenchless
DX22/5	532519	358015	Twelve Foot	Witham Fourth District IDB	Trenchless
DX22/6	532548	357847			Trenchless
DX22/7	532404	357389			Trenchless
DX23/1	532428	356962			Trenchless
DX23/2	532443	356432			Trenchless
DX23/3	532446	356341			Trenchless
DX23/4	532366	356072	Black Dyke	Witham Fourth District IDB	Trenchless
DX23/5	532284	355760	Hornbuckels	Witham Fourth District IDB	Trenchless
DX23/6	532240	355235			Trenchless
DX23/7	532280	354812			Trenchless
DX23/8	532309	354493			Trenchless
DX24/1	532200	353844	Medlam Drain	Witham Fourth District IDB	Trenchless
DX25/1	531299	353046	Carrington Road	Witham Fourth District IDB	Trenchless
DX26/1	530362	352455	Twenty Foot Drain	Witham Fourth District IDB	Trenchless
DX27/1	529307	351966	West Fen Drain	Witham Fourth District IDB	Trenchless
DX27/2	529047	351821			Trenchless
DX27/3	528842	351748			Trenchless
DX27/4	528543	351609	Newham Drain	Witham Fourth District IDB	Trenchless
DX28/1	527611	351177	Leagate Road	Witham Fourth District IDB	Trenchless
DX28/2	527598	351171			Trenchless
DX28/3	527138	350797	Castledyke Drain	Witham Fourth District IDB	Trenchless
DX28/4	526482	350205			Trenchless
DX29/1	525932	349729			Trenchless
DX29/2	525918	349726			Trenchless
DX29/3	525677	349592			Trenchless
DX29/4	525291	349350	Cut Dyke Drain	Witham Fourth District IDB	Trenchless
RVX29/1	525245	349316	River Witham	Navigable, WFD Waterbody	Trenchless
DX29/5	525207	349289			Trenchless

Surface Water Quality

5.4.22 The EA has provided the most current (2012) WFD Current Overall Status classifications for the watercourses within the 1 km LoD along Route Section 3 of the proposed DC cable route. Table 8.23 below lists the water bodies and associated WFD classification grade along the cable route corridor.

Table 8.23 Route Section 3 Overall WFD water quality data

Waterbody Name	Current Overall Status (2015)	Objective Status
East and West Fen Drains	Moderate	Good (2027)
Maud Foster and Fen Catchwater Drains	Moderate	Moderate (2015)

5.4.23 In summary, the WFD records show that the watercourses within Route Section 3 have a current WFD status of Moderate. The EA have designated that all lower status waterbodies have objectives to improve, with most aiming to achieve good status by 2027.

5.4.24 A full description of the WFD classification process and associated definitions are available at: https://www.gov.uk/government/consultations/river-basin-management-planning-ministerial-guidance-and-standards.

Chalk Streams

5.4.25 EA records indicate that no Chalk Streams are present within 250 m of Route Section 3 of the proposed DC cable route LoD.

Existing Drainage

5.4.26 The proposed DC cable route and construction site accesses cross a number of existing field drains, ditches and irrigation channels. The majority of the surface water channels crossed are privately owned and maintained. Several channels fall under the jurisdiction of the IDB, LLFA or EA and therefore, fall under the requirements of the LDA 1991.

5.4.27 The majority of Route Section 3 is utilised as agricultural land, which is drained by a complex network of buried land drains. Full details of these networks are presently unknown.

5.4.28 Schedule 25 of the Environmental Permitting (England and Wales) Regulation 2016 stipulate that consent is required from the relevant authority for any works within 8 m of a non-tidal water body (8 m starts from the toe of any flood defence of raised embankment) and 16 m of a tidal body.

5.4.29 Asset management plans indicate that the cable route corridor would cross Anglian Water-owned and maintained infrastructure at a number of locations.

5.4.30 Witham Fourth IDB Byelaws (Ref: 8.37) indicate that no obstructions shall be placed within 9 m of the edge of an IDB watercourse. The board indicates that the bank should not be used for storage of any weight, volume or nature that is likely to cause damage to or endanger the stability of the bank or channel of the watercourse. Consent will be sought from Witham Fourth IDB for any obstruction which may need to be placed within the 9 m restriction of IDB watercourses.

Surface Water abstraction

5.4.31 EA/Landmark Envirocheck® Report records indicate that there are twenty one abstraction licences within 250 m of Route Section 3 of the proposed DC cable route search area belonging to:

- J Kenway for the abstraction of water from the West Fen Catchwater Drain for use in spray irrigation;
- J & JF Edwards & Sons 9 No. for the abstraction of water from watercourses including Blowers Drove Drain, Little Medlam Drain, Ostlers Farm Drain and Riparian Drain for use in spray irrigation;
- Beeswax Farming (Rainbow) Limited 4 No. for the abstraction of water from watercourses including Castle Dyke, Twenty Foot Drain, Medlam Drain and Riparian Drain for use in spray irrigation;
- Bishops Farm Partners 3 No. for the abstraction of water from the Medlam Drain for use in spray irrigation;
- B Bush & Sons for the abstraction of water from the Medlam Drain for use in spray irrigation;
- J Lunn for the abstraction of water from the Riparian Drain for use in spray irrigation;
- F Roberts & Sons for the abstraction of water from the Riparian Drain for use in spray irrigation; and
- Grant Farming Limited for the abstraction of water from the River Witham for use in spray irrigation.

Discharge Consents

5.4.32 Landmark Envirocheck® Report records indicate that there are two active discharge consents to surface watercourses within 250m of Route Section 3 of the proposed DC cable route, summarised in Table 8.24 below:

Table 8.24 Summary of Discharge Consents within Route Section 3						
Unique ID	**Class**	**Receiving**	**Discharge Type**	**Operator**	**Discharge Environment**	**Effective Date**
26679052	Sewage Discharge	IDB Drain	Sewage Discharges - Final/Treated Effluent - Not Water Company	Mr & Mrs A G Dunn	Freshwater Stream/River	22/09/2004
32882380	Sewage Discharge	Tributary Of Castle Dike	Sewage Discharges - Final/Treated Effluent - Not Water Company	Old England Developments Ltd, Fao Mr Sanchez	Freshwater Stream/River	07/10/2005

Pollution Incidents

5.4.33 Landmark Envirocheck® Report indicates that three pollution incidents to surface watercourses have occurred historically within Route Section 3 of the proposed DC cable route (Table 8.25), affecting West Fen Catchwater and tributaries of Medlam Drain. No significant pollution incidents have occurred within Route Section 3.

Table 8.25 Summary of Discharge Consents within Route Section 3						
Unique ID	**Class**	**Receiving**	**Cause**	**Pollutant**	**Incident Date**	**Severity**
1909542	Pollution Incident: Miscellaneous Pollutants	West Fen Catchwater	Algal Bloom	Miscellaneous - Natural	01/07/1996	Category 3 - Minor Incident
1909571	Pollution Incident: Agricultural (Slurry/Animal Waste) Pollutants	Tributary Medlam Drain	Accidental Spillage/Leakage	Organic Wastes: Poultry Manure (solid)	12/12/1997	Category 3 - Minor Incident
1909572	Pollution Incident: Agricultural (Slurry/Animal Waste) Pollutants	Tributary Of Medlam Drain	Poor Operational Practice	Organic Wastes: Poultry Manure (solid)	18/12/1997	Category 3 - Minor Incident

Private Water Supply

5.4.34 ELDC/Landmark Envirocheck® Report records indicate that no private water supplies are present within 250 m of the proposed DC cable route search area within Route Section 3.

Relevant Designated Sites

5.4.35 No relevant designated sites are present within 250 m of Route Section 3 of the proposed DC cable route.

Current Land Use

5.4.36 The land use within Route Section 3 is agricultural land with a number of small farm holdings.

5.5 Route Section 4 River Witham to the Proposed Converter Station

Baseline Environment

5.5.1 Route Section 4 incorporating the proposed DC cable route lies within BBC, SHDC and NKDC authority boundaries, characterised by a rural relatively flat lying landscape primarily utilised for agricultural purposes. A significant proportion of the area is drained via a complex network of ordinary watercourses, drainage ditches and channels, which feed into Long Skerth Drain, South Forty Foot Drain and Helpringham Eau.

5.5.2 Route Section 4 of the proposed DC route is situated within the South Forty Foot Drain Operational Catchment which as stated encompasses South Forty Foot Drain and associated tributaries, which are heavily modified watercourses managed by Black Sluice IDB and LCC acting as LLFA under the Water and Flood Management Act 2010 and Land Drainage Act 1991.

5.5.3 A number of ordinary watercourse and smaller drains are present within the 250 m buffer of the proposed DC cable route. These drains are managed by Black Sluice IDB operating under the LDA 1991. The IDB is required to exercise general supervision over all matter relating to water level management of land within its district.

5.5.4 Further descriptions of the key water resource and hydrological characteristics within the defined study area for Route Section 4 of the proposed DC cable route are set out below.

Flood Risk and Flood Defences

Fluvial and Tidal Flooding

5.5.5 EA Flood map for Planners (Figure 8.4) indicates that the majority of the proposed DC cable route within Route Section 4 is located within undefended Flood Zone 2 and 3 ‘high probability’, defined by the EA as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

5.5.6 A localised section associated with the A17 is located within Undefended Flood Zone 1 ‘low probability’, defined by the EA as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

5.5.7 BBC SFRA flood hazard mapping indicates that the majority of Route Section 4 of the proposed DC cable route is at low flood hazard. A localised section along the route, associated with the River Witham is defined to be at low to high flood hazard.

5.5.8 BBC SFRA relative probability of flooding map indicates that Route Section 4 of the DC cable route is at low relative probability of flooding from fluvial or tidal flooding.

Flood Defences

5.5.9 EA mapping indicates that a number of flood defences are crossed by the proposed DC cable route within Route Section 4. Table 8.26 below outlines the characteristics of each flood defence within the section.

Table 8.26 - Route Section 4 Flood Defence Data

Watercourse	Flood Defence Type	Upstream crest level (mAOD)	Down Stream crest level (mAOD)	Design standard
East Skerth Soak Dike	Embankment	3.67	3.06	25
South Forty Foot Drain	Embankment (Floodbank within spoil bank)	6.68	3.25	50

Flooding from rising/high groundwater

5.5.10 A detailed geological review of the proposed DC cable route is available in *ES-2-B.03, Volume 2, Chapter 7: Geology and Hydrogeology*. In summary, the BGS 1:50,000 online map indicates the DC cable route will pass through superficial deposits including:

Table 8.27 Superficial Deposits

Superficial Deposits	Lithological Description
Barroway Drove Beds (Marine Deposits/Tidal Flat Deposits)	Soft grey clays and silty clays with frequent organic peat layers.
River Terrace Deposits	Sand and gravel, locally with lenses of silt, clay or peat.
Till (Boulder Clay)	Stiff to very stiff slightly sandy, slightly gravelly silty clay.

5.5.11 The bedrock underlying the superficial deposits comprises the West Walton Formation, Ampthill Clay Formation, Kimmeridge Clay Formation, Kellaways Formation and the Oxford Clay Formation. The Bedrock is characterised as unproductive strata defined as '…rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow'.

5.5.12 Groundwater strikes encountered during drilling of the boreholes for the preliminary ground investigation undertaken at the TPL in Route Section 4 are recorded on the borehole log records included within the preliminary ground investigation report for the underground DC cable route. The records show that groundwater was generally struck between 1.2 m bgl to 2.0 m bgl (rising to between 1.1 m bgl and 1.95 m bgl).

5.5.13 Based on the first groundwater monitoring event (undertaken between 8th May 2017 and 12th May 2017) of a one year long groundwater monitoring and sampling programme, the groundwater level within borehole monitoring wells at TPL 19 (south bank), TPL 20, TPL 21, TPL 24 and TPL 25 was found to be resting between 1.13 m (BH006, TPL 20) and 1.98 m bgl (BH003, TPL24). Adjacent to the River Witham's southern bank, the groundwater level was recorded to be resting at 1.95 m bgl.

