Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Environmental Statement

Volume 3

Appendix 18.1 – Water Framework Directive Compliance Assessment (Revision B) (Tracked)

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Title:		
Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects Environmental Statement **Appendix 18.1.1 Water Framework Directive Compliance Assessment (Revision B) (Tracked)**		
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Glossary of Acronyms

A/HMWB	Artificial or Heavily Modified Water Body
CBS	Cement Bound Sand
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CSCB	Cromer Shoal Chalk Beds
DCO	Development Consent Order
DEFRA	Department for the Environment and Rural Affairs
DEP	Dudgeon Extension Project
DwPAs	Drinking Water Protected Areas
EC	European Commission
EQSD	Environmental Quality Standards Directive
EU	European Union
GEP	Good Ecological Potential
GES	Good Ecological Status
GWDTEs	Groundwater Dependent Terrestrial Ecosystems
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
HVAC	High-Voltage Alternating Current
IDB	Internal Drainage Board
INNS	Invasive Non-Native Species
MCZ	Marine Conservation Zone
NVZ	Nitrate Vulnerable Zone
OSP	Offshore Substation Platform
PEIR	Preliminary Environmental Information Report
PPG	Environment Agency’s Pollution Prevention Guidance
PPP	Pollution Prevention Plan
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SEP	Sheringham Shoal Extension Project
SPZ	Source Protection Zone
WFD	Water Framework Directive

Glossary of Terms

Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP offshore site	The Dudgeon Offshore Wind Farm Extension consisting of the DEP wind farm site, interlink cable corridors and offshore export cable corridor (up to mean high water springs).
DEP onshore site	The Dudgeon Offshore Wind Farm Extension onshore area consisting of the DEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable corridor which would house HDD entry or exit points.
Infield cables	Cables which link the wind turbine generators to the offshore substation platform(s).
Interlink cable corridor	This is the area which will contain the interlink cables between offshore substation platform/s and the adjacent Offshore Temporary Works Area.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable corridor to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water
Offshore export cable corridor	This is the area which will contain the offshore export cables between offshore substation platform/s and landfall, including the adjacent Offshore Temporary Works Area.
Offshore export cables	The cables which would bring electricity from the offshore substation platform(s) to the landfall. 220 – 230kV.
Onshore cable corridor	The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction.
Order Limits	The area subject to the application for development consent, including all permanent and temporary works for SEP and DEP.

18.1 WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

18.1.1 Introduction

18.1.1.1 Project Background

1. Equinor New Energy Limited (hereafter Equinor) is proposing to extend the existing operational Sheringham Shoal and Dudgeon Offshore Wind Farms named the Sheringham Shoal Offshore Wind Farm Extension Project (hereafter SEP) and the Dudgeon Offshore Wind Farm Extension Project (hereafter DEP).
2. This Water Framework Directive (WFD) Compliance Assessment for SEP and DEP encompasses the following elements:
   - Offshore cable installation and offshore cable protection (<1 nautical mile of the coast);
   - Landfall;
   - Onshore cable corridor including haul roads and temporary construction compounds;
   - Onshore substation; and
   - 400kV connection to the existing National Grid substation at Norwich Main.
3. Note that the offshore arrays and interlink cables are, at the nearest point, located 14km beyond the WFD coastal water body boundaries and therefore are not considered further within this compliance assessment.

18.1.1.2 Aims and Objectives

4. This assessment aims to determine whether the construction, operation or decommissioning activities associated with SEP and DEP are compliant with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, as amended by the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 and Part 5 of the Environment Act 2021.
5. The objectives of this compliance assessment are to:
   - Identify water bodies that could potentially be affected by SEP and DEP;
   - Identify SEP and DEP construction and operation activities that could affect these water bodies;
   - Assess the potential for the activities to result in a deterioration in the status of WFD water bodies, or prevent status objectives being achieved in the future; and
   - Determine the compliance of SEP and DEP with the requirements of the WFD.
6. This assessment is an appendix to **Chapter 18 Water Resources and Flood Risk** of the Environmental Statement (ES). This assessment also supports ES **Chapter 6 Marine Geology, Oceanography and Physical Processes**, **Chapter 7 Marine Water and Sediment Quality** and **Chapter 8 Benthic Ecology**.

18.1.1.3 Legislative Background

18.1.1.3.1 The Water Framework Directive

7. The WFD was adopted by the European Commission in December 2000. The WFD requires that all EU Member States must prevent deterioration and protect and enhance the status of aquatic ecosystems. This means that Member States must ensure that new schemes do not adversely impact upon the status of aquatic ecosystems, and that historical modifications that are already impacting it need to be addressed. The WFD applies to all bodies of water, including those that are man-made.

8. There are two separate components used to classify the status of surface water bodies (rivers, lakes, estuaries and coastal waters); ecological and chemical. The ecological status of a surface water body is assessed according to the condition of the:
   - Biological quality elements, including fish, benthic invertebrates and aquatic flora;
   - Physico-chemical quality elements, including thermal conditions, salinity, pH, nutrient concentrations and concentrations of specific pollutants such as copper; and
   - Hydromorphological quality elements, including morphological conditions, hydrological regime and tidal regime.

9. River water bodies are defined in the appropriate River Basin Management Plan (RBMP) on the basis of surface hydrological catchments with an area of greater than $5km^2$. Smaller water bodies within these catchments are considered to be part of the water body into which they drain for the purposes of WFD monitoring and management.

10. The ecological status of surface waters is recorded on a scale of “high”, “good”, “moderate”, “poor” and “bad”. The ecological status of a water body is determined by the worst scoring quality element, which means that the condition of a single quality element can cause a water body to fail to reach its WFD classification objectives. The overall environmental objective of reaching Good Ecological Status (GES) applies to these water bodies.

11. The chemical status of surface waters is assessed by compliance with environmental standards that are listed in the Environmental Quality Standards Directive (2008/105/EC). These chemicals include priority substances and priority hazardous substances. Chemical status is recorded as either “good” or “fail” and is determined by the lowest scoring chemical.

12. Where the hydromorphology of a surface water body has been significantly altered as a result of anthropogenic activities, it can be designated as an Artificial or Heavily Modified Water Body (A/HMWB). An alternative environmental objective (to GES), Good Ecological Potential (GEP), applies in these cases.

13. Groundwaters are assessed in a different way to surface waters and are classified as either “good” or “poor” in terms of quantity (groundwater levels, flow directions) and chemical quality (pollutant concentrations and conductivity).

18.1.1.3.2 UK Legislation

14. This assessment is to evaluate compliance with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, as amended by the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 and the Environment Act 2021.The Regulations provide for the implementation of the WFD, from designation of all surface waters (rivers, lakes, estuarine waters, coastal waters and ground waters) as water bodies, and set objectives for the achievement of GES or GEP.

15. The standards used to determine the ecological or chemical status of a water body are listed in the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015. This includes the thresholds for determining the status of the biological, hydromorphological, physico-chemical and chemical status of surface water bodies, and the quantitative and chemical status of groundwater bodies.

18.1.1.4 Report Structure

16. This report is divided into the following sections:
    - **Section 18.1.1** provides an introduction to the report;
    - **Section 18.1.2** provides a description of SEP and DEP;
    - **Section 18.1.4** presents the WFD compliance assessment methodology used to inform the assessment;
    - **Section 18.1.5** - **Section 18.1.7** presents the results of the WFD compliance assessment; and
    - **Section 18.1.8** presents a summary of proposed mitigation, improvements and monitoring requirements.

18.1.2 Project Description

18.1.2.1 Offshore

17. SEP and DEP would comprise the following main offshore components:
    - Wind turbines and their associated foundations;
    - Offshore substation platform/s (OSP/s) and associated foundation/s; and
    - Subsea cables and cable protection – offshore export cables, infield cables and interlink cables.

18. Electricity would flow from the wind turbines via infield (array) cables to offshore substation platform(s). There will be up to two offshore substations with one in SEP and one in DEP, located to optimise the length of the offshore cables. Interlink cables will link the separate project areas. At the offshore substation/s, the generated power will be transformed to a higher alternating current (AC) voltage. The power will be exported through two export cables, in two separate trenches, to a landfall east of Weybourne on the north Norfolk coast.

18.1.3 Onshore

19. At the landfall the offshore export cables will meet and be joined up with the onshore export cables in a transition joint bay. The onshore export cables would then travel approximately 60km inland to a high voltage alternating current (HVAC) onshore substation near to the existing Norwich Main substation. The onshore substation would be constructed to accommodate the connection of both SEP and DEP to the transmission grid.

20. The main onshore components of SEP and DEP include:

- Landfall including transition joint bay;
- Up to two ducts installed under the beach at the landfall by Horizontal Directional Drilling (HDD);
- Onshore cable corridor, including:
    - Onshore export cables installed in ducts, and associated infrastructure including joint bays and link boxes;
    - Temporary construction access roads and haul roads;
    - Temporary construction compounds; and
    - Trenchless crossings at sensitive features and habitats (e.g. A roads, main rivers and sites designated for nature conservation).
- Onshore substation, including:
    - 400kV connection to Norwich Main substation
    - Substation operational access road; and
    - Associated earthworks, surface water attenuation and/or landscaping.

21. Further details of the key components of offshore and onshore infrastructure can be found in ES **Chapter 4 Project Description** (document reference 6.1.4).

22. The offshore wind farm arrays and associated infrastructure, would be located outside the WFD water body boundaries (i.e. >1 nautical mile offshore). The onshore elements, landfall and offshore cabling up to 1 nautical mile offshore are the subject of this assessment.

18.1.3.1 Construction Scenarios

23. This assessment considers three construction scenarios for SEP and DEP (further detail of the three construction scenarios is provided in **Chapter 4 Project Description** of the ES):

- Build SEP or build DEP in isolation;

- Build SEP and DEP sequentially with a gap of up to four years between the start of construction of each Project – reflecting the maximum duration of effects; and
- Build SEP and DEP concurrently – reflecting the maximum peak effects.

24. In the event that both SEP and DEP are built, the following principles set out the framework for how SEP and DEP may be constructed:
    - SEP and DEP may be constructed at the same time, or at different times;
    - If built at the same time both SEP and DEP could be constructed in four years;
    - If built at different times, either Project could be built first;
    - If built at different times, each Project would require a four year period of construction;
    - If built at different times, the offset between the start of construction of the first Project, and the start of construction of the second Project may vary from two to four years;
    - Taking the above into account, the total maximum period during which construction could take place is eight years for both Projects; and
    - The earliest construction start date is 2025.

25. The impacts of construction of SEP and DEP in isolation or if both are built, on WFD compliance, will be discussed in Stage 3: Detailed Compliance Assessment (**Section 18.1.7**).

18.1.3.2 Operation Scenarios

26. Operation scenarios are described in detail in **Chapter 4 Project Description**. Where necessary, the assessment considers the following three scenarios:
    - Only SEP in operation;
    - Only DEP in operation; and
    - The two Projects operating at the same time, with a gap of two to four years between each Project commencing operation.

27. The operational lifetime of each Project is expected to be 40 years.

18.1.3.3 Decommissioning Scenarios

28. Decommissioning scenarios are described in detail in **Chapter 4 Project Description**. Decommissioning arrangements for the offshore elements of SEP and DEP will be agreed through the submission of a decommissioning programme prior to construction. For the onshore elements the decommissioning arrangement will be agreed through the submission of an onshore decommissioning plan to the relevant planning authority for approval within six months of the permanent cessation of commercial operation (unless otherwise agreed in writing by the relevant planning authority). For the purpose of this assessment it is assumed that decommissioning of SEP and DEP could be conducted separately, or at the same time.

18.1.3.4 Offshore Construction Activities

18.1.3.4.1 Pre-installation Works

29. A pre-lay grapnel run would be undertaken to clear any identified debris in advance of any offshore cable installation during each phase.

18.1.3.4.2 Installation and Burial

30. Following the pre-installation works, the cables would be installed and buried as far as possible. The following methods may be used for cable burial and would be dependent on the results of the pre-construction survey and post-consent procurement of the cable installation contractor:

- Ploughing;
- Trenching or mechanical cutting; or
- Jetting.

18.1.3.4.3 Offshore Cable Protection

31. There are certain situations where the use of external cable protection may be required. These are:

- Where an adequate degree of protection has not been achieved from the burial process. This may be as a result of challenging ground conditions, or unforeseen circumstances with the burial process, such as break down of the burial tool/s;
- At cable crossings (there are no cable crossings required inside the CSCB Marine Conservation Zone (MCZ));
- At the HDD exit pits; and
- In the event that cables become unburied as a result of sea bed mobility during the operation of the wind farms or (where necessary) in the event of making a cable repair. If these works were required, they would be the subject of a separate marine licence application and therefore are not included in the project design envelope.

32. The offshore cable protection requirements within the Cromer Shoal Chalk Beds MCZ are described within the **Cromer Shoal Chalk Beds (CSCB) MCZ Cable Specification, Installation and Monitoring Plan** (document reference 9.7). Remedial repair, replacement and reburial works may be required throughout the lifetime of SEP and DEP as described in **Chapter 4 Project Description**.

