RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Environmental Statement

Volume 7

Chapter 20 – Flood Risk and Hydrology (Revision 2) (Clean)

January 2025

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Unrestricted

Company:	**RWE Renewables UK Dogger Bank South (West) Limited and RWE Renewables UK Dogger Bank South (East) Limited**	Asset:	**Development**
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Unrestricted

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Rev No.	**Page**	**Section**	**Description**
01	N/A	N/A	Submitted for DCO Application
02	55, 56, 57, 58 166, 167	20.4.3.1 References	Chapter 20 Flood Risk has been updated to address Issue Specific Hearing 2 Supplementary Agenda Questions ISH2.11.1 and ISH2.11.2 raised by the ExA prior to the ISH2 [EV5-002]. More details are contained within 'The Applicants' Responses to Issue Specific Hearing 2 Supplementary Agenda Questions' [document reference 11.5].
02	83, 84, 85, 88, 89, 93, 94, 119, 122, 124	20.6.1.1.1 20.6.1.1.2 20.6.1.1.5 20.6.1.4.5	Chapter 20 Flood Risk and Hydrology and Appendix 20-3 Water Environmental Regulations Compliance Assessment (Revision 2) have been updated to address Action Point 30 of Agenda Item 11: Onshore Water Environment, raised by the ExA following the ISH2 [EV5-004]. The number of watercourse crossings have been reviewed and updated throughout Chapter 20 and Appendix 20-3. More details are provided in 'The Applicants' Responses to January 2025 Action Points' [document reference 11.6].

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Glossary

Term	Definition
Aquifer	Geological strata that hold water.
Coastal catchment	Land which drains directly to the coastal or estuarine waters, rather than through a river water body – not part of a river water body catchment.
Concurrent Scenario	A potential construction scenario for the Projects where DBS East and DBS West are both constructed at the same time.
Development Scenario	Description of how the DBS East and/or DBS West Projects would be constructed either In Isolation, Sequentially or Concurrently.
Geomorphology	The study of landforms and the processes that shape them.
Groundwater	Water stored below the ground in rocks or other geological strata.
Haul Road	The track along the Onshore Export Cable Corridor used by traffic to access different sections of the Onshore Export Cable route for construction.
Horizontal Directional Drill (HDD)	HDD is a trenchless technique to bring the offshore cables ashore at the landfall and can be used for crossings other obstacles such as roads, railways and watercourses onshore.
In Isolation Scenario	A potential construction scenario for one Project which includes either the DBS East or DBS West array, associated offshore and onshore cabling and only the eastern Onshore Converter Station within the Onshore Substation Zone and only the northern route of the onward cable route to the proposed Birkhill Wood National Grid Substation.
Landfall	The point on the coastline at which the Offshore Export Cables are brought onshore, connecting to the onshore cables at the Transition Joint Bay (TJB) above mean high water.

Term	Definition
Main River	Main Rivers are usually large rivers or streams that are designated under the Water Resources Act (1991) and are shown on the statutory Main River Map. They are managed by the Environment Agency, who carry out construction, maintenance and improvement works to manage flood risk.
Onshore Converter Stations	A compound containing electrical equipment required to transform and stabilise electricity generated by the Projects so that it can be connected to the electricity transmission network. There will be one Onshore Converter Station for each Project.
Onshore Development Area	The Onshore Development Area for ES is the boundary within which all onshore infrastructure required for the Projects would be located including Landfall Zone, Onshore Export Cable Corridor, accesses, Temporary Construction Compounds and Onshore Converter Stations.
Onshore Export Cable Corridor	This is the area which includes cable trenches, Haul Roads, spoil storage areas, and limits of deviation for micro-siting. For assessment purposes, the cable corridor does not include the Onshore Converter Stations, Transition Joint Bays or temporary access routes; but includes Temporary Construction Compounds (purely for the cable route).
Onshore Substation Zone	Parcel of land within the Onshore Development Area where the Onshore Converter Station infrastructure (including the Haul Roads, Temporary Construction Compounds and associated cable routeing) would be located.
Ordinary watercourse	Rivers which are not Main Rivers are called 'ordinary watercourses'. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on ordinary watercourses.
Sequential Scenario	A potential construction scenario for the Projects where DBS East and DBS West are constructed with a lag between the commencement of construction activities. Either Project could be built first

Term	Definition
Surface water flooding	Surface water flooding occurs when rainwater does not drain away through normal drainage systems or soak into the ground but lies on or flows over the ground instead.
Temporary Construction Compound	An area set aside to facilitate construction of the Projects. These will be located adjacent to the Onshore Export Cable Corridor and within the Onshore Substation Zone, with access to the highway.
The Applicants	The Applicants for the Projects are RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South Offshore Wind Farms).

Acronyms

Term	Definition
AEP	Annual Exceedance Probability
CEA	Cumulative Effect Assessment
CIRIA	Construction Industry Research and Information Association
DBS	Dogger Bank South
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
EIA	Environmental Impact Assessment
ES	Environmental Statement
FRA	Flood Risk Assessment
FWMA	Flood and Water Management Act 2010
HDD	Horizontal Directional Drilling
IDB	Internal Drainage Board
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
NPS	National Policy Statement
OCoCP	Outline Code of Construction Practice
PBDE	Polybrominated diphenyl ethers
PEIR	Preliminary Environmental Information Report
PPG	Pollution Prevention Guidance
RBD	River Basin District

Term	Definition
RBMP	River Basin Management Plan
RNAG	Reasons for Not Achieving Good
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
TJB	Transition Joint Bay
WER	The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, commonly referred to as the Water Environment Regulations
WFD	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, commonly referred to as the Water Framework Directive

20 Flood Risk and Hydrology

20.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the likely significant effects of the Projects on Flood Risk and Hydrology. The chapter provides an overview of the existing environment for the proposed Onshore Development Area, followed by an assessment of likely significant effects for the construction, operation, and decommissioning phases of the Projects.

2. The assessment should be read in conjunction with the following linked chapters:

- **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**; and
- **Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)**.

3. **Volume 7, Chapter 20 Flood Risk and Hydrology (application ref: 7.20)** and **Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)** both assess impacts on groundwater quality. **Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)** specifically assesses risks associated with potential sources of contamination based on historical and current land uses and considers in detail underlying hydrogeological conditions and source receptor pathways from potential sites of contamination. **Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)** is informed by results of a Preliminary Risk Assessment (**Volume 7, Appendix 19-2 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (application ref: 7.19.19.2)**).

4. **Volume 7, Chapter 20 Flood Risk and Hydrology (application ref: 7.20)** assesses the potential for contamination from construction materials (e.g. fuels, oils and lubricants) and methods (e.g. trenched crossings), as well as the supply of nutrients, and assesses how pollutants may interact with groundwater and potentially transfer from surface waters to groundwater. Impacts on groundwater in **Volume 7, Chapter 20 Flood Risk and Hydrology (application ref: 7.20)** inform the Water Environment Regulations Compliance Assessment (**Volume 7, Appendix 20-3 Water Environment Regulations Compliance Assessment (application ref: 7.20.20.3)**).

5. Additional information to support the Flood Risk and Hydrology assessment include:

- **Volume 7, Appendix 20-1 Consultation Responses (application ref: 7.20.20.1)**;
- **Volume 7, Appendix 20-2 Geomorphology Baseline Survey Technical Report (application ref: 7.20.20.2)**;
- **Volume 7, Appendix 20-3 Water Environment Regulations Compliance Assessment (application ref: 7.20.20.3)**; and
- **Volume 7, Appendix 20-4 Flood Risk Assessment (application ref: 7.20.20.4)**.

20.2 Consultation

6. Consultation with regard to Flood Risk and Hydrology has been undertaken in line with the general process described in **Volume 7, Chapter 7 Consultation (application ref: 7.7)** and the **Consultation Report (Volume 5, application ref: 5.1)** The key elements to date have including scoping, the ongoing Evidence Plan Process (EPP) via the Flood Risk and Hydrology Expert Topic Group (ETG) and the Preliminary Environmental information Report (PEIR).

7. The feedback received throughout this process has been considered in preparing the ES. This chapter has been updated following consultation in order to produce the final assessment submitted within the Development Consent Order (DCO) application. **Volume 7, Appendix 20-1 (application ref: 7.20.20.1)** provides a summary of the consultation responses received to date relevant to this topic, and details how the comments have been addressed within this chapter.

20.3 Scope

20.3.1 Effects Scoped In and Scoped Out

8. During the Projects' scoping stage, it was agreed that the following construction impacts would be assessed within the Flood Risk and Hydrology ES:

- Direct disturbance of surface water bodies;
- Increased sediment supply;
- Accidental release of contaminants to surface and groundwaters; and
- Changes to surface and groundwater flows and flood risk.

9. During the Projects' scoping stage, it was agreed that the direct disturbance of surface water bodies would be scoped out during the operational phase. Once the Projects are operational there will be no mechanisms by which elements of the Projects could directly disturb water bodies.

20.3.2 Study Area

10. The Humber River Basin Management Plan (RBMP) has been developed to comply with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 by the Environment Agency (Environment Agency, 2022). The RBMP defines river water body catchments based on surface hydrological catchments with an area of greater than 5km^2. The study area for Flood Risk and Hydrology has been defined based on these surface hydrological catchments (see **Volume 7, Figure 20-1 (application ref: 7.20.1)**).

11. Catchments have been included within the study area if they are crossed by the Onshore Development Area, or they are hydrologically connected downstream. Catchments that are hydrologically connected upstream are not considered due to the lack of any mechanism for likely effects to propagate upstream. The Onshore Development Area is shown on **Volume 7, Figure 20-1 (application ref: 7.20.1)**.

12. The study area includes a narrow strip of land termed the onshore coastal catchment (**Volume 7, Figure 20-1 (application ref: 7.20.1)**). This is land which drains directly to coastal or estuarine waters, rather than through a river water body – i.e., it is not part of a river water body catchment. For this assessment, the onshore coastal catchment extends to Mean High Water Springs (MHWS). Potential impacts in the intertidal zone and on associated protected areas are assessed in **Volume 7, Appendix 20-3 Water Environment Regulations Compliance Assessment (application ref: 7.20.20.3)** and in **Volume 7, Chapter 8 Marine Physical Environment (application ref: 7.8)**.

13. When considering the potential impacts to groundwater, the study area is limited to those groundwater bodies that lie directly beneath the Onshore Development Area, which are shown on **Volume 7, Figure 20-2 (application ref: 7.20.1)**.

14. This chapter considers the potential impacts of the Projects on the hydrology, geomorphology and quality of surface waters and the quality and quantity of groundwaters. It also considers potential changes to flood risk.

20.3.3 Realistic Worst Case Scenario

20.3.3.1 General Approach

15. The realistic worst case design parameters for likely significant effects scoped into the ES for the Flood Risk and Hydrology assessment are summarised in **Table 20-1**. These are based on the project parameters described in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**, which provides further details regarding specific activities and their durations.

16. In addition to the design parameters set out in **Table 20-1**, consideration is also given to the different Development Scenarios still under consideration as set out in sections 20.3.2.2 to 20.3.3.4.

Table 20-1 Realistic Worst Case Design Maximum Parameters

Impacts	**Parameter**			
	DBS East or DBS West In Isolation	**DBS East and DBS West Concurrently**	**DBS East and DBS West Sequentially**	**Notes and Rationale**
Construction				
Landfall Zone	• Total landfall zone area (m²): 420,000 • Number of completed trenchless crossing ducts (maximum): 3 (2 for power cables, 1 for fibre optic cables) • Indicative trenchless crossing depth (m): 20 • • No. of transition joint bays: 2 • Transition joint bay dimensions (m): 5 x 20 • Permanent land take for TJBs (m²): 200 – including below ground infrastructure • Number of Link Boxes (2.5 x 4m): 2 – the only above ground infrastructure • Permanent land take for total number of Link Boxes (m²): 20 • Landfall TJB construction compound works area (m): 110 x 75 • Landfall satellite construction compound (m): 75x 75 • Temporary access: Route from the existing road system • Duration of works: 18 months overall (not continuous)	• Total landfall zone area (m²): 420,000 • Number of completed trenchless crossing ducts: 6 (4 for power cables, 2 for fibre optic cables) • Indicative trenchless crossing depth (m): 20 • No. of transition joint bays: 4 • Transition joint bay dimensions (m): 5 x 20 • Permanent land take for TJBs (m²): 400 – including below ground infrastructure • Number of Link Boxes (2.5 x 4m): 4 – the only above ground infrastructure • Permanent land take for total number of Link Boxes (m²): 40 • Landfall TJB construction compound works area (m): 190 x 75 • Landfall satellite construction compound (m): 75x 75 Temporary access: Route from the existing road system • Duration of works: up to 18 months overall (not continuous)	• Total landfall zone area (m²): 420,000 • Number of completed trenchless crossing ducts: 6 (4 for power cables, 2 for fibre optic cables) • Indicative trenchless crossing depth (m): 20 • No. of transition joint bays: 4 • Transition joint bay dimensions (m): 5 x 20 • Permanent land take for TJBs (m²): 400 – including below ground infrastructure • Number of Link Boxes (2.5 x 4m): 4 – the only above ground infrastructure • Permanent land take for total number of Link Boxes (m²): 40 • Landfall TJB construction compound works area (m): 190 x 75 • Landfall satellite construction compound (m): 75x 75 • Duration of works: up to 48 months overall (not continuous)	The TJB compound works area and TJBs locations within the Landfall Zone are subject to detailed design. The TJBs would be set back from the cliffs to account for potential coastal erosion over time.
Onshore Export Cable route from Landfall Zone to the Onshore Substation Zone	• Indicative corridor length between Landfall Zone and the Onshore Substation Zone (km): 32 • Number of export circuits: 1 (HVDC) • Number of power cables per circuit: 2 (HVDC)	• Indicative corridor length between Landfall Zone and the Onshore Substation Zone (km): 32 • Number of export circuits: 2 (HVDC) • Number of power cables per circuit: 2 (HVDC)	• Indicative corridor length between Landfall Zone and the Onshore Substation Zone (km): 32 • Number of export circuits: 2 (HVDC) Number of power cables per circuit: 2 (HVDC)	Deeper burial depth may be required if open cut crossing of obstacle such as utility / watercourse / road etc. The Concurrent and Sequential Scenarios will involve a greater extent of construction works. The

<table>
<tr><th rowspan="2">Impacts</th><th colspan="4">Parameter</th></tr>
<tr><th>DBS East or DBS West In Isolation</th><th>DBS East and DBS West Concurrently</th><th>DBS East and DBS West Sequentially</th><th>Notes and Rationale</th></tr>
<tr><td></td><td>• Number of fibre optic (communication) cables per circuit: 1
• Number of earth cables per circuit: 1
• Number of trenches: Up to 2
• Cable duct trench dimensions: 1.1m base to 3.9m surface for each single. 3.35m base to 6.15m surface for dual HVDC
• Number of Temporary Construction Compounds: 17 (2 main compounds, 15 satellite compounds including the Landfall Zone satellite construction compound)
• Size of main construction compound (m²): 10,000 (roughly 100x100m)[1]
• Size of satellite construction compounds (m²): 5625 (roughly 75x75m)
• Cable corridor width (m): 41
• Cable corridor width at trenchless crossings (m): 45
• Approximate depth of trench to top of duct / cables (m): 1.3 – 1.7
• Maximum burial depth (m) where restrictions are not present: 2
• Indicative burial depth (m): 1.6
• Jointing Bays (km): every 0.75 – 1.5
• Indicative number of Jointing Bays: 103
• Jointing Bay construction dimensions (per bay) (m): 10 x 25</td><td>• Number of fibre optic (communication) cables per circuit: 1
• Number of earth cables per circuit: 1
• Number of trenches: Up to 4
• Cable duct trench dimensions: 1.1m base to 3.9m surface for each single. 3.35m base to 6.15m surface for dual HVDC
• Number of Temporary Construction Compounds: 17 (2 main compounds, 15 satellite compounds including the Landfall Zone satellite construction compound)
• Size of main construction compound (m²): 10,000 (roughly 100x100m)
• Size of satellite construction compounds (m²): 5625 (roughly 75x75m)
• Cable corridor width (m): 75
• Cable corridor width at trenchless crossings (m): 90
• Approximate depth of trench to top of duct / cables (m): 1.3 – 1.7
• Maximum burial depth (m) where restrictions are not present: 2
• Indicative burial depth (m): 1.6
• Jointing Bays (km): every 0.75 – 1.5
• Indicative number of Jointing Bays: 205
• Jointing Bay construction dimensions (per bay): 10 x 25m</td><td>• Number of fibre optic (communication) cables per circuit: 1
• Number of earth cables per circuit: 1
• Number of trenches: Up to 4
• Cable duct trench dimensions: 1.1m base to 3.9m surface for each single. 3.35m base to 6.15m surface for dual HVDC
• Number of Temporary Construction Compounds: 17 (2 main compounds, 15 satellite compounds including the Landfall Zone satellite construction compound)
• Size of main construction compound (m²): 10,000 (roughly 100x100m)
• Size of satellite construction compounds (m²): 5625 (roughly 75x75m)
• Cable corridor width (m): 75
• Cable corridor width at trenchless crossings (m): 90
• Approximate depth of trench to top of duct / cables (m): 1.3 – 1.7
• Maximum burial depth (m) where restrictions are not present: 2
• Indicative burial depth (m): 1.6
• Jointing Bays (km): every 0.75 – 1.5
• Indicative number of Jointing Bays: 205
• Jointing Bay construction dimensions (per bay): 10 x 25m</td><td>Sequential Scenario will result in the longest duration. Therefore, the DBS East and DBS West Sequential Scenario is considered worst case and assessed in this chapter.

Sequential construction would result in a longer duration of temporary watercourse crossings being in place along the Onshore Export Cable Corridor.</td></tr>
</table>

[1] Actual size may vary due to site specifics

Impacts	Parameter			
	DBS East or DBS West In Isolation	**DBS East and DBS West Concurrently**	**DBS East and DBS West Sequentially**	**Notes and Rationale**
	• Jointing Bay infrastructure dimensions (all below ground) (m): 3x8 • Jointing Bay burial depth from existing ground level to bottom of Jointing Bays (m): 2.2 • Jointing Bay depth from existing ground level to top of Jointing Bays (m): 1.35m • Number of Earth / Link boxes and associated manhole covers: 103 • Link box dimensions / manhole cover permanent infrastructure above ground (m): 2.5x4 • Link box construction dimensions (m): 6.5x8 • Haul Road: 5m (increasing to 8m at passing places) • Approximate permanent easement along the cable corridor (m): 15 • Expected maximum trenchless crossing depth (m): 20 • Trenchless crossing compound dimensions: 60 x 40m assumed for the Project's compounds on each side of the obstacle (entry and exit compounds). • No. of trenchless crossings compounds: Min 41 and up to maximum of 147 entry compounds • Min 41 and up to maximum of 147 exit compounds • All other crossings assumed to be open cut (see **Volume 7, Appendix 5-2 Obstacle Crossing Register (application ref: 7.5.5.2)**) • Total onshore cable corridor works area (est.) (m^2): 4,252,209	• Jointing Bay infrastructure dimensions (all below ground) (m): 3x8 • Jointing Bay burial depth from existing ground level to bottom of Jointing Bays (m): 2.2 • Jointing Bay depth from existing ground level to top of Jointing Bays (m): 1.35m • Number of Earth / Link boxes and associated manhole covers: 205 • Link box dimensions / manhole cover permanent infrastructure above ground (m): 2.5x4 • Link box construction dimensions (m): 6.5x8 • Haul Road: 5m (increasing to 8m at passing places) • Approximate permanent easement along the cable corridor (m): 24. • Expected maximum trenchless crossing depth (m): 20 • Trenchless crossing compound dimensions: 60 x 40m per project assumed for the Project's compounds on each side of the obstacle (entry and exit compounds). • No. of trenchless crossings compounds: Min 82 and up to maximum of 294 entry compounds • Min 82 and up to maximum of 294 exit compounds • All other crossings assumed to be open cut (see **Volume 7, Appendix 5-2 Obstacle Crossing Register (application ref: 7.5.5.2)**) • Total onshore cable corridor works area (est.) (m^2): 4,503,397	• Jointing Bay infrastructure dimensions (all below ground) (m): 3x8 • Jointing Bay burial depth from existing ground level to bottom of Jointing Bays (m): 2.2 • Jointing Bay depth from existing ground level to top of Jointing Bays (m): 1.35m • Number of Earth / Link boxes and associated manhole covers: 205 • Link box dimensions / manhole cover permanent infrastructure above ground (m): 2.5x4 • Link box construction dimensions (m): 6.5x8 • Haul Road: 5m (increasing to 8m at passing places) • Approximate permanent easement along the cable corridor (m): 24. • Expected maximum trenchless crossing depth (m): 20 • Trenchless crossing compound dimensions: 60 x 40m per project assumed for the Project's compounds on each side of the obstacle (entry and exit compounds). • No. of trenchless crossings compounds: Min 82 and up to maximum of 294 entry compounds • Min 82 and up to maximum of 294 exit compounds • All other crossings assumed to be open cut (see **Volume 7, Appendix 5-2 Obstacle Crossing Register (application ref: 7.5.5.2)**) • Total onshore cable corridor works area (est.) (m^2): 4,503,397	

Impacts	Parameter			
	DBS East or DBS West In Isolation	**DBS East and DBS West Concurrently**	**DBS East and DBS West Sequentially**	**Notes and Rationale**
	• Duration: 33 months	• Duration: 33 months	• Duration of works: up to 57 months overall (note this would not be continuous working within that timeframe)	
Onshore Substation Zone	• Operational compounds for Converter Station (m): 244 x 264 (HVDC Converter) • Total construction area (m^2): 94,000 (based on one HVDC Converter station + Temporary Construction Compound area) o Area of Converter station (m^2): 64,000 o No. of Converter Station compounds: 1 main temporary compound (3 location options identified) o Converter Station compound (m^2): 30,000 • Duration: 4 years	• Operational compounds for Converter Station (m): 244 x 264 (HVDC Converter) plus 244 x 264 (HVDC Converter) • Total construction area (m^2): 189,000 (based on two HVDC Converter Station + Temporary Construction Compound areas) o Area of Converter Station(s) (m^2): 129,000 o No. of Converter station compounds: 2 (1 main Temporary Construction Compound and 1 satellite Temporary Construction Compound) o Converter Station compounds total area (m^2): 60,000 • Duration: 4 years	• Operational compounds for Converter Station (m): 244 x 264 (HVDC Converter) plus 244 x 264 (HVDC Converter) • Total construction area (m^2): 189,000 (based on two HVDC Converter Station + Temporary Construction Compound area) o Area of Converter Station(s) (m^2): 129,000 o No. of Converter Station compounds: 2 (1 main Temporary Construction Compound and 1 satellite Temporary Construction Compound) o Converter Station compounds total area (m^2): 60,000 • Duration: 6 years	The concurrent and Sequential Scenarios will involve a greater extent of construction works. The Sequential Scenario will result in the longest duration. Therefore, the DBS East and DBS West Sequential Scenario is considered worst case and assessed in the Chapter.
Onward Cable Connection to Proposed Birkhill Wood National Grid Substation	• Onward corridor length from Onshore Converter Station to proposed Birkhill Wood National Grid Substation (km): 2.5 • Number of export circuits: 4x400kV • Technology: HVAC • Cabling from Project Onshore Converter Station to National Grid Substation: Buried • General cable corridor approximate permanent easement swathe (m): 20 • Cable corridor construction swathe (m): 53.5	• Onward corridor length from Onshore Converter Station to proposed Birkhill Wood National Grid Substation (km): 2.5 • Number of export circuits: 8x400kV • Technology: HVAC • Cabling from Projects Onshore Converter Station to National Grid Substation: Buried • General cable corridor approximate permanent easement swathe (m): 34 • Cable corridor construction swathe (m): 100	• Onward corridor length from Onshore Converter Station to proposed Birkhill Wood National Grid Substation (km): 2.5 • Number of export circuits: 8x400kV • Technology: HVAC • Cabling from Projects Onshore Converter Station to National Grid Substation: Buried • General cable corridor approximate permanent easement swathe (m): 34 • Cable corridor construction swathe (m): 100	