5.5.14 The BGS Groundwater Flooding Susceptibility map provided in the Landmark Envirocheck® Report shows that the Zone of Influence is not in an area at risk from groundwater flooding.

5.5.15 Based on the information outlined above the potential for groundwater flooding is considered to be Low.

Surface Watercourses

5.5.16 As stated above, Route Section 4 LoD for the proposed DC cable route crosses a number of tributaries and drains that are located within the watershed of surface water catchments, namely Long Skerth Drain, South Forty Foot Drain and Helpringham Eau. The aforementioned catchments are within BBC, NKDC and LCC jurisdictional areas.

5.5.17 The Long Skerth Drain and Helpringham Eau flow in a generally easterly direction and are tributaries of South Forty Foot Drain.

5.5.18 The River Witham CFMP indicates that the Scheme is located within an area designated as CFMP Policy Area 4 (The Fens) defined as '…*areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change'*.

5.5.19 Potential crossing types are described in the project description (ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable).

5.5.20 No surface water flow data has been provided by consultees for rivers and streams in the immediate vicinity of Route Section 4 of the proposed DC cable route study area. The underground cable description (*ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable*) outlines that main rivers and those with significant flow rates and crossing where channel width and depth preclude the use of open-cut will be crossed via trenchless techniques and therefore, flow rates will not be affected. Table 8.28 below indicates that the majority of the surface watercourses within Route Section 4 will be crossed by trenchless techniques. One unnamed surface watercourse (DX34/6) associated with the Old Sixteen Foot Drain will be crossed by open cut techniques.

5.5.21 Minor and ordinary watercourses, where practical, will be crossed via either open cut or trenchless techniques, which will be designed in line with the requirements of the EA, LLFA and where required the IDB and conditioned within the planning application. In accordance with the Environmental Permitting (England and Wales) Regulations 2016, no works within 8 m from the top of bank or toe of a flood defence will be undertaken on any watercourse without prior consent from the relevant stakeholder (i.e. the EA, IDB or LA) and subject to planning conditions.

5.5.22 Watercourses will be crossed via open cut/culverting and trenchless techniques, which will be designed in line with the requirements of the EA, IDB's, LLFAs and conditioned within the planning application.

Table 8.28 Summary of surface water cable crossing locations and techniques within Route Section 4

Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX29/6	524818	348868			Trenchless
DX29/7	524481	348433			Trenchless
DX30/1	524463	348419	North Forty Foot (Gill Syke to Harts Grounds)	Black Sluice IDB, WFD Waterbody	Trenchless
DX31/1	523978	348033			Trenchless
DX31/2	523964	348022			Trenchless
DX31/3	523719	347726	Gill Syke and Thacker's Cut (two drains)	Black Sluice IDB	Trenchless
DX31/4	523269	347469	Ten Foot Drain	Black Sluice IDB	Trenchless
DX31/5	522932	347312			Trenchless
DX32/1	522776	347192			Trenchless
DX33/1	522338	346855	Clay Dike	Black Sluice IDB	Trenchless
DX33/2	522121	346688			Trenchless
DX33/3	521707	345882	East Skerth Soak Dike	Black Sluice IDB	Trenchless
RVX33/1	521694	345853	Skerth Drain	WFD Waterbody	Trenchless
DX33/4	521683	345828	Drain West from Trinity College Pumping Station to Six Hundreds Drove	Black Sluice IDB	Trenchless
DX33/5	520944	343540			Trenchless

Table 8.28 Summary of surface water cable crossing locations and techniques within Route Section 4					
Crossing Location	Grid Reference		River/Beck	Operator (Consenting Body)	Crossing technique
	Eastings	Northings			
DX34/1	520791	343163			Trenchless
DX34/2	520634	343002			Trenchless
DX34/3	520406	342790	Labour In Vain Drain towards East Heckington	Black Sluice IDB	Trenchless
DX34/4	519881	342493	Great Hale Eau	Black Sluice IDB	Trenchless
DX34/5	519682	342087			Trenchless
DX34/6	519381	341570			Open cut
DX34/7	519291	341378			Trenchless
DX34/8	519213	341210			Trenchless
DX34/9	519117	341005			Trenchless
DX34/10	518915	340573	Branch East from Old Forty Foot to South Forty Foot	Black Sluice IDB	Trenchless
DX35/1	518561	339814			Trenchless
DX35/2	518395	339564			Trenchless
DX35/4	518653	338601			Trenchless
DX35/3	518486	338830			Trenchless
RVX35/1	518267	338931	South Forty Foot Drain	WFD Waterbody	Trenchless
DX35/5	518551	338379			Trenchless
DX35/6	518469	338202			Trenchless
DX35/7	518377	338002			Trenchless
DX35/8	518316	337763	Mill Drain	Black Sluice IDB	Trenchless
DX35/9	518429	337280	Branch South from Mill Drain to North Ing Drove	Black Sluice IDB	Trenchless

Surface Water Quality

5.5.23 The EA has provided the most current (2012) WFD Current Overall Status classifications for the watercourses within the LoD along Route Section 4 of the proposed DC cable route. Table 8.29 below lists the water bodies and associated WFD classification grade along the cable route corridor.

Table 8.29 Route Section 4 Overall WFD water quality data		
Waterbody Name	Current Overall Status (2015)	Objective Status
Black Sluice IDB draining to the South Forty Foot Drain	Moderate	Moderate (2015)

5.5.24 In summary, the WFD records show that the watercourses within Route Section 4 have a current WFD status of Moderate. The EA have designated that all lower status waterbodies have objectives to improve, with most aiming to achieve good status by 2027.

5.5.25 A full description of the WFD classification process and associated definitions are available at: https://www.gov.uk/government/consultations/river-basin-management-planning-ministerial-guidance-and-standards.

Chalk Streams

5.5.26 EA records indicate that no Chalk Streams are crossed by Route Section 4 of the proposed DC cable route.

Existing Drainage

5.5.27 The proposed DC cable route and construction site accesses cross a number of existing field drains, ditches and irrigation channels. The majority of the surface water channels crossed are privately owned and maintained. Several channels fall under the jurisdiction of the IDB, LLFA or EA and therefore, fall under the requirements of the LDA 1991.

5.5.28 The majority of Route Section 4 is utilised as agricultural land, which is drained by a complex network of buried land drains. Full details of these networks are presently unknown.

5.5.29 Schedule 25 of the Environmental Permitting (England and Wales) Regulation 2016 stipulate that consent is required from the relevant authority for any works within 8 m of a non-tidal water body (8 m starts from the toe of any flood defence of raised embankment) and 16 m of a tidal body.

5.5.30 Asset management plans indicate that the cable route corridor would cross Anglian Water-owned and maintained infrastructure at a number of locations.

5.5.31 Black Sluice IDB Guidance for property owners and developers (Ref: 8.38) indicates that no obstructions shall be placed within 9 m of the edge of a IDB watercourse. The board's consent is required before any board watercourse or riparian/private watercourse is culverted, filled in, or otherwise obstructed.

Surface Water abstraction

5.5.32 EA/Landmark Envirocheck® Report records indicate that there are no surface water abstraction licences within 250 m of the proposed DC cable route within Route Section 4.

Discharge Consents

5.5.33 Landmark Envirocheck® Report records indicate that there are three active discharge consents to surface watercourses within 250m of the proposed DC cable route, summarised in Table 8.30 below:

Table 8.30 Summary of Discharge Consents within Route Section 4

Unique ID	Class	Receiving	Discharge Type	Operator	Discharge Environment	Effective Date
22690291	Sewage Discharge	Tributary Of North Forty Foot Drain	Sewage Discharges - Final/Treated Effluent - Not Water Company	Mrs J F England	Freshwater Stream/River	23/12/2003
8886472	Sewage Discharge	Unnamed Tributary Of North Forty Foot Drain	Sewage Discharges - Final/Treated Effluent - Not Water Company	Mr H Turner	Freshwater Stream/River	21/10/1999
11290010	Sewage Discharge	Unnamed Tributary Of North Forty Foot Drain	Sewage Discharges - Final/Treated Effluent - Not Water Company	Mr M A Hendy	Freshwater Stream/River	21/10/1999

Pollution Incidents

5.5.34 Landmark Envirocheck® Report Records indicates that no pollution incident to surface watercourses have occurred within the Zone of Influence of Route Section 4

Private Water Supply

5.5.35 SHDC/Landmark Envirocheck® Report records indicate that no private water supplies are present within 250 m of the proposed DC cable route within Route Section 4.

Relevant Designated Sites

5.5.36 No relevant designated sites are present within 250 m of Route Section 4 of the proposed DC cable route search area.

Current Land Use

5.5.37 Land use within Route Section 4 is currently agricultural land with a number of small farm holdings.

6 Potential Impacts

6.1 Overview of Potential Impacts

6.1.1 A range of potential impacts on water resources and hydrology have been identified which may occur during the construction, operation/maintenance and decommissioning of the proposed landfall and proposed DC cable route. The impacts have been assessed based on a realistic worst case base scheme design as outlined in section 3 of this chapter and described in more detail in ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable Section 3, with the impacts having been assessed incorporating the design mitigation (Section 3.5 of this chapter) and following the methods described in section 2 of this chapter.

Temporary Impacts

6.1.2 The temporary impacts of the proposed landfall, proposed DC cable route and TCC typically occur during the construction phase only. These impacts are mainly due to the cable installation techniques used along the proposed DC cable route. The temporary impacts assessed within this chapter are as follows:

- Impacts which may affect temporary (construction) flood risk;
- Impacts of trenchless techniques affecting surface watercourses;
- Impacts of open cut, ducting and culverts affecting surface watercourses;
- Construction works (access roads, compound areas, heavy vehicle movements) affecting field drainage and irrigation; and
- Impacts that may affect Chalk Streams.

Longer Term, Operational and Permanent Impacts

6.1.3 Operational, longer term and permanent effects are those which would occur as a result of the proposed landfall and proposed DC cable route/TCC land take or as a result of its operation. The longer term impacts assessed within this chapter are as follows:

- Impacts that may affect flood risk;
- Impact on main surface watercourses (including water quality);
- Impacts on minor/ordinary watercourses; and
- Impacts of operation that may affect field drainage and irrigation.

Decommissioning impacts

6.1.4 Decommissioning impacts are those which would occur as a result of the decommissioning of the proposed DC cable route and associated infrastructure. The decommissioning impacts assessed within this chapter are as follows:

- Impact that may affect flood risk;
- Impact on Main River water quality; and
- Impact on ordinary watercourse water quality.

6.2 Route Section 1 Landfall to Well High Lane

Temporary Impacts

Impacts which may affect temporary (construction) flood risk

6.2.1 There is a high risk of flooding at the landfall and along the majority of Route Section 1 of the proposed DC cable route, with a significant proportion of land defined by the EA as Flood Zone 2 and 3. Six temporary compound areas are present along the DC cable route within Route section 1. The compounds are split as 1 primary compound, 1 secondary compound and 4 tertiary compounds. Route Section 1 runs through rural land with limited residential properties present within the LoD. The Land adjoining Route Section 1 is defined as Flood Zone 3, 2 and 1 and the sensitivity of the receptor is therefore considered to be **medium**.

6.2.2 Impacts on flood risk would arise from exposure to tidal inflows and any temporary change in run-off over the areas affected during construction, such as; crossing coastal flood defences, temporary construction compounds, temporary accesses, construction access roads and the DC cable route (full details provided within ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable). If the correct methodologies are not selected to cross coastal flood defences, EA main rivers and watercourses the risk of flooding could potentially increase during construction.

6.2.3 The proposed engineering methods for the landfall, TCC and construction site access roads may comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard. Surface water runoff will be intercepted via temporary drainage systems. The systems will manage surface water runoff from construction compounds in terms of both flow rate and water quality, in accordance with local policies and relevant permits.