18.1.3.4.4 Offshore Export Cable Protection for Existing Cable/Pipeline Crossings

33. The offshore export cables will cross the existing Dudgeon offshore wind farm cables and Hornsea Three wind farm cables. Crossings are designed to protect the obstacle being crossed, as well as the SEP and DEP cables once they have been installed. Detailed methodologies for the crossing of cables and pipelines will be determined in consultation with the owners of the infrastructure to be crossed and crossing agreements will be entered into. However, a number of techniques may be utilised, including:
    - Pre-lay and post-lay concrete mattresses;
    - Pre-lay and post-lay rock dumping; and
    - Pre-lay cable with Uraduct protection and post-lay rock placement / rock bags.

18.1.3.5 Landfall

34. The offshore export cables will make landfall at Weybourne. To facilitate construction, a temporary compound will be required to accommodate drilling rigs, ducting and welfare facilities. The compound will be set back between 100m to 150m from the cliff edge and would be up to 75m long by 75m wide.
35. Offshore export cables will be installed using trenchless techniques (e.g. horizontal directional drilling (HDD)). Each offshore export cable will require one trenchless installation, with a second trenchless installation included for contingency (in the unlikely event of a drill failure). This means that there could be a maximum of four trenchless installations across both projects. Each drill will start from an onshore construction compound, travel beneath the beach, and will exit in the subtidal zone at a suitable water depth.
36. Following completion of the duct installation, the landfall compound would be demobilised, drilling rigs and welfare would be removed from site and the land reinstated.
37. As stated in **Section 18.1.3.1** there are three construction scenarios for SEP and DEP. For each scenario, different worst-case parameters are required for each component of landfall construction and are presented below in **Table 18.1-1**~~**Table 18.1-1Table 18.1-1**~~.

Table 18.1-1: Landfall Construction Parameters

Landfall	Worst-case parameters		
	DEP/SEP alone	DEP/SEP concurrently	DEP/SEP together sequentially
Number of HDD drills	Up to 2	Up to 4	Up to 4
Number of joint transition bays	1	2	2
Transition bay dimensions (length x width)	26m x 10m	2x (26 x 10m) if adjacent to each other or 26 x 12m if combined	2x (26 x 10m) - adjacent to each other

Landfall	Worst-case parameters		
Depth of transition joint bay (m)	Up to 3m	Up to 3m	Up to 3m
Landfall HDD compound size	75 x 75 m	75 x 75 m	75 x 75 m for each project
Length of HDD	Up to 1,150m	Up to 1,150m	Up to 1,150m
Approximate distance inland from cliff edge of transition bay(s)	150m	150m	150m

18.1.3.5.1 Subtidal HDD Exit Point

38. The HDD will exit in the subtidal zone, approximately 1,000m from the coastline (up to 1,150m from the onshore entry point). At the HDD exit point in the subtidal zone, there is a requirement for a transition zone between where the ducts exit the sea bed and the point at which it is possible for the burial tool to start the process of burying the cables. There are two options for the transition zone. The first would involve the excavation of an initial trench up to 20m wide, 30m long and 1m deep, with a further transition zone trench of up to 50m in length and up to 0.5m deep per cable at the end of which the burial tool would be able to take over the cable burial process.

18.1.3.5.2 Transition Bays

39. The offshore and onshore cables will be jointed together in one or two underground transition bays located onshore within the landfall compound. This would comprise an excavated area of up to 26m x 10m (construction of SEP or EP in isolation), either 2x (26 x 10m) or 26 x 12m if constructed concurrently, or 2x (26 x 10 m) if constructed sequentially. Transition bays will have a reinforced concrete floor to allow winching during cable pulling and a stable surface to allow jointing.

40. Following cable pulling and jointing activities, the joints would be buried to a depth of 1.2m using stabilised backfill, pre-excavated material or a concrete box. The remainder of the joint transition bay will be backfilled with the pre-excavated material and returned to the pre-construction condition, so far as is reasonably possible.

18.1.3.6 Onshore Construction Activities

18.1.3.6.1 Onshore Cable Corridor

41. The onshore cable corridor will contain the high-voltage alternating current (HVAC) onshore export cables within ducts. The DCO Order Limits up to 45m wide if SEP or DEP are constructed in isolation and up to 60m wide if SEP and DEP are constructed concurrently or sequentially. At trenchless crossings, the cable corridor will be up to 100m wide. The length of the onshore cable corridor will be approximately 60km with several temporary construction areas along the corridor.

42. The cable corridor continues south, passing the villages of Oulton and Cawston, and crosses the River Wensum near Attlebridge and the A47 between Hockering and Easton. From this point the onshore cable corridor heads south east, crossing the A11 at Ketteringham, and eventually reaches the onshore substation site near the existing Norwich Main substation.

43. The installation of the onshore export cable is expected to take up to 24 months in total (for the single project in isolation) or 26 months for two projects constructed concurrently. For the two projects constructed sequentially it would be two separate periods of 24 months. Construction may be carried out by up to ten teams (one per 1km section) along the export cable corridor at the same time. Each team typically working on a 400m length of the corridor on any given day, and within that length the extent of open trenches would typically be between 50-100m on any given day, with the trench being excavated at one end and backfilled at the other as works progress along that section.

44. Once the cable ducts have been installed in each section and the trench reinstated, the workfront will move onto the next section to minimise the amount of land worked on at any one time. Construction may be carried out by multiple teams at more than one location along the export cable corridor at the same time.

45. Tracked excavators will be required to excavate open cut trenches at approximately 3-6 mm width by 2m depth. Topsoil and subsoil will be stripped from the section to be worked on and stored separately within the working width. The minimum depth of cable after burial will be 1.2 m. Bedding material such as cement bound sand (CBS) will be compacted to form the base layer of the trench to encase the ducting. Each excavated section will then be backfilled in stages with the stored subsoil previously excavated from the trench. The stored topsoil would then be replaced on top of the backfilled subsoil to reinstate the trench to pre-construction condition, so far as reasonably possible.

46. Within the working width of the cable corridor, up to 55km haul road will be constructed to enable delivery of equipment to the workfronts from construction compounds, storage areas for topsoil and subsoil and drainage. The haul road would be up to 5m wide (with passing places up to 8m wide) and as a worst case it is assumed it may be required along the full length of the cable corridor. The haul road would be installed in stages as each workfront progresses. It would be formed of protective matting, temporary metal road or permeable gravel aggregate dependant on the ground conditions, vehicle requirements and any necessary protection for underground services.

47. Where the onshore export cable must traverse Main Rivers, trenchless crossing techniques would be used. The cable would be installed at least 2m below the bed of the watercourse and, although ground disturbance will occur at entry and exit points, there would be no direct disturbance to the watercourses crossed using a trenchless technique. Trenchless techniques will also be used to traverse any WFD water bodies that are classified as IDB Drains and Ordinary Watercourses (e.g. watercourses that were designated as Main Rivers when river water bodies were identified in the second RBMP, but have since been reclassified and are no longer considered to be Main Rivers).

48. Trenched crossings would be carried out on the majority of the Ordinary Watercourses (including some internal drainage board (IDB)-maintained watercourses, depending upon their width, depth and environmental sensitivity). Trenched crossings of watercourses 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 river bed between the two dams with the river flow maintained using a temporary pump or flume. The different watercourse crossings within each WFD surface water catchment are listed in **Table 18.1-2** and can be seen on **Figure 18.5** of ES **Chapter 18 Water Resources and Flood Risk**.

Table 18.1-2: Water Body Crossings in Surface Water Catchments

Catchment	River water body catchment	Trenchless crossings			Trenched crossings
		Main River	IDB Drain	Ordinary Watercourse	Ordinary watercourse
North Norfolk Rivers	Spring Beck	0	0	2	0
	River Glaven	0	0	0	1
	Coastal catchment	0	0	0	0
River Bure	Scarrow Beck	0	0	0	0
	River Bure	1	0	5	2
	Mermaid Stream	0	0	0	0
River Wensum	Blackwater Drain	0	0	0	0
	Swannington Beck	0	1	2	0
	River Wensum	1	2	2	0
	River Tud	1	0	0	0
River Yare	River Yare	1	0	8	1
	River Tiffey	1	0	2	3
	Intwood Stream	1	0	4	2
	River Tas	0	0	0	0

49. To maintain haul road access at Ordinary Watercourse crossings, an appropriately sized culvert would be installed within the ditch and the haul road would be installed over the top of the culvert to main access along the cable corridor either side of the ditch. The culvert would be installed in the channel bed so as to avoid upstream impoundment and would be sized to accommodate reasonable 'worst-case' water volumes and flows. These culverts may remain in place for the duration of the cable duct installation, i.e. up to 24 months for SEP or DEP in isolation, or up to 26 months for SEP and DEP concurrently.

50. At larger crossings, temporary bridges may be employed to allow continuation of the haul road. At sensitive locations such as some river crossings, the haul road would effectively stop and would re-start on the opposite side. When duct installation is completed, the haul road would be removed and the ground reinstated using the stored topsoil (although it may be necessary to retain or reinstate some sections of the haul road to provide access for the subsequent cable pulling stage).

51. Cables would be pulled through the pre-laid ducts from jointing bays, at a later stage of the construction programme. Approximately 60-120 jointing bays installed at least 1.2m below ground (every circa 1000m) will be required along the corridor. All excavation and reinstatement activities for the joint bays would be conducted as in the same manner as those described for the cable trenching activities.

52. Link boxes are required in proximity to jointing bay locations (up to one every 1000m) to enable the cables to be bonded to earth to maximise cable ratings. Each link box (buried to ground level) would require periodic access for inspection and testing during operation.

53. **Table 18.1-3~~Table 18.1-3~~** shows the onshore cable corridor construction parameters for each of the construction scenarios.

Table 18.1-3: Onshore Cable Corridor Construction Parameters.

	Worst-case parameters		
	DEP/SEP alone	**DEP/SEP concurrently**	**DEP/SEP sequentially**
Onshore cable length	60km	60km	60km + 60km
Onshore haul road length	55km	55km	55km + 55km
Maximum number of work fronts at any one time	10	10	10
Total number of main construction compounds	1	1	1 for each project
Estimated main compound area [m2]	30 000 sq m	30 000 sq m	30 000 sq m for each project
Max number of secondary construction compounds with CBS Batching	2	2	2 for each project
Estimated secondary compound area with CBS batching [m2]	7500 sq m	7500 sq m	7500 sq m

	Worst-case parameters		
	DEP/SEP alone	**DEP/SEP concurrently**	**DEP/SEP sequentially**
Total number of secondary construction compounds without CBS Batching	6	6	6 for each project
Estimated secondary compound area without CBS batching [m2]	2500 sq m	2500 sq m	2500 sq m
Cable corridor width	45m	60m	60m
Cable corridor at trenchless crossings	Up to 100m	Up to 100m	Up to 100m
No of trenches	1	2	2
Cable burial depth (minimum)	1.2m	1.2m	1.2m
Approximate volume of trench excavated material	180,000m3	360,000m3	360,000m3
Trenchless (HDD) crossings compound (length x width)	1,500 - 4,500m2	1,500 - 4,500m2	1,500 - 4,500m2
Typical jointing bay frequency	Every 1000m	Every 1000m	Every 1000m
Total No. jointing bays	60	120	120
Jointing bay (length x width x height)	16m (L) x 3.5m (W) x 2m (D)	16m (L) x 3.5m (W) x 2m (D) - per circuit	16m (L) x 3.5m (W) x 2m (D) - per circuit
Depth to top of jointing bay (m)	> 1.2m	> 1.2m	> 1.2m
Link box frequency	Every 1000m	Every 1000m	Every 1000m
Link box (length x width)	Up to 2.6m x 2m x 1.5m	Up to 2.6m x 2m x 1.5m	Up to 2.6m x 2m x 1.5m
Total No. link boxes	60	120	120

18.1.3.6.2 Onshore Substation Construction

54. The onshore substation will be constructed to accommodate the connection of both SEP and DEP to the transmission grid. If only one project comes forward the substation will be 3.25ha in size. If both SEP and DEP are taken forward a single substation will be constructed to accommodate both connections and will be 6.0ha in size.

55. **Table 18.1-4~~Table 18.1-4~~** presents the main construction parameters for the onshore substation under each scenario.

Table 18.1-4: Onshore Substation Construction Parameters.

Onshore cable corridor	Worst-case parameters		
	DEP or SEPSEP or DEP alone	DEP and SEP concurrently	DEP and SEP sequentially
Maximum operational area (Ha)	3.25 Ha	6.0 Ha	6.0 Ha
Substation construction compound (m^2)	10,000	10,000	10,000

56. The substation site is located in arable land 250m south of Norwich Main, immediately west of the Norwich to Ipswich rail line, and approximately 600m north of the nearest village (Swainsthorpe).