Impacts	Parameter			
	DBS East or DBS West In Isolation	DBS East and DBS West Concurrently	DBS East and DBS West Sequentially	Notes and Rationale
	• Cable construction satellite construction compound dimensions (m) : 75x75 • Number of earth / link boxes: 35	• Cable construction satellite construction compound dimensions (m) : 75x75 • Number of earth / link boxes: 70	• Cable construction satellite construction compound dimensions (m) : 75x75 • Number of earth / link boxes: 70	
Operation and Maintenance				
Landfall Zone	• Permanent land take for the total number of TJBs (m2): 200 – including below ground infrastructure • Number of manhole covers within Landfall Zone: 2 • Total area of permanent land take for manhole covers above ground (m^2): 20 • All other construction disturbance restored to pre-existing condition.	• Permanent land take for the total number of TJBs (m2): 400 – including below ground infrastructure • Number of manhole covers within Landfall Zone: 4 • Total area of permanent land take for manhole covers above ground (m^2): 40 • All other construction disturbance restored to pre-existing condition.	• Permanent land take for the total number of TJBs (m^2): 400 – including below ground infrastructure • Number of manhole covers within Landfall Zone: 4 • Total area of permanent land take for manhole covers above ground (m^2): 40 • All other construction disturbance restored to pre-existing condition.	Concurrent or sequential are considered the worst case as they would result in a greater area of permanent land take/permanent infrastructure.
Onshore Export Cable route from Landfall Zone to the Onshore Substation Zone	• Jointing Bay permanent infrastructure dimensions (all below ground): 3x8m • Jointing Bay depth (m): 2.2 (from existing ground level to the bottom of the joint bay) • Number of Earth/Link boxes (buried, manhole at the surface and the only above ground permanent infrastructure along the cable corridor): up to 103 (up to 2 link boxes per HVDC circuit) • Link Box dimensions (permanent infrastructure/manhole covers) (m) : 2.5x4 • Total permanent land take for link boxes/manhole covers (m^2): 1,030 • All construction disturbance restored to pre-existing condition	• Jointing Bay permanent infrastructure dimensions (all below ground): 3x8m • Jointing Bay depth (m): 2.2 (from existing ground level to the bottom of the joint bay) • Number of Earth/Link boxes (buried, manhole at the surface and the only above ground permanent infrastructure along the cable corridor): up to 205 (up to 2 link boxes per HVDC circuit) • Link Box dimensions (permanent infrastructure/manhole covers) (m) : 2.5x4m • Total permanent land take for link boxes/manhole covers (m^2): 2,050 • All construction disturbance restored to pre-existing condition	• Jointing Bay permanent infrastructure dimensions (all below ground): 3x 8m • Jointing Bay depth (m): 2.2 (from existing ground level to the bottom of the joint bay) • Number of Earth/Link boxes (buried, manhole at the surface and the only above ground permanent infrastructure along the cable corridor): up to 205 (up to 2 link boxes per HVDC circuit) • Link Box dimensions (permanent infrastructure/manhole covers) (m) : 2.5x4m • Total permanent land take for link boxes/manhole covers (m^2): 2,050 • All construction disturbance restored to pre-existing condition	Concurrent or sequential are considered the worst case as they would result in a greater area of permanent land take/permanent infrastructure.

Impacts	Parameter			
	DBS East or DBS West In Isolation	**DBS East and DBS West Concurrently**	**DBS East and DBS West Sequentially**	**Notes and Rationale**
	• Approximate permanent easement along the cable corridor (m): 15.	• Approximate permanent easement along the cable corridor (m): 24	• Approximate permanent easement along the cable corridor (m): 24.	
Onshore Substation Zone	• Permanent Converter Station area (m^2); 64,416 (244m x 264m) (based on one HVDC Converter station) • All other construction disturbance restored to pre-existing condition. • Operational duration: 30 years	• Permanent Converter Station area (m^2): 128,832 (244m x 264m plus 244m x 264m) (based on two HVDC Converter stations) • All other construction disturbance restored to pre-existing condition. • Operational duration: 30 years	• Permanent Converter Station area (m^2): 128,832 (244m x 264m plus 244m x 264 m) (based on two HVDC Converter stations) • All other construction disturbance restored to pre-existing condition. • Operational duration: 32 years	The Concurrent and Sequential Scenarios will require two Converter stations within the Onshore Substation Zone and therefore will have greater effects than DBS West or DBS East in isolation. The Sequential Scenario will result in a slightly longer operational duration, due to the assumed two-year lag in construction between the two Projects. Therefore, the DBS East and DBS West Sequential Scenario is considered worst case and assessed in this Chapter.
Onshore Onward Cable Route to the Proposed Birkhill Wood National Grid Substation	• 35 manholes at the surface • Approximate total area of permanent land take for link boxes/manhole covers (m^2): 350 • General cable corridor approximate permanent easement swathe (m): 20	• 70 manholes at the surface • Approximate total area of permanent land take for link boxes/manhole covers (m^2): 700 • General cable corridor approximate permanent easement swathe (m): 34	• 70 manholes at the surface • Approximate total area of permanent land take for link boxes/manhole covers (m^2): 700 • General cable corridor approximate permanent easement swathe (m): 34	
Decommissioning				
No final decision regarding the final decommissioning policy for the onshore Project infrastructure including landfall, onshore cable route and onshore substation has yet been made. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore Project equipment, including the cable, will be removed, reused or recycled wherever possible and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the worst case scenario, the impacts will be no greater than those identified for the construction phase. A decommissioning plan for the onshore works would be submitted prior to any decommissioning commencing.				

20.3.3.2 Development Scenarios

17. Following Statutory Consultation high voltage alternating current (HVAC) technology (previously assessed in PEIR) was removed from the Projects' design envelope (see **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4)** for further information). As a result, only high voltage direct current (HVDC) technology has been taken forward for assessment purposes. The ES considers the following development scenarios:

- Either DBS East or DBS West is built In Isolation; or
- DBS East and DBS West are both built either sequentially or concurrently.

18. An In Isolation Scenario has been assessed within the ES on the basis that theoretically one Project could be taken forward without the other being built out. If an In Isolation Scenario is taken forward, either DBS East or DBS West may be constructed. As such the onshore assessment considers both DBS East and DBS West in isolation.

19. If an In Isolation Scenario is taken forward, only the eastern Onshore Converter Station within the Onshore Substation Zone would be constructed. In either the Concurrent or Sequential Scenario, both Onshore Converter Station locations within the Onshore Substation Zone would be taken forward for the onshore assessment.

20. In order to ensure that a robust assessment has been undertaken, all Development Scenarios have been considered to ensure the realistic worst-case scenario for each topic has been assessed. A summary is provided here, and further details are provided in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**.

21. The three Development Scenarios to be considered for assessment purposes are outlined in **Table 20-2**.

Table 20-2 Development Scenarios and Construction Durations

Development Scenarios and Construction Durations	Description	Total Maximum Construction Duration (Years)	Maximum construction Duration Offshore (Years)	Maximum construction Duration Onshore (Years)
In Isolation	Either DBS East or DBS West is built in isolation.	Five	Five	Four
Sequential	DBS East and DBS West are both built sequentially, either Project could commence construction first with staggered / overlapping construction.	Seven	A five year period of construction for each project with a lag of up to two years in the start of construction of the second project (excluding landfall duct installation) – reflecting the maximum duration of effects of seven years.	Construction works (i.e. onshore cable civil works, including duct installation) to be completed for both Projects simultaneously in the first four years, with additional works at the Landfall Zone, in the Onshore Substation Zone and cable joint bays in the following two years. Maximum duration of effects of six years.

Development Scenarios and Construction Durations	Description	Total Maximum Construction Duration (Years)	Maximum construction Duration Offshore (Years)	Maximum construction Duration Onshore (Years)
Concurrent	DBS East and DBS West are both built concurrently reflecting the maximum peak effects.	Five	Five	Four

22. Any differences between the Projects, or differences that could result from the manner in which the first and the second Projects are built (concurrent or sequential and the length of any lag) are identified and discussed where relevant in section 20.6. For each potential impact, the worst case construction scenario for the In Isolation Scenario and the Concurrent or Sequential Scenario is presented. The worst case scenario presented for the Concurrent or Sequential Scenario will depend on which of these is the worst case for the potential impact being considered. The justification for what constitutes the worst case is provided, where necessary, in section 20.3.3.

20.3.3.3 Operation Scenarios

23. Operation scenarios are described in detail in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**. The assessment considers the following scenarios:

- Only DBS East in operation;
- Only DBS West in operation; and
- DBS East and DBS West operating concurrently with or without a lag of up to two years between each Project commencing operation.

24. If the Projects are built using a phased approach, there would also be a phased approach to starting the operational phase. The worst case scenario for the operational phases for the Projects have been assessed. See section 5.1.1 of **Volume 7, Chapter 5 Project Description (application ref: 7.5)** for further information on phasing scenarios for the Projects.

25. The operational lifetime of each Project is expected to be 30 years for an In Isolation and Concurrent Scenario and 32 years for a Sequential Scenario to reflect the lag between the Projects.

20.3.3.4 Decommissioning Scenarios

26. Decommissioning scenarios are described in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**. Decommissioning arrangements will be agreed through the submission of the Decommissioning Plan to be submitted and approved following cessation of commercial operation prior to decommissioning commencing. For the purpose of this assessment, it is assumed that decommissioning of the Projects could be conducted separately, or at the same time.

20.3.4 Embedded Mitigation

27. This section outlines the embedded mitigation relevant to the Flood Risk and Hydrology assessment, which has been incorporated into the design of the Projects or constitutes standard mitigation measures for this topic (**Table 20-3**). Mitigation is also detailed within the **Commitments Register (Volume 8, application ref: 8.6)** and cross-referenced within **Table 20-3**. Where additional mitigation measures are proposed, these are detailed in the impact assessment (section 20.4).

Table 20-3 Embedded Mitigation Measures

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
Outline Code of Construction Practice (OCoCP)	The **OCoCP (Volume 8, application ref: 8.9)** outlines the control measures and standards that will be implemented to control the impacts on the environment. This includes measures to manage runoff, soils and sediment and the storage and use of potential contaminants. Measures specific to Flood Risk and Hydrology that will be secured in the OCoCP and commitments within the **Commitments Register (Volume 8, application ref: 8.6)**.	DCO Requirement 19
Outline Drainage Strategy	The **Outline Drainage Strategy (Volume 8, application ref: 8.12)** is submitted with the DCO application and includes the pre and post construction land drainage proposals.	DCO Requirement 16

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	This outline strategy will form the basis of the detailed drainage scheme would be submitted to the Lead Local Flood Authority (LLFA) at East Riding of Yorkshire Council for approval prior to the commencement of construction of the Projects, in consultation with the Environment Agency, Internal Drainage Boards and the relevant sewerage and drainage authorities. In addition to the pre and post construction land drainage scheme, described above a Surface Water Management Plan setting out the requirements for temporary surface water drainage during construction would also be prepared by the contractor, should any temporary dewatering be required, as set out in the **OCoCP (Volume 8, application ref: 8.9)**.	
Outline Soil Management Plan (OSMP)	An outline Soil Management Plan (SMP), which forms the Appendix A of the **OCoCP (Volume 8, application ref: 8.9)**, outlines the mitigation measures and best practice techniques, which contractors would be obliged to comply with. Mitigation measures included within the OSMP include: • Consideration of weather conditions where it is appropriate to work for each soil type, e.g. not working in an area of poorly draining soils following a period of heavy rain; • Storing soils appropriately; • Ensuring effective drainage systems are used during construction; and • Employing reinstatement and plant vegetation following completion of construction works.	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	The OSMP also sets out procedures for the appropriate handling of soils during the works, including: • Using a competent contractor for soil handling, storage and reinstatement under Defra '*Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*' (2009); • Storing topsoil adjacent to where it is stripped, wherever practicable; • Storing excavated subsoil separately from the topsoil, with sufficient separation to ensure segregation; • Restricting movements of heavy plant and vehicles to specified routes; and • Minimising the footprint of excavation works as much as reasonably possible. Measures set out in the MAFF (2000) Good Practice Guide for Handling Soils and Defra's (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites would be adopted. Additionally, guidance from IES (2020) Sustainable, Healthy and Resilient: Practice-Based Approaches to Land and Soil Management would also be used.	
Direct disturbance of surface water bodies		
Cable crossings beneath Main Rivers	All Main Rivers will be crossed using trenchless techniques such as HDD to avoid direct interaction with these watercourses. The crossing methodology will be agreed with the Environment Agency prior to construction. Trenchless crossing methodologies entry and exit points will be located at least 20m from Environment Agency surface water courses or	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	the landward toe of the Environment Agency surface watercourse's flood defences and would be installed at a depth to minimise potential interaction with current, or any planned, infrastructure (e.g., sheet piles), at least 2m below the channel bed. The crossing methodology will be agreed with the Environment Agency prior to construction. See Crossing Method Statement(s), below. In line with Environment Agency consultation any Haul Road crossing points, would use clear span crossings, where possible.	
Flood Defence Monitoring	Where the cable is crossing defences, this will likely require monitoring to ensure there is no detrimental impact to defences (i.e. no settlement occurs as a result of trenchless techniques). This is to ensure that the standard of protection of defences is maintained and would be agreed with the Environment Agency prior to construction. This is referred to in the **OCoCP (Volume 8, application ref: 8.9)**.	DCO Requirement 19
Cable Crossing beneath Ordinary Watercourses	Ordinary watercourses may be undertaken by open cut methods. In such cases, temporary measures will be employed to maintain flow of water along the watercourse. Trenchless crossing methodologies (e.g. HDD) entry and exit points will be located at least 9m away from Internal Drainage Board (IDB) and Ordinary surface watercourses to ensure the ongoing maintenance of IDB drains. The crossing methodology for all water courses is set out in the **Volume 7, Appendix 5-2 Obstacle Crossing Register (application ref: 7.5.5.2)**. The detailed methodology to be used for any temporary construction at crossing points over existing ditches and watercourses shall be	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	agreed with the Environment Agency, LLFA and Internal Drainage Board (ID), as appropriate. See Crossing Method Statement(s), below. A 6m wide strip from the outside edge of any pipe which is forming a culverted IDB watercourse will be maintained during both construction and once it is located in situ to enable access and to prevent damage. If temporary culverts are needed, they will be adequately sized to avoid impounding flows (including allowing for increased winter flows as a result of climate change) and the invert set below bed level to allow bedload transport. As referenced in the **OCoCP (Volume 8, application ref: 8.9)** where temporary dams are used: • The Onshore Export Cables will be set below the channel bed at a depth dependent on local geology and geomorphological risks. This would avoid exposure during periods of higher energy flow when the bed could be mobilised. This depth takes into consideration anticipated climate-change related changes in fluvial flows and erosion that will occur over time; • The amount of time that temporary dams or flumes are in place will be kept to a minimum; • Flumes or pumps would be adequately sized to ensure that flows downstream are maintained whilst minimising upstream impoundment;	

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• A sediment / siltation trap would be installed upstream of any temporary dams, the contractor should remove excess sediment before, or as they remove the temporary dam, to stop mobilisation downstream once works complete; • A silt trap would also be installed downstream to of the temporary dam to capture any sediment that is over pumped, for lower flows this could also be captured by the use of hay bales or similar; • A review of the weather forecast and any flood alerts will be undertaken, to ensure works are not undertaken during flood events; • Scour protection would also be used to protect the river bed downstream of the dam from high energy flow at the outlets of flumes and pumps; • If a diversion channel is required, geotextiles or similar techniques will be used to line the channel and prevent sediment entering the watercourse; • Vegetation would not be removed from the banks unless necessary to undertake the works, in which case removal would be restricted to the smallest practicable footprint;	

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• Channel bed and banks would be sympathetically reinstated (e.g. by replacing re-sectioned banks with more natural profiles that are typical of the natural geomorphology of the watercourse) avoiding very wet weather conditions at any time of the year; • Prior to dewatering the area between the temporary dams, a fish rescue would be undertaken; and • Pumps would be fitted with a mesh of suitable site prevent fish access.	
Crossing Method Statements	As referenced in the **OCoCP (Volume 8, application ref: 8.9)** the Contractor will be required to prepare a Crossing Method Statement Prior to Construction. This will set out construction operations to be undertaken (including construction methods and types of plant required) and the associated environmental and health and safety issues for certain crossings where an increased risk is identified. The method statements will include details of crossing techniques to be deployed at crossings, including sensitive environmental crossings (such as Main Rivers). These will be developed with the relevant asset owner or key stakeholder such as the Environment Agency, IDB or ERYC.	DCO Requirement 19
Drilling Fluid Breakout Management Plan	A Drilling Fluid Breakout Management Plan will be agreed with the Environment Agency prior to commencement of construction activities. Bentonite or another inert clay-based material (comprising approximately 95% water and 5% clay) would be used as a lubricant at the drill head for trenchless crossing techniques. As set	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	out in the **OCoCP (Volume 8, application ref: 8.9)**. Procedures will include: • Measures to ensure drilling stops once a breakout is reported (there will be a drop in pressure at the drill head); • Measures to contain the breakout, for example sandbags, to minimise the extent of any smothering; and • Measures to remove the released bentonite or other inert drilling fluid if a significant volume of material is contained – for example pumped back to the drilling fluid lagoon within the trenchless crossing compound, or pumped to the interceptor drains, or pumped to the mobile settling tanks that will be used for managing sediment traps. The exact specification for the contingency plan will be informed by further ground investigation and the specific design of the trenchless crossing and selected construction methodology.	
Temporary access across watercourses	Temporary bridges (e.g. Bailey bridges or similar) may be used as options to traverse watercourses where direct access is not readily available from both sides. Selection of cable crossing technique for all watercourses (including Internal Drainage Board (IDB) drains) will be dependent on local site conditions and may include the use of temporary culverts. In line with Environment Agency consultation, where possible clear span crossings would be used at crossing points. If culverts are needed, they will be adequately sized to avoid impounding flows (including allowing for increased winter flows as a result of climate change) and the invert set below bed level to allow bedload transport.	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	The Applicant has made a commitment for both Projects (DBS East and West) to share a Haul Road and share construction accesses to minimise physical disturbance.	
Construction Methodology and Reinstatement	As described in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**, in a Concurrent or Sequential construction scenario, the ducts for both Projects would be laid in the same phase of works i.e. the ducts for the second Project would be laid by the first. The areas of land between Jointing Bays would be reinstated within 2 years and returned to the landowner for agricultural use or the habitat restored. Cables would then be pulled through the ducts at Jointing Bay locations along the Onshore Export Cable Route, limiting physical disturbance to locations every 0.75 to 1.5km. Works to install the platform for the Onshore Converter Station(s) for the second Project within the Substation Zone and the ducting at the Landfall Zone would also be undertaken in the same phase of works. On completion of construction, the Landfall Zone and Onshore Export Cable Corridor, including Temporary Construction Compounds, would be reinstated to its previous condition (e.g. agricultural use) as far as reasonably practical. The only above-ground infrastructure that would remain would be manholes for link boxes.	DCO Schedule 1
Increased sediment supply		
Outline Pollution Prevention Plan (OPPP) - Sediment supply to watercourses	The requirement for a Pollution Prevention Plan (PPP) is included within the **OCoCP (Volume 8, application ref: 8.9),** an OPPP is included in **Appendix D** of the **OCoCP (Volume 8, application ref: 8.9)**. This plan would also incorporate the Environment Agency best practice guidelines for pollution prevention.	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	Environment Agency best practise guidelines for pollution prevention are: Pollution Prevention Guidance (PPG) notes (PPG1, PPG5, PPG8 and PPG21). Although the Environment Agency's PPG notes have been revoked in England, they have been updated as Guidance for Pollution Prevention (GPP notes) for use in Scotland and Northern Ireland (NetRegs, 2022). Construction Industry Research and Information Association (CIRIA) (2001) and Defra (2009) guidance will also be adhered to. The following mitigation measures will be applied to all catchments to ensure best practice is followed and any potential impacts are minimised. Specific measures will include: • Temporary works areas (e.g., construction compounds and trenchless crossing areas) within the Onshore Development Area may comprise hardstanding of permeable material, such as gravel aggregate or alternatively matting/timber or similar, underlain by geotextile or another suitable material to a minimum of 50% of the exposed area. This would minimise the area of open ground; • Only removing vegetation from the area that needs to be exposed in the near future; • Using geotextile silt fencing at the toe of the stockpile slope, to reduce the movement of silt – this should be installed before soil stripping has begun and vehicles start tracking over the site;	

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• On-site retention of sediment to be maximised by routing all drainage through the site drainage system as detailed in the **Outline Drainage Strategy (Volume 8, application ref: 8.12)**; • Plant and wheel washing is carried out in a designated area of hard standing at least 10m from any watercourse or surface water drain, rock outcrop (hard rock at surface) or sinkhole; • Traffic movements would be restricted to minimise surface disturbance; • Collect run-off in lagoons and allow suspended solids to settle before disposal; • Divert clean water away from the area of construction work in order to minimise the volume of contaminated water; and • Buffer strips of vegetation will be retained where possible to prevent runoff.	
Accidental spills and leaks of contaminants		
Outline Pollution Prevention Plan (OPPP) - Use and storage of potential contaminants	The requirement for a Pollution Prevention Plan (PPP) is included within the **OCoCP (Volume 8, application ref: 8.9),** an OPPP is included in **Appendix D** of the **OCoCP (Volume 8, application ref: 8.9)**. This plan would also incorporate the Environment Agency best practice guidelines for pollution prevention. The specific measures listed below and outlined in the **OPPP**, **Appendix D** of the **OCoCP (Volume 8, application ref: 8.9)** will prevent the discharge of contaminants from the Onshore Development Area to the surface drainage network and connected groundwaters.	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• Concrete and cement mixing and washing areas will be located at least 10m away from the nearest watercourse. These areas will incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment would take place in a contained area and the water collected for disposal off-site; • Storing all fuels, oils, lubricants and other chemicals in impermeable bunds with at least 110% of the stored capacity, with any damaged containers being removed from site. Refuelling would take place in a dedicated impermeable area, using a bunded bowser, located at least 10m away from the nearest water body; • Ensuring that spill kits are available on site at all times as well as sand bags and stop logs for deployment on the outlets from the site drainage system in case of emergency spillages; • During construction, the onshore cable installation will be designed such that it will be bounded by parallel drainage channels (one on each side) to intercept drainage within the working width. Additional drainage channels will be installed to intercept water from the cable trench. This will be discharged at a controlled rate into local ditches or drains via temporary interceptor drains. Depending upon the precise location, water from the channels will be infiltrated or discharged into the existing drainage network;	