6.2.4 The design mitigation (as set out in section 3.5 of this chapter) will ensure the risk of flooding is not increased by the TCC or the instillation of the DC cable route. The impact on flood risk (including increase in surface water runoff and disrupting natural flood defences) would therefore be reduced during construction and are predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible assuming the design mitigation measures are implemented. The magnitude is therefore considered to be **low**.

6.2.5 The significance of effects will be of **minor adverse** significance, which is **not significant**.

Impacts of trenchless techniques affecting surface watercourses

6.2.6 Route Section 1 of the proposed DC cable route would require 28 water crossings. The largest of these would be crossed by trenchless techniques, including but not limited to:

- Boygrift Drain;
- Huttoft Main Drain;
- Bilsby Tank Trap Drain Branch; and
- Wold Grift Drain.

6.2.7 The sensitivity of watercourses is dependent on the nature of the specific watercourses. WFD classifications obtained from the EA website for water quality indicate that main rivers within Route Section 1 of the proposed DC cable route have a moderate status defined as a moderate deviation from the biological, chemical and morphological condition associated with no or very low human pressure. The sensitivity of surface watercourses along Route Section 1 are considered to be **medium**.

6.2.8 Trenchless techniques would avoid any direct effect on the structure of the watercourse by drilling beneath the bed. TCC would be required either side of the watercourse. Activity involving the use of trenchless techniques and associated machinery during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil or other pollutants that could affect nearby watercourses. There is the potential for this to impact on water quality within the watercourses and therefore cause a reduction in the WFD classification. Similarly, the use of construction vehicles during construction phase of the proposed DC cable route along with the exposed DC cable trenches could increase soil erosion/dust generation and act as drainage channels, leading to turbid (sediment laden) run-off from construction affecting nearby watercourses.

6.2.9 The construction processes outlined within section 3.5 of this chapter will include measures to intercept run-off and ensure discharge along the DC cable route is controlled in quality and volume causing no degradation in WFD classification. The impact is predicted to be of local spatial extent, short to medium term duration, intermittent occurrence and high reversibility. It is predicted that any impact will affect the receptor indirectly. The magnitude is considered to be **low**.

6.2.10 The significance of effects on surface watercourses from trenchless techniques has been assessed as **minor adverse** significance and considered **not significant**.

Impacts of open cut, ducting and culverting may affect surface watercourses

6.2.11 Two minor/ordinary watercourses would be crossed by Route Section 1 of the DC cable route and by temporary accesses associated with the installation process and construction site access roads.

6.2.12 Minor and ordinary watercourses WFD statuses are determined by the WFD classification of surrounding main surface watercourses. Based on the surrounding main watercourses the ordinary drain designated to be crossed by open cut techniques is considered to have a 'moderate' status. Taking this into account the sensitivity of the receptor is considered to be **medium**.

6.2.13 The temporary accesses may be constructed over a pre-installed culvert pipe in the watercourse. The pipe will be of suitable size to accommodate the water volumes and flows. An alternative method may be to install temporary bridging. The temporary accesses will be removed at the end of the construction programme.

6.2.14 Activities on-site during construction (including the use of heavy vehicles and the removal of sediment) could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses, in turn reducing the water quality (WFD classification). Similarly, the DC cable route itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

6.2.15 The use of open cut techniques within Route Section 1 has the potential to cause adverse impacts on surrounding watercourses and receptors increasing turbid surface water runoff into surrounding watercourses. The incorporation of design mitigation (section 3.5 of this chapter) including construction methods into the construction process, runoff will be intercepted to ensure discharge is controlled in quality and volume. The impact is predicted to be of local spatial extent, short to medium term duration, intermittent occurrence and highly reversible. The magnitude is therefore considered to be **low**.

6.2.16 The significance of effects of open cut techniques on ordinary watercourses within Route Section 1 have been assessed as **minor adverse significance** and considered **not significant**.

<u>Construction works affecting field drainage and irrigation</u>

6.2.17 Construction works including open cut techniques may lead to the severing or blockage of field drains, which could lead to flooding of affected fields. Activities during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants contaminating field drainage affecting nearby watercourses and ecosystems.

6.2.18 Based on the setting of the proposed DC cable route and TCC along Route section 1 field drains sensitivity of receptors is considered to be **medium**.

6.2.19 The permanent removal of field drains during the installation of the proposed DC cable route and construction of the TCC may cause a backup on surrounding field drains, in turn increasing the flood risk to surrounding receptors. Design mitigation measures incorporated into the construction methods would include the restoration to field drains where appropriate and the incorporation of an temporary drainage strategy (outlined in section 3.5 of this chapter) to limit the disruption of field drains. The impact is predicted to be of local spatial extent with a minor shift away from the existing hydrological environment of local receptors, short term duration, intermittent occurrence and reversible. The magnitude is therefore considered to be **low**.

6.2.20 The significance of effects on field drainage and irrigation during the construction phase are considered to be **minor adverse significance** and considered **not significant**.

Impacts that may affect Chalk Streams

6.2.21 No Chalk Streams are present within 250 m of the proposed DC cable route within Route Section 1.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

6.2.22 Following the installation of the buried cables no impacts on water resources and/or hydrology flood risk receptors are anticipated.

6.2.23 Following construction, the areas occupied by the TCC would be restored to pre-construction conditions (where practicable) and therefore no impacts on flood risk receptors are anticipated.

The impact on Main surface watercourses

6.2.24 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to main surface watercourses are anticipated.

The impact on minor/ordinary surface watercourses

6.2.25 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to minor/ordinary surface watercourses are anticipated.

Impacts of operation that may affect field drainage and irrigation

6.2.26 Following construction field drains and irrigation will be restored to pre-construction conditions where appropriate and based on the rural setting of Route section 1, the sensitivity of receptors are considered **medium**.

6.2.27 With the incorporation of appropriate design mitigation techniques along the DC cable route, the impact is predicted to be of local spatial extent, short term duration and intermittent occurrence. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

6.2.28 The significance of effects on field drainage during the operational phase are considered to be **minor adverse significance** and considered **not significant**.

Decommissioning Impacts

6.2.29 The impacts of decommissioning along Route Section 1 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

6.2.30 The decommissioning impacts along Route Section 1 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance** which is **not significant**.

6.3 Route Section 2 Well High Lane to A16 (Keal Road)

Temporary Impacts

Impact that may affect temporary (construction) flood risk

6.3.1 There is a low risk of flooding (areas within Flood Zone 1) along the majority of Route Section 2 of the proposed DC cable route. However, areas along Main watercourses which may be affected by construction works are within Flood Zone 2 and 3 and therefore defined as at high risk of fluvial flooding. Route Section 2 runs through mainly rural area with limited residential properties present within the LoD. Six TCC are present within Route Section 2 split as 1 secondary and 5 tertiary construction compounds. The Land adjoining Route Section 2 is defined as majority within Flood Zone 1, with localised areas associated with surface watercourses being within Flood Zone 2 and 3. Therefore, the sensitivity of the receptor is considered to be **low**.

6.3.2 Impacts on flood risk would arise from any change in run-off over the areas affected during construction, such as TCC , temporary work areas, temporary accesses, construction access roads and the cable route corridor (full details provided within ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable). If the correct methodologies are not selected to cross EA main rivers and watercourses the risk of flooding could potentially increase during construction.

6.3.3 The proposed engineering methods for the TCC and construction site access roads could comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard. Surface water runoff will be intercepted via temporary drainage systems. The system will manage surface water runoff from the construction compounds in terms of both flow rate and water quality, in accordance with local policies and relevant permits. In areas where watercourses are not present, temporary drainage systems would incorporate infiltration techniques in order to mitigate against any increase in surface runoff.

6.3.4 The construction methodologies (as set out in section 3.5 of this chapter) will ensure the risk of flooding is not increased by the TCC or the instillation of the DC cable route. The impact on flood risk (including increase in surface water runoff and disrupting natural flood defences) would therefore be reduced during construction and are predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible assuming the design mitigation measures are implemented. The magnitude is therefore considered to be **low**.

6.3.5 The significance of potential effects will be of **minor adverse significance**, which is **not significant**.

Impacts of trenchless techniques affecting surface watercourses

6.3.6 Route Section 2 of the proposed DC cable route would require 6 water crossings. The largest of these would be crossed by trenchless techniques including but not limited to:

- Langton Beck; and
- River Lymn.

6.3.7 The sensitivity of watercourses is dependent on the nature of the specific watercourses. WFD classifications obtained from the EA website for water quality indicate that Main Rivers within Route Section 2 of the proposed DC cable route have a moderate status defined as a moderate deviation from the biological, chemical and morphological condition associated with no or very low human pressure. The sensitivity of the surface watercourses crossed by trenchless techniques are considered to be **medium**.

6.3.8 Trenchless techniques would avoid any direct effect on the structure of the watercourse by drilling beneath the bed. TCC would be required either side of the watercourse. Activity involving the use of trenchless techniques and associated machinery during the construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. There is the potential for this to impact on water quality within the watercourses and therefore cause a reduction in the WFD classification.

6.3.9 The DC cable route could act as a drainage channel, leading to run-off from construction areas affecting nearby watercourses, potential causing degradation to surrounding surface watercourse quality and therefore WFD classification. However, the construction processes outlined in section 3.5 of this chapter will include measures to intercept run-off and ensure discharge along the DC cable route is controlled in quality and volume causing no degradation in WFD classification. The impact is predicted to be of local spatial extent, short to medium term duration, intermittent occurrence and high reversibility. It is predicted that any impact will affect the receptor indirectly. The magnitude is considered to be **low**.

6.3.10 The significance of effects on surface watercourses from trenchless techniques has been assessed as **minor adverse significance** and considered **not significant**.

<u>Impacts of open cut, ducting and culverting may affect surface watercourses</u>

6.3.11 A number of minor/ordinary watercourses would be crossed by Route Section 2 of the DC cable route and by temporary accesses associated with the installation process and construction site access roads.

6.3.12 Minor and ordinary watercourses with WFD statuses are determined by the WFD classification of surrounding main surface watercourses. Based on the surrounding main watercourses the ordinary drains designated to be crossed by open cut techniques are considered to have a 'moderate' status. Taking this into account the sensitivity of the receptor is considered to be **medium**.

6.3.13 The temporary accesses may be constructed over a pre-installed culvert pipe in the watercourse. The pipe will be of suitable size to accommodate the water volumes and flows. An alternative method may be to install temporary bridging. The temporary accesses will be removed at the end of the construction programme.

6.3.14 Activities on-site during construction (including the use of heavy vehicles and the removal of sediment) could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses, in turn reducing the water quality (WFD classification). Similarly, the DC cable route itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

6.3.15 The use of open cut techniques within Route Section 2 has the potential to cause adverse impacts on surrounding watercourses and receptors increasing turbid surface water runoff into surrounding watercourses. The incorporation of design mitigation (section 3.5 of this chapter) including construction methods into the construction process, runoff will be intercepted to ensure discharge is controlled in quality and volume. The impact is predicted to be of local spatial extent, short to medium term duration, intermittent occurrence and highly reversible. The magnitude is therefore considered to be **low**.

6.3.16 The significance of effects of open cut techniques on ordinary watercourses within Route Section 2 have been assessed as **minor adverse significance** and considered **not significant**.

Construction works affecting field drainage and irrigation

6.3.17 Construction works including open cut techniques may lead to the severing or blockage of field drains, which could lead to flooding of affected fields. Activities during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants contaminating field drainage affecting nearby watercourses and ecosystems.

6.3.18 Based on the setting of the proposed DC cable route and TCC along Route Section 2 field drains sensitivity of the receptors is considered to be **medium**.

6.3.19 The permanent removal of field drains during the installation of the proposed DC cable route and construction of the TCC may cause a backup on surrounding field drains, in turn increasing the flood risk to surrounding receptors. Design mitigation measures incorporated into the construction methods would include the restoration to field drains where appropriate and the incorporation of a temporary drainage strategy (outlined in section 3.5 of this chapter) to limit the disruption of field drains. The impact is predicted to be of local spatial extent with a minor shift away from the existing hydrological environment of local receptors, short term duration, intermittent occurrence and reversible. The magnitude is therefore considered to be **low**.