57. This will require conversion from existing agricultural land to hard standing surface. The facility will comprise of a control building and SVC building and electrical transmission equipment if SEP or DEP are built in isolation, up to two control rooms and two SVC buildings if SEP and DEP are both built, as well as ancillary infrastructure such as a car park and welfare facilities. A dedicated access road for operation and maintenance access to equipment, will also be constructed.

58. The construction programme for the onshore substation would be expected to be approximately 28 months if SEP or DEP are built in isolation, 30 months if SEP and DEP are built concurrently or 28 months per project if SEP and DEP are built sequentially.

18.1.3.7 Operational Activities

18.1.3.7.1 Offshore Operational Maintenance Activities

59. There may be a requirement for operational and maintenance activities to the offshore export cable. Based on current knowledge and technology the estimated rate of cable failure for SEP and DEP is one export cable repair every ten years up to 800m with a 3m sea bed disturbance width. As the cable repair is anticipated to be very small scale and infrequent and potentially only occasionally within the boundary of the WFD water body (i.e. within 1nm of the coast) this activity is not considered further in this assessment.

18.1.3.7.2 Onshore Operational Maintenance Activities

60. There will be a requirement for unspecified operational maintenance activities at the onshore substation and along the onshore cable corridor for activities such as periodic link box inspection and testing. When required, repairs will be undertaken throughout the operational phase. Inspections will be carried out to ensure the cables remain buried and have no risk of exposure and re-burial works will be undertaken in locations at risk of becoming exposed.

18.1.3.8 Decommissioning

61. No decision has yet been made regarding the final decommissioning policies for either SEP or DEP as it is recognised that industry best practice, rules and legislation change over time. It is likely the cables would be removed from the ducts and recycled, with the transition pits and ducts capped and sealed then left in situ.

62. The detail and scope of decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator with a decommissioning programme provided.

63. It is anticipated that impacts from decommissioning will be no greater than impacts from construction. Each decommissioning activity will be subject to separate compliance assessments.

18.1.4 Assessment Method

18.1.4.1 Overall Approach

64. There is no detailed published methodology undertaking WFD compliance assessments across all types of water bodies. However, the following relevant guidance exists to support the assessment of various water body types:

- ‘Advice Note 18’ (Planning Inspectorate, 2017): This Advice Notes provides an overview of the WFD and provides an outline methodology for considering the WFD as part of the DCO process;
- ‘Clearing the waters for all’ (Environment Agency, 2017): Outlines a detailed methodology for assessing impacts on transitional and coastal water bodies;
- ‘WFD risk assessment’ (Environment Agency, 2016a): This provides information on how to assess the risk of your activity, as well as guidance for proposed developments planning to undertake activities that would require a flood risk activity permit; and
- ‘Protecting and improving the water environment’ (Environment Agency, 2016b): Provides guidance on the WFD compliance of physical works (Environment Agency 2016c) and other activities in river water bodies.

65. For the purposes of this assessment, the broad methodologies outlined in the guidance documents listed above have been brought together to develop an assessment methodology that can be used for all types of water bodies. The methodology used in this assessment therefore covers the following three stages, which are described in more detail in the subsequent sections:

- Stage 1 (**Section 18.1.5**): Screening Assessment;
- Stage 2 (**Section 18.1.6**): Scoping Assessment; and
- Stage 3 (**Section 18.1.7**): Detailed Compliance Assessment.

18.1.4.2 Stage 1: Screening Assessment

66. The first stage consists of an initial screening exercise to identify relevant water bodies which have the potential to be affected by the construction, operation and decommissioning of SEP and DEP. Water bodies have been selected for inclusion in the early stages of the compliance assessment using the following criteria, with reference to the 2015 Anglian River Basin Management Plan (RBMP) (as presented in the online Catchment Data Explorer (Environment Agency, 2020):

- All surface water body catchments that contain SEP and DEP infrastructure.
- Any surface water bodies that have direct connectivity (e.g. upstream and downstream) that could potentially be affected by SEP and DEP infrastructure.
- Any groundwater bodies that underlie, or are potentially hydrologically connected to, SEP and DEP infrastructure.

18.1.4.3 Stage 2: Scoping Assessment

67. This stage identifies whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1. This stage considers potential non-temporary impacts and impacts on critical or sensitive habitats in relation to each water body and activity. At this stage, water bodies and activities can be scoped out of further assessment if it can be satisfactorily demonstrated that there will be no impacts. If impacts are predicted, it will be necessary to undertake a detailed compliance assessment (Stage 3).

68. The Stage 2 assessment considers the potential for each activity planned as part of the proposed project to affect each quality element in turn, based on a series of scoping questions for the quality elements that are applicable in each type of water body. The scoping questions are set out in detail in **Section 18.1.6**.

69. Where an activity and water body is not scoped out, they will be progressed to the detailed compliance assessment (Stage 3), but only for those quality elements that could potentially be impacted.

18.1.4.4 Stage 3: Detailed Compliance Assessment

18.1.4.4.1 Overview of Method

70. The Stage 3 assessment determines whether any project activities that have been put forward from Stage 2 will cause deterioration and whether this deterioration will have a significant non-temporary effect on the status of one or more WFD quality elements at water body level.

71. If it is established that an activity or project component is likely to affect status at water body level (that is, by causing deterioration in status or by preventing achievement of WFD objectives and the implementation of mitigation measures for HMWBs), or that an opportunity may exist to contribute to improving status at a water body level, potential measures to avoid the effect or achieve improvement that can be reasonably delivered within the scope of the proposed project will be investigated. Where applicable to a development, this stage considers such measures and, where necessary, evaluates them in terms of cost and proportionality in relation to the scale of SEP and DEP and the nature of any impacts. Note that this stage is referred to as a WFD Impact Assessment in the Planning Inspectorate guidance (Planning Inspectorate, 2017).

18.1.4.4.2 Determination of Deterioration

72. The Environment Agency has not issued guidance on how deterioration in the status of water bodies should be assessed. The assessment therefore draws upon the following guidance documents:

- The WFD (Standards and Classification) Directions (England and Wales (2017): Provides the most up to date standards used to determine the ecological and chemical status of surface water bodies, and the quantitative and chemical status of groundwater;
- UKTAG (2011) Defining and Reporting on Groundwater Bodies: Provides information on the approaches used to classify groundwater bodies;
- Joint DEFRA / EA Flood and Coastal Erosion Risk Management Research and Development Programme (2009) WFD Expert Assessment of Flood Management Impacts: Provides a framework for the assessment of changes to hydromorphology;
- UKTAG (2003) Guidance on Morphological Alterations and the Pressures and Impacts Analyses: Provides additional information on hydromorphological pressures;
- Internal Environment Agency guidance on WFD deterioration and risk to the status objectives of river water bodies (Environment Agency, 2016c): Provides an assessment of the level of risk of deterioration in water body status associated with different activities, based upon activity type and risk screening thresholds; and
- Water Framework Directive Assessment: Estuarine and Coastal Waters (Environment Agency, 2017): Provides guidance on assessing the impact of activities in estuarine (transitional) and coastal waters for the WFD. The guidance is also called ‘Clearing the Waters for All’.

73. The assessment considers the potential for deterioration in water body status between classes (e.g. high, good, moderate, poor or bad), within classes, and including temporary deterioration. Where deterioration is not predicted, the activity will also be considered against the water body objectives to ensure status objectives (i.e. GES or GEP) will not be prevented.

18.1.5 Stage 1: Screening Assessment

18.1.5.1 Purpose of this Section

74. The first stage consists of an initial screening exercise to identify the individual activities that could potentially impact on WFD compliance parameters. It then identifies the relevant water bodies that could be affected by the construction and operation of SEP and DEP. The baseline characteristics of each water body are presented, and each water body is assessed for inclusion into the scoping assessment.

18.1.5.2 Identification of Activities to be Considered

75. A summary of the activities screened in and the potential risks to WFD compliance parameters are presented in **Table 18.1-5**~~**Table 18.1-5**~~. These will be considered in more detail in **Section 18.1.7.**

Table 18.1-5: Summary of Activities for Consideration within the WFD Scoping Assessment and WFD Parameters at Risk

Phase	Activity	Potential impacts on WFD water bodies	WFD compliance parameter potentially at risk
Coastal water bodies			
Construction	Offshore export cable installation and burial	Potential temporary impact associated with resuspension of sediment.	Physico-chemistry and biology (habitats and fish)
	Subtidal HDD exit point	Potential temporary impact associated with resuspension of sediment as a result of HDD methodology.	Physico-chemistry and biology (habitats and fish)
Operation	Presence of offshore cable protection	Potential hydrodynamic impacts associated with the presence of the offshore cable protection and subsequent loss of habitat.	Hydromorphology and biology
	Presence of cable protection for existing cable/pipeline crossings	Potential hydrodynamic impacts associated with the presence of the offshore cable protection and subsequent loss of habitat.	Hydromorphology and biology
River and groundwater bodies			
Construction	Landfall and installation of onshore export cables	Changes in surface water and groundwater quality, quantity and distribution	Hydromorphology and physico-chemistry, groundwater quality and quantity

Phase	Activity	Potential impacts on WFD water bodies	WFD compliance parameter potentially at risk
		associated with land use change	
	Cable crossing of Main Rivers and IDB-maintained Ordinary Watercourses using trenchless technique (HDD method)	Changes to water quality associated with any leakage or accidental spills and physico-chemical changes	Physico-chemistry and priority substances, biological elements, groundwater quality
	Cable crossing of Ordinary Watercourses using trenching technique	Indirect impacts from changes to hydromorphology, surface water hydrology, and water quality of ordinary watercourses.	Hydromorphology, biological elements, physico-chemistry
	Haul road construction	Changes to volume and distribution of surface water flows, changes to water quality associated with leakage or accidental spills	Hydromorphology, biological elements and physico-chemistry
	Temporary bridges to allow continuation of the haul road at larger ordinary watercourse crossings.	Changes to hydromorphology, surface water conveyance and changes in water quality associated with leakage or accidental spills	Hydromorphology, biological elements, physico-chemistry and priority substances, groundwater quality
	Temporary haul road crossings of Ordinary Watercourses using culverts.	Indirect impacts from changes to hydromorphology, surface water hydrology, and water quality of ordinary watercourses.	Hydromorphology, biological elements, physico-chemistry
Operation	Presence of landfall and cable ducting	Changes in infiltration to the groundwater body. Presence of an impermeable barrier may change subsurface flow routes.	Groundwater quantity
	Presence of permanent infrastructure along the cable corridor and at the onshore substation	Changes to volume and distribution of surface water flows, changes to water quality associated with runoff and leakage/accidental spills of contaminants.	Hydromorphology, physico-chemistry and priority substances, biological elements

Phase	Activity	Potential impacts on WFD water bodies	WFD compliance parameter potentially at risk
	Operational activities at the substation and maintenance of onshore cable corridor	Changes to water quality associated with runoff and leakage/accidental spills of contaminants. Increase in fine sediment runoff into the water body.	Physico-chemistry and priority substances, hydromorphology, biological elements.

18.1.5.3 Identification of Water Bodies

76. Table 18.1-6~~**Table 18.1-6**~~ presents the coastal surface water (**Figure 18.1.1**), river and lake surface water (**Figure 18.1.2**), and ground water bodies (**Figure 18.1.3**) that could potentially be affected by the proposed construction and operation of SEP and DEP. The water bodies were identified using the Environment Agency's Catchment Data Explorer (Environment Agency, 2022). As such the following water bodies are considered in this stage of the assessment (as defined in section 18.1.4.2):

- Norfolk East (Coastal);
- Norfolk North (Coastal);
- Blakeney Spit Lagoon (Coastal) (downstream of River Glaven);
- Glaven (River);
- Scarrow Beck (River);
- Bure (u/s confluence with Scarrow Beck) (River);
- Bure (Scarrow Beck to Horstead Mill) (River);
- Blackwater Drain (Wensum) (River);
- Mermaid Stream (River);
- Swannington Beck (River);
- Hevingham Watercourse (River);
- Wensum US Norwich (River);
- Wensum DS Norwich (River);
- Tud (River);
- Yare (u/s confluence with Tiffey – Lower) (River);
- Yare (Tiffey to Wensum) (River);
- Tiffey (River);
- Intwood Stream (River);
- Tas (Tasburgh to R. Yare) (River);
- Costessey Pits (Lake);
- North Norfolk Chalk (Groundwater);
- Broadland Rivers Chalk and Crag (Groundwater).