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• Construction drainage will be developed and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. If water enters the trenches during installation from surface runoff of groundwater seepage, this will be pumped via settling tanks, sediment basins or mobile treatment facilities to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains. Existing land drains will be reinstated where required following construction; • Potential contaminants will be stored under cover to prevent rainwater carrying pollutants away; • Potential contaminants will be stored in a safe place away from vehicles, to prevent collisions; • Buffer strips of vegetation will be retained adjacent to water bodies where possible, to intercept any contaminated runoff; and • To protect groundwater bodies, excavation will be shallow, except where below road or rail infrastructure and water bodies, where it may be deeper. Embedded mitigation measures at sites where excavations may be deeper are described in the hydrogeological risk assessments section of this table (below).	
Hydrogeological risk assessments	The Ground investigations and a hydrogeological risk assessment meeting the requirements of the Environment Agency's approach to groundwater	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	protection (Environment Agency, 2018) would be undertaken at each trenchless crossing location. Hydrogeological risk assessments would also be undertaken where earthworks / excavations are within 50m (or 250m dependent upon volume abstracted) of private potable groundwater abstractions pose a potential risk from either existing or potentially introduced contamination. Further hydrogeological risk assessments will be undertaken where earthworks / excavations are within influencing distance of abstractions whereby they may interrupt flow pathways due to dewatering or other associated activities. The risk assessment, which would be desk-based, follows a tiered approach with more detailed assessments carried out in areas considered to be a potentially greater risk to groundwater. The production of the hydrogeological risk assessment would be undertaken prior to the commencement of construction works (should one be deemed necessary) and meet the requirements of Environment Agency's Approach to Groundwater Protection 2018 Framework.	
Piling Risk Assessment	A piling risk assessment would be undertaken if piles are to be used for the construction of Onshore Converter Station(s), in line with the Environment Agency's Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (Environment Agency, 2001).	DCO Requirement 19
Contaminated Land and Groundwater Scheme	A contaminated land and groundwater scheme will be prepared to identify any contamination. If areas of potential concern are identified during ground investigation, then a remediation strategy would be developed and agreed with the relevant bodies prior to the commencement of remedial works and construction activities. The	DCO Requirement 29

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	ground investigation, risk assessment and remediation would follow guidance provided within the 2023 Environment Agency Land Contamination Risk Management Framework. The ground investigation may include, but is not limited to, the collection of soil, soil-leachate, groundwater and surface water samples for laboratory analysis. The range of contaminants tested for may vary between locations and sample type, examples of contaminants that may be test for include, but are not limited to, metals, PAHs, PCBs and PFAS. Ground gas monitoring wells will be installed in areas identified as potentially containing ground gas generating materials. Groundwater monitoring wells would also be required as part of the ground investigation in order to establish the groundwater regime and to identify, for example, whether contamination is from onsite or offsite sources. This would characterise the conditions within the Onshore Development Area, identify unacceptable risks and determine whether remediation is required.	
Foul Water Drainage	An **Outline Drainage Strategy (Volume 8, application ref: 8.12)** including detail on foul water drainage is submitted with the DCO application. As described in the **Outline Drainage Strategy (Volume 8, application ref: 8.12)**, the exact details of any welfare areas associated with the onshore Converter station(s) are still to be determined. Given the nature of the development, foul flows are likely to be minimal. It is anticipated that any foul water flows from the site will drain to a septic tank and be tankered away or to a package treatment plant prior to discharge to a nearby watercourse. Design sizing and requirements will be determined at the	DCO Requirement 16

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	detailed design stage. They may also be taken off site by a tanker. The **Outline Drainage Strategy (Volume 8, application ref: 8.12)** at the Onshore Converter Stations also includes attenuation and hydrocarbon interceptors to prevent the accidental release of contaminants (including oils and fine sediment).	
Changes to surface and groundwater flows and flood risk		
Emergency Response, flood Evacuation and Pollution Control Plan	The Flood Evacuation and Pollution Control Plan will be developed as part of the final CoCP and would set out details of the emergency procedures in cases of spillages or leaks during construction. This will also include the Flood Evacuation measures, for those areas of works located in Flood Zone 2 and 3 as set out in the **Volume 7, Appendix 20-4 Flood Risk Assessment (application ref: 7.20.20.4)**.	DCO Requirement 19

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
Works Located in Flood Zone 2 and 3	The Surface Water Management Plan and Soil Management Plan prepared prior to construction and included in the **OCoCP (Volume 8, application ref: 8.9)** will include measures for locations where soil storage in Flood Zones 2 and 3 is unavoidable. Where soil storage in Flood Zones 2 and 3 is unavoidable, spoil storage areas will be located such that they do not block or divert existing surface water flow paths. Topsoil and subsoil will be stored in separate stockpiles in line with DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298, or the latest relevant available guidance. Once the stockpile has been completed the area would be cordoned off with secure fencing to prevent any disturbance or contamination by other construction activities. If the soil is to be stockpiled for more than six months, the surface of the stockpiles should be seeded with a grass/clover mix or covered to minimise soil erosion.	DCO Requirement 19
Surface Runoff and Groundwater Flows	The management of surface water at the onshore substations is described in the **Outline Drainage Strategy (Volume 8, application ref: 8.12)**. Key measures included in the Outline Drainage Strategy include:	DCO Requirement 16

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• Where the Projects intercept land drainage, pre-construction drainage would be installed at the edge(s) of the cable route corridor. This permanent drainage would intercept existing field drains and ensure the integrity of the existing land drainage is maintained during construction and operation of the Projects. All drains and outfalls would be risk assessed and appropriate control measures used prior to discharge into any watercourses at a controlled rate. Temporary attenuation / storage would be provided, where necessary. • Drainage would be developed according to the principles of the SuDS discharge hierarchy. Generally, the aim will be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable: i) into the ground (infiltration); ii) to a surface water body; iii) to a surface water sewer, highway drain or another drainage system; or iv) to a combined sewer. This will include attenuation and hydrocarbon interceptors to prevent the accidental release of contaminants (including oils and fine sediment).	

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• Based on the SuDS treatment train and SuDS discharge hierarchy, it is anticipated that surface water run-off from the proposed Converter stations(s) will be collected by perimeter drains and attenuated within an adjacent SuDS (detention) basin (site control), prior to discharge to the nearby watercourse. The detention basin will have an area of approximately 16,000 m^2 and accommodate the 1:100 year storm + 40% climate change allowance. Additional SuDS components will be incorporated as necessary (source control) and confirmed at detailed design stage. • Surface water run-off from topography tending towards the proposed location of the Onshore Converter Station platform(s) shall be redirected by installing cut-off drains/ditches at the platform perimeter, thus diverting overland flows around the Converter station and back into watercourse immediately to the east of the proposed development. Cut off drains / ditches will be designed at detailed design stage to mimic existing overland flows.	

Parameter	Embedded Mitigation Measures	Where Commitment is Secured
	• Surface water run-off from the proposed access road will be collected and attenuated in filter trenches adjacent to the road (source control) prior to discharge to nearby watercourses. Filter trenches are subject to detailed design and may incorporate additional SuDS components as necessary (to be confirmed at the detailed design stage). In addition, **Volume 7, Appendix 5-2 Obstacle Crossing Register (application ref: 7.5.5.2)** identifies where the Projects cross watercourses. At these locations, flow would be maintained to ensure there is no increase in flood risk. The temporary crossing methodology would be agreed with the relevant authority Environment Agency, LLFA and / or Internal Drainage Board, and in consultation with landowners, where necessary. Water Crossings are also described in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**. As described for watercourse crossings, temporary culverts will be adequately sized to avoid impounding flows.	

20.4 Assessment Methodology

20.4.1 Policy, Legislation and Guidance

20.4.1.1 National Policy Statements

28. The assessment of potential impacts upon Flood Risk and Hydrology has been made with specific reference to the relevant National Policy Statements (NPS) including the Overarching NPS for Energy (EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and the NPS for Electricity Networks Infrastructure (EN-5). These were published in November 2023 and were designated in January 2024.

29. The specific assessment requirements for Flood Risk and Hydrology, as detailed in the NPS, are summarised in **Table 20-4** together with an indication of the section of this chapter where each is addressed.

Table 20-4 NPS Assessment Requirements

NPS Requirement	NPS Reference	ES section Reference
EN-1 NPS for Energy		
Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance (including those outside England), on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity, including irreplaceable habitats. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the Secretary of State consider thoroughly the potential effects of a proposed project.	EN-1 - Section 5.4, paragraphs 5.4.17 to 5.4.24	Potential impacts on river channels, which provide physical habitats of importance for ecology, protected species and the conservation of biodiversity, are considered in section 20.6.1. Impacts on species and habitats are discussed in detail in **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**.
Development on land within or outside a SSSI, and which is likely to have an adverse	EN-1 Section 5.4, paragraph	Potential impacts to Sites of Special

NPS Requirement	NPS Reference	ES section Reference
effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits (including need) of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs. The Secretary of State should use requirements and/or planning obligations to mitigate the harmful aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest.	5.4.8; paragraph 5.4.50	Scientific Interest (SSSI) impacts are considered in section 20.6.1. Impacts on SSSIs are discussed in detail in **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**.
A site-specific flood risk assessment should be provided for all energy projects in Flood Zones 2 and 3 in England or Zones B and C in Wales. In Flood Zone 1 in England or Zone A in Wales, an assessment should accompany all proposals involving: • Sites of 1 hectare or more • Land which has been identified by the EA or NRW as having critical drainage problems • Land identified (for example in a local authority strategic flood risk assessment) as being at increased flood risk in future • Land that may be subject to other sources of flooding (for example surface water) where the EA or NRW, Lead Local Flood Authority, Internal Drainage Board or other body have indicated that there may be drainage problems. This should identify and	EN-1 Section 5.8, paragraphs 5.8.13 to 5.8.23	Potential impacts on flood risk are considered in section 20.6.1, 20.6.2 and **Volume 7, Appendix 20-4 Floor Risk Assessment (application ref: 7.20.20.4).**

NPS Requirement	**NPS Reference**	**ES section Reference**
assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account.		
Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment, as part of the ES or equivalent. The ES should in particular describe: • The existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges. • Existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Abstraction Licensing Strategies) and also demonstrate how proposals minimise the use of water resources and water consumption in the first instance.	EN-1 Section 5.16, paragraphs 5.16.3 – 5.16.7	Potential impacts on water quality, the physical characteristics of surface watercourses and the quality and quantity of groundwater are considered in section 20.6.1, and **Volume 7, Appendix 20-3 WER Compliance Assessment (application ref: 7.20.20.3)**.

NPS Requirement	NPS Reference	ES section Reference
• Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics. • Any impacts of the proposed project on water bodies or protected areas (including shellfish protected areas) under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and source protection zones (SPZs) around potable groundwater abstractions. • How climate change could impact any of the above in the future. • Any cumulative effects.		
EN-3 NPS for Electricity Networks Infrastructure		
Offshore wind farms will not be affected by flooding. However, applicants should demonstrate that any necessary land-side infrastructure (such as cabling and onshore substations) will be appropriately resilient to climate-change induced weather phenomena. Similarly, applicants should particularly set out how the proposal would be resilient to storms.	Paragraph 2.4.8	Changes to surface and groundwater flows and flood risk are assessed in section 20.6.1.4 and section 20.6.2.2. Flood risk is assessed in **Volume 7, Appendix 20-4 Flood Risk Assessment (application ref: 7.20.20.4).**
EN-5 NPS for Electricity Networks Infrastructure		
Section 4.9 of EN-1 sets out the generic considerations that applicants and the Secretary of State should take into account in order to ensure that electricity networks	EN-5 Section 2.3, paragraphs 2.3.1, 2.3.3	Flooding and the potential effects of climate change are considered in section

NPS Requirement	NPS Reference	ES section Reference
infrastructure is resilient to the effects of climate change. As climate change is likely to increase risks to the resilience of some of this infrastructure, from flooding for example, or in situations where it is located near the coast or an estuary or is underground, applicants should in particular set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to: • Flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change; • The effects of wind and storms on overhead lines; • Higher average temperatures leading to increased transmission losses; • Earth movement or subsidence caused by flooding or drought (for underground cables); • Coastal erosion – for the landfall of offshore transmission cables and their associated substations in the inshore and coastal locations respectively. Section 4.9 of EN-1 advises that the resilience of the project to the effects of climate change must be assessed in the Environmental Statement (ES) accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see sections 5.8 in EN-1).		20.6.1, 20.6.2 and **Volume 7, Appendix 20-4 Flood Risk Assessment (application ref: 7.20.20.4)**.

20.4.1.2 Other

30. In addition to the NPS, there a number of pieces of legislation, policy and guidance applicable to the assessment of Flood Risk and Hydrology, described below.

20.4.1.2.1 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

31. The Water Framework Directive (WFD) (Council Directive 2000/60/EC) establishes a framework for community action in the field of water policy was adopted in 2000. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transposed the WFD into English and Welsh law. The WFD Regulations remain in force following the UK's withdrawal from the European Union under the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

32. Under the Regulations, surface waters are designated as water bodies and are set objectives for achieving Good Ecological Status or Good Ecological Potential (in the case of artificial or heavily modified water bodies). The Environment Agency is required to produce RBMPs which describe the current state of the water environment within the River Basin District (RBD) and set out the objectives for protecting and improving it.

20.4.1.2.2 The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

33. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 set out the standards and thresholds used to determine the ecological and chemical status of water bodies. These are considered in terms of biological, hydromorphological, physico-chemical and chemical status for surface water bodies, and quantitative and chemical status for groundwater bodies.

20.4.1.2.3 The Conservation of Habitats and Species Regulations 2017

34. The 'Dutch Nitrogen Case' (Official Journal of the European Union, 2019) ruled that where an internationally important site (i.e., Special Protection Area, Special Area of Conservation and Ramsar Sites) is failing to achieve the required condition due to nutrient pollution, the potential for a new development to add to the nutrient load is "necessarily limited". This has informed the way in which the Conservation of Habitats and Species Regulations 2017 should apply to pollution related pressures and incidents.

35. Note that the further information on the Conservation of Habitats and Species Regulations 2017 is provided in **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**.

20.4.1.2.4 National Planning Policy Framework (2021) and Supporting Guidance (2022)

36. The NPPF sets out the UK Government planning policies for England and seeks to ensure that flood risk is considered at all stages of the planning and development process. Its policies aim to avoid inappropriate development in areas at highest risk of flooding, and to direct development away from these areas.

37. NPPF provides clarification that all strategic policies/plans should apply a sequential, risk-based approach to the location of development taking into account all sources of flood risk (e.g., fluvial, coastal, surface water, groundwater, reservoir and sewer flooding). It also provides guidance on how this is to be considered in the context of the location of site-specific development. Further guidance, on the application of the Sequential Test and Exception Test is provided in the supporting Planning Practice Guidance for Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022), which was updated on 25 August 2022.

38. In the recent update to the Planning Practice Guidance, it was extended to include clarification on the application of the Sequential Test for all sources of flood risk, not only fluvial and coastal/tidal flooding, as well as summarising an additional consideration with regard to the presence of flood risk management infrastructure.

20.4.1.2.5 Flood and Water Management Act 2010

39. The Flood and Water Management Act 2010 (FWMA) aims to improve the management of flood risk management and water resources by creating clear roles and responsibilities. It gave local authorities the new role of LLFA under which they take on the responsibility of managing flood risk on a local scale from surface water, groundwater and Ordinary Watercourses. The Environment Agency gained a strategic overview role of all flood risk. The FWMA provides opportunities for a comprehensive, risk-based approach on land use planning and flood risk management by local authorities and other key partners.

20.4.1.2.6 Humber RBD: RBMP (2022)

40. RBMPs provide a framework for the protection and enhancement of the benefits provided by the water environment in each RBD and are produced in order to implement the WFD. As water resources and land use are closely linked, RBMPs also inform decisions on land-use planning.

41. The third RBMP for the Humber RBD was finalised by the Department for the Environment, Food and Rural Affairs (Defra) and the Environment Agency in 2022. It provides a baseline classification of the water environment in the Humber RBD and highlights statutory objectives for protected areas such as waters used for drinking water, bathing, and designated sites. It lays out the actions needed to improve the water environment and achieve the objectives of the WFD.

42. Further detail is provided in **Volume 7, Chapter 3 Policy and Legislative Context (application ref: 7.3)**.

20.4.2 Data and Information Sources

20.4.2.1 Site Specific Surveys

43. In order to provide site specific and up to date information on which to base the impact assessment, a geomorphology baseline survey was conducted in October 2022. The aim of the survey was to characterise the physical characteristics of the watercourses (Main Rivers, Ordinary Watercourses and WFD water bodies) within the Onshore Development Area. The survey included an assessment of channel form, flow conditions, floodplain characteristics, in-channel and riparian vegetation, and any evidence of channel modification. Summary findings are provided in section 20.5.2 and a detailed report can be found in **Volume 7, Appendix 20-2 (application ref: 7.20.20.2)**.

20.4.2.2 Other Available Sources

44. Other sources that have been used to inform the assessment are listed in **Table 20-5**.

Table 20-5 Other Available Data and Information Sources

Data Set	Spatial coverage	Year	Notes
WFD water body status objectives and classification data	National	Updated 2022	Environment Agency Catchment Data Explorer (https://environment.data.gov.uk/catchment-planning/)
Water quality data	National	Updated ~every 6 months	Environment Agency Water Quality Data Archive (https://environment.data.gov.uk/water-quality/view/landing)

Data Set	Spatial coverage	Year	Notes
Aquatic ecology data	National	Undated	Environment Agency Ecology and Fish Data Explorer (https://environment.data.gov.uk/ecology/explorer/)
Source Protection Zones (SPZs) Aquifer designation mapping Groundwater vulnerability mapping	National	Undated	Defra Magic (https://magic.defra.gov.uk/MagicMap.aspx)
Geological mapping	National	Undated	British Geological Survey (https://www.bgs.ac.uk/map-viewers/geology-of-britain-viewer/)
Abstraction and discharge data	National	Abstractions dated individually	Environment Agency (available on request); local authority (East Riding of Yorkshire Council)
Statutory and non-statutory designated sites	National	Undated	Defra Magic (https://magic.defra.gov.uk/MagicMap.aspx)
Flood Map for Planning; Flood risk mapping (rivers and sea, surface water, reservoirs)	National	Undated	Environment Agency (https://flood-map-for-planning.service.gov.uk/; https://check-long-term-flood-risk.service.gov.uk/postcode)

20.4.3 Impact Assessment Methodology

45. **Volume 7, Chapter 6 EIA Methodology (application ref: 7.6)** provides a summary of the general impact assessment methodology applied. The following sections describe the methods used to assess the likely significant effects on Flood Risk and Hydrology.

20.4.3.1 Definitions

46. For each potential impact, the assessment identifies receptors sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors. The definitions of sensitivity and magnitude for the purpose of the Flood Risk and Hydrology assessment are provided in **Table 20-6** and **Table 20-7.**

47. The definitions of sensitivity and magnitude of impact have been informed by the following guidance documents:

- Transport Analysis Guidance (TAG) Unit A3 Environmental Impact Appraisal (Department for Transport, 2024);
- Design Manual for Roads and Bridges LA113 Road drainage and the water environment (Standards for Highways, 2020); and
- National Planning Policy Framework (Annex 3 Flood Risk Vulnerability Classification) (Department for Levelling Up, Housing and Communities, 2023).

48. The guidance documents provide a limited amount of detail with regard to the different types of receptors that fall within each category. The definitions set out in **Table 20-6** and **Table 20-7** have been expanded based on professional judgement to include more explicit reference to each type of water receptor.

Table 20-6 Definition of Sensitivity for a Flood Risk and Hydrology Receptor

Sensitivity	Definition
High	The receptor has no or very limited capacity to tolerate changes to hydrology, geomorphology, water quality or flood risk and has little potential for substitution. This includes water resources which support human health and/or the economic activity at a regional scale, or receptors with a high vulnerability to flooding.

Sensitivity	Definition
	Water resources • Controlled waters with an unmodified, naturally diverse hydrological regime, a naturally diverse geomorphology with no barriers to the operation of natural processes, and good water quality; • Supports habitats or species that are highly sensitive to changes in surface hydrology, geomorphology or water quality; • Supports Principal Aquifer with public water supply abstractions by provision of recharge; and • Site is within Inner or Outer Source Protection Zone (SPZ). **Flood risk** • Highly Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021); and • Land with more than 100 residential properties (after Department for Transport, 2024).
Medium	The receptor has limited capacity to tolerate changes to hydrology, geomorphology, water quality or flood risk. This includes water resources which support human health and/or economic activity at a local scale or receptors with a high vulnerability to flooding. **Water resources** • Controlled waters with hydrology that sustains natural variations, geomorphology that sustains natural processes, and water quality that is not contaminated to the extent that habitat quality is constrained; • Supports or contributes to habitats or species that are sensitive to changes in surface hydrology, geomorphology and/or water quality; • Supports Secondary A or Secondary B Aquifer with water supply abstractions; and • Site is within a Catchment SPZ. **Flood risk** • More Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021); and

Sensitivity	Definition
	• Land with between 1 and 100 residential properties or more than 10 industrial premises (after Department for Transport, 2024).
Low	The receptor has moderate capacity to tolerate changes to hydrology, geomorphology and water quality or flood risk. This includes water resources that support human health and/or economic activity at a neighbourhood (multiple property) scale and receptors with a moderate vulnerability to flooding. **Water resources** • Controlled waters with hydrology that supports limited natural variations, geomorphology that supports limited natural processes, and water quality that may constrain some ecological communities; • Supports or contributes to habitats that are not sensitive to changes in surface hydrology, geomorphology or water quality; and • Supports Secondary A or Secondary B Aquifer without abstractions. **Flood risk** • Less Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021); and • Land with 10 or fewer industrial properties (after Department for Transport, 2024).

Sensitivity	Definition
Negligible	The receptor is generally tolerant of changes to hydrology, geomorphology, water quality or flood risk. This includes water resource that supports human health and/or economic activity at a single property scale and receptors with a low vulnerability to flooding. **Water resources** • Controlled waters with hydrology that does not support natural variations, geomorphology that does not support natural processes, and water quality that constrains ecological communities; • Aquatic or water-dependent habitats and/or species are tolerant to changes in hydrology, geomorphology or water quality; and • Non-productive strata that does not support groundwater resources. **Flood risk** • Water Compatible Land Use as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021); and • Land with limited constraints and a low probability of flooding of residential and industrial properties (after Department for Transport, 2024).