The significance of effects on field drainage and irrigation during the construction phase are considered to be **minor adverse significance** and considered **not significant**.

Impacts that may affect Chalk Streams

6.3.20 The proposed DC cable route within Route Section 2 would require the crossing of two chalk streams which will be crossed by trenchless techniques. Chalk streams have characteristic features that support special wildlife habitats and species. They are fed from groundwater aquifers, meaning that the water is of high clarity and good chemical quality. WFD classifications obtained from the EA website for water quality indicate that Chalk Streams within Route Section

2 of the cable route corridor are considered to be medium. Based on the significance of chalk streams the sensitivity of the receptor is considered to be **high**.

6.3.21 Activity involving the use of trenchless techniques and associated machinery during the construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. Similarly, the cable route corridor itself could act as a drainage channel, leading to run-off from construction affecting nearby chalk watercourses.

6.3.22 With the incorporation of construction methodologies for works in close proximity to Chalk Streams (as set out in section 3.5 of this chapter) and the temporary drainage strategy will ensure that runoff is intercepted and discharge within Route Section 2 would be controlled in quality and volume causing no degradation to surrounding chalk streams. The impact is therefore predicted to be of local spatial extent, medium term duration, intermittent occurrence and high reversibility. It is predicted that any impact will affect the receptor indirectly. The magnitude is therefore, considered to be **low**.

6.3.23 The significance of effects on Chalk Streams during the construction phase are considered to be **moderate adverse significance**, which is considered **significant**.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

6.3.24 Following the installation of the buried cables no impacts on water resources and/or hydrology flood risk receptors within Route Section 2 are anticipated. Following construction, the areas occupied by the TCC would be restored to pre-construction conditions (where practicable) and therefore no impacts on flood risk receptors are anticipated.

The impact on Main surface watercourses

6.3.25 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to main surface watercourses are anticipated.

The impact on minor/ordinary surface watercourses

6.3.26 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to minor/ordinary surface watercourses are anticipated.

Impacts of operation that may affect field drainage and irrigation

6.3.27 Following construction field drains and irrigation will be restored to pre-construction conditions where appropriate and based on the rural setting of Route section 2, the sensitivity of receptors are considered **medium**.

6.3.28 With the incorporation of appropriate design mitigation techniques along Route Section 2 of the DC cable route, the impact is predicted to be of local spatial extent, short term duration and intermittent occurrence. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

6.3.29 The significance of effects on field drainage during the operational phase are considered to be **minor adverse significance** and considered **not significant**.

Decommissioning Impacts

6.3.30 The impacts of decommissioning along Route Section 2 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

6.3.31 The decommissioning impacts along Route Section 2 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance** which are **not significant**.

6.3.32 The decommissioning impacts on Chalk Streams within Route Section 2 are considered to be **moderate adverse significance**, which is considered **significant**.

6.4 Route Section 3 A16 (Keal Road) to River Witham

Temporary Impacts

Impact which may affect temporary (construction) flood risk

6.4.1 There is a high risk of flooding along the majority of Route Section 3 of the proposed DC cable route, with a significant proportion of land defined by the EA as Flood Zone 2 and 3. A localised section within the north-east extent is at low risk within Flood Zone 1. Seven TCC are present within Route Section 3 split as 1 primary, 3 secondary and 3 tertiary construction compounds. Route Section 3 runs through rural land with limited residential properties present within the LoD. The sensitivity of the receptor is considered to be **medium**.

6.4.2 Impacts on flood risk would arise from any change in run-off over the areas affected during construction, such as TCC, temporary accesses, construction access roads and the DC cable route (full details provided within ES-2-B-0.1, Volume 2, Chapter 5: The Proposed Underground DC Cable). If the correct methodologies are not selected to cross EA main rivers and watercourses the risk of flooding could potentially increase during construction.

6.4.3 The proposed engineering methods for the TCC and construction site access roads could comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard. Surface water runoff will be intercepted via temporary drainage systems. The system will manage surface water runoff from the construction compounds in terms of both flow rate and water quality, in accordance with local policies and relevant permits.

6.4.4 The construction methodologies (as set out in section 3.5 of this chapter) will ensure the risk of flooding is not increased by the TCC or the instillation of the DC cable route. The impact (including increase in surface water runoff and disrupting natural flood defences) would therefore be reduced during construction and are only likely to affect the surrounding local receptors, with short term impacts on drainage networks and runoff rates. The impacts are therefore predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. It is predicted that the impact will affect surrounding local receptor directly. The magnitude is therefore, considered to be **low**.

6.4.5 The significance of effects are considered to be of **minor adverse significance**, which is **not significant**.

Impacts of trenchless techniques may affect surface watercourses

6.4.6 Route Section 3 of the proposed DC cable route would require 46 water crossings. The largest of these would be crossed by trenchless techniques including but not limited to:

- River Witham;
- Black Dyke;
- Twenty Foot Drain;
- Hagnaby Beck; and
- West Fen Catchwater.

6.4.7 The sensitivity of watercourses is dependent on the nature of the specific watercourses. WFD classifications obtained from the EA website for water quality indicate that main Rivers within Route Section 3 of the proposed DC cable route have a moderate status defined as a moderate deviation from the biological, chemical and morphological condition associated with no or very low human pressure. The sensitivity of the surface watercourses are considered to be **medium**.

6.4.8 Trenchless techniques would avoid any direct effect on the structure of the watercourse by drilling beneath the bed. TCC would be required either side of the watercourse. Activity involving the use of trenchless techniques and associated machinery during the construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. There is the potential for this to impact on water quality within the watercourses and therefore cause a reduction in the WFD classification. Similarly, the use of heavy construction machinery and exposed DC cable trenches acting as drainage channels could lead to turbid run-off from construction affecting nearby watercourses.

6.4.9 Construction processes outlined within section 3.5 of this chapter will include measures to intercept run-off and ensure discharge along the DC cable route is controlled in quality and volume causing no degradation in WFD classification. The impact is predicted to be of local spatial extent, short to medium term duration, intermittent occurrence and high reversibility. It is predicted that any impact will affect the receptor indirectly. The magnitude is therefore considered to be **low**.

6.4.10 The significance of effects on surface watercourses has been assessed as **minor adverse significance**, which is **not significant**.

Impacts of open cut, ducting and culverting may affect surface watercourses

6.4.11 No open cut techniques are presently anticipated within Route Section 3 of the proposed DC cable route in relation to crossing surface watercourses/drains.

Impacts of construction may affect field drainage and irrigation

6.4.12 Construction works including open cut techniques may lead to the severing or blockage of field drains, which could lead to flooding of affected fields. Activities during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants contaminating field drainage affecting nearby watercourses and ecosystems.

6.4.13 Based on the setting of the proposed DC cable route and TCC along Route section 3 field drains sensitivity of receptors is considered to be **medium**.

6.4.14 The permanent removal of field drains during the installation of the proposed DC cable route and construction of the TCC may cause a backup on surrounding field drains, in turn increasing the flood risk to surrounding receptors. Design mitigation measures incorporated into the construction methods would include the restoration to field drains where appropriate and the incorporation of a temporary drainage strategy (outlined in section 3.5 of this chapter) to limit the disruption of field drains. The impact is predicted to be of local spatial extent with a minor shift away from the existing hydrological environment of local receptors, short term duration, intermittent occurrence and reversible. The magnitude is therefore considered to be **low**.

6.4.15 The significance of effects on field drainage and irrigation during the construction phase are considered to be **minor adverse significance** and considered **not significant**.

Impacts that may affect Chalk Streams

6.4.16 No Chalk Streams are present within 250 m of the DC route within Route Section 3.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

6.4.17 Following the installation of the buried cables no impacts on flood risk are anticipated within Route Section 3.

6.4.18 Following construction, the areas occupied by the TCC would be restored to pre-construction conditions (where practicable) and therefore no impacts on flood risk receptors are anticipated.

The impact on Main surface watercourses

6.4.19 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to main surface watercourses are anticipated within Route Section 3.

The impact on minor/ordinary surface watercourses

6.4.20 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to minor/ordinary surface watercourses are anticipated within Route Section 3.

Impacts of operation that may affect field drainage and irrigation

6.4.21 Following construction field drains and irrigation will be restored to pre-construction conditions where appropriate and based on the rural setting of Route section 3, the sensitivity of receptors are considered **medium**.

6.4.22 With the incorporation of appropriate design mitigation techniques along the DC cable route, the impact is predicted to be of local spatial extent, short term duration and intermittent occurrence. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

6.4.23 The significance of effects on field drainage during the operational phase are considered to be **minor adverse significance** and considered **not significant**.

Decommissioning Impacts

6.4.24 The impacts of decommissioning along Route Section 3 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

6.4.25 The decommissioning impacts along Route Section 3 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance**, which are **not significant**.

6.5 Route Section 4 River Witham to the Proposed Converter Station

Temporary Impacts

Impact which may affect temporary (construction) flood risk

6.5.1 There is a high risk of flooding along the majority of Route Section 4 of the proposed DC cable route, with a significant proportion of land defined by the EA as Flood Zone 2 and 3. A localised section associated with the A17 is at low risk within Flood Zone 1. Seven tem TCC are present within Route Section 4 split as 1 primary, 1 secondary and 5 tertiary construction compounds. Route Section 4 runs through rural land with limited residential properties present within the LoD. The sensitivity of the receptor is therefore considered to be **medium**.

6.5.2 Impacts on flood risk would arise from any permanent change in run-off over the areas affected during construction, such as TCC, temporary accesses, construction access roads and the proposed DC cable route (full details provided within ES-2-B-0.1, Volume 2, Chapter 5: The

Proposed Underground DC Cable). If the correct methodologies are not selected to cross EA main rivers and watercourses the risk of flooding could potentially increase during construction.

6.5.3 The proposed engineering methods for the TCC and construction site access roads could comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard. Surface water runoff will be intercepted via temporary drainage systems. The system will manage surface water runoff from the construction compounds in terms of both flow rate and water quality, in accordance with local policies and relevant permits.

6.5.4 The construction methodologies (as set out in section 3.5 of this chapter) will ensure the risk of flooding is not increased by the TCC or the instillation of the DC cable route. The impact (including increase in surface water runoff and disrupting natural flood defences) would therefore be reduced and are only likely to affect the surrounding local receptors, with short term impacts on drainage networks and runoff rates. The impacts are therefore predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. It is predicted that the impact will affect surrounding local receptor directly. The magnitude is therefore, considered to be **low**.

6.5.5 The significance of effects is considered to be of **minor adverse significance**, which is **not significant**.

<u>Impacts of trenchless techniques may affect surface watercourses</u>

6.5.6 Route Section 4 of the proposed DC cable route would require 35 water crossings. The largest of these would be crossed by trenchless techniques including but not limited to:

- South Forty Foot Drain;
- Long Skerth Drain;
- North Forty Foot; and
- Helpringham Eau.

6.5.7 The sensitivity of watercourses is dependent on the nature of the specific watercourses. WFD classifications obtained from the EA website for water quality indicate that Main Rivers within Route Section 4 of the proposed DC cable route have a moderate status defined as a moderate deviation from the biological, chemical and morphological condition associated with no or very low human pressure. The sensitivity of the surface watercourses along Route Section 4 are considered **medium**.

6.5.8 Trenchless techniques would avoid any direct effect on the structure of the watercourse by drilling beneath the bed. TCC would be required either side of the watercourse. Activity involving the use of trenchless techniques and associated machinery during the construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. There is the potential for this to impact on water quality within the watercourses and therefore cause a reduction in the WFD classification. Similarly, the use of construction vehicles during construction phase of the proposed DC cable route along with the exposed DC cable trenches could increase soil erosion/dust generation and act as drainage channels, leading to turbid (sediment laden) run-off from construction affecting nearby watercourses.