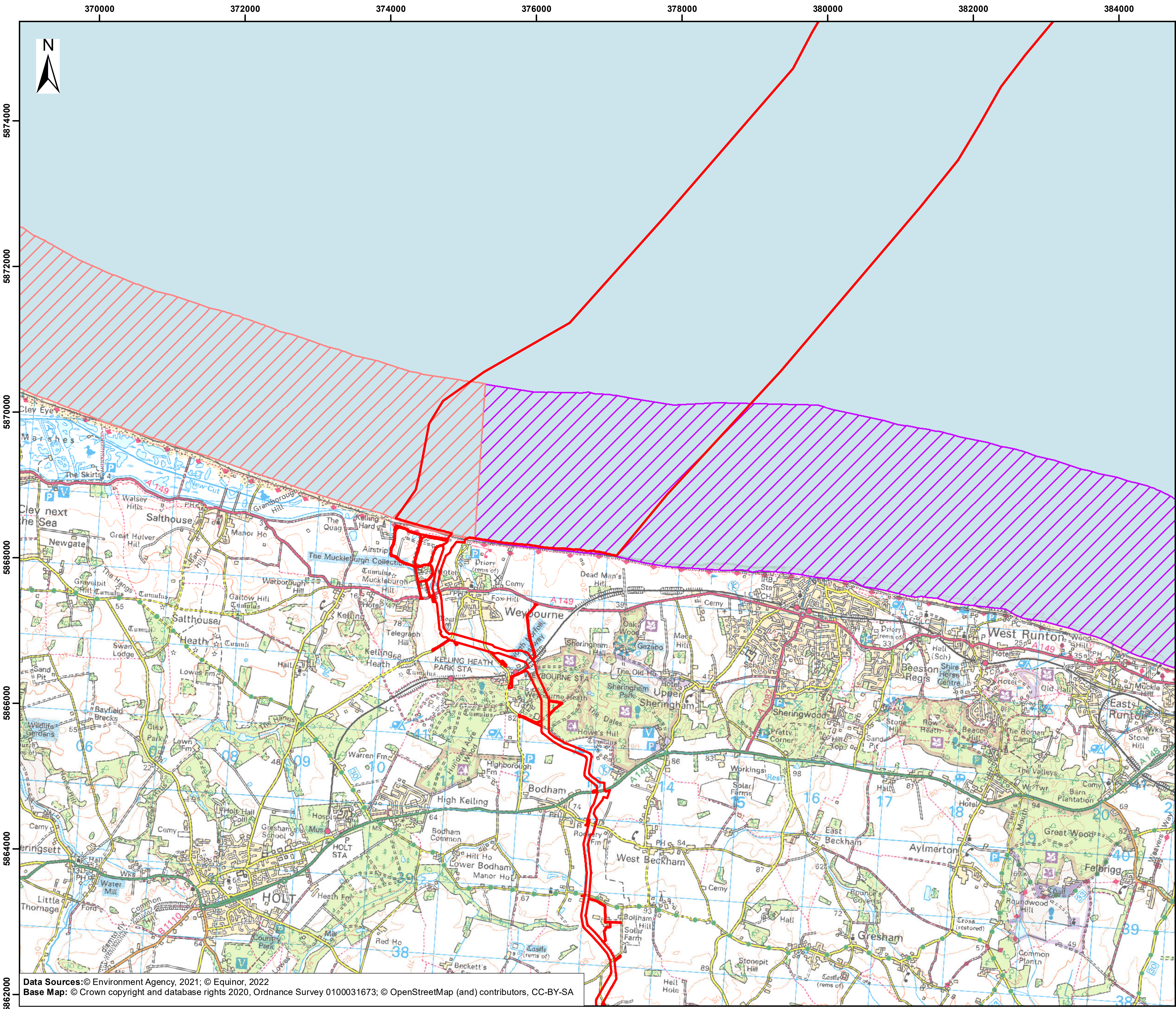
Table 18.1-6: WFD Water Bodies (Environment Agency, 2022) Screened into the WFD Compliance Assessment.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Norfolk East	GB650503520003	Coastal	Heavily modified for flood and coastal protection. The water body is currently at Moderate Ecological Potential as a result of elevated concentrations of dissolved inorganic nitrogen due to continuous sewage discharge and arable land management practices.	Yes. The proposed works will take place within the water body and there is therefore potential for direct impact on WFD quality elements.
Norfolk North	GB640503300000	Coastal	Heavily modified for flood protection. The water body is currently at Moderate Ecological Potential as a result of elevated concentrations of dissolved inorganic nitrogen.	Yes. The proposed works will take place within the water body and there is therefore potential for direct impact on WFD quality elements.
Blakeney Spit Lagoon	GB610050082000	Coastal (lagoon)	Designated as an artificial water body. The water body is currently at Good Ecological Status.	No. The proposed offshore works are located 1.7km to the west of the water body. This distance of separation means that there is no mechanism for impact on the water body.
Glaven	GB105034055780	River	Not designated artificial or heavily modified. 'Moderate' due to pressures on macrophytes and phytobenthos.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Scarrow Beck	GB105034055740	River	Heavily modified due to land drainage activity. 'Moderate Ecological Potential as a result of in-channel morphological diversity measure not in place due to disproportionate burdens.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Bure (u/s confluence with Scarrow Beck)	GB105034055690	River	Not designated artificial or heavily modified. 'Poor' due to pressures on macrophytes and phytobenthos, and fish.	Yes., The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Bure (Scarrow Beck to Horstead Mill)	GB105034050932	River	Heavily modified due to designated recreation use and barriers causing ecological discontinuity. The water body is currently at 'Moderate Ecological Potential' due to the Mitigation Measures Assessment classed as 'Moderate or less'.	No. The proposed onshore works are located approximately 7km upstream of the water body. The nature of the proposed activities and the distance of separation means that any changes to the hydromorphology, physico-chemistry or chemistry of the upstream water body are unlikely to propagate sufficiently far downstream to affect this water body.
Blackwater Drain (Wensum)	GB105034051120	River	Heavily modified due to land drainage activity. The water body is currently at 'Moderate Ecological Potential' due to the Mitigation Measures Assessment classed as 'Moderate or less'.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Mermaid Stream	GB105034050900	River	Heavily modified due to land drainage activities and barriers causing ecological discontinuity. The water body is currently at 'Moderate Ecological Potential' due to hydromorphological modifications and pressures on fish, macrophytes and phytobenthos.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Swannington Beck	GB105034051070	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at 'Moderate Ecological Potential' due to pressures on fish.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Hevingham Watercourse	GB105034051070	River	Heavily modified due to flood protection and agriculture. 'Moderate Ecological Potential' due to mitigation measures assessment at moderate or less and fish at moderate status.	No. No construction or operational activities will take place within this water body catchment. Furthermore, although the Hevingham Watercourse drains into the River Bure, there is no mechanism for any changes to the Bure to propagate upstream and affect this water body.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
				There is no mechanism for impact
Wensum US Norwich	GB105034055881	River	Heavily modified due to flood protection, navigation and recreation designations. The water body is currently at 'Moderate Ecological Potential' due to pressures on phytobenthos and hydromorphological modifications.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Wensum DS Norwich	GB105034055882	River	Heavily modified due to flood protection, navigation and recreation designations. The water body is currently at 'Moderate Ecological Potential' due to pressure on macrophytes and phytobenthos.	No. The proposed onshore works are located approximately 8km upstream of the water body. The nature of the proposed activities and the distance of separation means that any changes to the hydromorphology, physico-chemistry or chemistry of the upstream water body are unlikely to propagate sufficiently far downstream to affect this water body.
Tud	GB105034051000	River	Heavily modified. The water body is currently at 'Moderate Ecological Potential' as a result of moderate phosphate and moderate or less mitigation measures assessment.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Yare (u/s confluence with Tiffey – Lower)	GB105034051290	River	Not designated artificial or heavily modified water body. 'Moderate' status due to moderate macrophytes and phytobenthos.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Yare (Tiffey to Wensum)	GB105034051281	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at 'Moderate Ecological Potential' due to moderate macrophytes and phytobenthos and mitigation measure assessment.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Tiffey	GB105034051282	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at ‘Moderate Ecological Potential’ due to pressures on fish and a moderate or less mitigation measures assessment.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Intwood Stream	GB105034051240	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at ‘Moderate Ecological Potential’ due to high concentrations of phosphate from sewage discharge and poor soil management.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Tas (Tasburgh to R. Yare)	GB105034051230	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at ‘Moderate Ecological Potential’ due to high concentrations of phosphate from sewage discharge and poor soil and livestock management.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Costessey Pits	GB30536219	Lake	Artificial water body currently at ‘Moderate Ecological Potential’ due to high nitrogen and phosphorous concentrations.	No. No construction or operational activities will take place within the catchment that directly contributes to the lake and there is therefore no mechanism for impact on the water body.
North Norfolk Chalk	GB40501G400100	Groundwater	Underlies the landfall area of the substation project area. The water body is currently at ‘Poor Quantitative Status’ and ‘Poor Chemical Status’ as a result of general chemical testing.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Broadland Rivers Chalk & Crag	GB40501G400300	Groundwater	Underlies the majority of the onshore project area. The water body is currently at ‘Poor Quantitative Status’ and ‘Poor Chemical Status’.	Yes. The proposed works will take place within the groundwater body catchment and there is therefore potential for direct impact on WFD quality elements.



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Sheringham Shoal and Dudgeon Extension Projects

Title:

Figure 18.1.1 Coastal Water Bodies within Landfall and the Offshore Cable Corridor

Document:

Environmental Statement (ES)
Appendix 18.1 WFD Compliance Assessment

Application Doc. no.: 6.3.18.1

Legend:

Order Limits

WFD Coastal Water Bodies

Norfolk East

Norfolk North

Coordinate Reference System: WGS 1984 UTM Zone 31N
Transformation WGS84: OSGB_1936_To_WGS_1984_7

0 500 1,000 1,500 2,000 2,500 3,000 Metres

0 500 1,000 1,500 2,000 2,500 3,000 Yards

Scale: 1:50,000 Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00077
RHDHV Doc. no.: PB8164-RHD-ZZ-OF-DR-Z-0108

REV	DATE	STATUS	DRW	CHK	APR
C	12/04/2023	Third Issue	DE	SM	ES
B	28/07/2022	Second Issue	JT	HW	SM
A	29/04/2022	First Issue	AZ	HW	SM

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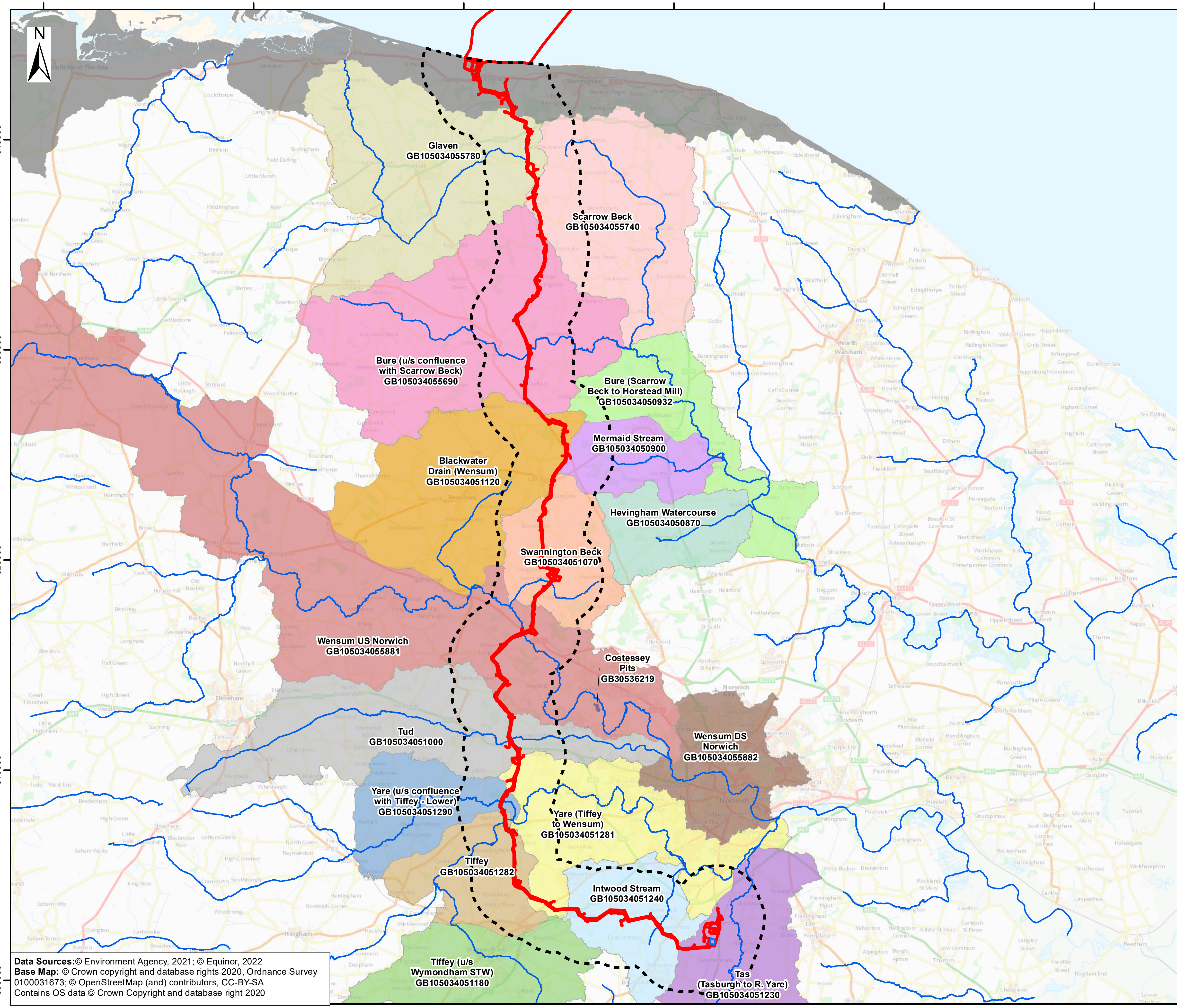