Table 20-7 Definition of Magnitude of Impacts

Magnitude	Definition
High	Permanent/irreversible, or large-scale changes, over the whole receptor affecting usability, risk, or value. This causes fundamental changes to key features of the receptor's character or distinctiveness. **Water resources** • Permanent changes to geomorphology and/or hydrology that prevent natural processes operating; • Permanent and/or wide scale effects on water quality or availability; • Permanent loss or long-term degradation of a water supply source resulting in prosecution; • Permanent or wide scale degradation of habitat quality; • Deterioration in WFD surface water body status or prevention of achieving future status objectives; and • Deterioration in groundwater levels, flows or quality leading to a deterioration in WFD groundwater body status. **Flood risk** • Permanent or major change to existing flood risk; • Reduction in on-site flood risk by raising ground level in conjunction with provision of compensation storage; • Increase in off-site flood risk due to raising ground levels without provision of compensation storage; and • Failure to meet either sequential or exception test (if applicable).
Medium	Partial loss or noticeable change over the majority of the receptor, and/or discernible alteration to key features of the receptor's character or distinctiveness. Moderate permanent or long-term reversible change may result affecting usability, value, or risk, over the medium- term or local area. **Water resources** • Medium-term effects on water quality or availability; • Medium-term degradation of a water supply source, possibly resulting in prosecution; • Habitat change over the medium-term;

Magnitude	Definition
	• Potential temporary downgrading in the status of individual WFD elements, without affecting the ability of the surface water to achieve future objectives; and • Medium-term deterioration in groundwater levels, flow or quality leading to potential temporary downgrading of WFD status. **Flood risk** • Medium-term or moderate change to existing flood risk; • Possible failure of sequential or exception test (if applicable); and • Reduction in off-site flood risk within the local area due to the provision of a managed drainage system.
Low	Discernible temporary change over a minority of the receptor, and/or with minimal effect on usability, risk or value. There may also be a potential discernible alteration to key features of the receptor's character or distinctiveness. **Water resources** • Short-term or local effects on water quality or availability; • Short-term degradation of a water supply source; • Habitat change over the short-term; and • No change to WFD status. **Flood risk** • Short-term temporary or minor change to existing flood risk; • Localised increase in on-site or off-site flood risk due to increase in impermeable area; and • Passing of sequential and exception test.
Negligible	Temporary change, undiscernible over longer timescales, with no effect on usability, risk or value. This may result in light, or no, alteration to the characteristics or features of the receptor's character or distinctiveness. **Water resources** • Temporary impact on local water quality or availability; • Temporary or no degradation of a water supply source; and • Very slight local changes to habitat that have no observable impact on dependent receptors.

Magnitude	Definition
	Flood risk • Temporary or very minor change to existing flood risk; and • Highly localised increase in on-site or off-site flood risk due to increase in impermeable area.

20.4.3.2 Significance of Effect

49. The assessment of significance of an effect is informed by the sensitivity of the receptor and the magnitude of the impact. The determination of significance is guided by the use of an impact significance matrix presented in **Volume 7, Chapter 6 EIA Methodology (application ref: 7.6)** and **Table 20-8**. Definitions of each level of significance are provided in

50. **Table** 20-9. For the purposes of this assessment, any effect that is of major or moderate significance is considered to be significant in EIA terms, whether this be adverse or beneficial. Any effect that has a significance of minor or negligible is not significant.

Table 20-8 Flood Risk and Hydrology Significance of Effect Matrix

		Adverse Magnitude				Beneficial Magnitude			
		High	**Medium**	**Low**	**Negligible**	**Negligible**	**Low**	**Medium**	**High**
Sensitivity	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

Table 20-9 Definition of Effect Significance

Significance	Definition
Major	Very large or large change in receptor condition, which is likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and / or breaches of legislation.

Significance	Definition
Moderate	Intermediate change in receptor condition, which is likely to be important considerations at a local level.
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
No change	No impact, therefore, no change in receptor condition.

20.4.4 Cumulative Effect Assessment Methodology

51. The cumulative effect assessment (CEA) considers other schemes, plans, projects and activities that may result in significant effects in cumulation with the Projects. **Volume 7**, **Chapter 6 EIA Methodology (application ref: 7.6)** (and accompanying **Volume 7**, **Appendix 6-1 Onshore Cumulative Assessment (application ref: 7.6.6.1)**) provides further details of the general framework and approach to the CEA.

20.4.5 Assumptions and Limitations

52. This assessment is based on a range of publicly available information and data sources (as listed in **Table 20-5**) and is largely desk-based. Although these data sets are considered robust, there is a level of uncertainty and assumptions associated with their use in this impact assessment. For example, the known characteristics of the drainage network and attributes and conditions specific to water bodies have been used as a proxy to assign value and sensitivity to the wider catchments and the Ordinary Watercourses within them. This is a precautionary approach that ensures value and sensitivity have not been under-assessed within this preliminary assessment.

20.5 Existing Environment

20.5.1 Surface Water Drainage

53. As discussed in section 20.3.1, this assessment is based on river water body catchments as defined by the Environment Agency. Water body catchments are shown on **Volume 7, Figure 20-1 (application ref: 7.20.1)**. Receptors are those river water bodies (and catchments) crossed by the Onshore Development Area, as well as those that are downstream. Water body catchments are grouped within their respective operational catchments.

54. The majority of the Onshore Development Area falls within the catchment of the River Hull. This river system drains the eastern side of the Yorkshire Wolds and flows in a generally north-south direction to join the Humber Estuary at Hull. Within the Landfall Zone there are several short artificial drains.

55. The Onshore Development Area lies within three operational river catchments and crosses the following water bodies:

- Barmston Sea Drain operational catchment:
  - Barmston Sea Drain/Skipsea Drain to Confluence;
  - Barmston Sea Drain from Skipsea Drain to North Sea; and
  - Onshore coastal catchment.
- Upper Hull operational catchment:
  - Mickley Dike catchment; and
  - Old How/Frodingham Beck to River Hull.
- Lower Hull operational catchment:
  - Catchwater Drain;
  - Foredyke Stream Upper;
  - Foredyke Stream Lower to Holderness Drain;
  - Holderness Drain Source to Foredyke Stream;
  - Beverley and Barmston Drain;
  - Hull from Arram Beck to Humber;
  - High Hunsley to Arram Area; and
  - High Hunsley to Woodmansey Area.

56. The Onshore Development Area crosses the following Main Rivers:

- Stream Dike (note this is the watercourse south of Catwick as opposed to Stream Dyke north of Catwick);
- Monk Dike;
- Meaux and Routh East Drain;
- Holderness Drain;
- River Hull;
- Beverley and Barmston Drain; and
- Catchwater Drain.

57. The Onshore Development Area also crosses the following drains which are part of the Beverley and North Holderness IDB):

- Skipsea Drain (West Branch);
- Dunnington Sewer;
- Arnold and Riston Drain;
- Turf Gutter and Eske River Side Drain;
- South Bullock (N. Branch - Diggins Arms);
- South Bullock (S. Branch - Chalk Arm); and
- Storkhill Drain.

20.5.2 Geomorphology

58. The methodology and results of the geomorphological baseline survey undertaken in October 2022 are discussed in detail in **Volume 7, Appendix 20-2 Geomorphology Baseline Survey Technical Report (application ref: 7.20.20.2)**.

59. Watercourses in the Onshore Development Area are typically of uniform depth and have trapezoidal cross sections with steep banks, indicative of artificial straightening. The majority of water body catchments are also classified as artificial (section 20.5.3). Most channels are relatively narrow agricultural drains, except for the River Hull, which is 25-30m wide. Channels are typically incised below adjacent arable farmland. Most channels appear to be dominated by depositional processes, with slow flows, low gradients and low velocities contributing to the settling out of fine sediments/silts. Fine sediment loads are likely sourced from adjacent agricultural fields and upstream in the wider catchment. Banks and channel margin areas are generally well-vegetated with rushes, sedges and reeds, as well as in-channel duckweed (*Lemna minor)* and Frogbit (*Hydrocharis morsus-ranae*). In some locations there are minor rock and wood bank protection structures.

20.5.3 Water Quality

60. A review of the Environment Agency's Catchment Data Explorer and water quality archive for surface water bodies gives an indication of water quality across the catchments of interest (**Table 20-10**). The most recent Environment Agency water body classification data is for River Basin Planning Cycle 3 (beginning in 2022). It is an update in the classification for all water bodies from the Cycle 2 classification round.

61. The ecological status (or ecological potential for artificial/heavily modified water bodies) is Moderate across the Onshore Development Area and Fail for chemical status.

62. Water body chemical status was not assessed in the 2022 update by the Environment Agency, so 2019 classifications are shown in **Table 20-10.** Chemical status is fail for all water bodies in England due to a group of global pollutants (polybrominated diphenyl ethers (PBDEs – a group of brominated flame retardants); mercury; certain polycyclic aromatic hydrocarbons (PAHs) and perfluorooctane sulfonate (PFOS) – a group of per-and polyfluoroalkyl substances (PFAS)). No feasible technical solution exists to remove these chemicals entirely and that they will take time to naturally drop to required levels – 2063 is listed as the objective date for many water bodies.

63. Apart from the global pollutants described above, Reasons for Not Achieving a Good (RNAG) status or Good potential are related to physical modifications (e.g., flood protection and land drainage) and pollution from urban (e.g., sewage discharge, landfill leaching, septic tanks) and rural (e.g., poor nutrient management, riverbank erosion) sources. Baseline groundwater quality is summarised in section 20.5.3.

64. Surface water bodies support the Tophill Low Drinking Water Safeguard Zone (surface water) (SWSGZ6010). The Onshore Development Area crosses the safeguard zone for approximately 6km between Dunnington and Nunkeeling (**Volume 7, Figure 20-1 (application ref: 7.20.1)**). In July 2021 the water undertaker responsible for the safeguard zone was issued with a notice under regulation 28 (4) of the Water Supply (Water Quality) Regulations 2016 by the Drinking Water Inspectorate (DWI, 2021). Issues are related to *Cryptosporidium*, taste and odour. The completion date for requirements of the notice is 30/06/2025.

Table 20-10 Water Quality in River Water Bodies (after Environment Agency 2022)

Water Body	Type and designation	Ecological status/potential and RNAG elements	Chemical status and RNAG elements
Beverley and Barmston Drain **GB104026067211**	River; artificial	**Moderate** Dissolved oxygen Phosphate Mitigation measures assessment	**Fail** PBDEs Mercury and its compounds
Catchwater Drain **GB104026066970**	River; artificial	**Moderate** Dissolved oxygen Phosphate Ammonia Invertebrates	**Fail** PBDEs Mercury and its compounds
Foredyke Stream Lower to Holderness Drain **GB104026066910**	River; artificial	**Moderate** Dissolved oxygen Phosphate Ammonia Fish Mitigation measures assessment	**Fail** PBDEs PFOS Mercury and its compounds

Water Body	Type and designation	Ecological status/potential and RNAG elements	Chemical status and RNAG elements
Foredyke Stream Upper **GB104026066890**	River; artificial	**Moderate** Phosphate Ammonia Invertebrates Mitigation measures assessment	**Fail** PBDEs Mercury and its compounds
High Hunsley to Arram Area **GB104026066841**	River; artificial	**Moderate** Phosphate Ammonia Mitigation measures assessment	**Fail** PBDEs Mercury and its compounds Benzo(k)fluoranthene Benzo(g-h-i) perylene Benzo(b)fluoranthene
High Hunsley to Woodmansey Area **GB104026066820**	River; artificial	**Moderate** Fish	**Fail** PBDEs Mercury and its compounds
Holderness Drain Source to Foredyke Stream **GB104026066950**	River; artificial	**Moderate** Dissolved oxygen Phosphate Ammonia Mitigation measures	**Fail** PBDEs Mercury and its compounds

Water Body	Type and designation	Ecological status/potential and RNAG elements	Chemical status and RNAG elements
Hull from Arram Beck to Humber **GB104026067212**	River; heavily modified	**Moderate** Phosphate	**Fail** Tributyltin compounds PBDEs Mercury and its compounds Benzo(k)fluoranthene Benzo(g-h-i) perylene Benzo(b)fluoranthene
Mickley Dike Catchment **GB104026066990**	River; artificial	**Moderate** Dissolved oxygen Mitigation measures assessment	**Fail** PBDEs Mercury and its compounds
Old Howe/ Frodingham Beck to River Hull **GB104026067021**	River; heavily modified	**Moderate** Mitigation measures assessment	**Fail** PBDEs Mercury and its compounds
Barmston Sea Drain/ Skipsea Drain to Confluence **GB104026077770**	River; not designated artificial or heavily modified	**Moderate** Dissolved oxygen Phosphate Invertebrates Macrophytes and phytobenthos combined Ammonia	**Fail** PBDEs Mercury and its compounds

Water Body	Type and designation	Ecological status/potential and RNAG elements	Chemical status and RNAG elements
Barmston Sea Drain from Skipsea Drain to North Sea **GB104026077780**	River; artificial	**Moderate** Phosphate	**Fail** PBDEs Mercury and its compounds

20.5.4 Abstractions and discharges

65. Details of abstractions have been obtained from the Environment Agency. Although there are no surface water abstraction points within the Onshore Development Area, several active surface water abstraction licences are located within 1km of the Onshore Development Area, which are for agricultural spray irrigation. The abstractions are located in surface water catchments of Holderness Drain Source to Foredyke Stream, and Beverley and Barmston Drain (**Volume 7, Figure 20-1 (application ref: 7.20.1)**).

66. Maximum volumes of abstracted water are:

- **Holderness Darin Source to Foredyke Stream**
  - Licence number: 2/26/32/189
    - Maximum annual quantity (m^3): 103,000
    - Maximum daily quantity (m^3): 1,363
- **Beverley and Barmston**
  - Licence number: 2/26/32/253
    - Maximum annual quantity (m^3): 25,003
    - Maximum daily quantity (m^3): 1,363
  - Licence number: 2/26/31/101
    - Maximum annual quantity (m^3): 25,700
    - Maximum daily quantity (m^3): 514

67. There are also seven active Environment Agency licensed groundwater abstractions and 18 private East Riding of Yorkshire Council registered groundwater abstractions located within 1km of the Onshore Development Area. Four of the active Environment Agency licensed abstractions and 16 private East Riding of Yorkshire Council registered abstractions are recorded as potable abstractions. Full details of groundwater abstractions are provided in **Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)** and **Figure 19-2-8** in **Volume 7, Appendix 19-1 Geo-Environmental Desk Study and Preliminary Risk Assessment Report (application ref: 7.19.19.1)**,

68. Some low-risk water discharge and groundwater activities can be exempt from requiring a permit – most exceptions are for small sewage discharges. Environment Agency data show one historical permit exception located in the Landfall Zone beside Hornsea Road. These permit exemptions were replaced by general binding rules in 2015 (i.e., they are still active). The discharge in the landfall consists of biologically treated domestic effluent that must not exceed $2m^3$ per day.

20.5.5 Flood Risk

69. A summary of flood risk is provided in this section and a detailed FRA is provided in **Volume 7, Appendix 20-4 (application ref: 7.20.20.4)**.

70. Large areas of the East Riding of Yorkshire are defended against fluvial and coastal flooding. As such, much of the flood risk posed to the area is residual, as a result of flood events exceeding the standard of protection afforded by the defences; defence or pumping failure; or flooding behind defences due to local runoff or groundwater (East Riding of Yorkshire Council 2019).

20.5.5.1 Flooding from Rivers and the Sea

71. Environment Agency mapping shows that most of the Onshore Development Area lies outside Flood Zones 2 and 3 (i.e., Flood Zone 1 (<0.1% Annual Exceedance Probability (AEP)) (**Volume 7, Figure 20-4 (application ref: 7.20.1)**). Any land that is not mapped as Flood Zones 2 or 3 is part of Flood Zone 1, although this is not specifically mapped.

72. There are four main higher risk areas (Flood Zones 2 and 3) within the Onshore Development Area:

- In the Landfall Zone, the coastline (seaward of MHWS) is in Flood Zone 3 (land that has a 1% or greater annual probability of river flooding, or a 0.5% or greater probability of flooding from the sea). In this area the dominant source of flooding is from tidal sources, as opposed to being at risk from fluvial sources. The Environment Agency Historical Flood Extent map at the Landfall Zone demonstrates that it is situated in a location along the coastline that has not been affected by a historic flood extent. However, mapping indicates that historic flooding has occurred to the west of Skipsea, associated with the Skipsea Drain;
- Between Skipsea and Dunnington there are two narrow (~75-100m wide) areas in Flood Zones 2 and 3 associated with Skipsea Drain (West Branch) and Dunnington Sewer. Flood Zone 2 is defined as land that has a 0.1% to 1% annual probability of river flooding, or a 0.1% to 0.5% annual probability of flooding from the sea;
- South of Catwick the Onshore Development Area crosses a ~200m wide area of floodplain in Flood Zone 3 (with some small peripheral areas in Flood Zone 2) associated with Stream Dike; and
- From the junction of the A1035 and A165, south of Leven, the Onshore Development Area crosses a wide swathe of floodplain (~9km) in Flood Zones 2 and 3. Most of this area is in Flood Zone 3, but there is a large area of land that occupies Flood Zone 2 between Routh in the north and Meaux in the south. To the west and south of Beverley, flood risk associated with Flood Zones 2 and 3 is limited and associated with an ordinary watercourse near Jillywood Farm.

20.5.5.2 Surface Water Flood Risk

73. Given the low-lying topography of the Onshore Development Area, the risk of surface water flooding is high in many places as assessed in **Volume 7, Appendix 20-4 Flood Risk Assessment (application ref: 7.20.20.4)** on **Figure 20-4-4**.

74. Surface water flood risk occurs as isolated areas of ponding and discrete flow pathways. For example, there are small areas of high risk at the Landfall Zone, and in the area west of Beverley there are numerous narrow high risk (3.3% AEP) flow paths that drain towards Beverley. A high risk flow path also crosses the area that will be occupied by the Onshore Converter Stations, associated with an ordinary watercourse. There are more extensive areas of surface water flood risk in the area containing the onward cable route between the Onshore Converter Stations and the proposed Birkhill Wood National Grid Substation.

20.5.5.3 Groundwater Flood Risk

75. The Strategic Flood Risk Assessment (SFRA) shows the Areas Susceptible to Groundwater Flooding (AStGWF), which is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions indicate groundwater might emerge. At the landfall, mapping demonstrates that the Landfall Zone is situated in an area where <25% of the area is classified as being at risk of groundwater emergence.

76. The Onshore Export Cable Corridor also passes through areas at relatively low risk of groundwater emergence (i.e., < 25% of the area within the 1km grid is at risk of groundwater emergence) through to areas at greater risk (i.e. >= 75% of the 1km grid is at risk of groundwater emergence).

77. The Onshore Converter Stations are located in an area which is not susceptible to groundwater flooding.

20.5.6 Groundwater

20.5.6.1 Bedrock Geology and Bedrock Aquifers

78. Groundwater features are shown on **Volume 7, Figure 20-2 (application ref: 7.20.1)** and **Volume 7, Figure 20-3 (application ref: 7.20.1)**.

79. Bedrock geology across the Onshore Development Area is characterised by the White Chalk Subgroup. The subgroup is divided into two formations:

- The area from the coast to east of the A165 Beverley Road is characterised by rocks of the Rowe Chalk Formation; and
- The rest of the Onshore Development Area is characterised by rocks of the Flamborough Chalk Formation.

80. These rocks support a Principal aquifer across the entire Onshore Development Area (**Volume 7, Figure 20-3 (application ref: 7.20.1)**). Principal aquifers provide significant quantities of drinking water and water for business needs. They may also support rivers, lakes and wetlands.

20.5.6.2 Superficial Geology and Superficial Aquifers

81. Superficial deposits are more varied but are dominated by till (diamicton). A wide belt of alluvium (sand, silt and clay), interspersed with more restricted pockets of glaciofluvial sand and gravel, runs north-south through the Onshore Development Area. Around the periphery of Beverley there are also Quaternary river terrace sediments and areas of head (head is poorly sorted, poorly stratified angular rock debris and/or clayey hill wash and soil creep, mantling a hillslope).

82. Superficial deposits support extensive Secondary (undifferentiated) aquifers (**Volume 7, Figure 20-3 (application ref: 7.20.1)**). For these features it is not possible to apply either a Secondary A or B definition, because of the variable characteristics of the rock type, they have only a minor value. The Onshore Development Areas also crosses several Secondary A aquifers in the River Hull valley and other alluvial settings. Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers. Small Secondary B aquifers are also present near the coast in the Skipsea area. Secondary B aquifers are lower permeability layers which may yield limited amounts of groundwater due to localised features such as fissures, permeable horizons and weathering.

20.5.6.3 Groundwater Vulnerability

83. Groundwater vulnerability is medium across most of the Onshore Development Area (**Volume 7, Figure 20-3 (application ref: 7.20.1)**). Medium-high vulnerability zones are crossed near Skipsea, near Catwick, and north-east of Beverley. Immediately north, west and south of Beverley the Onshore Development Area crosses a medium vulnerability area with an associated soluble rock risk. The Onshore Development Area also crosses a small area with soluble rock risk north of Skipsea.

20.5.6.4 Drinking Water Protected Areas, Source Protection Zones (SPZs)

84. A large part of the Onshore Development Area crosses Cottingham Drinking Water Safeguard Zone (groundwater) (GWSGZ0240). The Drinking Water Safeguard Zone overlaps an SPZ (**Volume 7, Figure 20-2 (application ref: 7.20.1)**). To the west of the junction between A1035 and A165 roads, near Leven, the Onshore Development Area crosses into Zone III (total catchment) of the SPZ. SPZ III is defined as the area around a supply source within which all the groundwater ends up at the abstraction point. Southwest of Beverley the Onshore Development Area crosses into Zone II (outer protection) of the SPZ. Zone II has a 400-day travel time of pollutant to source and has a 250 or 500m minimum radius around the source, depending on the amount of water taken. Immediately south of the A1079 road, near Jillywood Farm, the Onshore Development Area crosses into Zone I (inner protection) of the SPZ. SPZ I is the most sensitive, having a 50-day travel time of pollutant to source with a 50m default minimum radius. Note that the small red circles shown on **Volume 7, Figure 20-2 (application ref: 7.20.1)** are individual boreholes (SPZ I).

20.5.6.5 Groundwater Quality

85. The Onshore Development Area is underlain by a single groundwater body: Hull and East Riding Chalk (GB40401G700700) (**Volume 7, Figure 20-2 (application ref: 7.20.1)**). Both quantitative and chemical classification elements are Poor. Groundwater quality pressures are being caused by:

- Poor nutrient management;
- Atmospheric deposition;
- Private sewage treatment;
- Sewage discharge (continuous);
- Farm/site infrastructure; and
- Groundwater abstraction.

86. These pressures affect the following classification elements that result in the water body not achieving good status.

- General chemical test;
- Trend assessment;
- Chemical Drinking Water Protected Area;
- Chemical GWDTEs test;
- Quantitative saline intrusion; and
- Chemical saline intrusion.

20.5.7 Designated Sites

87. The Onshore Development area does not cross any designated sites (Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar).

88. Skipsea Bail Mere SSSI is located approximately 900m downstream of the Onshore Development Area. The SSSI is important for the interpretation of the vegetational history of the northern part of the Holderness coastal plain. The SSSI was last assessed in 2022 as in favourable (100%) condition.

89. West of Beverley the Onshore Development Area is 120m west of Burton Bushes SSSI, although there is no surface water connectivity to the designated site. The SSSI is characterised by oak woodland that is known to exceed 200 years in age, and evidence suggests that it is of natural origins. It is considered a good example of the woodland characteristic of Holderness Till soils. The SSSI was last assessed in 2010 as in favourable (100%) condition.