6.5.9 The construction processes outlined within section 3.5 of this chapter will include measures to intercept run-off and ensure discharge along the DC cable route is controlled in quality and volume causing no degradation in WFD classification. The impact is predicted to be of local spatial extent, short to medium term duration, intermittent occurrence and high reversibility. It is predicted that any impact will affect the receptor indirectly. The magnitude is considered to be **low**.

6.5.10 The significance of effects on surface watercourses has been assessed as **minor adverse significance** and considered **not significant**.

Impacts of open cut, ducting and culverting may affect surface watercourses

6.5.11 One minor/ordinary watercourses/drain would be crossed (using open cut techniques) by Route Section 4 of the proposed DC cable route associated with the installation process and construction site access roads.

6.5.12 Minor and ordinary watercourses WFD statuses are determined by the WFD classification of surrounding main surface watercourses. Based on the surrounding main watercourses the ordinary drain designated to be crossed by open cut techniques is considered to have a 'moderate' status. Taking this into account the sensitivity of the receptor is considered to be **medium**.

6.5.13 The temporary accesses may be constructed over a pre-installed culvert pipe in the watercourse. The pipe will be of suitable size to accommodate the water volumes and flows. An alternative method may be to install temporary bridging. The temporary accesses will be removed at the end of the construction programme.

6.5.14 Activities on-site during construction (including the use of heavy vehicles and the removal of sediment) could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses, in turn reducing the water quality (WFD classification). Similarly, the DC cable route itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

6.5.15 The use of open cut techniques within Route Section 4 has the potential to cause adverse impacts on surrounding watercourses and receptors increasing turbid surface water runoff into surrounding watercourses. The incorporation of design mitigation (section 3.5 of this chapter) including construction methods into the construction process, runoff will be intercepted to ensure discharge is controlled in quality and volume. The impact is predicted to be of local spatial extent, short to medium term duration, intermittent occurrence and highly reversible. The magnitude is therefore considered to be **low**.

6.5.16 The significance of effects of open cut techniques on ordinary watercourses within Route Section 4 have been assessed as **minor adverse significance** and considered **not significant**.

Impacts of construction may affect field drainage and irrigation

6.5.17 Construction works including open cut techniques may lead to the severing or blockage of field drains, which could lead to flooding of affected fields. Activities during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants contaminating field drainage affecting nearby watercourses and ecosystems.

6.5.18 Based on the setting of the proposed DC cable route and TCC along Route section 4 field drains sensitivity of receptors is considered to be **medium**.

6.5.19 The permanent removal of field drains during the installation of the proposed DC cable route and construction of the TCC may cause a backup on surrounding field drains, in turn increasing the flood risk to surrounding receptors. Design mitigation measures incorporated into the construction methods would include the restoration to field drains where appropriate and the incorporation of a temporary drainage strategy (outlined in section 3.5 of this chapter) to limit the disruption of field drains. The impact is predicted to be of local spatial extent with a minor shift away from the existing hydrological environment of local receptors, short term duration, intermittent occurrence and reversible. The magnitude is therefore considered to be **low**.

6.5.20 The significance of effects on field drainage and irrigation during the construction phase are considered to be **minor adverse significance** and considered **not significant**.

Impacts that may affect Chalk Streams

6.5.21 No Chalk Streams are present within 250 m of the DC route within Route Section 4.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

6.5.22 Following the installation of the buried cables no impacts on flood risk are anticipated along Route Section 4.

6.5.23 Following construction, the areas occupied by the TCC would be restored to pre-construction conditions (where practicable) and therefore no impacts on flood risk receptors are anticipated.

The impact on Main surface watercourses

6.5.24 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to main surface watercourses are anticipated along Route Section 4.

The impact on minor/ordinary surface watercourses

6.5.25 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to minor/ordinary surface watercourses are anticipated along Route Section 4.

Impacts of operation may affect field drainage and irrigation

6.5.26 Following construction field drains and irrigation will be restored to pre-construction conditions where appropriate and based on the rural setting of Route section 4, the sensitivity of receptors are considered medium.

6.5.27 With the incorporation of appropriate design mitigation techniques along the DC cable route, the impact is predicted to be of local spatial extent, short term duration and intermittent occurrence. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **low**.

6.5.28 The significance of effects on field drainage during the operational phase are considered to be **minor adverse significance** and considered **not significant**.

Decommissioning Impacts

6.5.29 The impacts of decommissioning along Route Section 4 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

6.5.30 The decommissioning impacts along Route Section 4 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance** which is **not significant**.

7 Mitigation

7.1 Overview of Mitigation

7.1.1 Potential impacts to the water environment will be avoided where practicable through careful consideration of the drainage design, construction techniques and operational best practice of the proposed DC cable route. The EA, LLFA and IDB will be consulted through the planning process to ensure all appropriate permits and consents are in place. The construction mitigation measures are outlined below and featured in the CEMP.

7.2 Construction Mitigation

7.2.1 Construction mitigation measures would reduce any potential adverse impacts associated with the proposed DC cable route, TCC and temporary accesses through careful consideration of the drainage network and construction techniques.

Water Quality/Flood Risk mitigation

7.2.2 Temporary drainage mitigation techniques including, but not limited to, run-off interceptor channels would be installed prior to the construction of any TCC or compound used for trenchless techniques, ensuring discharge from the proposed DC cable route are controlled in quality and volume.

7.2.3 Clean surface water intercepted within TCC and along the Proposed DC cable route will be diverted around construction, to discharge to surrounding watercourses at an agreed upon rate. All silt laden/dirty water captured from construction within the temporary drain networks will control the volume and quality of water before discharge to the surrounding watercourses.

7.2.4 It may be necessary for temporary drains to be installed along the length of the DC cable route trenches during construction in order to intercept surface water runoff and limit the amount of water filling the excavation trenches and leading to a drainage channel being formed. These drains would control the volume and quality of surface water discharge to the surrounding watercourses. This may include the use of settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake.

7.2.5 Where possible, any stockpiled excavated materials within the TCC will be placed away from the drainage system and no hazardous substances will be stored within close proximity of the drainage network. Gaps will be included within all stockpiled material (when practicable) in order to retain floodplain connectivity/flow pathways.

7.2.6 Any areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) to be bunded or otherwise isolated and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses. Additionally the bunded/isolated areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage.

7.2.7 Proposed techniques for crossing water features and channels for the base design scheme will be subject to Consents under the LDA 1991. Individual flood defence and watercourse crossing engineering techniques are to be agreed with the relevant stakeholders prior to works commencing. In the case of the construction site access crossings, existing field accesses, tracks and roads will be used where appropriate, with new temporary crossing over watercourses provided where necessary. However, where accesses are not robust enough for construction traffic, the construction site access crossings will be upgraded or widened, with details to be supplied to relevant stakeholders prior to works commencing under appropriate consenting regimes. Site access roads to facilitate construction activities may require widening up to 5 m to accommodate machinery.

7.2.8 A number of Main watercourses would be crossed by the proposed DC cable route and access track. All TCC will be bunded or otherwise protected/isolated in order for any increase in turbid surface water runoff to be mitigated. The construction works will be undertaken in accordance with a methodology for the crossing of watercourses agreed with the EA, LLFA and IDBs.

7.2.9 A number of minor watercourses and drains would be crossed by the proposed DC cable route and access track. The construction site access road and temporary accesses may be installed over a pre-installed culvert pipe in the watercourse. The pipe will be of suitable size to accommodate the water volumes and flows. An alternative method may be to install temporary bridging. The access and temporary accesses will be removed at the end of the construction programme. The construction works will be undertaken in accordance with a methodology for the crossing of watercourses agreed with the EA, LLFA and IDB's. This will include measures to ensure that watercourses, including their banks, are reinstated to their previous condition where possible.

7.2.10 The location of joint bay has not yet been confirmed. Siting for joint bays will be carried out at the detailed design stage. Joint bays will be designated to areas at lowest flood risk within each Route Section.

7.3 Route Section 1 Landfall to Well High Lane

7.3.1 Mitigation measures associated with trenchless and open cut crossing techniques vary according to the size of the watercourse. Within Route Section 1 of the proposed DC cable route trenchless and open cut techniques will be used (Crossing schedule Table 8.10).

7.3.2 Mitigation measures within Route Section 1 include:

- All open cut trenches will be prevented from discharging directly to watercourses, with surface water runoff pumped via settling tanks or ponds to remove sediment and potential contaminants before discharging into local ditches or drains;
- It may be necessary for temporary drainage to be constructed along the proposed DC cable route to reduce the amount of runoff which fills the excavated trenches;

- TCC will be bunded or otherwise isolated and a surface water management strategy will be developed in order that surface water runoff will be cleaned before discharging to local watercourses;
- Where possible, any stockpiled excavated materials within the TCC will be placed away from the drainage system and no hazardous substances will be stored within close proximity of the drainage network; and
- All construction works will be undertaken in accordance with the industry guidelines and best practice measures.

7.4 Route Section 2 Well High Lane to A16 (Keal Road)

7.4.1 Within Route Section 2 of the proposed DC cable route, trenchless techniques and open cut techniques will be used to cross watercourses in the Section. Mitigation measures within Route Section 2 include:

- All open cut trenches will be prevented from discharging directly to watercourses, with surface water runoff pumped via settling tanks or ponds to remove sediment and potential contaminants before discharging into local ditches or drains;
- It may be necessary for temporary drainage to be constructed along the proposed DC cable route to reduce the amount of runoff which fills the excavated trenches;
- TCC will be bunded or otherwise isolated and a surface water management strategy will be developed in order that surface water runoff will be cleaned before discharging to local watercourses;
- Where possible, any stockpiled excavated materials within the TCC will be placed away from the drainage system and no hazardous substances will be stored within close proximity of the drainage network; and
- All construction works will be undertaken in accordance with the industry guidelines and best practice measures.

7.5 Route Section 3 A16 (Keal Road) to River Witham

7.5.1 Within Route Section 3 of the DC route, trenchless techniques will be used to cross all watercourses. Technique specific mitigation measures within Route Section 3 include:

- TCC will be bunded or otherwise isolated and a surface water management strategy will be developed in order that surface water runoff will be cleaned before discharging to local watercourses;
- It may be necessary for temporary drainage to be constructed along the proposed DC cable route to reduce the amount of runoff which fills the excavated trenches;
- Where possible, any stockpiled excavated materials within the TCC will be placed away from the drainage system and no hazardous substances will be stored within close proximity to the drainage network; and

- All construction works will be undertaken in accordance with the industry guidelines and best practice measures.

7.6 Route Section 4 River Witham to the Proposed Converter Station

7.6.1 Within Route Section 4 of the DC route, trenchless and open cut techniques will be used to cross all watercourses. Technique specific mitigation measures within Route Section 4 include:

- All open cut trenches will be prevented from discharging directly to watercourses, with surface water runoff pumped via settling tanks or ponds to remove sediment and potential contaminants before discharging into local ditches or drains;
- It may be necessary for temporary drainage to be constructed along the proposed DC cable route to reduce the amount of runoff which fills the excavated trenches;
- TCC will be bunded or otherwise isolated and a surface water management strategy will be developed in order that surface water runoff will be cleaned before discharging to local watercourses;
- Where possible, any stockpiled excavated materials within the TCC will be placed away from the drainage system and no hazardous substances will be stored within close proximity to the drainage network; and
- All construction works will be undertaken in accordance with the industry guidelines and best practice measures.

8 Residual Effects

8.1 Route Section 1 Landfall to Well High Lane

Temporary Impacts

Impact which may affect temporary (construction) flood risk

8.1.1 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.1.2 Impacts on flood risk would arise from exposure to tidal inflows and any change in run-off over the areas affected during construction, such as; crossing coastal flood defences, construction compounds, temporary accesses, construction access roads and the proposed DC cable route. If the correct methodologies are not selected to cross coastal flood defences, EA main rivers and the risk of flooding could potentially increase during construction. The proposed engineering methods for the landfall, TCC and construction site access roads will comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard.