Data Sources:© Environment Agency, 2021; © Equinor, 2022
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Title:

Figure 18.1.2 WFD River and Lake Water Bodies within 2km of the Onshore Cable Corridor and Substation

Document:

Environmental Statement (ES)
Appendix 18.1 WFD Compliance Assessment

Application Doc. no.: 6.3.18.1

Legend:

- Order Limits
- Onshore Substation Site
- Onshore Cable Corridor 2km Buffer
- WFD River Water Bodies

WFD Lake Water Body Catchment

- Costessey Pits

WFD River Water Body Catchment

- Blackwater Drain (Wensum)
- Bure (Scarrow Beck to Horstead Mill)
- Bure (u/s confluence with Scarrow Beck)
- Glaven
- Hevingham Watercourse
- Intwood Stream
- Mermaid Stream
- Scarrow Beck
- Swannington Beck
- Tas (Tasburgh to R. Yare)
- Tiffey
- Tiffey (u/s Wymondham STW)
- Tributary of Tas
- Tud
- Wensum DS Norwich
- Wensum US Norwich
- Yare (Tiffey to Wensum)
- Yare (u/s confluence with Tiffey - Lower)
- Not part of a river WB catchment

Coordinate Reference System: British National Grid
Transformation WGS84: OSGB_1936_To_WGS_1984_7

0 2 4 6 8 10 Kilometres
0 2 4 6 Miles

Scale: 1:175,000 Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00077
RHDHV Doc. no.: PB8164-RHD-ZZ-ON-DR-Z-0070

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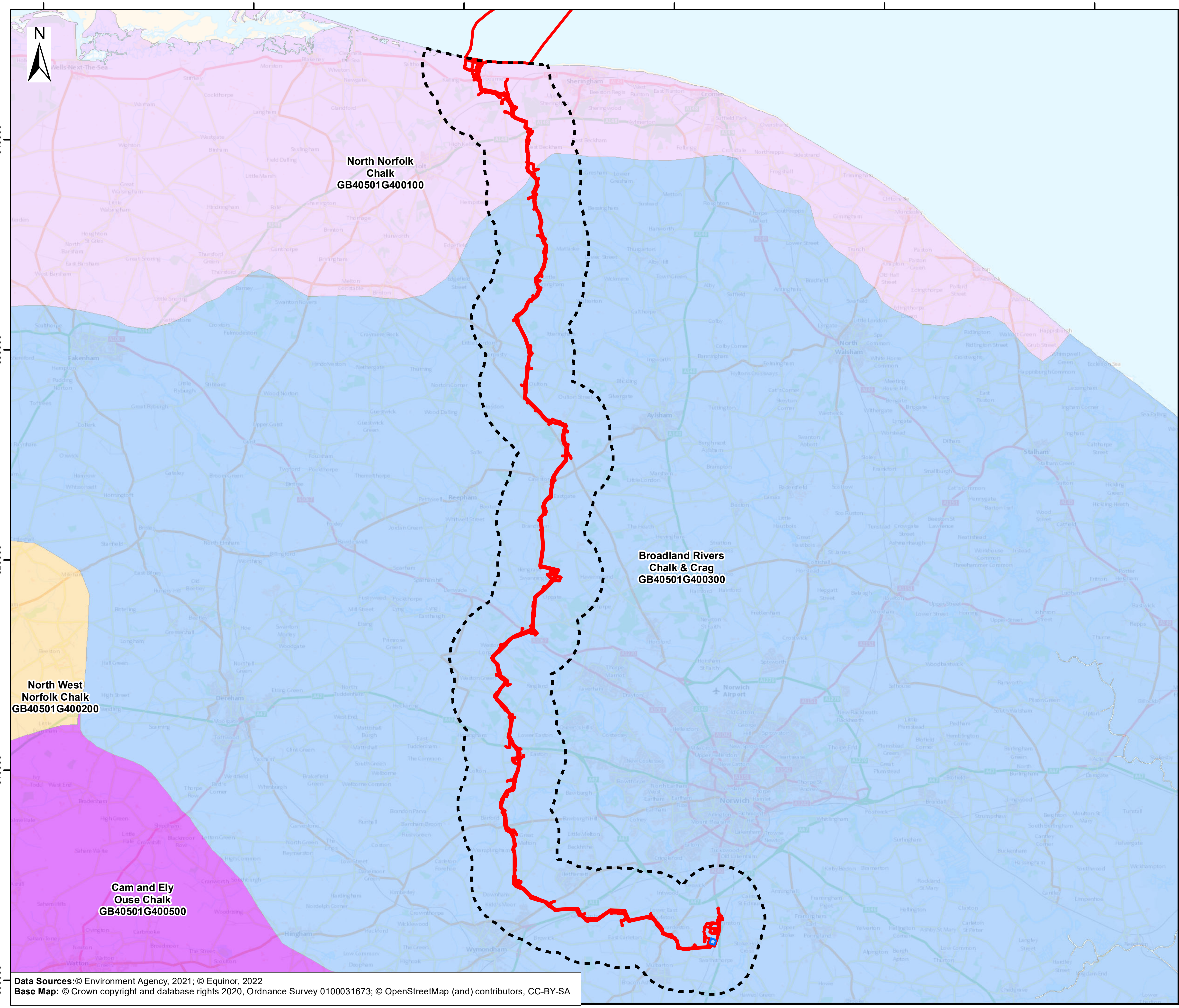

Sheringham Shoal and Dudgeon Extension Projects

Title:

Figure 18.1.3 WFD Groundwater Bodies within the Onshore Cable Corridor and Substation

Document:

Environmental Statement (ES)
Appendix 18.1 WFD Compliance Assessment

Application Doc. no.: 6.3.18.1

Legend:

- Order Limits
- Onshore Substation Site
- Onshore Cable Corridor 2km Buffer

WFD Groundwater Body

- Broadland Rivers Chalk & Crag
- Cam and Ely Ouse Chalk
- Cam and Ely Ouse Woburn Sands
- North Norfolk Chalk
- North West Norfolk Chalk
- North west Norfolk Sandringham Sands

Coordinate Reference System: British National Grid
Transformation WGS84: OSGB_1936_To_WGS_1984_7

0 2 4 6 8 10 Kilometres
0 2 4 6 Miles

Scale: 1:175,000 Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00077
RHDHV Doc. no.: PB8164-RHD-ZZ-ON-DR-Z-0078

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A	29/04/2022	First Issue	AZ	HW	SM

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18.1.6 Stage 2: Scoping Assessment

77. The WFD scoping assessment determines potential impacts on quality elements, the temporary and non-temporary impacts on improvements and mitigation measures, the impacts on protected areas and critical habitats, and any impacts on Invasive Non-Native Species. This stage will therefore determine the scope for the detailed compliance assessment (**Section 18.1.7**) which may be required for SEP and DEP.

78. The aim of this section is to highlight the quality elements within each coastal, river and groundwater water body that have the potential to be impacted by the proposed construction and operation activities associated with SEP and DEP, as identified in Stage 1 of the WFD compliance assessment (**Table 18.1-5**~~**Table 18.1-5**~~).

79. The results of the scoping assessment for the identified coastal, river and groundwater water body quality elements are presented in the Annexes of this assessment. A summary of the outcomes of the tables is presented in the below sections.

18.1.6.1 Impacts on Coastal Water Bodies

80. Scoping has been undertaken using the Environment Agency's impact assessment template (Environment Agency, 2016f). The assessment is presented in **Annex 2** split into the construction phase and the operational phase for both water bodies and considers the following activities:

- Construction – Installation of the offshore export cables and subtidal HDD exit point.
- Operation – Presence of offshore cable protection.

81. Scoping assessment tables are presented in **Annex 2**. The scoping phase confirms that the construction and operational activities have the potential to impact upon the biological (higher sensitivity habitats chalk reef) quality elements of screened in water bodies within the DCO Order Limits. The impact on these quality elements will be considered at detailed assessment for the following coastal water bodies:

- Norfolk East; and
- Norfolk North.

18.1.6.2 Impacts on River Water Bodies

82. The WFD scoping assessment tables for river water bodies are presented in **Annex 3** of this document. The onshore construction and operation activities have potential to impact upon the hydromorphology (hydrological regime, morphological conditions), physico-chemistry (general, specific pollutants) and biological (aquatic flora, benthic invertebrates, fish) quality elements of screened in water bodies within the onshore WFD scoping area. The impact on these quality elements will be considered at detailed assessment for the following water bodies because watercourses within these catchment areas would be crossed by SEP & DEP:

- Glaven;

- Bure (u/s confluence with Scarrow Beck);
- Swannington Beck;
- Wensum US Norwich;
- Tud;
- Yare (u/s confluence with Tiffey – Lower);
- Yare (Tiffey to Wensum);
- Tiffey; and
- Intwood Stream.

83. The WFD scoping assessment presented in **Annex 3** determined there to be four water bodies to be scoped out from detailed assessment in Stage 3 due to distance from the water body to the onshore cable corridor and proposed substation sites and the associated lack of hydrological connectivity. These water bodies are listed below:

- Distance from cable corridor and lack of connectivity:
    - Scarrow Beck;
    - Blackwater Drain (Wensum);
    - Mermaid Stream; and
    - Tas (Tasburgh to R. Yare).
- Distance from proposed substation and lack of connectivity:
    - Tas (Tasburgh to R. Yare)

18.1.6.3 Impacts on Groundwater Water Bodies

84. The WFD scoping assessment table for groundwater bodies is presented in **Annex 4** of this document. This assessment determined that onshore construction activities will not impact upon the groundwater quantity elements of North Norfolk Chalk groundwater body and Broadland Rivers Chalk and Crag groundwater body, but there is the potential for impacts on both water bodies for the following groundwater quality elements:

- Groundwater Dependent Terrestrial Ecosystems (GWDTEs);
- Deterioration in water quality; and
- Increasing pollution concentrations.

85. Operational activities and the presence of permanent onshore infrastructure were deemed to have no mechanisms for impact upon the quantity or quality of groundwater elements. The size of the onshore infrastructure in relation to the size of the groundwater bodies would prevent any risk to both groundwater bodies achieving good status.

18.1.6.4 Impacts on Improvement and Mitigation Measures

86. Within the RBMP, Mitigation Measures are specifically set for A/HMWBs and improvement measures are defined for natural water bodies. These measures were identified for each of the water bodies screened into the Stage 2: Scoping Assessment. **Table 18.1-7**~~**Table 18.1-7**~~ outlines whether there will be any impact on the current measures that are in place and those not yet in place for each water body catchment. It then determines whether further assessment is needed for in the Stage 3 Detailed Compliance Assessment. The assessment determined there to be no impact on the improvement measures and mitigation measures in place, and delivery of those measures not yet in place throughout each identified WFD water body. There will therefore be no requirement for further assessment.

Table 18.1-7: Impact on RBMP Improvement and Mitigation Measures in Place or not in Place Within Each River and Groundwater Water Body.

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
Glaven GB105034055780	No measures identified.	N/A	No measures identified.	N/A
Bure (u/s confluence with Scarrow Beck) GB105034055690	No measures identified.	N/A	No measures identified.	N/A
Swannington Beck GB105034051070 (HMWB)	Maintenance – prevent sediment transfer Selective vegetation control Vegetation control Vegetation control timing Invasive species techniques Sediment management strategy	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	No additional measures identified.	N/A
Wensum US Norwich GB105034055881 (HMWB)	Maintenance – minimise habitat impact Maintenance – prevent sediment transfer Vegetation control Vegetation control timing Invasive species techniques Retain habitats	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	Flood bunds Set-back embankments Floodplain connectivity Fish passes Remove obsolete structure Changes to locks etc. Water level management Sediment management strategy	No mechanisms to prevent the future implementation of these measures have been identified

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
			In-channel morph diversity	
Tud GB105034051000 (HMWB)	Selective vegetation control Vegetation control Vegetation control timing Invasive species techniques Sediment management strategy Maintenance – prevent sediment transfer	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	No additional measures identified	N/A
Yare (u/s confluence with Tiffey – Lower) GB105034051290	Measures are in place to prevent or control the input of pollution from urban areas, transport and built infrastructure	No. Any potential increase in pollutants associated with construction and operational activities are likely to be short term and localised within this water body catchment.	No additional measures identified.	N/A
Yare (Tiffey to Wensum) GB105034051281 (HMWB)	Maintenance – minimise habitat impact Maintenance – prevent sediment transfer Selective vegetation control Vegetation control Vegetation control timing Invasive species techniques Retain habitats	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	Set-back embankments Floodplain connectivity Fish passes Changes to locks etc. In-channel morph diversity	No mechanisms to prevent the future implementation of these measures have been identified

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
	Sediment management strategy			
Tiffey GB105034051282 (HMWB)	Maintenance – minimise habitat impact Maintenance – prevent sediment transfer Selective vegetation control Vegetation control Vegetation control timing Invasive species techniques Retain habitats Sediment management strategy	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	Set-back embankments Floodplain connectivity Fish passes Changes to locks etc. In-channel morph diversity	No mechanisms to prevent the future implementation of these measures have been identified
Intwood Stream GB105034051240 (HMWB)	Maintenance – prevent sediment transfer Selective vegetation control Vegetation control Vegetation control timing Invasive species techniques Sediment management strategy	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	No additional measures identified	N/A

18.1.6.5 Impacts on Protected Areas and Critical Habitats

87. Protected areas within each of the WFD water body catchments identified during the screening phase are listed in **Table 18.1-8**~~**Table 18.1-8**~~ and shown in **Figure 18.1.4**. They cover the following protected area types:

- Drinking Water Protected Areas (DWPA);
- Bathing Waters (none located within catchment areas);
- Nitrates Vulnerable Zones (NVZ);
- Drinking Water Protected Area;
- Urban Waste Water Treatment Directive Sensitive Areas;
- Special Protection Areas (SPA); and
- Special Areas of Conservation (SAC).