90. Designated sites are discussed in **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)** and mapped in **Volume 7, Figure 18-3 (application ref: 7.18.1)**.

91. Skipsea Bail Mere SSSI and Burton Bushes SSSI are assessed in section 20.6 and water dependent designated sites associated with surface and groundwater bodies are assessed separately in **Volume 7, Appendix 20-3 Water Environment Regulations Compliance Assessment (application ref: 7.20.20.3)**.

20.5.8 Receptor Sensitivity

92. Catchment receptor sensitivity is described in **Table 20-11**. Catchments are shown on **Volume 7, Figure 20-1 (application ref: 7.20.1)**.

Table 20-11 Flood Risk and Hydrology Receptor Sensitivity

Catchment	Sensitivity	Justification
Barmston Sea Drain/ Skipsea Drain to Confluence	Medium	Catchment supports Tophill Low Drinking Water Safe-guard Zone. River waterbody (not designated artificial or heavily modified) characterised by numerous straight planform reaches indicative of resectioning for land drainage and flood defence purposes. Ecological status is Moderate (with a Bad classification for ammonia) and Fail for chemical status. Skipsea Bail Mere SSSI is located ~900m downstream of the Onshore Development Area.
Barmston Sea Drain from Skipsea Drain to North Sea	Medium	Catchment supports Tophill Low Drinking Water Safe-guard Zone. Artificial water body at Moderate ecological potential due to diffuse pollution (poor nutrient management) and point source pollution (private sewage treatment) adversely affecting phosphate levels. The macrophytes sub element and the mitigation measures assessment are classified as Moderate and Moderate or less, respectively.
Onshore coastal catchment	High	A narrow strip of land near the coast characterized by several short artificial drains and small ponds. Sensitivity is high because the catchment drains to the Greater Wash SPA.
Mickley Dike catchment	Medium	Catchment supports Tophill Low Drinking Water Safeguard Zone. Artificial river water body with a straight planform over most of its length. Ecological potential is Moderate (with a Poor classification for dissolved oxygen) and Fail for chemical status.

Catchment	Sensitivity	Justification
Old Howe/ Frodingham Beck to River Hull	Medium	Catchment supports Tophill Low Drinking Water Safeguard Zone. Heavily modified river water body with several long, straight planform sections reaches indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate (with a Poor classification for dissolved oxygen) and Fail for chemical status.
Catchwater Drain	Low	Artificial river water body with a straight planform over most of its length. Ecological potential is Moderate (with Bad classifications for ammonia and dissolved oxygen) and Fail for chemical status.
Foredyke Stream Upper	Low	Artificial river water body with several long, straight planform sections. Ecological potential is Moderate (with a Bad classification for ammonia) and Fail for chemical status.
Foredyke Stream Lower to Holderness Drain	Low	Artificial river water body with a straight planform over most of its length. Ecological potential is Moderate (with a Bad classification for fish and Poor classifications for ammonia, dissolved oxygen and phosphate) and Fail for chemical status.
Holderness Drain Source to Foredyke Stream	Low	Artificial river water body with a straight planform over most of its length. Ecological potential is Moderate (with a Bad classification for dissolved oxygen) and Fail for chemical status.
Beverley and Barmston Drain	Low	Artificial river water body with a straight planform over most of its length. Ecological potential is Moderate (with a Bad classification for dissolved oxygen) and Fail for chemical status. Burton Bushes SSSI is designated for its broadleaved woodland on till soils. The SSSI is not crossed by any watercourses or surface water flow paths that connect to the Onshore Development Area.
Hull from Arram Beck to Humber	Medium	Heavily modified river water body with a low sinuosity planform for much of its length. Although ecological potential is Moderate, sensitivity has been set to medium because the majority of biological and physico-chemical quality elements are classed as High.

Catchment	Sensitivity	Justification
High Hunsley to Arram Area	Low	Artificial river water body with a straight planform over most of its length. Ecological potential is Moderate (with a Poor classification for phosphate) and Fail for chemical status. Catchment contains a very small section of Burton Bushes SSSI. The SSSI is not crossed by any watercourses or surface water flow paths that connect to the Onshore Development Area.
High Hunsley to Woodmansey Area	Low	Artificial river water body with several long, straight planform sections. Ecological potential is Moderate (with a Moderate classification for fish) and Fail for chemical status.
Hull and East Riding Chalk	High	Groundwater body that supports a Principal aquifer across the entire Onshore Development Area. Superficial deposits support a Secondary A aquifer. Groundwater vulnerability is mainly medium with some areas classed medium-high. The groundwater body also supports an SPZ and drinking water (groundwater) safeguard zone.

20.5.9 Future Trends

93. In the event that the Projects are not developed, an assessment of future conditions for Flood Risk and Hydrology has been carried out and is described within this section. The following description is based on a 'do nothing' scenario.

94. The review of the existing environment in this chapter demonstrates that surface water bodies in the study area support limited areas of high-quality natural habitats. Many of these water bodies have experienced physical modification for land drainage and flood risk management, affecting their geomorphology. Water quality is generally moderate but locally poor across the study area. Watercourses are adversely affected by diffuse pollution from agriculture and point source pollution (sewage). Some water bodies are affected by saline intrusion and surface water abstraction.

95. Ongoing measures to reduce existing pressures on geomorphology and water quality as part of the implementation of the WER is likely to improve conditions over time.

96. The hydrology of the surface drainage network is expected to change with higher winter flows and lower summer flows with a greater number of storm-related flood flows (climate change is causing more extreme weather). This is likely to lead to changes in the hydrology of the river systems with increased geomorphological activity occurring as a result of storm events. Therefore, the drainage network is unlikely to remain stable over time and may revert to more natural river types in future, although there would be ongoing channel management (e.g., by IDBs).

97. Groundwater resources face pressure from diffuse pollution from agriculture (e.g., poor livestock and nutrient management). Ongoing initiatives are in place to reduce pressures on groundwater, including increased regulation of agricultural chemicals, in order to achieve compliance with the Water Environment Regulations (WER). This would suggest that groundwater quality and quantity is likely to improve in the future, although this would occur over long timescales.

98. In summary, water quality is likely to improve due to better contaminant management (due to the WER), however climate change impacts, such as more extreme weather (increased precipitation), are likely to impact catchment hydromorphology (e.g. as a result of higher flows and more geomorphic activity). Consequently, river channels may become more dynamic and flood risk may increase.

20.6 Assessment of Significance

20.6.1 Potential Effects During Construction

20.6.1.1 Impact 1 Direct Disturbance of Surface Water Bodies

99. Trenchless crossing techniques such as HDD have been embedded in the scheme design for Main Rivers (**Table 20-3**). The location and method of Main River and ordinary watercourse crossings are shown in **Volume 7, Figure 20-5 (application ref: 7.20.1)**. The location and method of IDB drain crossings are shown in **Volume 7, Figure 20-6 (application ref: 7.20.1)**. Further details of watercourse crossing are provided in **Volume 7, Appendix 5-2 Obstacle Crossing Register (application ref: 7.5.5.2)**. The cables would be buried a maximum of 20 m deep at trenchless crossings. Although ground disturbance will occur at the entry and exit points (which could potentially be located on the floodplain), there would be no direct disturbance to the watercourses crossed using a trenchless technique. Therefore, there is no direct mechanism for impacts to occur to the geomorphology, hydrology and physical habitats of these watercourses.

100. Direct disturbance of Ordinary Watercourses (including IDB drains) will occur at trenched crossings as shown in **Volume 7, Figure 20-6 (application ref: 7.20.1)**. Trenched crossings will involve installing temporary dams (composed of sand bags, straw bales and ditching clay, or another suitable technique) upstream and downstream of the crossing point. The cable trench is then excavated in the dry area of riverbed between the two dams with the river flow maintained using a temporary pump or flume.

101. This installation technique would directly disturb the bed and banks of the watercourse and would result in the direct loss of natural geomorphological features and changes to their associated physical habitat niches. It may also result in increased geomorphological instability due to enhanced scour and increased sediment supply and changes to hydrology. These are, however, temporary impacts which would only occur whilst construction work is in progress, and the bed and banks would be reinstated to their original level, position, planform and profile.

102. The footprint of the Onshore Converter Stations crosses two ordinary watercourses that would be infilled and surface waters captured in cut-off drains and re-routed around the Onshore Converter Stations. The strategy for managing runoff from these ordinary watercourses is described in details in the **Outline Drainage Strategy (Volume 8, application ref: 8.12)**.

103. In addition to the cable infrastructure itself, it may be necessary to install temporary crossing structures to allow Haul Road access across watercourses where direct access is not readily available from both sides. This may potentially be required on watercourses which will be crossed using trenchless techniques.

104. Temporary crossings may comprise an appropriately sized culvert installed within the ditch with the Haul Road being installed over the top of the culvert. The base of the culvert would be installed beneath the channel bed so as to avoid upstream the impoundment of water and sediment, and the culvert would be sized to accommodate reasonable 'worst-case' weather volumes and flows. These culverts may remain in place for the duration of the cable duct installation and subsequent cable pull. For the worst case of sequential construction, it is assumed that all temporary crossings could be in place for six years. At larger crossings, or sensitive rivers, temporary bridges (e.g., Bailey bridges or similar) may be installed to allow continuation of the Haul Road.

105. Installation of temporary culverts across Ordinary Watercourses could potentially directly disturb the bed and banks of the watercourse and result in the direct loss of natural geomorphological features. They could also result in reduced flow and sediment conveyance, create upstream impoundment and affect the patterns of erosion and sedimentation. These impacts would be reversible once the temporary culverts have been removed and the bed and banks reinstated.

106. Temporary bridges are unlikely to result in significant disturbance to the bed and banks of the channel, with any impacts limited to the footprint of the bridge abutments themselves.

107. For the purposes of this assessment, the magnitude of impact is assumed to be directly proportional to the total number of trenched watercourse crossings within each river water body catchment and the length of time over which temporary structures could be in place, as given in **Table 20-12**. In addition, embedded mitigation for watercourse crossings (**Table 20-3**) is also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the number of trenched crossings will be lowered due to embedded mitigation such as the **OCoCP (Volume 8, application ref: 8.9)** and the **Outline Drainage strategy (Volume 8, application ref: 8.12)**. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no impact' scenario.

108. The worst case parameters of the sequential and Concurrent Scenarios are the same (**Table 20-1**), but the longer duration for construction of the Sequential Scenario means that any temporary structures associated trenched crossings, such as the Haul Road, would be in place for a longer continuous period. This means that the total continuous period of disturbance would be greater in the Sequential Scenario, which is therefore considered to represent the worst-case.

Table 20-12 Magnitude of Impact for Trenched Watercourse Crossings

Magnitude of impact	Number of trenched crossings per water body catchment	
	Temporary crossings in place up to 4 years (In Isolation or Concurrent Scenarios)	Temporary crossings in place up to 6 years (Sequential Scenarios)
No impact	0	0
Negligible	1-4	1
Low	5-9	2-4
Medium	10-14	5-9
High	>15	>10

20.6.1.1.1 Magnitude of Impact – DBS East or DBS West In Isolation Scenario

109. Either Project In Isolation or both Projects built will cross the same number of Main Rivers and Ordinary Watercourses in each water body catchment. Numbers and types of crossings, and magnitude of impact based on the criteria set out in **Table 20-12** are shown in **Table 20-13**.

110. Considering the number of trenched crossings and embedded mitigation measures, magnitude of impact is negligible in most catchments. Impacts are medium in the catchment of Beverley and Barmston because the catchment is crossed three times by the Onshore Development Area, resulting in a high number of trenched crossings.

111. There would be no impacts in the Barmston Sea Drain from Skipsea Drain to North Sea catchment, onshore coastal catchment or Hull from Arram Beck to Humber catchment, as there are no trenched crossings in these catchments.

Table 20-13 Water Body Crossings in Surface Water Catchments

Catchment	Sensitivity	Trenchless crossings		Trenched crossings	Magnitude of impact taking into account embedded mitigation	
		Main River	Ordinary Watercourse	Ordinary Watercourse	In place up 4 years (In Isolation or Concurrent Scenario)	In place up 6 years (Sequential Scenario)
Barmston Sea Drain/Skipsea Drain to Confluence	Medium	0	2	4	Negligible	Negligible
Barmston Sea Drain from Skipsea Drain to North Sea	Low	0	0	0	No impact	No impact
Onshore coastal catchment	High	0	0	0	No impact	No impact
Mickley Dike catchment	Medium	0	0	1	Negligible	Negligible

Catchment	Sensitivity	Trenchless crossings		Trenched crossings	Magnitude of impact taking into account embedded mitigation	
		Main River	Ordinary Watercourse	Ordinary Watercourse	In place up 4 years (In Isolation or Concurrent Scenario)	In place up 6 years (Sequential Scenario)
Old Howe/Frodingham Beck to River Hull	Medium	0	0	3	Negligible	Negligible
Catchwater Drain	Low	0	4	7	Negligible	Low
Foredyke Stream Upper	Low	1	0	3	Negligible	Negligible
Foredyke Stream Lower to Holderness Drain	Low	2	0	1	Negligible	Negligible
Holderness Drain Source to Foredyke Stream	Low	1	2	5	Negligible	Low

Catchment	Sensitivity	Trenchless crossings		Trenched crossings	Magnitude of impact taking into account embedded mitigation	
		Main River	Ordinary Watercourse	Ordinary Watercourse	In place up 4 years (In Isolation or Concurrent Scenario)	In place up 6 years (Sequential Scenario)
Beverley and Barmston Drain	Low	1	3	19	Medium	Medium
Hull from Arram Beck to Humber	Medium	1	0	0	No impact	No impact
High Hunsley to Arram Area	Low	1	0	1	Negligible	Negligible
High Hunsley to Woodmansey Area	Low	0	0	2	Negligible	Negligible

20.6.1.1.2 Magnitude of Impact – DBS East and DBS West Together

112. Magnitude of impact for concurrent construction is as described for the In Isolation Scenario because the durations are the same and the same number of watercourses will be crossed.

113. Magnitude of impact for the worst-case scenario (Sequential Scenario) is mainly negligible except for Catchwater Drain and Holderness Drain Source to Foredyke Stream (low impact due to the longer duration sequential scenarios (**Table 20-12**) and Beverley and Barmston Drain (medium impact), as shown in **Table 20-13**.

114. There would be no impact in the Barmston Sea Drain from Skipsea Drain to North Sea catchment, onshore coastal catchment or Hull from Arram Beck to Humber catchment as there are no trenched crossings.

20.6.1.1.3 Sensitivity of Receptor

115. Receptor sensitivity is described in **Table 20-11** of the 13 surface water catchments crossed by the Onshore Development Area, sensitivity is high in one (onshore coastal catchment), medium in four catchments and low in eight. High sensitivity is due to connectivity to the Greater Wash SPA (onshore coastal catchment). Medium sensitivity is related to High status for some biological and physico-chemical quality elements and the presence of Tophill Low Drinking Water Safeguard Zone.

20.6.1.1.4 Significance of Effect – DBS East or DBS West In Isolation Scenario

116. Significance of effect on each watercourse resulting from the direct disturbance of surface water bodies due to construction of a Project in isolation is given in **Table 20-14**. All effects are **negligible** or **minor** adverse except in catchments where there are no trenched crossings (**no change**).

117. All direct disturbance effects relating to construction of the Projects In Isolation are deemed to be not significant.

20.6.1.1.5 Significance of Effect – DBS East and DBS West Together

118. Significance of effect for the Concurrent Scenario is as described for the In Isolation Scenario because the durations are the same and the same number of watercourses will be crossed.

119. Significance of effect on each watercourse resulting from direct disturbance of surface water bodies due to construction of the Projects in a Sequential Scenario is given in **Table 20-15**. All effects are **negligible** or **minor** adverse except in catchments where there are no trenched crossings (**no change**).

120. All direct disturbance effects relating to construction of the Projects together are deemed to be not significant.

Table 20-14 Effects Resulting from Direct Disturbance of Water Bodies During the Construction of a Project In Isolation Scenario

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Barmston Sea Drain /Skipsea Drain to Confluence	Medium	Four trenched crossings are required. Mitigation for watercourse crossings is embedded in the project design, resulting in impacts of negligible magnitude and minor adverse effects. Skipsea Bail Mere SSSI is located approximately 900m downstream of the Onshore Development Area. Three trenched crossings would be required on watercourses that drain to the mere. The site's interest lies in the lake deposits (pollen) underlying the fields and can be accessed by auger or borehole. Due to the distance from the SSSI, small scale of works and embedded mitigation to limit the sediment supply and control flows at trenched crossing sites, impacts on the SSSI are not anticipated.	Negligible	**Minor adverse**
Barmston Sea Drain from Skipsea Drain to North Sea	Low	There are no trenched crossings or temporary crossings is this catchment, therefore no impacts are anticipated.	No impact	**No change**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Onshore coastal catchment	High	There are no trenched crossings or temporary crossings is this catchment, therefore no impacts are anticipated.	No impact	**No change**
Mickley Dike catchment	Medium	There is one trenched crossing in this catchment giving a negligible impact and minor adverse effect due to medium sensitivity.	Negligible	**Minor adverse**
Old Howe/ Frodingham Beck to River Hull	Medium	Three trenched crossings are required, resulting in impacts of negligible magnitude and minor adverse effects due to medium sensitivity.	Negligible	**Minor adverse**
Catchwater Drain	Low	Seven trenched crossings are required. Mitigation for watercourse crossings is embedded in the project design, resulting in impacts of negligible magnitude and negligible significance of effect.	Negligible	**Negligible**
Foredyke Stream Upper	Low	Three trenched crossings are required, resulting in impacts of negligible magnitude and negligible significance of effect.	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Foredyke Stream Lower to Holderness Drain	Low	One trenched crossing is required, resulting in negligible impacts and negligible significance of effect.	Negligible	**Negligible**
Holderness Drain Source to Foredyke Stream	Low	Five trenched crossings are required, resulting in impacts of negligible magnitude and minor adverse effects prior to mitigation. Residual effects remain negligible because magnitude of impact is negligible prior to mitigation.	Negligible	**Negligible**
Beverley and Barmston Drain	Low	Up to 16 trenched crossings could be required in this catchment and three sections of Ordinary Watercourse at the Onshore Converter Stations would require infilling. For the purpose of the assessment the infilled channels at the OCS have been counted as trenched crossings (total of 19). Mitigation for watercourse crossings is embedded in the project design, resulting in impacts of medium magnitude and minor adverse effects.	Medium	**Minor adverse**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
		Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site (and therefore no trenched crossings that could affect the site). Due to the distance from the SSSI lack of connectivity and small scale of works, impacts on the SSSI are not anticipated.		
Hull from Arram Beck to Humber	Medium	There are no trenched crossings or temporary crossings is this catchment, therefore no impacts are anticipated.	No impact	**No change**
High Hunsley to Arram Area	Low	Two trenched crossing are required, resulting in impacts of negligible magnitude and negligible significance of effect. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site (and therefore no trenched crossings that could affect the site). Due to the distance from the SSSI lack of connectivity, small scale of works, and embedded mitigation measures to limit the sediment supply and control flows at trenched crossing sites, impacts on the SSSI are not anticipated.	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
High Hunsley to Woodmansey Area	Low	Two trenched crossings are required, resulting in impacts of negligible magnitude and minor adverse effects prior to mitigation.	Negligible	**Negligible**

Table 20-15 Effects Resulting from Direct Disturbance of Water Bodies During the Construction of the Projects Together

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Barmston Sea Drain/Skipsea Drain to Confluence	Medium	Four trenched crossings are required, resulting in impacts of negligible magnitude and minor adverse effects. Skipsea Bail Mere SSSI is located approximately 900m downstream of the Onshore Development Area. Three trenched crossings would be required on watercourses that drain to the mere. The sites interest lies in the lake deposits (pollen) underlying the fields and can be accessed by auger or borehole. Due to the distance from the SSSI, small scale of works and embedded mitigation measures to limit the sediment supply and control flows at trenched crossing sites, impacts on the SSSI are not anticipated.	Negligible	**Minor adverse**
Barmston Sea Drain from Skipsea Drain to North Sea	Low	There are no trenched crossings; no impacts are anticipated.	No impact	No change

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Onshore coastal catchment	High	There are no trenched crossings; no impacts are anticipated.	No impact	No change
Mickley Dike catchment	Medium	There is one trenched crossing in this catchment, resulting in negligible impact and minor adverse effects.	Negligible	**Minor adverse**
Old Howe/ Frodingham Beck to River Hull	Medium	Three trenched crossings are required, resulting in impacts of negligible magnitude and minor adverse effects.	Negligible	**Minor adverse**
Catchwater Drain	Low	Seven trenched crossings are required, resulting in impacts of low magnitude and minor adverse effects.	Low	**Minor adverse**
Foredyke Stream Upper	Low	Three trenched crossings are required, resulting in impacts of negligible magnitude and negligible significance of effect.	Negligible	**Negligible**
Foredyke Stream Lower	Low	One trenched crossing is required, resulting in impacts of negligible magnitude and negligible effects.	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
to Holderness Drain				
Holderness Drain Source to Foredyke Stream	Low	Five trenched crossings are required, resulting in impacts of low magnitude and minor adverse effects.	Negligible	**Minor adverse**
Beverley and Barmston Drain	Low	Up to 16 trenched crossings could be required in this catchment and three sections of Ordinary Watercourse at the Onshore Converter Stations would require infilling. For the purpose of the assessment the infilled channels at the OCS have been counted as trenched crossings (total of 19). Mitigation for watercourse crossings is embedded in the project design, resulting in impacts of medium magnitude and minor adverse effects. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site (and therefore no trenched crossings that could affect the site). Due to the distance from the SSSI lack of connectivity, small scale of works, embedded mitigation measures to limit the	Medium	**Minor adverse**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
		potential for accidental spills, impacts on the SSSI are not anticipated.		
Hull from Arram Beck to Humber	Medium	There are no trenched crossings or temporary crossings is this catchment, therefore no impacts are anticipated.	No impact	No change
High Hunsley to Arram Area	Low	One trenched crossing is required, resulting in impacts of negligible magnitude and negligible. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site (and therefore no trenched crossings that could affect the site). Due to the distance from the SSSI lack of connectivity, small scale of works, and embedded mitigation measures to limit the potential for accidental spills, impacts on the SSSI are not anticipated.	Negligible	**Negligible**
High Hunsley to Woodmansey Area	Low	Two trenched crossings are required in this catchment, resulting in impacts of negligible magnitude and negligible effects.	Negligible	**Negligible**

20.6.1.2 Impact 2 Increased Sediment Supply

121. Construction of the landfall, Onshore Export Cable Corridor, Haul Road, Temporary Construction Compounds, Onshore Converter Stations and onward connection to National Grid will involve earthworks (e.g., piling, earthworks and the tracking of large construction machinery). This will create areas of bare ground by removing vegetation cover and topsoil and will increase the potential for the erosion of soil particulates. This could result in an increase in the supply of fine sediment (e.g., clays, silts and fine sands) to surface water bodies (including land drainage channels) through surface runoff and the erosion of exposed soils.

122. Increased sediment supply can affect the geomorphology of water bodies by increasing the turbidity of the water column and, where energy is sufficiently low, encouraging increased deposition of fine sediment on the bed of the channel. Increased sediment loads could therefore smother existing bed habitats, reduce light penetration and reduce dissolved oxygen concentrations, adversely affecting the biota of the water body including macrophytes, aquatic invertebrates and fish. This has the overall effect of reducing the quality of in-channel habitats.