8.1.3 Construction methodologies/mitigation (outlined within section 7) will ensure the risk of flooding is not increased during construction through the use of surface water run-off management strategies. The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility with little to no observable increase in flood risk. It is predicted that the impact will affect surrounding local receptor directly. The magnitude is therefore, considered to be **negligible**.

8.1.4 The significance of the effect on flood risk based on the situation which included the integration of measures adopted in section 7 of this report is assessed as **negligible** and considered **not significant**.

Impacts of trenchless techniques affecting surface watercourses

8.1.5 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.1.6 The impacts on main and ordinary watercourses from construction activities involving the use of trenchless techniques and associated machinery could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants affecting nearby watercourses and therefore causing a reduction in the WFD classification. Similarly, the cable route corridor itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

8.1.7 However, the construction process will include measures to intercept run-off and ensure that discharges from the site are controlled in quality and volume causing no degradation in WFD classification. This may include the use of settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake. Consequently, it is considered that the magnitude of impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. The magnitude is therefore considered to be **negligible**.

8.1.8 The overall significance of effects on main/ordinary watercourses crossed by trenchless techniques which includes the integration of measures adopted in section 3.5 and 7 of this chapter and is considered to be **negligible**, which is **not significant**.

Impacts of open cut, ducting and culverting may affect surface watercourses

8.1.9 One minor/ordinary watercourse would be crossed by Route Section 1 of the DC cable route and by temporary accesses associated with the installation process and construction site access roads. As noted in Section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.1.10 The use of open cut techniques to construct Route Section 1 of the DC route has the potential to cause adverse impacts on surrounding watercourses and receptors. The use of heavy vehicles and the removal of sediment may lead to an increase in turbid runoff, reducing water quality (in turn WFD classification) in surrounding watercourses. The construction site access road and temporary accesses may be constructed over a pre-installed culvert pipe in the watercourse. The pipe will be of suitable size to accommodate the water volumes and flows. An alternative method may be to install temporary bridging. Activities-on site during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. Similarly, the cable route itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

8.1.11 The construction process would include measures to intercept run-off and ensure that discharges from the site are controlled in quality and volume causing no degradation in WFD classification. This may include the use of settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake. With the incorporation of mitigation measures set out in section 3.5 and 7 of this chapter the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. The magnitude is therefore, considered to be **negligible**.

8.1.12 The significance of effects on the minor watercourse (that would be crossed without trenchless technology) within Route Section 1, including the integration of measures adopted in section 7 of this chapter are considered to be of **negligible**, which is **not significant**.

Construction works affecting field drainage and irrigation

8.1.13 As noted in section 6 of this chapter the sensitivity of receptor is **medium**.

8.1.14 The excavation of the trench for the installation of the cable route during the construction phase could temporarily affect surface water flow pathways, impacting on water quality and potential flow rates. The disruption of field drains along Route Section 1 of the proposed DC cable route may cause a backup on surrounding field drains, increasing the flood risk to the site and surrounding receptors.

8.1.15 The construction process is designed so that transition joint pits and joint bays would be buried and therefore not at risk of flooding. Measures would be included to restore field drainage where appropriate following the installation of the proposed DC cable route.

8.1.16 With the incorporation of construction mitigation measures set out in section 3.5 and 7 of this chapter the impact is predicted to be of local spatial extent with a minor shift away from the existing hydrological environment of local receptors, short term duration, intermittent occurrence and reversible with field drains to be re-established where appropriate. It is predicted that any impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

8.1.17 The significance of effects on field/land drainage during the construction phase is considered to be **negligible**, which is **not significant**.

Impacts that may affect Chalk Streams

8.1.18 No chalk streams are present within 250 m of the proposed DC route within Route Section 1.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

8.1.19 Following the installation of the proposed DC cable route, no impacts on the water resources and/or hydrological baseline are anticipated.

The impact on main surface watercourses

8.1.20 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to main surface watercourses are anticipated within Route Section 1.

The impact on minor/ordinary surface watercourses

8.1.21 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to minor/ordinary surface watercourses are anticipated within Route Section 1.

Impacts of operation that may affect field drainage and irrigation

8.1.22 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.1.23 With the incorporation of mitigation measures set out in section 7 of this chapter the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

8.1.24 The significance of effects is considered to be **negligible**, which is **not significant**.

Decommissioning Impacts

8.1.25 The impacts of decommissioning along Route Section 1 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

8.1.26 The decommissioning impacts along Route Section 1 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance** which is **not significant**.

8.2 Route Section 2 Well High Lane to A16 (Keal Road)

Temporary Impacts

Impact which may affect temporary (construction) flood risk

8.2.1 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.2.2 Impacts on flood risk would arise from any change in run-off over the areas affected during construction, such as TCC, temporary accesses, construction access roads and the DC cable route. If the correct methodologies are not selected to cross EA main rivers and watercourses the risk of flooding could potentially increase during construction.

8.2.3 The proposed engineering methods for the TCC and construction site access roads will comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard.

8.2.4 Design mitigation measure and construction methodologies (outlined in section 3.5 and 7 respectively) would ensure the risk of flooding during construction is not increased. The potential for impacts on flooding to occur would be reduced by implementing appropriate flood risk mitigation measures as set in section 7 of this chapter and the CEMP. Therefore, the magnitude of the impact has reduced to **negligible**.

8.2.5 The overall significance of effects on flood risk based on the situation which included the integration of measures adopted is assessed as **negligible**, which is **not significant**.

Impacts of trenchless techniques affecting surface watercourses

8.2.6 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.2.7 The impacts on main and ordinary watercourses from construction activities involving the use of trenchless techniques and associated machinery could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants affecting nearby watercourses. Route Section 2 of the proposed DC cable route would require a number of water crossings. Trenchless techniques would avoid any direct effect on the structure of the watercourse by drilling beneath the bed.

8.2.8 The DC cable route corridor itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses. TCC would be required either side of the watercourse. The compounds would house all machinery and potential pollutants used within the construction phase of the development.

8.2.9 Construction process will include measures to intercept run-off and ensure that discharge along the DC cable route and from the TCC are controlled in quality and volume, in turn causing no degradation to water quality. This may include the use of settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake. Consequently it is considered that the magnitude of impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. The magnitude is therefore considered to be **negligible**.

8.2.10 The overall significance of effects to surface watercourses crossed by trenchless techniques which included the integration of measures adopted in section 3.5 and 7 of this chapter has been assessed as **negligible**, which is **not significant**.

Impacts of open cut, ducting and culverting may affect surface watercourses

8.2.11 A number minor/ordinary watercourse would be crossed by Route Section 2 of the DC cable route and by temporary accesses associated with the installation process and construction site access roads. As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.2.12 The use of open cut techniques to construct Route Section 2 of the DC route has the potential to cause adverse impacts on surrounding watercourses and receptors. The use of heavy vehicles and the removal of sediment may lead to an increase in turbid runoff, reducing water quality (in turn WFD classification) in surrounding watercourses. The construction site access road and temporary accesses may be constructed over a pre-installed culvert pipe in the watercourse. The pipe will be of suitable size to accommodate the water volumes and flows. An alternative method may be to install temporary bridging. Activities-on site during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. Similarly, the cable route itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

8.2.13 The construction process would include measures to intercept run-off and ensure that discharges from the site are controlled in quality and volume causing no degradation in WFD classification. This may include the use of settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake. With the incorporation of mitigation measures set out in section 3.5 and 7 of this chapter the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. The magnitude is therefore, considered to be **negligible**.

8.2.14 The significance of effects on the minor watercourse (that would be crossed without trenchless technology) within Route Section 2, including the integration of measures adopted in section 7 of this chapter are considered to be of **negligible**, which is **not significant**.

Construction works affecting field drainage and irrigation

8.2.15 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.2.16 Construction works may lead to the severing or blockage of field drains, which could lead to flooding of affected fields. Activities during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants contaminating field drainage affecting nearby watercourses and ecosystems. The disruption of field drains along Route Section 2 along the proposed DC cable route may cause a backup on surrounding field drains, increasing the flood risk to the site and surrounding receptors.

8.2.17 The construction process is designed so that transition joint pits and joint bays would be buried and therefore not at risk of flooding. Measures would be included to restore field drainage following the installation of the proposed DC cable route.

8.2.18 With the incorporation of construction mitigation measures the impact is predicted to be of local spatial extent with a minor shift away from the existing hydrological environment of local receptors, short term duration, intermittent occurrence and reversible with field drains to be re-established where appropriate. It is predicted that any impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

8.2.19 The significance of effects on drainage/field infrastructure which included the integration of measures adopted in section 3.5 and 7 of this chapter is **negligible**, which is **not significant**.

Impacts that may affect Chalk Streams

8.2.20 The proposed DC cable route would require the crossing of two chalk streams by trenchless techniques. Chalk streams have characteristic features that support special wildlife habitats and species. They are fed from groundwater aquifers, meaning that the water is of high clarity and good chemical quality. As noted in section 6 of this chapter the sensitivity of receptor is considered **high**.

8.2.21 Activity involving the use of trenchless techniques and associated machinery during the construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. Similarly, the cable route corridor itself could act as a drainage channel, leading to run-off from construction affecting nearby chalk watercourses.

8.2.22 The impact with the incorporation of mitigation measures presented within section 3.5 and 7 of this chapter is predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible. It is predicted that any impact will affect the receptor directly. The magnitude is therefore considered to be **negligible**.

8.2.23 The significance of effects on Chalk Streams which include the integration of measures adopted in section 3.5 and 7 of this chapter is **minor adverse significance**, which is **not significant**.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

8.2.24 Following the installation of the proposed DC cable route no impacts on the water resources and/or hydrological baseline are anticipated.

The impact on Main surface watercourses

8.2.25 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline are anticipated.

The impact on minor/ordinary surface watercourses

8.2.26 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline are anticipated.

Impacts of operation that may affect field drainage and irrigation

8.2.27 As noted in section 6 of this chapter the sensitivity of receptor is considered medium.

8.2.28 With the incorporation of mitigation measures set out in section 3.5 and 7 of this chapter the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

8.2.29 The significance of effects is considered to be **negligible**, which is **not significant**.

Decommissioning Impacts

8.2.30 The impacts of decommissioning along Route Section 2 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

8.2.31 The decommissioning impacts along Route Section 2 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance** which is **not significant**.

8.2.32 The decommissioning impacts on Chalk Streams within Route Section 2 are considered to be **minor adverse significance**, which is considered **not significant**.

8.3 Route Section 3 A16 (Keal Road) to River Witham

Temporary Impacts

Impact which may affect temporary (construction) flood risk

8.3.1 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.3.2 Impacts on flood risk would arise from any change in run-off over the areas affected during construction, such as; TCC, temporary accesses, construction access roads and the DC cable route. If the correct methodologies are not selected to cross EA main rivers and watercourses the risk of flooding could potentially increase during construction. The proposed engineering methods for the TCC and construction site access roads will comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard.

8.3.3 Construction methodologies (outlined within section 7) will ensure the risk of flooding is not increased during construction through the use of surface water run-off management strategies. The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility with little to no observable increase in flood risk. It is predicted that the impact will affect surrounding local receptor directly. The magnitude is therefore, considered to be **negligible**.

8.3.4 The overall significance of the effect on flood risk based on the situation which included the integration of measures adopted in section 3.5 and 7 of this report is assessed as **negligible**, which is **not significant**.

Impacts of trenchless techniques affecting surface watercourses

8.3.5 As noted in Section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.3.6 The impacts on main and ordinary watercourses from construction activities involving the use of trenchless techniques and associated machinery could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants affecting nearby watercourses. Route Section 3 of the proposed DC cable route would require a number of water crossings. The largest of these would be crossed by trenchless techniques which would avoid any direct effect on the structure of the watercourse by drilling beneath the bed. TCC would be required either side of the watercourse.