88. Each protected area is assessed in **Table 18.1-8**~~**Table 18.1-8**~~ to identify whether it is within 2km of the onshore WFD study area, and therefore if it should be taken forward for further impact assessment.

89. Potential impacts on protected areas under the Habitats and Species Directive and the Birds Directive are considered in detail in the separate **Report to Inform Appropriate Assessment (RIAA)** (document reference 5.4). The HRA does not identify any Likely Significant Effects on the River Wensum SAC and North Norfolk Coast SAC, SPA and Ramsar resulting from the proposed development.

90. Impacts associated with additional nutrient loading to water-dependent protected areas are considered in ES **Chapter 18 Water Resources and Flood Risk.** This demonstrates that the proposed development would not result in an increase in nutrient loadings to the River Wensum SAC or the downstream Broads SAC into which the Wensum and its tributaries drain.

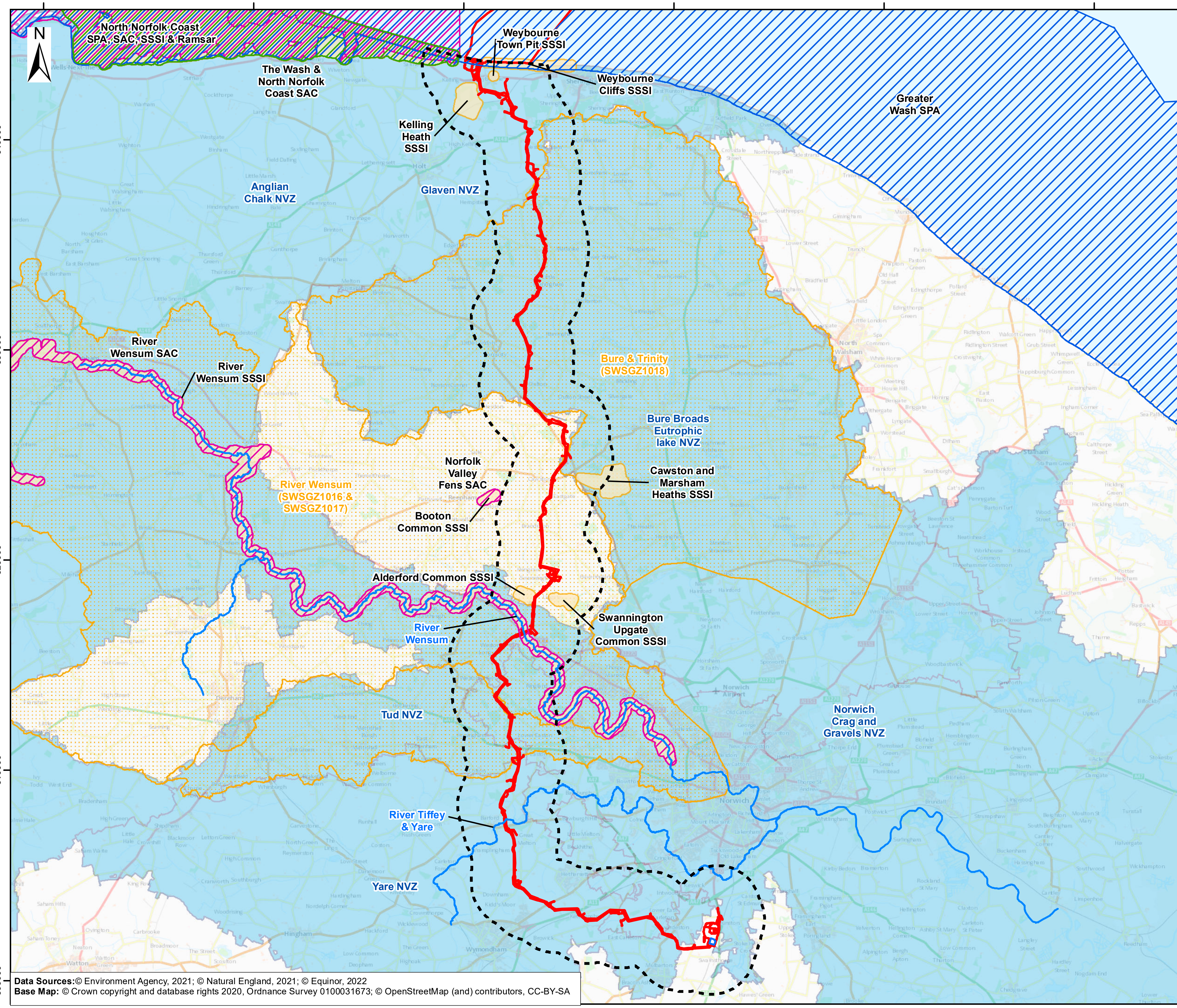
Table 18.1-8: List of Protected Areas Within Each WFD Water Body

Water body name	Protected Area Driver	Protected area name	Further assessment required?
Norfolk East	Habitats and Species Directive	North Norfolk Coast SAC	No Likely Significant Effects identified in the HRA
	Birds Directive	North Norfolk Coast SPA	No Likely Significant Effects identified in the HRA
Norfolk North	Habitats and Species Directive	North Norfolk Coast SAC	No Likely Significant Effects identified in the HRA
	Birds Directive	North Norfolk Coast SPA	No Likely Significant Effects identified in the HRA
Glaven	Habitats and Species Directive	Norfolk Valley Fens SAC	Norfolk Valley Fens will not require further assessment as it is more than 2km from the onshore WFD scoping area.
	Nitrates Directive	Glaven NVZ S402 Anglian Chalk S71 Binham Tributary NVZ S403	Yes, scoped in for further assessment.
Bure (u/s confluence with Scarrow Beck)	Nitrates Directive	Glaven NVZ S402	Yes, scoped in for further assessment.
Blackwater Drain (Wensum)	Habitats and Species Directive	Norfolk Valley Fens SAC	No, more than 2km from onshore WFD scoping area.
	Nitrates Directive	Norwich Crag and Gravels NVZ	Yes, scoped in for further assessment.
Mermaid Stream	Nitrates Directive	Norwich Crag and Gravels NVZ	Yes, scoped in for further assessment.

Water body name	Protected Area Driver	Protected area name	Further assessment required?
Swannington Beck	None	Anglian Chalk NVZ S71	Yes, scoped in for further assessment.
	Nitrates Directive	Norwich Crag and Gravels NVZ	Yes, scoped in for further assessment.
Wensum US Norwich	Drinking Water Protected Area	Wensum US Norwich	Yes, scoped in for further assessment.
	Habitats and Species Directive	River Wensum SAC	No, although the River Wensum SAC is within 2km, potential impacts will be considered separately in the Habitat Regulations Assessment and **Appendix 18.4**.
	Safeguard Zone	SWSGZ1016 SWSGZ1017	No, onshore activities are not within this SGZ.
	Nitrates Directive	Tud NVZ S397 Wendling Beck NVZ S398 Burn NVZ S401	Yes, scoped in for further assessment.
	Urban Waste Water Treatment Directive	River Wensum UKENRI73	No, there will be no mechanism for impact.
Tud	Habitats and Species Directive	Norfolk Valley Fens SAC River Wensum SAC	No, although the River Wensum SAC is within 2km, potential impacts will be considered separately in the Habitat Regulations Assessment and **Appendix 18.4**. No further assessment is required for Norfolk

Water body name	Protected Area Driver	Protected area name	Further assessment required?
			Valley Fens as this is not within 2km.
	Nitrates Directive	Yare NVZ S400 Tud NVZ S397 Wendling Beck NVZ S398	Yes, scoped in for further assessment.
Yare (u/s confluence with Tiffey – Lower)	Habitats and Species Directive	Norfolk Valley Fens SAC	No, more than 2km from onshore WFD scoping area.
	Nitrates Directive	Yare NVZ S400 Tud NVZ S397	Yes, scoped in for further assessment.
Yare (Tiffey to Wensum)	Nitrates Directive	Yare NVZ S400 Tud NVZ S397	Yes, scoped in for further assessment.
	Urban Waste Water Treatment Directive	River Tiffey & Yare UKENRI89	Yes, scoped in for further assessment
Tiffey	Nitrates Directive	Yare NVZ S400	Yes, scoped in for further assessment.
	Urban Waste Water Treatment Directive	River Tiffey & Yare UKENRI89	Yes, scoped in for further assessment.
Intwood Stream	Nitrates Directive	Yare NVZ S400	Yes, scoped in for further assessment.
North Norfolk Chalk	Drinking Water Protected Area	North Norfolk Chalk UKGB40501G400100	Yes, scoped in for further assessment.
	Safeguard Zone	Glandford GWSGZ0012	No, onshore activities of the onshore cable corridor and substation will not be within this safeguard zone.

Water body name	Protected Area Driver	Protected area name	Further assessment required?
	Nitrates Directive	Saxthorpe G171 Sandringham Sands South G150 Anglian Chalk G71	Yes, scoped in for further assessment.
Broadland Rivers Chalk and Crag	Drinking Water Protected Area	Broadland Rivers Chalk & Crag UKGB40501G400300	Yes, scoped in for further assessment.
	Nitrates Directive	Sandlings and Chelmsford G78 Anglian Chalk G71 Norwich Crag and Gravels G79 Saxthorpe G171	Yes, scoped in for further assessment.



Sheringham Shoal and Dudgeon Extension Projects

Title:

Figure 18.1.4 Protected Areas within 2km of the Onshore Cable Corridor and Substation

Document:

Environmental Statement (ES)
Appendix 18.1 WFD Compliance Assessment

Application Doc. no.: 6.3.18.1

Legend:

- Order Limits
- Onshore Substation Site
- Onshore Cable Corridor 2km Buffer
- Urban Waste Water Treatment Directive Sensitive Areas - Eutropic River
- Drinking Water Safeguard Zones
- Nitrate Vulnerable Zone

Designated sites

- Ramsar
- Special Protection Areas (SPA)
- Special Area of Conservation (SAC)
- Sites of Special Scientific Interest (SSSI)

Note: Drinking Water Protected Areas shapefile not available

Coordinate Reference System: British National Grid
Transformation WGS84: OSGB_1936_To_WGS_1984_7

0 2 4 6 8 10 Kilometres
0 2 4 6 Miles

Scale: 1:175,000 Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00077
RHDHV Doc. no.: PB8164-RHD-ZZ-ON-DR-Z-0069

REV	DATE	STATUS	DRW	CHK	APR
C	12/04/2023	Third Issue	DE	SM	ES
B	28/07/2022	Second Issue	JT	HW	SM
A	29/04/2022	First Issue	AZ	HW	SM

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Enhancing Society Together
equinor

18.1.6.6 Impacts on Invasive Non Native Species

91. The main risks of invasive non-native species (INNS) are associated with the transfer of INNS between watercourses or water bodies by construction plant used at multiple sites. The majority of watercourse crossings are being undertaken using trenchless techniques, but there remains a risk of INNS transfer where works are undertaken in or near water.

92. Three separate stands of Himalayan balsam have been recorded within, or in proximity to the DCO order limits; these are located on the River Tud between Honingham and Easton, the River Bure to the east of Saxthorpe, and an unnamed tributary of the River Wensum to the east of Swannington. No other INNS have been identified (ES **Appendix 20.1 Extended Phase 1 Habitat Survey**).