123. In addition to the potential sources of sediment considered, temporary bridges may be used to maintain Haul Road access across water bodies. These crossings would provide a mechanism by which sediment could be produced close to the water bodies which they cross. Disturbed ground associated with trenched crossings also has the potential to increase sediment supply.

124. **Table 20-16** shows the criteria used to assess the magnitude of impact associated with increased sediment supply resulting from exposed land in a water body catchment. In addition, embedded mitigation for increased sediment supply (**Table 20-3**) is also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the area of disturbed ground will be lowered due to embedded mitigation. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no impact' scenario.

125. For all scenarios (isolation, concurrent and sequential) the area of disturbed ground has been estimated from the area of Onshore Development Area in each water body catchment (**Table 20-17**). The area of disturbed ground will very likely be less than the figures presented in **Table 20-17** for the In Isolation Scenario due to the narrower corridor swathe and smaller construction compounds at the landfall and Onshore Converter Stations compared to sequential or concurrent construction (**Table 20-1**).

126. Although the worst case construction parameters are the same for Sequential and Concurrent Scenarios, sequential construction is considered the worst case for increased sediment supply due to the longer duration of construction activity.

Table 20-16 Magnitude of Impact Resulting from Exposed Land in a Water Body Catchment

Magnitude of impact	Area of exposed ground per catchment during construction (%)
Negligible	≤1
Low	1 – <6
Medium	6 – <10
High	>10

20.6.1.2.1 Magnitude of Impact – DBS East or DBS West In Isolation Scenario

127. The area of each water body catchment occupied by the Onshore Development Area is shown in **Table 20-17**. For all catchments except Beverley and Barmston Drain and Barmston Sea Drain/Skipsea Drain to Confluence, the area of disturbed ground is less than $0.5km^2$. For Beverley and Barmston Drain the figure is $1.22km^2$ and $0.54km^2$ for Barmston Sea Drain/Skipsea Drain to Confluence. The maximum proportion of each catchment affected is 3.1% (onshore coastal catchment). Magnitude of impact in all catchments is negligible.

128. The very small area affected in the Barmston Sea Drain from Skipsea Drain to North Sea catchment is due to the presence of a very short section of emergency access track ($383m^2$), which equates to only 0.006% of the catchment area.

129. Although **Table 20-17** represents the worst case scenario in terms of possible extent of exposed land, areas of exposed will very likely be reduced for the In Isolation Scenario due to the narrower corridor swathe and smaller compounds at the landfall and at the Onshore Substation Zone (**Table 20-1**).

20.6.1.2.2 Magnitude of Impact – DBS East and DBS West Together

130. Areas of exposed ground would be the same for a Concurrent Scenario, but the longer duration of the sequential build means there is more opportunity for soil erosion and sediment supply to watercourses. All impacts are negligible.

Table 20-17 Worst Case Estimated Maximum Area of Disturbed Ground in each Catchment Receptor for all scenarios

Water body catchment	Estimated total area of disturbed ground during construction		Magnitude of impact tsking into account embedded mitigation
	km^2	%	
Foredyke Stream Upper	0.30	1.5	Negligible
Foredyke Stream Lower to Holderness Drain	0.25	1.1	Negligible
Old Howe/ Frodingham Beck to River Hull	0.33	1.3	Negligible
Beverley and Barmston Drain	1.22	1.2	Negligible
Hull from Arram Beck to Humber	0.01	0.03	Negligible
Barmston Sea Drain / Skipsea Drain to Confluence	0.54	1.9	Negligible
Barmston Sea Drain from Skipsea Drain to North Sea	0.0004	0.006	Negligible
High Hunsley to Woodmansey Area	0.42	2.8	Negligible
High Hunsley to Arram Area	0.32	0.8	Negligible
Holderness Drain Source to Foredyke Stream	0.47	1.1	Negligible
Catchwater Drain	0.49	2.2	Negligible
Mickley Dike Catchment	0.04	0.2	Negligible
Onshore coastal catchment	0.04	3.1	Negligible

20.6.1.2.3 Sensitivity of Receptor

131. Receptor sensitivity is described in **Table 20-11**, of the 13 surface water catchments crossed by the Onshore Development Area, sensitivity is high in one (onshore coastal catchment), medium in four catchments and low in eight. High sensitivity is due to connectivity to the Greater Wash SPA (onshore coastal catchment). Medium sensitivity is related to High status for some biological and physico-chemical quality elements and the presence of Tophill Low Drinking Water Safeguard Zone.

20.6.1.2.4 Significance of Effect – DBS East or DBS West In Isolation Scenario

132. Effects are **negligible** or **minor** adverse in all catchments depending on catchment sensitivity. The significance of the effect on each water body resulting from increased sediment supply due to the construction is assessed in **Table 20-18**.

133. All effects relating to increased sediment supply for construction of the Projects together are deemed to be not significant.

20.6.1.2.5 Significance of Effect – DBS East and DBS West Together

134. The significance of the effect on each water body resulting from increased sediment supply due to the construction of the Projects sequentially is as assessed in **Table 20-18**.

135. Effects are **negligible** or **minor** adverse in all catchments depending on catchment sensitivity. All effects relating to increased sediment supply for construction of the Projects together are deemed to be not significant.

Table 20-18 Effects Resulting from Increased Sediment Supply to Catchments Resulting from Construction of the Projects (all Scenarios)

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Onshore coastal catchment	High	Although only 0.04km^2 of the catchment would be affected by construction, this represents 3.1% of the total catchment area, which is a narrow strip of land beside the coast. The area disturbed by construction is unlikely to be reduced in the In Isolation Scenario because the landfall construction compound will be set back from the coast. Magnitude of impact is negligible and significance of effect minor adverse due to high sensitivity.	Negligible	**Minor adverse**
Barmston Sea Drain/Skipsea Drain to Confluence	Medium	Only 0.54km^2 (1.9%) of the catchment would be disturbed by construction activities. For the In Isolation Scenario, the area of exposed land would be reduced by 0.0006km^2 due to the smaller landfall construction compound compared to a Sequential or Concurrent Scenarios. Magnitude of impact is negligible and significance of effect minor adverse due to medium sensitivity. Skipsea Bail Mere SSSI is located approximately 900m downstream of the Onshore Development Area. The sites interest lies in the lake deposits (pollen) underlying	Negligible	**Minor adverse**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
		the fields and can be accessed by auger or borehole. Due to the distance from the SSSI, small scale of works and use of mitigation measures to limit sediment supply associated with disturbed ground, impacts on the SSSI are not anticipated.		
Barmston Sea Drain from Skipsea Drain to North Sea	Low	Less than 0.0004km^2 of the catchment (0.006%) would be affected by construction, which relates to a short section of existing access track. Onshore infrastructure will not be installed in this catchment in any scenario. The potential for increased sediment supply is very limited and magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Mickley Dike catchment	Medium	A maximum of 0.04km^2 (0.2%) of the catchment could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact is negligible and significance of effect minor adverse due to medium sensitivity.	Negligible	**Minor adverse**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Old Howe/ Frodingham Beck to River Hull	Medium	A maximum of 0.33km^2 (1.3%) of the catchment could be disturbed by construction activities could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact is negligible and significance of effect minor adverse due to medium sensitivity.	Negligible	**Minor adverse**
Catchwater Drain	Low	A maximum of 0.49km^2 (2.2%) of the catchment could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Foredyke Stream Upper	Low	A maximum of 0.30km^2 (1.5%) of the catchment could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Foredyke Stream Lower to Holderness Dr	Low	A maximum of 0.25km^2 (1.1%) of the catchment could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Holderness Drain Source to Foredyke Stream	Low	A maximum of 0.47km^2 (1.1%) of the catchment could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Beverley and Barmston Drain	Low	1.22km^2 (1.2%) of the catchment could be disturbed by construction activities. The Onshore Converter Stations straddle the catchment and the High Hunsley to Woodmansey Area catchment. Depending on the final location of the Converter stations the area of exposed land would be reduced for the In Isolation Scenario due to the smaller compound size and narrower corridor swathe. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
		Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site. Due to the distance from the SSSI lack of connectivity, small scale of works, and embedded mitigation measures to limit sediment supply associated with disturbed ground, impacts on the SSSI are not anticipated.		
Hull from Arram Beck to Humber	Medium	Only 0.01km^2 (0.03%) of the catchment could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact is negligible and significance of effect minor adverse due to medium sensitivity.	Negligible	**Minor adverse**
High Hunsley to Arram Area	Low	Only 0.32km^2 (0.8%) of the catchment could be disturbed by construction activities and this would likely be reduced further for the In Isolation Scenario due to the narrower corridor swathe. Magnitude of impact and significance of effect are negligible. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site. Due to the distance	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
		from the SSSI lack of connectivity, small scale of works, and embedded mitigation measures to limit sediment supply associated with disturbed ground, impacts on the SSSI are not anticipated.		
High Hunsley to Woodmansey Area	Low	A maximum of 0.42km^2 (2.8%) of the catchment could be disturbed by construction activities. The area of disturbed ground is higher in this catchment because of the location of the Onshore Converter Stations. The Onshore Converter Stations straddle the catchment and the Beverley and Barmston Drain catchment. Depending on the final location of the Converter station the area of exposed land would be reduced in the In Isolation Scenario due to the smaller construction compound and narrower corridor swathe. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**

20.6.1.3 Impact 3 Accidental Release of Contaminants to Surface and Groundwaters

136. During construction there is potential for the accidental release of lubricants, fuels and oils from construction machinery. This can occur because of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies, including land drainage channels. Bentonite, which is an inert clay-based material used at the drillhead during the installation of trenchless crossings, can breakout during use and cause smothering of habitats, although it is inert and not a pollutant. There is also potential for accidental leakages of foul water from welfare facilities, and construction materials including concrete and inert drilling fluids. These can enter surface waters and connected groundwaters through run-off, especially following rainfall.

137. A significant leakage or spillage has the potential to cause adverse effects to water quality if contaminants enter the surface drainage network and can adversely affect the ecology of the water bodies.

138. Construction activities, including excavations for cable trenching, could result in the remobilisation of contaminants that are already present in the soil. This could include in situ contaminated land and nutrients such as nitrogen and phosphorus from nitrogen-rich arable soils. It is anticipated that foul drainage from welfare systems would be via a mains sewer connection or septic tanks. The supply of nutrients to surface waters, either from soil disturbance, septic tanks or via a mains sewer connection could result in adverse effects on water quality (including, in extreme cases, eutrophication) and aquatic plant, invertebrate and fish communities supported by surface waters.

139. The closest wetland that falls under Defra's nutrient neutrality principles is Hornsea Mere (approximately 850m east of the Onshore Export Cable Corridor). Hornsea Mere is part of the Stream Dyke Hornsea Mere to North Sea water body catchment. This catchment is not crossed by the Onshore Development Area, which means there is no mechanism for impact. Other designated sites within each catchment are assessed in **Table 20-19**. Designated sites outside the Onshore Development Area are assessed in **Volume 7, Appendix 20-3 Water Environment Regulations Compliance Assessment (application ref: 7.20.20.3)**.

140. Construction activities such as excavation, piling and underground trenchless crossing techniques (e.g. HDD) which disturb the ground can also introduce contaminants (including nutrients) into underlying groundwater bodies, particularly shallow aquifers. The length of trenchless drills (e.g. HDD) is likely to vary depending on the obstacle being crossed. Longer crossings, such as the landfall trenchless crossing, have a greater potential to interact with the underlying chalk aquifer. These activities could adversely affect the quality of the underlying groundwater and any licensed or unlicensed abstractions associated with it.

20.6.1.3.1 Magnitude of Impact – DBS East or DBS West In Isolation Scenario

141. The area of each catchment disturbed by construction (**Table 20-17**) is used as a proxy for the area of land that could be affected by the accidental release of contaminants. In addition, embedded mitigation for accidental spills and leaks of contaminants (**Table 20-3**) is also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the area of disturbed ground and potential for spills or leaks during construction will be lowered due to embedded mitigation. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no impact' scenario.

142. As described in section 20.6.1.2, although the areas in **Table 20-17** represent the worst case extent for each scenario, for the In Isolation Scenario, areas will very likely be reduced due to a narrower corridor and smaller landfall and Onshore Substation Zone compounds.

143. Based on the figures **Table 20-17**, the maximum proportion of any catchment that will be disturbed by construction is 3.1% (onshore coastal catchment) and for most catchments the figure is less than 2%. This means magnitude of impact is negligible in all surface water catchments.

144. Magnitude of impact is also negligible in the Hull and East Riding Chalk groundwater catchment, which underlies the entire Onshore Development Area. Although the Onshore Development Area occupies 4.5km^2 of the groundwater catchment, this equates to only 0.23% of the total area.

20.6.1.3.2 Magnitude of Impact – DBS East and DBS West Together

145. The magnitude of impact will be the same as for the In Isolation scenario, described above as the areas in **Table 20-17** represent the worst case extent for all construction scenarios.

20.6.1.3.3 Sensitivity of Receptor

146. Receptor sensitivity is described in **Table 20-11**. Of the 13 surface water catchments crossed by the Onshore Development Area, sensitivity is high in one (onshore coastal catchment), medium in four catchments and low in eight. High sensitivity is due to connectivity to the Greater Wash SPA (onshore coastal catchment). Medium sensitivity is related to High status for some biological and physico-chemical quality elements and the presence of Tophill Low Drinking Water Safeguard Zone.

147. Groundwater sensitivity is high due to the presence of a Principal aquifer, SPZ and drinking water (groundwater) safeguard zone.

20.6.1.3.4 Significance of Effect – DBS East or DBS West In Isolation Scenario

148. Effects are **negligible** or **minor** adverse in all catchments depending on catchment sensitivity. The significance of the effect on each water body resulting from accidental release of contaminants due to the construction of the Projects in isolation is assessed in **Table 20-19**.

149. Significance of effect is **minor** adverse for the Hull and East Riding Chalk groundwater body due to high sensitivity.

150. All effects relating to the accidental release of contaminants for construction of the Projects in isolation are deemed to be not significant.

20.6.1.3.5 Significance of Effect – DBS East and DBS West Together

151. Effects are **negligible** or **minor** adverse in all catchments depending on catchment sensitivity. The significance of the effect on each water body resulting from the accidental release of contaminants due to construction of the Projects sequentially is assessed in **Table 20-19**.

152. Significance of effect is **minor** adverse for the Hull and East Riding Chalk groundwater body due to high sensitivity.

153. All effects relating to the accidental release of contaminants for construction of the Projects together are deemed to be not significant.

Table 20-19 Effects Associated with the Accidental Release of Contaminants to Surface and Groundwaters Resulting from Construction of the Projects (all Scenarios)

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Onshore coastal catchment	High	Although only 0.04km^{2}of the catchment would be affected by construction, this represents 3.1% of the total catchment area, which is a narrow strip beside the coast. Sensitivity is high as the catchment is hydrologically connected to the Greater Wash SPA. Trenchless technique (e.g. HDD) would take place at the landfall, using a drilling rig, drilling fluid and fuels and oils associated with construction machinery. The presence of these activities increases the likelihood of a contamination event occurring in the areas affected by onshore construction activities. The area disturbed by construction is unlikely to be reduced in the In Isolation Scenario because the landfall construction compound will be set back from the coast by a minimum of 120m. Magnitude of impact is negligible and significance of effect minor adverse due to high sensitivity.	Negligible	**Minor adverse**
Barmston Sea Drain/ Skipsea	Medium	Nearly all of the landfall is located in the Barmston Sea Drain/Skipsea Drain to Confluence catchment, with a small area in the onshore coastal catchment.	Negligible	**Minor adverse**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Drain to Confluence		Trenchless technique (e.g. HDD) would take place at the landfall, using a drilling rig, drilling fluid and fuels and oils associated with construction machinery. In addition, a temporary works compound would be required with fuel storage. The presence of these activities increases the likelihood of a contamination event occurring in the areas affected by onshore construction activities. Magnitude of impact is negligible and significance of effect minor adverse due to medium sensitivity. For the In Isolation Scenario the area of exposed land during construction, and potential for contamination, could be reduced by $600m^2$ depending on the final location of the construction compound. Skipsea Bail Mere SSSI is located approximately 900m downstream of the Onshore Development Area. The sites interest lies in the lake deposits (pollen) underlying the fields and can be accessed by auger or borehole. Due to the distance from the SSSI, small scale of works and embedded mitigation measures to limit the potential for accidental spills and leakages, impacts on the SSSI are not anticipated.		

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Barmston Sea Drain from Skipsea Drain to North Sea	Low	Less than 400m^2 of the catchment (0.006%) would be affected by construction under any scenario, which relates to a short section of existing access track. Onshore infrastructure will not be installed in this catchment. The potential for the accidental release of contaminants is very limited and magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Mickley Dike catchment	Medium	Approximately 0.02% of Mickley Dike's catchment would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. Magnitude of impact is negligible and significance of effect minor adverse due to medium sensitivity.	Negligible	**Minor adverse**
Old Howe/ Frodingham Beck to R Hull	Medium	Approximately 1.3% of the Old Howe/Frodingham Beck to R Hull catchment would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. Magnitude of impact is negligible and the significance of effect is minor adverse due to medium sensitivity.	Negligible	**Minor adverse**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Catchwater Drain	Low	Approximately 3.1% of Catchwater Drain's catchment would be affected by construction of the Onshore Export Cable Corridor, which could result in the accidental release of contaminants to the surface drainage network. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Foredyke Stream Upper	Low	Approximately 2.2% of the Foredyke Stream Upper catchment would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Foredyke Stream Lower to Holderness Drain	Low	Approximately 1.1% of the catchment would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Holderness Drain Source	Low	Approximately 1.5% of the catchment would be affected by construction of the Onshore Export Cable Corridor, which could result in the accidental release of	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
to Foredyke Stream		contaminants to the surface drainage network. Magnitude of impact and significance of effect are negligible.		
Beverley and Barmston Drain	Low	Approximately 1.2% of the catchment would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. The Onshore Converter Stations straddle the catchment and the High Hunsley to Woodmansey Area catchment. Depending on the final location of the Converter station the area of exposed land would be reduced in the In Isolation Scenario. Magnitude of impact and significance of effect are negligible. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site. Due to the distance from the SSSI' lack of connectivity, small scale of works and embedded mitigation measures to limit the potential for accidental spills, impacts on the SSSI are not anticipated.	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Hull from Arram Beck to Humber	Medium	Approximately 0.3% of the catchment would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. Magnitude of impact is negligible and significance of effect is minor adverse due to medium sensitivity.	Negligible	**Minor adverse**
High Hunsley to Arram Area	Low	Approximately 0.8% of the catchment would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. Magnitude of impact and significance of effect are negligible. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site. Due to the distance from the SSSI lack of connectivity, small scale of works and use of mitigation measures to limit the potential for accidental spills, impacts on the SSSI are not anticipated.	Negligible	**Negligible**
High Hunsley to	Low	Approximately 2.8% of the catchment would be affected by construction activities, which could result in	Negligible	**Negligible**

River water body catchment	Sensitivity	Assessment	Magnitude of impact	Significance of effect
Woodmansey Area		the accidental release of contaminants to the surface drainage network. The relatively high figure in this catchment is due to the presence of the Onshore Converter Stations. Magnitude of impact and significance of effect are negligible.		
Hull and East Riding Chalk	High	Approximately 0.23% of the groundwater body would be affected by construction activities, which could result in the accidental release of contaminants to the surface drainage network. This percentage would reduce slightly for the In Isolation Scenario. Although there may be some very localised increases in salinity in the vicinity of the landfall trenchless technique works (e.g. HDD), there would not be any consumptive abstraction of groundwater during construction or operation, which would cause a drawdown in the underlying aquifer. As the Landfall Zone is above mean sea level, the head difference would also limit any minor changes in salinity. Magnitude of impact is negligible and significance of effect is minor adverse.	Negligible	**Minor adverse**

20.6.1.4 Impact 4 Changes to Surface and Groundwater Flows and Flood Risk

154. Initial site preparation activities and construction works could alter surface drainage patterns and surface flows by changing the distribution of surface drainage across the Landfall Zone, Onshore Export Cable Corridor and Onshore Substation Zone. Infiltration would be reduced, and surface runoff increased, by a reduction in the proportion of impermeable surfaces in a drainage catchment caused by the compaction of soil by construction vehicles and the development of surface infrastructure. This is directly related to the area of construction and can alter site runoff characteristics; the greater the area of construction, the greater the potential impact on surface and groundwater flows (including land drainage channels). A surface water management plan will be in place as set out in the **OCoCP (Volume 8, application ref: 8.9)**.

155. Temporary changes to surface flows because of trenched crossings (**Table 20-13**) of Ordinary Watercourses may also occur, particularly if the capacity of any pumps or flumes are exceeded. Any changes in surface flows can alter and/or increase flood risk in the proposed Onshore Development Area. Full details of all crossings are presented in **Volume 7, Appendix 5-2 (application ref: 7.5.5.2)**.

156. Surface and subsurface flow patterns can be altered because of changes to infiltration rates, surface flows and the installation of impermeable subsurface infrastructure. Therefore, the construction of the onshore infrastructure associated with the Projects has the potential to generate increased surface water flows. This could result in increased discharge within watercourses and associated bed and bank scour, as well as in-wash of increased volumes of fine sediment related to the additional surface runoff. This could adversely affect hydrology and geomorphology of the surface drainage network. The approach to managing surface water at the Onshore Converter Stations is set out in the **Outline Drainage Strategy (Volume 8, application ref: 8.12)**.

157. Potential flood risk implications of the project are assessed in detail in a Flood Risk Assessment (**Volume 7, Appendix 20-4 (application ref: 7.20.20.4)**).

20.6.1.4.1 Magnitude of Impact – DBS East or DBS West In Isolation Scenario

158. As described in section 20.6.1.2 and section 20.6.1.3 for increased sediment supply and the supply of contaminants, the proportion of each catchment disturbed by construction (based on the extent of the Onshore Development Area in each catchment) is used as a proxy for the area of land that could experience changes in land use, and therefore changes to infiltration rates, runoff rates and flood risk. In addition, embedded mitigation for changes to surface and groundwater flows (**Table 20-3**) is also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the area of disturbed ground and potential for changes in runoff during construction will be lowered due to embedded mitigation. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no impact' scenario.

159. The maximum area that will be disturbed by construction and potentially affect flows is 3.1% and for most catchments the figure is less than 2% (**Table 20-17**). This means magnitude of impact is negligible in all catchments. Although the areas in **Table 20-17** represent the worst case extent for each scenario, for the In Isolation Scenario, areas will very likely be reduced due to a narrower corridor and smaller Landfall Zone and Onshore Substation Zone Temporary Construction Compounds.

160. Magnitude of impact is also negligible in the Hull and East Riding Chalk groundwater catchment, which underlies the entire Onshore Development Area. Although the Onshore Development Area occupies 4.5km^2 of the groundwater catchment, this equates to only 0.23% of the total area.

20.6.1.4.2 Magnitude of Impact – DBS East and DBS Together

161. The magnitude of impact will be the same as for the In Isolation Scenario, described above as the areas in **Table 20-20** represent the worst case extent for all Development Scenarios.