8.3.7 Activity involving the use of trenchless techniques and associated machinery during the construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. Similarly, the cable route corridor itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

8.3.8 However, the construction process will include measures to intercept run-off and ensure that discharges from the site are controlled in quality and volume, in turn causing no degradation to water quality. This may include the use of settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake. Consequently it is considered that the magnitude of impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. The magnitude is therefore considered to be **negligible**.

8.3.9 The overall significance of effects to surface watercourses crossed by trenchless techniques which included the integration of measures adopted in section 3.5 and 7 of this chapter would be of **negligible**, which is **not significant**.

Impacts of open cut, ducting and culverting may affect surface watercourses

8.3.10 No open cut techniques are presently proposed to cross surface watercourses within Route Section 3 of the proposed DC cable route.

Construction works affecting field drainage and irrigation

8.3.11 As noted in section 6 of this chapter the sensitivity of receptor is **medium**.

8.3.12 Construction works may lead to the severing or blockage of field drains, which could lead to flooding of affected fields. Activities during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants contaminating field drainage affecting nearby watercourses and ecosystems. The impact on field drainage and irrigation from open cut techniques during the construction phase could temporarily affect surface water flow pathways, impacting on water quality and potential flow rates.

8.3.13 The construction process is designed so that transition joint pits and joint bays would be buried and therefore not at risk of flooding. Measures would be included to restore field drainage where appropriate following the installation of the proposed DC cable route.

8.3.14 The impact with the incorporation of mitigation measures presented within section 7 of this chapter is predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible. It is predicted that any impact will affect the receptor directly. The magnitude is therefore considered to be **negligible**.

8.3.15 The significance of effects on drainage/field infrastructure which included the integration of measures adopted in section 3.5 and 7 of this chapter is **negligible**, which is **not significant**.

Impacts that may affect Chalk Streams

8.3.16 No Chalk Streams are present within 250 m of the proposed DC cable route within Route Section 3.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

8.3.17 Following the installation of the proposed DC cable route no impacts on flood risk baseline are anticipated within Route Section 3.

The impact on main surface watercourses

8.3.18 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to main surface watercourses are anticipated for Route Section 3.

The impact on minor/ordinary surface watercourses

8.3.19 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to minor/ordinary surface watercourses are anticipated for Route Section 3.

Impacts of operation that may affect field drainage and irrigation

8.3.20 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.3.21 With the incorporation of mitigation measures set out in section 3.5 and 7 of this chapter the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

8.3.22 The significance of effects with the incorporation of mitigation measures set out in this chapter and the CEMP are considered to be **negligible**, which is **not significant**.

Decommissioning Impacts

8.3.23 The impacts of decommissioning along Route Section 3 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

8.3.24 The decommissioning impacts along Route Section 3 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance** which is **not significant**.

8.4 Route Section 4 River Witham to the Proposed Converter Station

Temporary Impacts

Impact which may affect temporary (construction) flood risk

8.4.1 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.4.2 Impacts on flood risk would arise from any change in run-off over the areas affected during construction, such as TCC, temporary accesses, construction access roads and the cable route corridor. If the correct methodologies are not selected to cross EA main rivers and watercourses the risk of flooding could potentially increase during construction. The proposed engineering methods for the construction compounds and construction site access roads will comprise permeable gravel overlying a permeable geotextile membrane of an appropriate standard.

8.4.3 Design and Construction methodologies (outlined within section 3.5 and 7 respectively) will ensure the risk of flooding is not increased during construction through the use of surface water run-off management strategies and flood risk mitigation measures. Therefore, the magnitude of the impact has reduced to **negligible**.

8.4.4 The overall significance of effects on flood risk based on the situation which included the integration of measures adopted in this chapter is assessed as **negligible**, which is **not significant**.

Impacts of trenchless techniques affecting surface watercourses

8.4.5 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.4.6 The impacts on main and ordinary watercourses from construction activities involving the use of trenchless techniques and associated machinery could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants affecting nearby watercourses. Route Section 4 of the proposed DC cable route would require a number of water crossings. The largest of these would be crossed by trenchless techniques which would avoid any direct effect on the structure of the watercourse by drilling beneath the bed with TCC required either side of the watercourse. However, exposed DC cable trenches could act as drainage channels, leading to run-off from construction affecting nearby watercourses.

8.4.7 The construction process will include measures to intercept run-off and ensure that discharges along the DC cable route and from the TCC are controlled in quality and volume. This may include the use of settling tanks or ponds to remove sediment, temporary interceptors and a hydraulic brake. Consequently taking into account the mitigation measures set out in section 3.5 and 7 of this chapter, it is considered that the magnitude of impact would be **negligible**.

8.4.8 The significance of effects to surface watercourses crossed by trenchless techniques which include the integration of measures adopted in section 3.5 and 7 of this chapter would be of **negligible**, which is **not significant**.

Impacts of open cut, ducting and culverting may affect surface watercourses

8.4.9 One minor/ordinary watercourses and drain would be crossed by the proposed DC cable route and by temporary accesses associated with the installation process and construction site access roads. As noted in Section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.4.10 The use of open cut techniques to construct Route Section 4 of the proposed DC route has the potential to cause adverse impacts on surrounding watercourses and receptors. The use of heavy vehicles and the removal of sediment may lead to an increase in turbid runoff, reducing water quality (in turn WFD classification) in surrounding watercourses. Activities on site during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants that could affect nearby watercourses. Similarly, the cable route itself could act as a drainage channel, leading to run-off from construction affecting nearby watercourses.

8.4.11 With the incorporation of mitigation measures set out in section 3.5 and 7 of this chapter the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. The magnitude is therefore, considered to be **negligible**.

8.4.12 The significance of effects on the surface watercourses and field drains (that would be crossed without trenchless technology); including the integration of measures adopted in section 3.5 and 7 of the chapter is considered to be of **negligible**, which is **not significant**.

Construction works affecting field drainage and irrigation

8.4.13 As noted in Section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.4.14 The impact on field drainage and irrigation from open cut techniques during the construction phase could temporarily affect surface water flow pathways, impacting on water quality and potential flow rates.

8.4.15 The disruption of field drains along Route Section 4 along the proposed DC cable route may cause a backup on surrounding field drains, increasing the flood risk to the site and surrounding receptors. Activities during construction could lead to an increase in turbid run-off and spillages/leaks of fuel, oil and other pollutants contaminating field drainage affecting nearby watercourses and ecosystems.

8.4.16 The construction process is designed so that transition joint pits and joint bays would be buried and therefore not at risk of flooding. Measures would be included to restore field drainage where appropriate following the installation of the proposed DC cable route.

8.4.17 With the incorporation of mitigation measures described in section 7 of this chapter, the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. The magnitude is therefore, considered to be **negligible**.

8.4.18 The significance of effects on drainage/field infrastructure which included the integration of measures adopted in section 3.5 and 7 of this chapter is **negligible**, which is **not significant**.

Impacts that may affect Chalk Streams

8.4.19 No Chalk Streams are present within 250 m of the proposed DC cable route within Route Section 4.

Longer Term, Operational and Permanent Impacts

Impacts that may affect flood risk

8.4.20 Following the installation of the proposed DC cable route no impacts on flood risk baseline within Route Section 4 are anticipated.

The impact on main surface watercourses

8.4.21 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to main surface watercourses are anticipated within Route Section 4.

The impact on minor/ordinary surface watercourses

8.4.22 Following the installation of the buried cables no impacts on the water resources and/or hydrology baseline in relation to minor/ordinary surface watercourses are anticipated within Route Section 4.

Impacts of operation that may affect field drainage and irrigation

8.4.23 As noted in section 6 of this chapter the sensitivity of receptor is considered **medium**.

8.4.24 With the incorporation of mitigation measures set out in section 3.5 and 7 of this chapter, the impact is predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

8.4.25 The potential mitigated operation impacts are considered to be **negligible**, which is **not significant**.

Decommissioning Impacts

8.4.26 The impacts of decommissioning along Route Section 4 of the DC cable route on water resources and hydrology have been assessed in line with the methods outlined within section 2 of this chapter.

8.4.27 The decommissioning impacts along Route Section 4 of the DC cable route have been determined to be similar to and no worse than the construction (temporary) impacts in relation to flood risk, water quality and field drainage, and therefore considered **minor adverse significance** which is **not significant**.

9 Cumulative Effects

9.1 Scope of Cumulative Assessment

9.1.1 This section considers the inter-project and intra-project cumulative effects of the proposed DC cable route on water resources and hydrology in conjunction with other projects/developments and the development itself.

9.1.2 The potential cumulative impacts with other major developments and the proposed converter station, permanent access road and AC cable route have been identified outlining likely significant effects (if any) and assessing the proposed DC cable route against the baseline position, including the built and operational development In assessing cumulative impacts, other major developments identified through consultation with the local planning authorities and other relevant authorities on the basis of those that are:

- Under construction;
- Permitted application(s), but not yet implemented;
- Submitted application(s) not yet determined;
- Projects on the Planning Inspectorate's Programme of Projects;
- Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and
- Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

9.2 Inter-Project Cumulative Effects

9.2.1 A review of approved and proposed developments within a 250 m search area from the LoD of the proposed DC cable route has been undertaken.

9.2.2 A 250 m search area is considered appropriate for data collection taking into account the nature of the development and likely ZoI on hydrological receptors. Given the landscape surrounding the development, current and ongoing activities, as well natural baseline fluctuations it will be difficult to ascertain the exact source of any impacts on flood risk and/or water quality beyond 250 m.

9.2.3 The review of approved and proposed development established that there are 11 cumulative developments within the defined 250 m study area of the proposed DC cable route outlined in Table 8.31 below.

Table 8.31 Proposed DC cable route cumulative developments					
Project Reference	**Location / Address**	**Distance from DC cable route (m)**	**Details**	**Potential Overlap of construction phase with NGVL construction phase**	**Overlap of operation phase with NGVL operation phase**
B/13/0357 Application to dismantle and rebuild 1.29 km of 11 kv overhead lines.	Boston Borough Council. Land adjacent to, Sellars Farm, Sutterton Drove, Amber Hill, Boston, Lincolnshire.	0	Favourable Planning Decision October 2013	Yes	Yes
S/203/01106/15 Installation of 19,230 no. 5 MW solar panels to a maximum height of 2.7 m to create a solar farm and to include associated works and construction of a vehicular access.	East Lindsey District Council. Land off Folly Lane, Stickney, Boston, Lincolnshire.	0	Approved September 2015	Yes	Yes
N/089/02430/14 Erection of a 11kv overhead line	East Lindsey District Council. OH Power Line Rebuild adjoining Yarlsgate Farm, Huttoft Road, Sutton on Sea.	0	No Objection January 2015	Yes	Yes
N/089/01630/14 Erection of a 11kv overhead line	East Lindsey District Council. Land at Willow Farm, Langham Road, Lincolnshire.	0	No Objection October 2014	Yes	Yes
15/0416/S36 Application to vary S. 36 consent and deemed permission for the Heckington Fen Wind Park, Heckington Fen, near East Heckington.	North Kesteven Council. Land At Six Hundred Farm Six Hundred Drove East Heckington Lincolnshire.	100	No Objection June 2015	Yes	Yes

Table 8.31 Proposed DC cable route cumulative developments					
Project Reference	Location / Address	Distance from DC cable route (m)	Details	Potential Overlap of construction phase with NGVL construction phase	Overlap of operation phase with NGVL operation phase
N/089/01982/15 Erection of a free range poultry unit, provision of 2 no. feed silos and construction of a hard standing and access road	East Lindsey District Council. Land off Crawcroft Lane, Huttoft, Lincolnshire.	130	Approved January 2016	Yes	Yes
S/168/01773/14 Siting of 3 no. containers with flues to provide housing for 9 no. biomass boilers and to include 9 no. buffer tanks to provide heating for the existing poultry units.	East Lindsey District Council. Hagnaby Farm, Back Lane, Stickford, Boston, PE22 8EW.	150	Approved November 2014	Yes	Yes
N/110/00182/17 Change of use of land to site 2 no. static caravans, 5 no. bell tents, 24 no. touring caravans, all for holiday use.	East Lindsey District Council. South Farm, Huttoft Road, Sutton on Sea, LN12 2RU.	160	Approved June 2017	Yes	Yes
S/204/01679/16 Erection of a poultry unit, 2 no. feed silos and construction of a vehicular and a pedestrian access.	East Lindsey District Council. Land at Poplar Farm, Mill Lane, Spilsby, PE23 4AJ.	240	Approved October 2016	Yes	Yes
S/096/01701/16/3 Erection of a grain storage building.	East Lindsey District Council. Beech House Farm, Main Road, Boston, PE22 7AW.	245	No Objection September 2016	Yes	Yes

Table 8.31 Proposed DC cable route cumulative developments					
Project Reference	Location / Address	Distance from DC cable route (m)	Details	Potential Overlap of construction phase with NGVL construction phase	Overlap of operation phase with NGVL operation phase
N/137/00144/15 Instillation of 20no. 6kW solar panels on the south elevation of existing dwelling to include re-roofing and provision of a biomass boiler.	East Lindsey District Council. The Stables, Raithby House, Spilsby, PE23 4DS.	245	Approved March 2015	Yes	Yes

9.2.4 It has been determined that no cumulative impacts on water resources and hydrology receptors are likely as there is no pathway from the proposed developments to either the proposed landfall, the DC cable route or the TCC.