93. The locations and extent of INNS, including Himalayan balsam will be informed by updated pre-construction surveys. Should INNS be located within the works area, the **Outline Ecological Management Plan** (document reference 9.19) sets out the following measures to be applied:

- To avoid disturbance and spread of INNS, where practical an exclusion zone will be created around INNS of at least 7m;
- Signage will be erected to indicate the location of soils, materials or water contaminated with INNS;
- Should exclusion not be practical, good site practice measures for managing the spread of INNS during works at watercourses will be followed including:
  - Personal working on or between sites should ensure their clothing and footwear and any machinery are cleaned where appropriate to prevent spread;
  - The use of tracked vehicles should be avoided within areas of INNS;
  - All vehicles leaving the infested area and/or transporting infested soil/materials must be thoroughly cleaned in a designated wash-down area before being used for other.
- Vegetation clearance within areas of INNS would be undertaken by an appropriately qualified contractor, under the watch of the ECoW.
- Topsoil containing INNS will be managed separately and contained within restricted areas to avoid the spreading INNS to unaffected areas.

94. The control measures outlined in the **Outline Ecological Management Plan** (document reference 9.19) would ensure that impacts on invasive non-native species do not need to be considered in Stage 3 of the assessment.

18.1.6.7 Summary of Stage 2

95. The WFD scoping assessment for river water bodies and groundwater water bodies have shown that the onshore construction and operation activities have the potential to impact upon several WFD quality elements. The quality elements that are to be taken forward with each relevant water body for further assessment in Stage 3, are summarised in **Table 18.1-9**~~**Table 18.1-9**~~. For marine WFD water bodies, biological quality elements in relation to the potential risk to the higher sensitivity habitat 'chalk reef' are scoped in to detailed assessment.

Table 18.1-9: WFD: Quality Elements, Identified WFD Water Bodies and Protected Areas to be Scoped in for Stage 3: Detailed Assessment

WFD quality element	Water body
Hydromorphology	
Hydrological regime	Glaven Bure (u/s confluence with Scarrow Beck) Swannington Beck Wensum US Norwich Tud Yare (u/s confluence with Tiffey – Lower) Yare (Tiffey to Wensum) Tiffey Intwood Stream
River continuity	
Physico-chemistry	
General	
Specific pollutants	
Biology	
Aquatic flora	
Benthic invertebrates	
Fish	
Groundwater quality	
GWDTEs	North Norfolk Chalk, Broadland Rivers Chalk and Crag
Deterioration in water quality	
Increasing pollution concentrations	
Protected areas	
Nitrates Directive;	Glaven NVZ S402 Anglian Chalk S71 Tud NVZ S397 Burn NVZ S401 Yare NVZ S400 Binham Tributary NVZ S403 Norwich Crag and Gravels NVZ Wendling Beck NVZ S398 Saxthorpe G171 Sandringham Sands South G150
Drinking Water Protected Area;	Wensum US Norwich

WFD quality element	Water body
	North Norfolk Chalk UKGB40501G400100 Broadland Rivers Chalk & Crag UKGB40501G400300
Urban Waste Water Treatment Directive	River Wensum UKENRI73 River Tiffey & Yare UKENRI89

18.1.7 Stage 3: Detailed Compliance Assessment

18.1.7.1 Purpose of this Section

96. This section presents the results of the detailed compliance assessment undertaken on the water bodies identified in **Section 18.1.6.7**, using the method outlined in **Section 18.1.4**.

97. The aim of this stage of the assessment is to determine whether SEP and DEP could result in deterioration in the status of the WFD quality elements for all scoped-in water bodies identified in Stage 2.This assessment considers the impact of construction and operation activities on each scoped in quality element and protected areas, considering any changes in impacts for the different construction scenarios of SEP and DEP. To mitigate against the potential impacts, various control measures are set out for implementation during construction and operation.

18.1.7.2 River water bodies

18.1.7.2.1 Hydromorphology (Hydrological Regime and Morphological Conditions)

Construction Activities

98. There is the potential for construction activities to alter surface water flows entering river water bodies. An increase in areas of hard-standing land use associated with the haul road, substation and temporary compound areas, could change flow conveyance pathways resulting in localised changes to volume, energy or distribution of flows of the identified water bodies. Such an increase in surface runoff could also potentially increase local bed and bank scour.

99. Greater levels of fine sediment could be released directly into the watercourse, predominantly from ground disturbance and vegetation cover removal associated with construction. This could result in increased sediment deposition and smothering of existing substrates. It is noted that of the water bodies identified, several are chalk rivers (Glaven, Bure and Wensum) where clean, coarse substrates are a key hydromorphological feature. The impact of potential smothering on these substrates would have a greater impact on these water bodies.

100. As stated in **Section 18.1.3.6.1** the onshore cable corridor will use trenchless methods to cross all Main Rivers, IDB Drains and some Ordinary Watercourses. Open cut trenching methods will be used to cross most other Ordinary Watercourses crossed by the cable corridor. In addition, Bailey bridges may be used to provide temporary haul road access across larger watercourses. The most appropriate technique to maintain construction access across Ordinary Watercourses (including IDB drains) will be selected to take account of local site conditions, and may include the use of temporary culverts. **Table 18.1-10**~~**Table 18.1-10**~~ shows the method of watercourse crossing for each watercourse type within the WFD water body catchments.

101. Installation of Bailey bridges or similar to enable the temporary haul road to cross WFD water bodies could result in the alteration of local bank morphology and potentially increase levels of fine sediment entering the water body. An increase in fine sediment supply from disturbed ground could cause changes to local geomorphological adjustment rates and therefore impact on any morphological features within the channel. The removal of the bridge crossings following construction could also increase sediment supply into the water body.

Table 18.1-10: Water Body Crossings in WFD River Water Body Catchments

WFD River Water Body Catchment	Number of trenchless crossings (Main Rivers, IDB Drain and Ordinary Watercourses)	Number of open cut crossings (Ordinary Watercourses only)
Glaven	0	1
Bure (u/s confluence with Scarrow Beck)	6	2
Swannington Beck	3	0
Wensum U/S Norwich	5	0
Tud	1	0
Yare (u/s confluence with Tiffey – Lower)	9	1
Tiffey	3	3
Intwood Stream	5	2

102. Where trenchless methods are used, the cable would be installed at least 2m below the bed of the watercourse and, although ground disturbance will occur at entry and exit points, there would be no direct disturbance to the watercourses crossed using a trenchless technique. There is therefore no direct mechanism for impacts to occur to the hydrological regime and morphological condition of the WFD water bodies.

103. There is potential for indirect impacts upon the hydrological regime and morphological condition of WFD water bodies from the use of multiple trenched crossings and culverts on Ordinary Watercourses which drain into the main water body. A large number of culverts and trenched crossings in the WFD water body catchment could alter the flow regime, disrupt coarse sediment transport patterns and increase the input of fine sediment into the WFD water body, impacting upon its morphological condition. However, as shown in **Table 18.1-10**~~**Table 18.1-10**~~ there are a low number of trenched crossings required within each WFD water body catchment. It is therefore likely that hydrological regime and morphological impacts at Ordinary Watercourses, will not have a significant or permanent impact on any downstream WFD water body.

Construction of SEP or DEP in Isolation or SEP and DEP

104. If SEP or DEP were constructed in isolation, a single cable trench of 3m width would be required within a working easement of 27m (allowing for micrositing within the 45m order limits).The use of trenchless crossings to traverse the identified water bodies will prevent direct impacts to hydromorphology from the cable corridor. However, an increase in sediment supply within each identified catchment, has the potential to cause greater fine sediment deposition and river bed smothering.

105. If both SEP and DEP are built, the concurrent scenario would require two 3m wide cable trenches within a 38m working easement (allowing for micrositing within the 60m order limits). The alternative sequential scenario would require a 3m cable trench within a 27m working easement in Phase 1, followed by a second 3m wide trench within a 25m working easement in Phase 2. This would disturb a total of 45m within the 60m order limits.

106. It is, however, considered that the concurrent construction scenario would have a greater potential impact on this quality element than the sequential scenario, because there would be a greater area of disturbed land at any one time and therefore an increased supply of fine sediment that could potentially runoff into each water body (i.e. 38m total disturbance resulting from the concurrent scenario, compared to two separate periods of up to 27m disturbance resulting from the sequential scenario). Additionally, a higher number of vehicle movements to construct concurrently could lead to higher fine sediment input.

107. If the sequential scenario was undertaken, sediment supply to each water body from construction activities would be reduced as land would be reinstated following completion of the first project and prior to construction of the second project.

Control Measures

108. To mitigate for any localised hydromorphological impact under either scenario, a range of construction control measures will be implemented to minimise the direct disturbance of surface watercourses, as set out in the **Outline Code of Construction Practice** (document reference 9.17):

- Trenchless crossing techniques will be employed at the following Main Rivers, IDB Drains and Ordinary Watercourse: Spring Beck, River Wensum, River Bure, Swannington Beck, River Tud, River Yare, River Tiffey and Intwood Stream.
- Stop ends would be employed on the haul road at each of the trenchless crossing points outlined above, i.e. there would be no introduction of culverts to maintain construction access along the haul road at Main River crossings.
- Trenched crossings would be carried out on the majority of the Ordinary Watercourses (depending upon their width, depth and environmental sensitivity). Trenched crossings of watercourses will involve installing temporary dams (composed of sandbags, straw bales and ditching clay, or another suitable technique) upstream and downstream of the crossing point. The cable trench would then be excavated in the dry area of riverbed between the two dams with the river flow maintained using a temporary pump or flume.

- In addition to the cable infrastructure itself, it may also be necessary to install temporary structures to allow haul road access across watercourses where direct access is not readily available from both sides. This may comprise an appropriately sized culvert installed within the ditch with the haul road being installed over the top of the culvert. The culvert would be installed in the channel bed so as to avoid upstream impoundment and 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. At larger crossings, temporary bridges (such as Bailey bridges) may be installed to allow continuation of the haul road.
- In order to ensure that there are no adverse impacts resulting from the installation of temporary dams, the following measures would be employed:
  - Restricting the amount of time that temporary dams are in place, e.g. typically no more than one week;
  - Fish rescue will be undertaken in the area between the temporary dams prior to dewatering;
  - Ensuring that any pumps, flumes (pipes) or diversion channels are appropriately sized to maintain flows downstream of the obstruction whilst minimising upstream impoundment;
  - Where appropriate, selecting a technique that can allow fish passage to be maintained in watercourses which support migratory fish species such as brown trout;
  - Where diversion channels are used, geotextiles or similar techniques will be used to line the channel and prevent sediment entering the watercourse;
  - 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; and
  - Potential impacts resulting from the use of temporary culverts at some ordinary watercourse crossings will be mitigated through:
    1. Ensuring that the culvert is adequately sized to avoid impounding flows (including an allowance for potential increases in winter flows as a result of projected climate change); and
    2. Installing the culvert below the active bed of the channel, so that sediment continuity and movement of fish and aquatic invertebrates can be maintained.

- The cable ducts would typically be installed 2m below the bed of the water body (dependent on local geology and geomorphological risks). This would avoid exposure during periods of higher energy flow when the bed could be mobilised and the consequent change in geomorphological conditions. This depth takes into consideration anticipated climate-change related changes in fluvial flows and erosion that will occur over time. In addition, 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..

- Where possible, localised improvements to the geomorphology and in-channel habitats supported by watercourses that would be crossed using open cut techniques, through the sympathetic reinstatement of banks (e.g. by replacing re-sectioned banks with more natural profiles that are typical of the natural geomorphology of the watercourse) will be considered. Note that any improvements would be restricted to within the working area of the project.

109. In addition, the **Outline Code of Construction Practice** (document reference 9.17) sets out a range of measures to manage surface drainage and control the supply of fine sediment:

- 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 or 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 following construction.
- In addition, buffer strips of vegetation will be retained adjacent to water bodies where possible, to intercept any contaminated runoff.
- A Construction Surface Water and Drainage Plan will be developed, as part of the CoCP, and agreed with the relevant regulators and implemented to minimise water within the cable trench and other working areas and ensure ongoing drainage of surrounding land. This typically includes interceptor drainage ditches being temporarily installed parallel to the trenches and soil storage areas to provide interception of surface water runoff and the use of pumps to remove water from the trenches during cable installation. The Construction Surface Water Drainage Plan will include the following measures:
  - Any pumps, flumes or channels will be designed to have sufficient capacity to convey the required range of flows at each location;
  - Interceptor drains for the settlement of sediment (sediment traps). Sediment traps are locally wider/deeper areas of the drains that will encourage passive sediment deposition;
  - Weekly monitoring of sediment traps (visual inspection) with increased monitoring during inclement weather. If required these traps can be pumped via settling tanks to remove sediment, based on a pre-defined level / depth of sediment;
  - Where water enters the construction areas, this will be pumped via settling tanks or ponds to remove sediment before being discharged into local ditches or drains via the interceptor drains in order to prevent increases in fine sediment supply to the watercourses; and

    - When the interceptor drains and associated sediment traps are decommissioned any standing water within the drains would be pumped out to settling tanks as described above. Sediment that has settled out within the interceptor drain would be left in place. Soils would be replaced in the reverse order that they were removed and turf reinstated.
- 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.
- Changes in surface water runoff resulting from the increase in impermeable area from the construction of the onshore cable corridor and particularly the onshore substation will be attenuated and discharged at a controlled rate, in consultation with the LLFA and the Environment Agency, and potentially Anglian Water if a connection to their drainage infrastructure is required during construction of the onshore substation. This controlled runoff rate will would be equivalent to the greenfield runoff rate.
- Limiting extent of open excavations along the onshore cable route to short sections at any one time (work fronts). Topsoil would be stripped from the entire width of the onshore cable route for the length of the workfront and stored and capped to minimise wind and water erosion within the onshore cable route.
- Once all the trenching is completed and back-filled within each workfront, the stored topsoil will be re-distributed over the area of the workfront, with the exception of the running track and any associated drainage.
- Mobilisation areas within the onshore project area will comprise hardstanding of permeable gravel aggregate underlain by geotextile, or other suitable material.
- Minimising of subsoil exposure and retention of strips of undisturbed vegetation on the edge of the working area where possible.
- Where surface vegetation has been removed (with the exception of arable crops), this will be reseeded to prevent future runoff.
- On-site retention of sediment will be maximised by routing all drainage through the site drainage systems.
- Cleaning of the wheels of vehicles leaving site to prevent the accumulation of soil and sediment on road surfaces. Traffic movements would be restricted to minimise surface disturbance.
- In locations where large areas of exposed ground lie adjacent to watercourses, buffer strips of vegetation will be retained where possible to prevent runoff.