20.6.1.4.3 Sensitivity of Receptor

162. Receptor sensitivity is described in **Table 20-11**, of the 13 surface water catchments crossed by the Onshore Development Area, sensitivity is high in one (onshore coastal catchment), medium in four catchments and low in eight. High sensitivity is due to connectivity to the Greater Wash SPA (onshore coastal catchment). Medium sensitivity is related to High status for some biological and physico-chemical quality elements and the presence of Tophill Low Drinking Water Safeguard Zone.

20.6.1.4.4 Significance of Effect – DBS East or DBS West In Isolation Scenario

163. Effects are **negligible** or **minor** adverse in all surface water catchments depending on catchment sensitivity. Significance of effect is **minor** adverse for the Hull and East Riding Chalk groundwater body due to high sensitivity. The significance of the effect on each water body resulting from changes to surface and groundwater flows and flood risk due to construction of the Projects In Isolation Scenario is assessed in **Table 20-20**.

164. All effects relating to changes to surface and groundwater flows and flood risk for construction of the Projects in isolation are deemed to be not significant.

20.6.1.4.5 Significance of Effect – DBS East and DBS West Together

165. Effects are **negligible** or **minor** adverse in all surface water catchments depending on sensitivity. Significance of effect is **minor** adverse for the Hull and East Riding Chalk groundwater body due to high sensitivity. The significance of the effect on each water body resulting from changes to surface and groundwater flows and flood risk due to construction of the Projects together is assessed in **Table 20-20**.

166. All effects relating to changes to surface and groundwater flows and flood risk for construction of the Projects in together are deemed to be not significant.

Table 20-20 Impacts and Effects Associated with Changes to Surface and Groundwater Flows and Flood Risk Resulting from Construction of the Projects (all Scenarios)

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
Onshore coastal catchment	High	Although only 0.04km^2 of the catchment would be affected by construction, this represents 3.1% of the total catchment area, which is a narrow strip beside the coast. Sensitivity is high as the catchment is hydrologically connected to the Greater Wash SPA. The area disturbed by construction is unlikely to be reduced in the In Isolation Scenario because the landfall construction compound will be set back from the coast by a minimum of 120m. The main activity would be the trenchless technique works (e.g. HDD) and use of access tracks. No trenched crossings are required which could locally affect flows. Magnitude of impact is negligible and significance of effect is minor adverse due to high sensitivity.	Negligible	**Minor adverse**
Barmston Sea Drain/Skipsea Drain to Confluence	Medium	Nearly all of the landfall is located in the Barmston Sea Drain/Skipsea Drain to Confluence catchment, with a small area in the onshore coastal catchment. It is likely that the landfall construction compound would be located in this catchment and there would be four	Negligible	**Minor adverse**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
		trenched crossings that could locally affect flows. As described in section 20.6.1.1, flumes or pumps at trenched crossings would be adequately sized to ensure that flows downstream are maintained whilst minimising upstream impoundment, and the amount of time that temporary dams are in place will be kept to a minimum. Less than 2% of the catchment would be affected by construction activity and at a catchment scale, construction activities are considered unlikely to lead to significant changes in surface water drainage or flood risk. The low number of temporary crossings to allow the Haul Road to continue are unlikely to affect flows or increase flood risk (e.g. through the exceedance or failure of pumps). Magnitude of impact is negligible and significance of effect is minor adverse due to medium sensitivity. For the In Isolation Scenario the area of exposed land during construction, which has the potential to locally affect flows, would be reduced by 0.0006km^2. Skipsea Bail Mere SSSI is located approximately 900m downstream of the Onshore Development Area. Due		

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
		to the distance from the SSSI, small scale of works and embedded mitigation measures to control flows at trenched crossing sites, impacts on the SSSI are not anticipated.		
Barmston Sea Drain from Skipsea Drain to North Sea	Low	Less than 0.0004km^2 of the catchment (0.006%) would be affected by construction under any scenario, which relates to a short section of existing access track. Onshore infrastructure will not be installed in this catchment. There would be no trenched or temporary crossing which could affect flows. The potential for changes to surface and groundwater flows is very limited although best practice mitigation measures will still be used and magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Mickley Dike catchment	Medium	Only a relatively small proportion of each catchment would be directly affected by construction activities (typically 0.2 to 1.5% with a maximum of 2.2% in Catchwater Drain's catchment), which could affect surface and groundwater flows. Across entire catchments, these activities are unlikely to lead to a	Negligible	**Minor adverse**
Old Howe/Frodingham Beck to R Hull	Medium		Negligible	**Minor adverse**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
Catchwater Drain	Low	significant change in surface water drainage or flood risk. Although each catchment except the Hull from Arram Beck to Humber will have trenched crossings (up to seven in Catchwater Drain's catchment), which could affect flows through the capacity of pumps or flumes, mitigation measures for trenched crossings are embedded in the project design. In all catchments magnitude of impact is negligible and effects negligible or minor adverse depending on catchment sensitivity. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site (and therefore no trenched crossings that could affect the site). Due to the distance from the SSSI lack of connectivity, small scale of works, and embedded mitigation measures, impacts on the SSSI are not anticipated.	Negligible	**Negligible**
Foredyke Stream Upper	Low		Negligible	**Negligible**
Foredyke Stream Lower to Holderness Drain	Low		Negligible	**Negligible**
Holderness Drain Source to Foredyke Stream	Low		Negligible	**Negligible**
Hull from Arram Beck to Humber	Medium		Negligible	**Minor adverse**
High Hunsley to Arram Area	Low		Negligible	**Negligible**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
High Hunsley to Woodmansey Area	Low	The relatively high catchment area (2.8%) that could be disturbed by construction activities and therefore affect surface and groundwater flows is due to the presence of the Onshore Converter Stations. For the In Isolation Scenario the area of disturbed ground which could affect flows would likely be reduced due to the smaller Onshore Substation Zone compounds compared to the Sequential or Concurrent Scenarios. Two trenched crossings would be required in this catchment, which could affect flows through the capacity of pumps or flumes. Magnitude of impact and significance of effect are negligible.	Negligible	**Negligible**
Beverley and Barmston Drain	Low	Approximately 1.2% of the catchment would be affected by construction activities, which could lead to changes in surface and groundwater flows. Part of the catchment would be occupied by the Onshore Substation Zone construction compound. For the In Isolation Scenario the area of disturbed ground which could affect flows would be reduced due	Negligible	**Negligible**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
		to the smaller Onshore Substation Zone compound compared to the Sequential or Concurrent Scenarios. Although there could be up to 19 trenched crossings (including infilled channels at the OCS) in this catchment, which could affect flows through the capacity of pumps or flumes, mitigation measures for trenched crossings are embedded in the project design. Magnitude of impact and significance of effect are negligible. Burton Bushes SSSI is 120m west of the Onshore Export Cable Corridor, although there is no surface water connectivity to the designated site (and therefore no trenched crossings that could affect the site). Due to the distance from the SSSI lack of connectivity, small scale of works, and embedded mitigation, impacts on the SSSI are not anticipated.		
Hull and East Riding Chalk	High	A very low proportion (0.23%) of the total area of the groundwater body catchment would be affected by construction of the Projects. This is likely to have a minimal impact on subsurface flows and the potential to cause flood risk. Magnitude of impact is negligible	Negligible	**Minor adverse**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
		and significance of effect is minor adverse due to high sensitivity.		

20.6.2 Potential Effects During Operation

20.6.2.1 Impact 1 Accidental Release of Contaminants to Surface and Groundwater

167. Operational activities at the Landfall Zone, along the Onshore Export Cable Corridor and at the Onshore Converter Stations will include planned and unplanned maintenance at Jointing Bayss, TJBs and link boxes below ground level as well as above ground maintenance at the Onshore Converter Stations, to the proposed landscaping and at manhole covers above link boxes. The cables which form the onward connection to the proposed Birkhill Wood National Grid Substation are also included in the assessment. The proposed Birkhill Wood National Grid Substation is outside the scope of this assessment.

168. Operational activities could lead to a supply of fine sediment, fuels, oils and lubricants from any local workings and the new section of permanent access road and any other impermeable surfaces. Contaminants, including fine sediment, could affect water quality and geomorphology of water bodies in the surface water drainage network. This in turn could impact upon aquatic ecology.

169. In the event of a cable failure, it is likely that the affected stretch of cable (750-1500m section) would be pulled out of the duct and replaced. To do this the joint bays, which are below ground at either end of that stretch of cable, would be exposed to get access to those bays, and then backfilled after the works are complete. This activity would be highly localised and may not be required during the operational life of the cable infrastructure.

170. Contaminants may leak into surface waters during operation through surface runoff or accidental spillage or leakage of fuel oils or lubricants from vehicles during operational activities, which could impact upon surface water quality and that of connected groundwaters (including aquifers which support potable water supplies, particularly in SPZ I in the area crossed by the onward connection to the proposed Birkhill Wood National Grid Substation). This could have subsequent impacts upon aquatic ecology and the use of water resources for licensed and unlicensed abstractions.

171. In addition, welfare facilities at the Onshore Converter Stations could increase the supply of nutrients such as nitrogen and phosphorus to the drainage system as increased loadings to the sewage treatment network and associated treated effluent discharges. The supply of additional nutrients to surface waters could result in adverse effects on water quality (including, in extreme cases, eutrophication) and aquatic plant, invertebrate and fish communities supported by surface waters.

172. Potential impacts on from contamination are also assessed in relation to ground conditions in **Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)**.

20.6.2.1.1 Magnitude of Impact – DBS East or DBS West In Isolation Scenario

173. The area of installed infrastructure (above ground or buried) can be used as a proxy to indicate the extent of required maintenance activities in each catchment for the different build scenarios. In addition, embedded mitigation for the accidental release of contaminants to surface and groundwater at the Onshore Substation Zone, as described in the **Outline Drainage Strategy (Volume 8, application ref: 8.12)** is considered in setting the magnitude of impact.

174. As a worst case these figures, as shown in **Table 20-21,** are based on the width of the cable trenches (including the onward cable route to the proposed Birkhill Wood National Grid Substation), permanent land take for the TJBs, Onshore Converter Stations (including the short section new permanent access road). Magnitude of impact is based on the same thresholds as shown in **Table 20-16**.

175. If either Project is built in isolation, catchment areas occupied by permanent infrastructure are very small, with a maximum of 0.13km^2 for surface water catchments (Beverley and Barmston Drain), and 0.38km^2 for the groundwater catchment. These areas equate to very small proportions of each catchment, reaching a maximum of 0.24% the High Hunsley to Woodmansey Area catchment. Operational activities at the landfall and along the Onshore Export Cable Corridor would be highly localised and infrequent nature and unlikely to generate large volumes or contaminants that could have a discernible alteration to the water quality of receptors. Impacts in all catchments are negligible.

Table 20-21 Areas and Percentages of Permanent Infrastructure in Each Surface and Groundwater Catchment for Different Build Scenarios

Catchment	In Isolation Scenario		Concurrent/Sequential Scenario		Magnitude of Impact
	Area of Permanent Infrastructure		Area of Permanent Infrastructure		
	km²	%	km²	%	
Beverley and Barmston Drain	0.13	0.12	0.25	0.24	Negligible
Catchwater Drain	0.04	0.19	0.09	0.39	Negligible
Foredyke Stream Lower to Holderness Drain	0.02	0.07	0.03	0.15	Negligible
Foredyke Stream Upper	0.03	0.15	0.06	0.29	Negligible
High Hunsley to Arram Area	0.03	0.07	0.05	0.13	Negligible
High Hunsley to Woodmansey Area	0.04	0.24	0.06	0.42	Negligible
Holderness Drain Source to Foredyke Stream	0.04	0.09	0.08	0.18	Negligible
Hull from Arram Beck to Humber	0.0008	0.003	0.002	0.01	Negligible
Mickley Dike Catchment	0.004	0.03	0.01	0.05	Negligible

Catchment	In Isolation Scenario		Concurrent/Sequential Scenario		Magnitude of Impact
	Area of Permanent Infrastructure		Area of Permanent Infrastructure		
	km²	%	km²	%	
Old Howe/ Frodingham Beck to River Hull	0.03	0.14	0.07	0.27	Negligible
Barmston Sea Drain/ Skipsea Drain to Confluence	0.02	0.06	0.05	0.12	Negligible
Onshore coastal catchment	0.001	0.06	0.002	0.12	Negligible
Hull and East Riding Chalk	0.38	0.02	0.75	0.04	Negligible

20.6.2.1.2 Magnitude of Impact – DBS East and DBS West Together

176. Building the Projects together (concurrently or sequentially) would result in the same area of permanent infrastructure in each catchment for each scenario. Catchment areas occupied by permanent infrastructure are very small, with a maximum of 0.25km² for surface water catchments (Beverley and Barmston Drain), and 0.75km² for the groundwater catchment. These areas equate to very small proportions of each catchment, reaching a maximum of 0.42% for the High Hunsley to Woodmansey Area catchment. All impacts are negligible.

20.6.2.1.3 Sensitivity of Receptor

177. Of the 13 surface water catchments crossed by the Onshore Development Area, sensitivity is high in one (onshore coastal catchment), medium in four catchments and low in eight. High sensitivity is due to connectivity to the Greater Wash SPA (onshore coastal catchment). Medium sensitivity is related to High status for some biological and physico-chemical quality elements and the presence of Tophill Low Drinking Water Safeguard Zone.

20.6.2.1.4 Significance of Effect – DBS East or DBS West In Isolation Scenario

178. Prior to mitigation, the significance of effect of the potential accidental release of contaminants into water bodies resulting from the operation of a single Project in isolation is **negligible** or **minor** adverse across all receptors (**Table 20-22**). **Minor** adverse effects are due to medium or high sensitivity.

179. All operational effects relating to the accidental release of contaminants to surface and groundwater for construction of the Projects in isolation are deemed to be not significant.

20.6.2.1.5 Significance of Effect – DBS East and DBS West Together

180. Prior to mitigation, the significance of effect of the potential supply of contaminants into water bodies resulting from the operation of the Projects is **negligible** or **minor** adverse across all receptors (**Table 20-22**). **Minor** adverse effects are due to medium or high sensitivity.

181. All operational effects relating to the accidental release of contaminants to surface and groundwater for construction of the Projects together are deemed to be not significant.

Table 20-22 Effects Associated with the Accidental Release of Contaminants due to the Operation of the Projects (all Scenarios)

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
Barmston Sea Drain/Skipsea Drain to Confluence	Medium	Permanent infrastructure would have a limited spatial extent within each catchment. There will be no permanent infrastructure in the Barmston Sea Drain from Skipsea Drain to North Sea catchment (no impact). In these catchments localised and infrequent maintenance activities may be necessary during the operational life of the Project. However, the mechanism for contaminants to enter the surface water drainage system, as a result of the operation of the Project, is limited. Embedded best practice mitigation measures would minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event. Magnitude of impact is negligible in all catchments and significance of effect is negligible or minor adverse depending on catchment sensitivity.	Negligible	**Minor adverse**
Barmston Sea Drain from Skipsea Drain to North Sea	Low		No impact	**No change**
Onshore coastal catchment	High		Negligible	**Minor adverse**
Mickley Dike catchment	Medium		Negligible	**Minor adverse**
Old Howe/Frodingham Beck to River Hull	Medium		Negligible	**Minor adverse**
Catchwater Drain	Low		Negligible	**Negligible**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
Foredyke Stream Upper	Low		Negligible	**Negligible**
Foredyke Stream Lower to Holderness Drain	Low		Negligible	**Negligible**
Holderness Drain Source to Foredyke Stream	Low		Negligible	**Negligible**
Hull from Arram Beck to Humber	Medium		Negligible	**Minor adverse**
High Hunsley to Arram Area	Low		Negligible	**Negligible**
Beverley and Barmston Drain	Low	These catchments will contain the Onshore Converter Stations, which straddle both catchments (most will be located in Beverley and Barmston Drain's catchment). This forms a small proportion of the overall catchment, and although some routine maintenance would be required throughout the operational life of the Project, measures described in **Outline Drainage Strategy**	Negligible	**Negligible**
High Hunsley to Woodmansey Area	Low		Negligible	**Negligible**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
		(Volume 8, application ref: 8.12) will be in place to control any potential accidental release of oils from the transformer, foul drainage and surface water drainage. Magnitude of impact and significance of effect are negligible in both catchments.		
Hull and East Riding Chalk	High	Only 0.03% of the groundwater body will be impacted by the Onshore Development Area. Infrequent planned and unplanned maintenance activities would be necessary during the operational life of the Project. Embedded mitigation measures will control potential for accidental release of foul drainage and surface water drainage from the Onshore Substation Zone. Magnitude of impact is negligible and significance of effect is minor adverse due to high sensitivity.	Negligible	**Minor adverse**

20.6.2.2 Impact 2 Changes to Surface and Groundwater Flows and Flood Risk

182. Permanent above ground infrastructure, including the Onshore Converter Stations and new permanent access road, would result in permanent changes to land use. Although permeable surface treatments will be used where possible, permanent features will include surface panels of link boxes along the Onshore Export Cable Corridor, and the Onshore Substation Zone. This change in land use from greenfield agricultural land would result in an increase in impermeable land area.

183. The presence of the buried cable ducting along the Onshore Export Cable Corridor may impact upon subsurface flow corridors as it will introduce an impermeable barrier which may change subsurface flow patterns; forcing water to move upwards towards the surface, or downwards away from the surface. Buried cable ducting may also impact upon the level of recharge and distribution of groundwater within the aquifers underlying the Onshore Development Area (including shallow aquifers and deeper Principal aquifers). However, the relatively shallow depth of the cable infrastructure (1.6 to 2m (although locally up to 20m deep at trenchless crossings)) means that any impacts are likely to be highly localised and confined to shallow near-surface groundwater bodies. As described **Table 20-3**, embedded mitigation includes ground investigations and a hydrogeological risk assessment.

184. An increase in the impermeable area in a catchment, especially associated with the Onshore Converter Stations, would result in a reduced rate of infiltration and therefore a potential increase in surface runoff in watercourses, including land drainage channels. Changes in surface water runoff and subsurface flows could be sufficient to impact upon the hydrology of the surface water system, by increasing surface water volumes, and may result in permanent changes to geomorphology by increasing rates of bed and bank erosion, encouraging geomorphological adjustment. Geomorphological changes may also impact upon in-channel habitat conditions for aquatic organisms. Impacts on geomorphology and in-channel habitats are likely to be particularly marked if drainage from a large area is discharged at a discrete location within the existing surface drainage network.

185. Furthermore, the ground disturbance during installation of the cable trench is likely to change the transmissivity of the ground which overlays the cable infrastructure after reinstatement and may therefore become a preferential corridor for subsurface water flow.

186. Changes to the proportion of groundwater contained in surface waters could potentially alter water chemistry and impact upon the quality of water-dependent habitats.

20.6.2.2.1 Magnitude of Impact – DBS East or DBS West in Isolation

187. As described in section 20.6.2.1, the area of installed infrastructure (above ground or buried) can be used as a proxy to indicate the extent of required maintenance activities in each catchment, which could affect surface and groundwater flows and flood risk. In addition, embedded mitigation for the changes to surface and groundwater flows and flood risk at the onshore substations, as described in the **Outline Drainage Strategy (Volume 8, application ref: 8.12)** is considered in setting the magnitude of impact.

188. If either Project is built in isolation, catchment areas occupied by permanent infrastructure would be very small, with a maximum of $0.13km^2$ for surface water catchments (Beverley and Barmston Drain), and $0.38km^2$ for the groundwater catchment. These areas equate to very small proportions of each catchment, reaching a maximum of 0.24% the High Hunsley to Woodmansey Area catchment. Due to these very small areas of each catchment that would be affected by operation of the Project, magnitude of impact is negligible in all catchments as there is very limited potential for surface or subsurface flow patterns to be altered.

20.6.2.2.2 Magnitude of Impact – DBS East and DBS Together

189. Building the Projects together (concurrently or sequentially) would result in the same area of permanent infrastructure in each catchment for each scenario. Catchment areas occupied by permanent infrastructure are very small, with a maximum of $0.25km^2$ for surface water catchments (Beverley and Barmston Drain), and $0.75km^2$ for the groundwater catchment. These areas equate to very small proportions of each catchment, reaching a maximum of 0.42% for the High Hunsley to Woodmansey Area catchment.

190. Due to these very small areas of each catchment that would be affected by operation of the Project, magnitude of impact is negligible in all catchments as there is very limited potential for surface or subsurface flow patterns to be altered.

20.6.2.2.3 Sensitivity of Receptor

191. Of the 13 surface water catchments crossed by the Onshore Development Area, sensitivity is high in one (onshore coastal catchment), medium in four catchments and low in eight. High sensitivity is due to connectivity to the Greater Wash SPA (onshore coastal catchment). Medium sensitivity is related to High status for some biological and physico-chemical quality elements and the presence of Tophill Low Drinking Water Safeguard Zone.

20.6.2.2.4 Significance of Effect – DBS East or DBS West In Isolation Scenario

192. Significance of effect for each catchment receptor as a result of the operation of either Project in isolation is given in **Table 20-23**, and is assessed as **negligible** or **minor** adverse for all catchment receptors. **Minor** adverse effects are due to medium or high sensitivity.

193. All operational effects relating changes to surface and groundwater flows and flood risk for construction of the Projects in isolation are deemed to be not significant.

20.6.2.2.5 Significance of Effect – DBS East and DBS West Together

194. Significance of effect for each catchment receptor as a result of the operation of the Projects in together (concurrent or sequentially) is given in **Table 20-23**, and is assessed as **negligible** or **minor** adverse for all catchment receptors. **Minor** adverse effects are due to medium or high sensitivity.

195. All operational effects relating changes to surface and groundwater flows and flood risk for construction of the Projects together are deemed to be not significant.