9.2.5 It is assumed, where relevant, in accordance with the NPS and/or NPPF and Planning Practice Guidance ID7 – Flood Risk and Coastal Change, any new development is required to attenuate surface water run-off, where practicable, to the greenfield run-off rate and provide appropriate management techniques to treat potentially contaminated run-off prior to discharge into the local drainage network.

9.2.6 Any Works undertaken within 8 m of a watercourse and/or flood defence will require consent. For the consent to be provided the developer is required to demonstrate that the risk of flooding during the lifetime of the development could be mitigated to a level acceptable to the EA, LLFA and/or IDB's. Therefore, the cumulative impacts on water resources and hydrology are predicted to not be significant.

9.3 Intra-Project Cumulative Effects

9.3.1 Intra-project effects on the proposed DC cable route are those effects occurring in combination with the proposed converter station, permanent access road and AC cable route.

9.3.2 It has been determined that no intra-project cumulative effects on water resources and hydrology receptors are likely as mitigation measures outlined within this chapter will be incorporated into the construction and operation of the components reducing any potential effects to not significant.

10 Summary of Assessment

10.1 Summary

Overview of Baseline Conditions

10.1.1 The majority of the proposed DC route is within Flood Zone 3 defined as at high risk of flooding from fluvial or tidal sources. Route Section 2 of the route is majority located within Undefended Flood Zone 1 'low probability' outside of tidal breach extents.

10.1.2 The surface water courses within the proposed DC cable route have an overall WFD status of moderate.

10.1.3 EA records indicate that two Chalk Streams, the River Lymn and an unnamed tributary, are present within the 250 m of the proposed DC cable route study area.

10.1.4 EA/Landmark Envirocheck® Report records indicate that there are a number of surface abstraction licences within 250 m of the proposed DC cable route search area associated with spray irrigation.

10.1.5 A number of SSSI's are present within 250 m of the proposed DC cable route search area including Sandilands Pit, Mavis Enderly Valley and Keal Carr.

10.1.6 A number of ancient woodlands are present within 250 m of the proposed DC cable route search area including Rigsby Wood, Horngy/Mother Woods and Callow Carr.

10.1.7 The majority of the proposed DC cable route is characterised by agricultural land with a number of small farm holdings.

Overview of Residual Effects

10.1.8 With the incorporation of appropriate mitigation measures, the significance of residual effects for the proposed DC cable route are a defined as minor to negligible adverse and therefore not significant.

Residual Effects in East Lindsey District Council

10.1.9 The residual effects within the ELDC area reflect the landfall and proposed DC cable route. During the construction phase of the development the TCC may affect the less permeable areas within the district, potentially increasing surface water flood risk. The use of trenchless and open cut techniques has the possibility to increase turbid surface water runoff into surrounding watercourses, potentially affecting WFD classification.

10.1.10 Design and Construction mitigation measures supplied within section 3.5 and 7 of this chapter respectively would reduce all potential residual effects to minor or negligible adverse and therefore not significant.

Residual Effects in Boston Borough Council

10.1.11 The residual effects within the BBC area reflect the proposed DC cable route, associated TCC and access road. During the construction phase of the development the temp TCC may affect the less permeable areas within the district, potentially increasing surface water flood risk. The use of trenchless and open cut techniques has the possibility to increase turbid surface water runoff into surrounding watercourses, potentially affecting WFD classification.

10.1.12 Design and Construction mitigation measures supplied within section 3.5 and 7 of this chapter respectively would reduce all potential residual effects to negligible adverse and therefore not significant.

Residual Effects in North Kesteven District Council

10.1.13 The residual effects within the NKDC area reflect the proposed DC cable route, associated TCC and access track. During the construction phase of the development the TCC may affect the less permeable areas within the district, potentially increasing surface water flood risk. The use of trenchless and open cut techniques has the possibility to increase turbid surface water runoff into surrounding watercourses, potentially affecting WFD classification.

10.1.14 Design and Construction mitigation measures supplied within section 3.5 and 7 of this chapter respectively would reduce all potential residual effects to negligible adverse and therefore not significant.

Residual Effects in South Holland District Council

10.1.15 The residual effects within the SHDC area reflect the proposed DC cable route, associated TCC and access track. During the construction phase of the development the TCC may affect the less permeable areas within the district, potentially increasing surface water flood risk. The use of trenchless and open cut techniques has the possibility to increase turbid surface water runoff into surrounding watercourses, potentially affecting WFD classification.

10.1.16 Design and Construction mitigation measures supplied within section 3.5 and 7 of this chapter respectively would reduce all potential residual effects to negligible adverse and therefore not significant.

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)								
Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
Temporary Impacts (Route Section 1)								
Impacts which may affect temporary (construction) flood risk	Medium	Low	Minor Adverse	The proposed construction compounds and access tracks may increase the less permeable area within the section. An appropriate temporary drainage system would be incorporated to manage off site flow outlined in section 7 of this chapter. No changes in surface water runoff rates are anticipated.	Medium	Negligible	Negligible	No
Impacts of trenchless techniques affecting surface watercourses	Medium	low	Minor Adverse	Activities involving trenchless techniques may increase soil erosion, increasing the likelihood of turbid runoff. All construction compounds associated with trenchless techniques will be dammed and on-site management protocols would be incorporated to manage off site flows.	Medium	Negligible	Negligible	No
Impacts of open cut, ducting and	Medium	low	Minor Adverse	Activities involving open cut techniques may increase the	Medium	Negligible	Negligible	No

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)								
Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
culverting may affect surface watercourses				likelihood of turbid runoff. open cut trenches will be dammed/culverted and pumped via settling tanks or ponds to remove sediment and potential contaminants before discharging into local ditches or drains.				
Construction works affecting field drainage and irrigation	Medium	Low	Minor Adverse	The construction phase has the potential to disrupt surrounding field drainage through the use of open cutting techniques. Field drainage would be restored to pre development condition where practicable, outlined in section 7 of this chapter.	High	Negligible	Negligible	No
Temporary Impacts (Route Section 2)								
Impacts which may affect temporary (construction) flood	Medium	Low	Minor Adverse	The proposed construction compounds and access tracks may increase the less permeable area within the section. An appropriate temporary drainage system would be incorporated to	Medium	Negligible	Negligible	No

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)								
Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
				manage off site flow outlined in section 7 of this chapter. No changes in surface water runoff rates are anticipated.				
Impacts of trenchless techniques affecting surface watercourses	Medium	Low	Minor Adverse	Activities involving trenchless techniques may increase soil erosion, increasing the likelihood of turbid runoff. All construction compounds associated with trenchless techniques will be dammed and on-site management protocols would be incorporated to manage off site flows.	Medium	Negligible	Negligible	No
Impacts of open cut, ducting and culverting may affect surface watercourses	Medium	Low	Minor Adverse	Activities involving open cut techniques may increase the likelihood of turbid runoff. open cut trenches will be dammed/culverted and pumped via settling tanks or ponds to remove sediment and potential contaminants before discharging into local ditches or drains.	Medium	Negligible	Negligible	

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)

Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
Construction works affecting field drainage and irrigation	Medium	Low	Minor Adverse	The construction phase has the potential to disrupt surrounding field drainage through the use of open cutting techniques. Field drainage would be restored to pre development condition where practicable, outlined in section 7 of this chapter.	Medium	Negligible	Negligible	No
Impacts that may affect Chalk Streams	High	Low	Moderate Adverse	Activities in close proximity of the Chalk Streams may increase soil erosion, increasing the likelihood of turbid runoff. All construction compounds associated with trenchless techniques will be dammed and on-site management protocols would be incorporated to manage off site flows.	High	Negligible	Minor Adverse	No
Temporary Impacts (Route Section 3)								
Impacts which may affect temporary	Medium	Low	Minor Adverse	The proposed construction compounds and access tracks may increase the less permeable area within the	Medium	Negligible	Negligible	No

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)								
Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
(construction) flood				section. An appropriate temporary drainage system would be incorporated to manage off site flow outlined in section 7 of this chapter. No changes in surface water runoff rates are anticipated.				
Impacts of trenchless techniques affecting surface watercourses	Medium	Low	Minor Adverse	Activities involving trenchless techniques may increase soil erosion, increasing the likelihood of turbid runoff. All construction compounds associated with trenchless techniques will be dammed and on-site management protocols would be incorporated to manage off site flows.	Medium	Negligible	Negligible	No
Impacts of open cut, ducting and culverting may affect surface watercourses	Medium	Low	Minor Adverse	Activities involving open cut techniques may increase the likelihood of turbid runoff. Open cut trenches will be dammed/culverted and pumped via settling tanks or ponds to remove sediment and	Medium	Negligible	Negligible	No

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)								
Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
				potential contaminants before discharging into local ditches or drains.				
Construction works affecting field drainage and irrigation	Medium	Low	Minor Adverse	The construction phase has the potential to disrupt surrounding field drainage through the use of open cutting techniques. Field drainage would be restored to pre development condition where practicable, outlined in section 7 of this chapter.	Medium	Negligible	Negligible	No
Temporary Impacts (Route Section 4)								
Impacts which may affect temporary (construction) flood	Medium	Low	Minor Adverse	The proposed construction compounds and access tracks may increase the less permeable area within the section. An appropriate temporary drainage system would be incorporated to manage off site flow outlined in section 7 of this chapter. No changes in surface water runoff rates are anticipated.	Medium	Negligible	Negligible	No

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)								
Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
Impacts of trenchless techniques affecting surface watercourses	Medium	Low	Minor Adverse	Activities involving trenchless techniques may increase soil erosion, increasing the likelihood of turbid runoff. All construction compounds associated with trenchless techniques will be dammed and on-site management protocols would be incorporated to manage off site flows.	Medium	Negligible	Negligible	No
Impacts of open cut, ducting and culverting may affect surface watercourses	Medium	Low	Minor Adverse	Activities involving open cut techniques may increase the likelihood of turbid runoff. open cut trenches will be dammed/culverted and pumped via settling tanks or ponds to remove sediment and potential contaminants before discharging into local ditches or drains.	Medium	Negligible	Negligible	No
Construction works affecting field drainage and irrigation	Medium	Low	Minor Adverse	The construction phase has the potential to disrupt surrounding field drainage through the use of open cutting	Medium	Negligible	Negligible	No

Table 8.32 Summary of Assessment: Water Resources and Hydrology (DC Cable Route)								
Description of Receptor	Potential Impacts			Mitigation	Residual Effects			Significant
	Sensitivity	Magnitude	Significance		Sensitivity	Magnitude	Significance	
				techniques. Field drainage would be restored to pre development condition where practicable, outlined in section 7 of this chapter.				

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