Table 20-23 Effects Associated with Surface and Groundwater Flows and Flood Risk Associated with the Operation of the Projects (all Scenarios)

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
Barmston Sea Drain / Skipsea Drain to Confluence	Medium	As a result of the limited spatial extent of permanent impermeable development across the Onshore Development Area, effects on surface water flows are considered to be of negligible or minor adverse magnitude in all catchments. No operational mitigation measures are proposed for the cable corridor and associated infrastructure therefore the magnitude of effect will remain negligible or minor adverse. There will be no permanent infrastructure in the Barmston Sea Drain from Skipsea Drain to North Sea catchment (no impact).	Negligible	**Minor adverse**
Barmston Sea Drain from Skipsea Drain to North Sea	Low		No impact	**No change**
Onshore coastal catchment	High		Negligible	**Minor adverse**
Mickley Dike catchment	Medium		Negligible	**Minor adverse**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
Old Howe/ Frodingham Beck to R Hull	Medium		Negligible	**Minor adverse**
Catchwater Drain	Low		Negligible	**Negligible**
Foredyke Stream Upper	Low		Negligible	**Negligible**
Foredyke Stream Lower to Holderness Drain	Low		Negligible	**Negligible**
Holderness Drain Source to Foredyke Stream	Low		Negligible	**Negligible**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
Beverley and Barmston Drain	Low		Negligible	**Negligible**
Hull from Arram Beck to Humber	Medium		Negligible	**Minor adverse**
High Hunsley to Arram Area	Low		Negligible	**Negligible**
Beverley and Barmston Drain	Low	These catchments will contain the Onshore Converter Stations, which straddles the two catchments (most will be located in Beverley and Barmston Drain's catchment). Short headwater sections of Ordinary watercourse will be infilled, and flows redirected to a nearby watercourse. Operational drainage will be managed through the **Outline Drainage Strategy (Volume 8, application ref: 8.12)**, including a SuDS basin, reducing any impacts on flood risk. A very small proportion of each catchment would be affected by changes to surface water runoff, groundwater flows and	Negligible	**Negligible**
High Hunsley to Woodmansey Area	Low		Negligible	**Negligible**

River Water Body Catchment	Sensitivity	Assessment	Magnitude of Impact	Significance of Effect
		flood risk resulting from the permanent presence of the Onshore Converter Stations, onshore cables and permanent access road (the latter is located in the High Hunsley to Woodmansey Area catchment). Mitigation measures will be implemented to ensure that runoff rates remain at their greenfield values would reduce the magnitude to negligible.		
Hull and East Riding Chalk	High	It is expected that subsurface (groundwater) flows would pass above or below the ducting along the cable corridor and would not change significantly. As a result, although there will be some minor changes in the distribution of flows, there is unlikely to be a significant perturbation/change in overall flow directions and quantities. Furthermore, the size and shallow depth of the impermeable subsurface barrier created by cable ducting and foundations for the Onshore Converter Stations, in comparison to the size of the groundwater bodies which underlie the Onshore Development Area, is very small. The impermeable area comprises is 0.04% of the overall area of the groundwater body. This would result in an effect upon infiltration rates, groundwater lows, sub-surface flow corridors and alterations in the distribution of groundwater of negligible magnitude.	Negligible	**Minor adverse**

20.6.3 Potential Effects During Decommissioning

196. Decommissioning scenarios are described in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**. An Onshore Decommissioning Plan would be submitted following permanent cessation of commercial operation of the onshore works. This Onshore Decommissioning Plan would be in place prior to the commencement of any decommissioning onshore. For the purpose of this assessment it is assumed that decommissioning of the Projects could be conducted separately, or at the same time.

197. For Flood Risk and Hydrology it is assumed that residual effects during decommissioning would be no worse and very likely less than for construction (**negligible** or **minor** adverse).

20.7 Potential Monitoring Requirements

198. Potential groundwater monitoring is described in **Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)**.

20.8 Cumulative Effects Assessment

199. Cumulative effects can be defined as incremental effects on that same receptor from other proposed and reasonably foreseeable schemes in combination with the Projects. This includes all schemes that result in a comparative effect that is not intrinsically considered as part of the existing environment and is not limited to offshore wind projects.

200. The overarching method followed in identifying and assessing potential cumulative effects is set out in **Volume 7, Chapter 6 EIA Methodology (application ref: 7.6)** and **Volume 7, Appendix 6-1 Onshore Cumulative Assessment (application ref: 7.6.6.1)**. The approach is based upon the Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment (PINS 2017). The approach to the CEA is intended to be specific to the DBS Projects and takes account of the available knowledge or the environment and other activities around the Onshore Development Area.

201. The CEA has followed a four-stage approach developed from the Planning Inspectorate Advice Note Seventeen. These stages are set out in **Table 1-2** of **Volume 7, Appendix 6-1 (application ref: 7.6.6.1)**. Stage four of this process, the CEA assessment is undertaken in two phases. The first step in the CEA is the identification of which residual impacts assessed for the Projects on their own have the potential for a cumulative impact with other plans, projects and activities. This information is set out in **Table 20-24** which sets out the potential impacts assessed in this chapter and identifies the potential for cumulative effects to arise, providing a rationale for such determinations. Only potential impacts assessed as negligible or above are included in the CEA. Those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact.

Table 20-24 Potential Cumulative Effects

Potential Impact	Potential for Cumulative Effect	Justification
Construction		
Impact 1: Direct disturbance of surface water bodies	Yes	Impacts to surface water bodies could act cumulatively with other projects if these cause direct disturbance to the same water body catchments.
Impact 2: Increased sediment supply	Yes	Other projects being constructed within the same water body catchments may lead to an increase in sediment supply.
Impact 3: Accidental release of contaminants to surface and groundwaters	Yes	Other projects being constructed within the same water body catchments may act cumulatively to reduce surface and groundwater quality if they cause a supply of contaminants to be released into the surface water drainage system.

Potential Impact	Potential for Cumulative Effect	Justification
Impact 4: Changes to surface and groundwater flows and flood risk	Yes	Other projects being constructed within the same water body catchments may act cumulatively to reduce surface and groundwater quality if they cause contaminants to be released into the surface water drainage system.
Operation		
Impact 1: Accidental release of contaminants to surface and groundwaters	Yes	New developments may require maintenance, including access by machinery, therefore increasing the risk of contaminants being released and acting cumulatively. Operational activities associated with the Projects will be largely confined to the Onshore Converter Stations site and as such could only result in cumulative impacts in catchments which contain the Onshore Converter Stations.

Potential Impact	Potential for Cumulative Effect	Justification
Impact 2: Changes to surface and groundwater flows and flood risk	Yes	As a result of the limited spatial extent of permanent impermeable in the Onshore Development Area, the effect is considered to be limited and highly localised and therefore unlikely to act cumulatively with other projects. However, the greater area of impermeable ground at the Onshore Converter Stations could result in cumulative impacts with other projects in the same catchments.
Decommissioning		
The detail and scope of the decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As such, cumulative effects during the decommissioning phase are assumed to be the same as those identified during the construction phase.		

202. The second stage of the CEA is a project specific assessment of the potential for any significant cumulative effects to arise due to the construction and/or operation and maintenance of the Projects. To do this, a short list of projects for CEA has been produced relevant to Geology and ground Conditions following the approach outlined in **Volume 7, Appendix 6-1 (application ref: 7.6.6.1)**. The second stage of this assessment is only undertaken if the first stage identifies that cumulative effects are possible.

203. The CEA has been based on information available on each potential scheme (e.g. as set out on the East Riding of Yorkshire Council and Hull City Council planning portals and the Planning Inspectorate projects website) as of January 2024. It is noted that the other scheme details available may change in the period up to construction or may not be available in detail at all. The assessment presented here is therefore considered to be conservative, with the level of impacts expected to be reduced compared to those presented here.

204. For Hydrology and Flood Risk, a long list of schemes and other plans within 5km of the Onshore Development Area has been screened against the 0.1% (1:1000 year) surface water flood risk outline. This allows for identification of schemes that could feasibly have a cumulative impact through connection to the surface water drainage network (i.e. runoff and the supply of fine sediment and contaminants).

205. A total of 16 schemes have been identified for inclusion on the short list of projects to be assessed cumulatively for Hydrology and Flood Risk. Schemes have not been considered as resulting in likely cumulative significant effects for Hydrology and Flood Risk if:

- They are located downstream of the Onshore Development Area as there is no mechanism for impact from downstream schemes;
- There is no possible surface drainage network connectivity (i.e. the red line boundary of the scheme does not connect to the Onshore Development Area);
- The scheme is very small scale (e.g. erection of masts and construction of single buildings or other small developments); and
- There is no temporal overlap in construction.

206. Summary information on the short list schemes progressing through this exercise (i.e. the short list of other schemes) for assessment on Hydrology and Flood Risk is provided below in **Table 20-25**. This presents the scenarios whereby the Projects and the other schemes/developments that have been identified on the short list of schemes screened for Hydrology and Flood Risk as listed in **Table 20-24**, could potentially result in cumulative effects for Hydrology and Flood Risk. Project tiers shown in **Table 20-25** are defined in PINS (2017).

207. The CEA for Hydrology and Flood Risk has not identified any schemes where significant cumulative effects could arise.

Table 20-25 Short List of Schemes Considered in the CEA for Hydrology and Flood Risk.

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
Carr Lane Tickton	3	The solar farm is located outside of and downstream of the Onshore Development Area. The EA state that the development shall be carried out in accordance with the submitted flood risk assessment. Mitigation measures include a drainage strategy incorporating SuDS and additional measures to control soil erosion.	As the development is downstream of the Onshore Development Area, there is limited potential for cumulative impacts and mitigation measures will be secured in a CEMP. Cumulative effects are not anticipated.
Barnes Way Land	1	The development is located outside of and downstream of the Onshore Development Area, over 5km away. No mechanism for impact has been identified.	Cumulative effects are not anticipated.
Land South Of Connaught	1	The development is located outside of and downstream of the Onshore Development Area, over 5km away. No mechanism for impact has been identified.	Cumulative effects are not anticipated.
Danepark Road	3	The development is located outside of and downstream of the Onshore Development	Cumulative effects are not anticipated.

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
		Area, over 2.5km away. No mechanism for impact has been identified.	
Creyke Beck Solar Farm	1	A small area of the solar farm red line boundary overlaps the Onshore Development Area near Jillywood Farm and Poplar Farm. There will be a temporal overlap during the first year of construction of the Projects and the final year of the solar farm. It is anticipated that the solar farm will be operational during the remaining construction period of the Projects. The solar farm site is hydrologically connected upstream of the Onshore Development Area through surface water runoff pathways. The solar farm red line boundary is located entirely within the Beverley and Barmston Drain catchment. There are several ordinary watercourses with the solar farm red line boundary. Parts of the development are in SPZ1 and underlain by a Principal aquifer.	An Outline Construction Environmental Management Plan has been submitted as part of the application. The Environment Agency have stated that the development may not commence until such time as a Construction and Environmental Management Plan has been submitted to, and approved in writing by, the local planning authority. The CEMP and associated mitigation measures will limit the potential for cumulative effects to occur. A detailed SuDS design and FRA have been undertaken and a full groundwater risk assessment must also be undertaken and approved. Given the small spatial and temporal overlap in the projects and regulatory regime under which the

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
			solar farm will be constructed, significant cumulative effects are not anticipated.
A164 and Jocks Lodge Improvement Scheme	1	A small area of the road improvement scheme red line boundary overlaps the Onshore Development Area near A164, in Beverley and Barmston's Drain catchment and the High Hunsley to Woodmansey Area catchment. The road improvement works red line boundary crosses a single ordinary watercourse and is in SPZ2. There will be a temporal overlap during the first year of construction of the Projects and the final year of the junction improvements. It is anticipated that the junction improvement scheme will be operational during the remaining construction period of the Projects.	The Secretary of State's EIA screening decision shows that the project is not an EIA development as it is unlikely to have significant effects on the environment. Mitigation measures to protect the environment must also be secured in a CEMP. A drainage impact assessment and FRA have been submitted for the project. Due to the nature of the development and the regulatory regime under which the scheme will be constructed, cumulative effects are not anticipated.
Foss Hill	3	Located in Catchwater Drain's catchment. The extension to the existing works area is very small and comprises an access track and 40m wide strip of land, equating to	There are no planning documents online for this project. However, as this is an extension to an existing, well established area of works, it is

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
		$0.02km^2$. The gravel extraction site is connected to several surface water flow paths, which appear drain away from the Onshore Development Area, although flow directions in this area of managed drains is unclear. There is potential connectivity with the Projects via the River Hull, although there is a distance of ~17km via the closest surface water hydrological pathway.	assumed that all relevant regulations have been followed and environmental protection measures in place (secured through a CEMP or similar), and these mitigation measures will be in place for the extension of works to prevent increased runoff and sediment supply. No potential for significant cumulative effects identified.
Longcroft Lower	3	Located in the catchments of Beverley and Barmston Drain and High Hunsley to Arram Area. The housing development red line boundary overlaps several small areas of surface water ponding. Although they are mainly unconnected areas of ponding, it is assumed that in a worst case there could be some connectivity to Ings Drain and downstream to the Onshore Development Area. The development area is relatively very small ($0.02km^2$) and occupies a brownfield	An environmental report has been undertaken which does not identify any ground contamination risk associated with former school site. An FRA has also been undertaken and surface runoff from the site will be discharged to a public sewer. Given the small scale of the development and measures in pace to manage runoff, significant

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
		site. There are no watercourses in the development boundary.	cumulative effects are not anticipated.
Skipsea Caravan Park	3	The project is located in the catchment of Barmston Sea Drain/Skipsea Drain to Confluence and is adjacent to Skipsea Drain (West Branch) which crosses the Onshore Development Area. The site is relatively small (0.35km^2) and a SuDS scheme has been developed and FRA submitted. The project must be implemented in line with FRA and have connection to foul sewerage.	Due to the small scale of the proposed development, SuDS design measures and the requirement to deal appropriately with foul waters, significant cumulative effects are not anticipated.
Westwood Park	1	A relatively small development (0.01km^2) located in the catchment of Beverley and Barmston Drain. There are some surface water flow paths on the site although it is not clear where these drain to. In a worst case they may connect to larger features that may cross the Onshore Export Cable Corridor ~2km downstream. An FRA and Drainage Management Strategy, including SuDS, has been submitted and a connection	Due to the small scale of the proposed development and appropriate measures to control runoff, significant cumulative effects are not anticipated.

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
		to the existing foul sewer has been agreed in principle.	
Dogger Bank A	1	Dogger Bank A is under construction since January 2020 and will be completed in 2023. Construction of the Projects would begin in 2026. Dogger Bank A will be operational when the Projects are being constructed.	There is no likelihood of cumulative effects for construction as there is no temporal overlap in the respective construction phases. Operational effects would be very minor and similar to the Projects due to the small increase in permanent infrastructure in the catchments affected. Significant cumulative effects are not anticipated.
Dogger Bank B	1	Dogger Bank B is under construction since January 2020 and will be completed in 2023. Construction of the Projects would begin in 2026. Dogger Bank B will be operational when the Projects are being constructed.	There is no likelihood of cumulative effects for construction as there is no temporal overlap in the respective construction phases. Operational effects would be very minor and similar to the Projects due to the small increase in

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
			permanent infrastructure in the catchments affected. Significant cumulative effects are not anticipated.
Creyke Beck Substation Extension	2	Located in Beverley and Barmston Drain's catchment. Limited details are available for this project – a scoping report has been submitted. Extension of the existing Creyke Beck substation is needed to accommodate Horse Project Four offshore windfarm. The area of the substation extension would be relatively small (approximately 0.05km^2 based on online maps).	Due to the nature of the development and the regulatory regime under which it will be constructed, it is assumed that appropriate mitigation measures secured through a CEMP or similar will be incorporated into the design, thus limiting the potential for cumulative effects to occur. Significant cumulative effects are not anticipated.
Hornsea 4 Offshore Wind Farm	1	Due to the proximity of the development to the Projects, there is the potential for cumulative effects of a direct/indirect nature on the receptors identified. However, due to the nature of the development and the regulatory regime under which it will be	Significant cumulative effects are not anticipated.

Scheme Name	Tier	Discussion	Likelihood and Significance of Cumulative Effects
		constructed, it is assumed that appropriate mitigation measures will be incorporated into the design (secured in a CEMP or similar).	

20.9 Interactions

208. The effects identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between effects are presented in **Table 20-26**. This provides a screening tool for which effects have the potential to interact. **Table 20-27** provides an assessment for each receptor (or receptor group) as related to these impacts.

209. Within **Table 20-27** the effects are assessed relative to each development phase to see if multiple effects could increase the significance of the effect upon a receptor. Following this a lifetime assessment is undertaken which considers the potential for effect to affect receptors across all development phases.

20.10 Inter-relationships

210. For Flood Risk and Hydrology potential inter-relationships between other topics assessed within this ES including Geology and Land Quality, and Ecology. A summary of the potential inter-relationships between these topics is provided in **Table 20-28**.

Table 20-26 Interactions Between Impacts - Screening

Potential Interactions between Impacts				
Construction	Impact 1: Direct disturbance of surface water bodies	Impact 2: Increased sediment supply	Impact 3 Accidental release of contaminants	Impact 4: Changes to surface water runoff and flood risk
Impact 1: Direct disturbance of surface water bodies		Yes	Yes	Yes
Impact 2: Increased sediment supply	Yes		Yes	Yes
Impact 3: Accidental release of contaminants	Yes	Yes		No
Impact 4: Changes to surface water runoff and flood risk	Yes	Yes	No	
Operation	Impact 1: Accidental release of contaminants		Impact 2: Changes to surface water runoff and flood risk	
Impact 1: Accidental release of contaminants			No	
Impact 2: Changes to surface water runoff and flood risk	No			

Potential Interactions between Impacts				
Decommissioning	Impact 1: Direct disturbance of surface water bodies	Impact 2: Increased sediment supply	Impact 3: Accidental release of contaminants	Impact 4: Changes to surface water runoff and flood risk
Impact 1: Direct disturbance of surface water bodies		Yes	Yes	Yes
Impact 2: Increased sediment supply	Yes		Yes	Yes
Impact 3: Accidental release of contaminants	Yes	Yes		No
Impact 4: Changes to surface water runoff and flood risk	Yes	Yes	No	

Table 20-27 Interaction Between Impacts - Phase and Lifetime Assessment

Receptor	Highest Significance Level following mitigation				
	Construction	**Operation**	**Decommissioning**	**Phase Assessment**	**Lifetime Assessment**
Surface watercourses	Minor adverse	Minor adverse	Minor adverse	**No greater than individually assessed impact**. The proposed mitigation would minimise the potential for the direct disturbance of watercourses, the direct (from in-channel works) and indirect (from activities in the vicinity of the channel) supply of fine sediment and contaminants, and changes to surface hydrology and flow patterns during the construction phase. There would be	**No greater than individually assessed impact**. The greatest magnitude of effect would occur during the construction of trenched watercourse crossings. Once this disturbance impact has ceased all further impact during construction and operation will be small scale, highly localised and episodic. It is therefore considered that over the Projects' lifetime

Receptor	Highest Significance Level following mitigation				
	Construction	Operation	Decommissioning	Phase Assessment	Lifetime Assessment
				no direct disturbance during operation, and further measures would be in place to prevent the accidental release of contaminants or changes to flow patterns during operation. It is therefore considered there would be no pathway for interaction to exacerbate the potential impacts associated with these activities during or between any of the project phases.	these impacts would not combine to increase the significance level of any impacts identified in this assessment.

Receptor	Highest Significance Level following mitigation				
	Construction	Operation	Decommissioning	Phase Assessment	Lifetime Assessment
Groundwater	Minor adverse	Minor adverse	Minor adverse	**No greater than individually assessed impact.** The proposed mitigation would minimise the potential for the introduction of contaminants to groundwater during construction. The inert nature of the cables will prevent contamination during operation. Furthermore, the small scale and relative shallowness of the permanent infrastructure means that impacts on groundwater flows	**No greater than individually assessed impact.** The greatest magnitude of impact will occur as a result of subsurface excavations during the construction phase. Once this disturbance impact has ceased, any further impact would be small scale, highly localised and episodic. It is therefore considered that over the Projects' lifetime these impacts would not combine to increase the

Receptor	Highest Significance Level following mitigation				
	Construction	**Operation**	**Decommissioning**	**Phase Assessment**	**Lifetime Assessment**
				during operation are minimal. It is therefore considered there would be no pathway for interaction to exacerbate the potential impacts associated with these activities during or between any of the project phases.	significance level of any impacts identified in this assessment.

Table 20-28 Flood Risk and Hydrology Inter-relationships

Topic and Description	Related Chapter	Where Addressed in this chapter	Rationale
Construction			
Impact 1: Direct disturbance of surface water bodies Impact 2: Increased sediment supply Impact 3 Accidental release of contaminants Impact 4: Changes to surface water runoff and flood risk	**Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)**	Section 20.6.1	Potential changes to ground conditions (including chemical quality and physical properties such as transmissivity) during construction could affect the quality and quantity of groundwater and hydrologically connected surface water receptors.
Impact 1: Direct disturbance of surface water bodies	**Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**	Section 20.6.1	Potential changes to the hydrology, geomorphology and water quality during construction could impact upon water-dependent biological communities and designated sites located in each catchment.

Topic and Description	Related Chapter	Where Addressed in this chapter	Rationale
Operation			
Impact 1: Accidental release of contaminants	**Volume 7, Chapter 19 Geology and Land Quality (application ref: 7.19)**	Section 20.6.2	Potential changes to ground conditions (including chemical quality and transmissivity) during operation could affect the quality and quantity of groundwater and hydrologically-connected surface water receptors.
Impact 2: Changes to surface water runoff and flood risk	**Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**	Section 20.6.2	Potential changes to the hydrology, geomorphology and water quality could impact upon water-dependent biological communities and designated sites located in each catchment.
Decommissioning			
Impacts associated with the decommissioning phase would be no greater than those identified for the construction phase.			

20.11 Summary

211. This chapter has provided a characterisation of the existing environment for Flood Risk and Hydrology based on both existing data (e.g., national flood risk and WER classification datasets) and site-specific survey data (e.g., a geomorphological walkover survey).

212. The assessment has established that surface and groundwater receptors could be affected as a result of direct disturbance, the supply of fine sediment and accidental spills or leaks of contaminants, and changes to flow patterns during the construction and decommissioning phases. Effects on all receptors during these phases would be either **negligible** or **minor** adverse depending on catchment sensitivity.

213. The assessment has also established that surface and groundwater receptors could be affected by the accidental release of contaminants and changes to flow patterns during the operational phase. However, given the passive or sporadic nature of operational activities, the resulting effects will be **negligible** or **minor** adverse depending on catchment sensitivity.

214. Assessment of other projects and plans withing 5km of the Onshore Development Area shows that significant cumulative effects are not anticipated.

215. A summary of the results of this assessment is provided in (**Table 20-29**). This summarises the worst-case scenario for all receptors and impacts, as determined in section 20.6.

Table 20-29 Summary of Potential Likely Significant Effects on Flood Risk and Hydrology for In Isolation and Concurrent and Sequential Scenarios

Potential Impact	Receptor	Sensitivity	Magnitude of Impact – In Isolation	Significance of effect – In Isolation	Magnitude of impact - Together	Significance of effect - Together
Construction						
Impact 1: Direct disturbance of surface water bodies	Surface water bodies	Low to high	No impact to medium	**No change** to **minor adverse**	No impact to medium	**No change** to **minor adverse**
Impact 2: Increased sediment supply	Surface water bodies	Low to high	Negligible	**Negligible** to **minor adverse**	Negligible	**Negligible** to **minor adverse**
Impact 3: Accidental release of contaminants	Surface and groundwater bodies	Low to high	Negligible	**Negligible** to **minor adverse**	Negligible	**Negligible** to **minor adverse**
Impact 4: Changes to surface water runoff and flood risk	Surface and groundwater bodies	Low to high	Negligible	**Negligible** to **minor adverse**	Negligible	**Negligible** to **minor adverse**

Potential Impact	Receptor	Sensitivity	Magnitude of Impact – In Isolation	Significance of effect – In Isolation	Magnitude of impact - Together	Significance of effect - Together
Operation						
Impact 1: Accidental release of contaminants	Surface and groundwater bodies	Low to high	Negligible	**Negligible** to **minor adverse**	Negligible	**Negligible** to **minor adverse**
Impact 2: Changes to surface water runoff and flood risk	Surface and groundwater bodies	Low to high	Negligible	**Negligible** to **minor adverse**	Negligible	**Negligible** to **minor adverse**
Decommissioning						
The detail and scope of the decommissioning works would be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A Decommissioning Plan would be provided prior to any decommissioning commencing onshore.						

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