110. With these control measures in place to manage sediment supply and surface runoff, and limit the potential for direct impacts to each water body, the onshore construction activities are not considered under any scenario to cause deterioration in water body status or prevent achieving GEP or GES in the future.

Operational Activities

111. The increase in impermeable area from the presence of above ground infrastructure (permanent access tracks, onshore substation) will reduce infiltration and potentially alter surface runoff rates and subsurface flows. This could impact upon surface water volumes to the extent to which rates of bed and bank erosion may increase and could lead to larger scale geomorphological change.

Operation of SEP or DEP in Isolation or SEP and DEP

112. The extent of the impact to hydrological regime and hydromorphological condition is likely to be dependent on the area of permanent infrastructure (onshore cable corridor, onshore substation and permanent access road) and the frequency of operational activities within each WFD catchment during operation. If SEP and DEP were both built, the substation operational platform would be larger than if SEP or DEP were constructed in isolation. Conversion of more arable land to hard-standing ground could lead to greater changes to surface water drainage pathways and increased runoff (although it is important to note that up to 50% of the platform would remain impermeable).

Control Measures

113. To ensure impacts are minimal to each water body, operational control measures will be in place, as set out in the **Outline Onshore Operational Drainage Plan** (document reference 9.20). This includes a commitment to develop and agree an operational drainage plan in consultation with Norfolk County Council, Environment Agency and other stakeholders. The plan will be implemented to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. This will assess the greenfield runoff rate, proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site.

114. Two viable options have been identified to manage surface water drainage at the onshore substation, which will be developed through post-consent detailed design:

- Attenuation combined with infiltration; and
- Attenuation with onward connection to foul sewer network.

115. With these control measures in place, impacts from the operational activities on the hydrological regime and hydromorphological condition of the WFD water bodies will be very low. There will therefore be no risk of deterioration in water body status or preventing GEP or GES being achieved in the future.

18.1.7.2.2 Physico-chemistry (General, Priority substances)

Construction Activities

116. Construction activities could result in accidental release of lubricants, oils and runoff into nearby water bodies, impacting upon surface water quality. This could occur accidentally from construction machinery (e.g. fuels and lubricants) and construction materials (e.g. concrete) located near water bodies. Vehicle and construction material storage areas could be an additional source of leaks and spills. Additionally, the presence of welfare facilities may potentially lead to foul water runoff into water bodies.

117. An increase in sediment supply from any disturbed soils along the cable corridor and at the substation during construction, could increase surface runoff into the WFD river water bodies. Greater fine sediment in the water body could reduce light penetration and affect local oxygenation and temperature conditions.

118. Construction activities which disturb the ground, 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. Nutrients could also be supplied through discharges of foul water from temporary welfare facilities and construction compounds. The supply of 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. This is likely to be a particularly significant issue in designated habitats supported in the River Wensum and the Norfolk Broads (cf. **Appendix 18.4**).

119. During construction the presence of temporary culverts and use of open cut trenching methods across Ordinary Watercourses could increase conveyance of pollutants and fine sediment to the downstream WFD water body, impacting on overall dissolved oxygen, pH and temperature.

120. However, as shown in **Table 18.1-10**~~**Table 18.1-10**~~ there are a low number of multiple trenched crossings required within each WFD water body catchment. It is therefore likely that the above impacts on Ordinary Watercourses will not have a significant or permanent cumulative physico-chemical impact on any WFD water body.

Construction of SEP or DEP in Isolation or SEP and DEP

121. If both SEP and DEP are built, it is considered the concurrent construction scenario would have a marginally greater potential impact on physico-chemistry than the sequential scenario. If SEP and DEP are built at the same time, greater numbers of construction machinery, materials and personnel will be on site at any one time, compared with the sequential scenario. There are likely to be more vehicle movements with materials along the cable corridor (e.g. across bailey bridges or similar). There would therefore be a greater likelihood of oils, lubricants and fine sediment reaching water bodies and impacting on their physico-chemistry. It is considered the larger area of land take needed for concurrent construction would cause greater alterations to surface water flows, and therefore a higher chance of contaminants and fine sediment reaching the water bodies.

Control Measures

122. To mitigate for any impacts on physico-chemistry or chemistry, the following construction-stage control measures will be implemented to minimise the supply of contaminants to surface and groundwaters, as set out in the **Outline Code of Construction Practice** (document reference 9.17):

- Locating concrete and cement mixing and washing areas at least 10m away from the nearest water body. 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.
- Perched waters within Made Ground or groundwater from dewatering activities will be collected within a tank or lagoon prior to any treatment or discharge. This waste water shall either be:
  - Discharged to foul sewer under a trade effluent consent agreed with the local water company / supplier; and / or
  - Discharged to surface water under an environmental permit issued from the Environment Agency.
- On site treatment plant may be required to treat the wastewater prior to disposal in order to meet discharge limits set by either the Environment Agency or local water company.

- Foul drainage (e.g. from construction welfare facilities) will be collected through mains connection to an existing mains sewer (if such a connection is available) or collected in a septic tank located within the development boundary and transported off site for disposal at a licensed facility with appropriate treatment capacity within its existing permit.

123. Following implementation of the control measures set out above and in **Section 18.1.7.2.1** for fine sediment supply, the construction activities will have minimal impacts on the physico-chemical elements of the water bodies. There will be therefore very low risk of deterioration in water body status or preventing GEP or GES being achieved in the water bodies in the future.

Operational Activities

124. Any routine maintenance along the cable corridor and at the onshore substation that is in proximity to the water bodies, has potential to impact upon the physico-chemistry quality elements. This risk is primarily from maintenance vehicles and the potential for lubricants and oils to runoff into the water bodies.

125. In addition, welfare facilities at the onshore substation could increase the supply of nutrients such as nitrogen and phosphorus to the drainage system, either as direct discharges from the site or 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. This is likely to be a particularly significant issue in designated habitats supported in the River Wensum and the Norfolk Broads (cf. **Appendix 18.4**).

Operation of SEP or DEP in Isolation or SEP and DEP

126. The extent of the impact to physico-chemistry is likely to be dependent on the area of permanent infrastructure (onshore cable corridor, onshore substation and permanent access roads), the amount of equipment used and the frequency of operational activities within each WFD catchment during operation.

127. For the substation, if SEP and DEP were both built, the substation operational area would be 3ha larger than if SEP or DEP were constructed in isolation. Although maintenance requirements and the use of welfare facilities is unlikely to differ significantly between the two scenarios, the presence of two transformers within a larger building if both SEP and DEP were constructed could potentially lead to greater changes to surface water drainage pathways and increased risk of runoff of contaminants.

Control Measures

128. To ensure deterioration in status is prevented, the following operational control measures will be in place, as set out in the **Outline Onshore Operational Drainage Plan** (document reference 9.20):

- Two viable options have been identified to manage surface water drainage at the onshore substation, which will be developed through post-consent detailed design:
  - Attenuation combined with infiltration; and
  - Attenuation with onward connection to foul sewer network.
- Regardless of whether the foul sewer or infiltration is adopted, clarification of mitigation measures including but not limited to; proposed oil or other separators, silt trap, bunds and details of any sapling points and treatment trains / filtration to minimise risk of groundwater pollution will be considered. Foul waters from welfare facilities will either be discharged through a mains connection to an existing mains sewer (if such a connection is available) or collected in a septic tank located within the order limits and transported off site for disposal at a licensed facility with appropriate treatment capacity within its existing permit. The operational use of the site is likely to be limited to a maximum of 2 workers visiting the site per week, and as such additional nutrient loadings are likely to be very low (cf. **Appendix 18.4**).

129. With these control measures in place, the onshore operational activities will have minimal impacts on the physico-chemistry elements of the WFD water bodies. There will be very low risk of deterioration in water body status or preventing GEP or GES being achieved in the future.

18.1.7.2.3 Biological (Aquatic Flora, Benthic Invertebrates, Fish)

Construction Activities

130. The construction activities could impact on aquatic flora, benthic invertebrates and fish fauna based on potential impacts to the hydromorphology and physico-chemistry quality elements. Increased fine sediment in the water body could smother bed habitats, reducing light penetration and dissolved oxygen. Additionally, changes to physico-chemistry could lead to loss or modification of in-channel and riparian habitats. This disturbance would limit the communities of all three biological parameters.

131. During construction the presence of temporary culverts and use of open cut trenching methods across ordinary watercourses could increase conveyance of pollutants and fine sediment to the downstream WFD water body, impacting on species and habitat populations.

132. However, as shown in **Table 18.1-10**~~**Table 18.1-10**~~ there are a low number of multiple trenched crossings required within each WFD water body catchment. It is therefore likely that impacts at Ordinary Watercourses, will not have a significant or permanent cumulative biological impact on any WFD water body.

Construction of SEP or DEP in Isolation or SEP and DEP

133. If SEP and DEP were completed concurrently, there would be a greater area of disturbed land at any one time and therefore a higher supply of fine sediment that could potentially runoff into each water body. Although, sequential construction would be the longest form of construction, pressures on biology would be reduced due to reinstatement of exposed land following construction of the first project. Additionally, there are likely to be more vehicle movements along the cable corridor (e.g. crossing Bailey bridges or similar) with concurrent construction. There would therefore be a greater chance of oils, lubricants and fine sediment reaching water bodies and impacting on their physico-chemistry, ultimately impacting upon the supporting biological communities of aquatic flora, benthic invertebrates and fish fauna.

Control Measures

134. Given the proposed control measures that will be implemented to prevent construction impacts to hydromorphology and physico-chemistry, these measures will indirectly reduce impacts to biological quality elements, preventing contaminants and fine sediment production from reaching the water bodies and causing risk of deterioration.

Operational Activities

135. The potential risk of ground disturbance in the event of cable failure and contaminant spills from operational infrastructure, maintenance activities and vehicles could potentially impact on the hydromorphology and physico-chemistry of the water bodies which could ultimately impact upon the supporting biological communities of aquatic flora, benthic invertebrates and fish fauna. However, the risk of direct interaction with surface water bodies during operation is considered to be very low.

Operation of SEP or DEP in Isolation or SEP and DEP

136. The extent of the impact to biological elements is likely to be dependent on the area of permanent infrastructure (onshore cable corridor, onshore substation and permanent access roads) and the frequency of operational activities within each WFD catchment. Although maintenance requirements are unlikely to differ significantly between the two scenarios, the presence of two transformers within a larger building if both SEP and DEP were constructed could potentially lead to greater changes to surface water drainage pathways and increased risk of runoff of contaminants, and by extension greater impacts on biological quality elements.

Control Measures

137. Given the proposed control measures that will be implemented to prevent operational impacts to hydromorphology and physico-chemistry, these measures will indirectly reduce impacts to biological quality elements, preventing contaminants and fine sediment production from reaching the water bodies. There will be very low risk of deterioration in water body status or preventing GEP or GES being achieved in the future.

18.1.7.3 Groundwater Bodies (GWDTEs, Deterioration in Water Quality, Increasing pollution concentrations)

18.1.7.3.1 Construction Activities

138. The use of trenchless crossing techniques will help to avoid any direct impact on the WFD river water bodies, however there is a risk that excavations to facilitate trenchless crossings, could potentially introduce contaminants to the North Norfolk Chalk and Broadland Rivers Chalk and Crag groundwater bodies. Accidental release of lubricants, fuels and oils from construction machinery could occur as a result of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies. If not prevented, these contaminants could enter connected groundwaters through run-off. An increase in groundwater contaminant concentrations could subsequently lead to an overall deterioration in groundwater quality. These contaminants could then be transferred to GWDTEs via subsurface flow routes.

18.1.7.3.2 Construction of SEP or DEP in Isolation or SEP and DEP

139. It is considered that construction of SEP and DEP concurrently is likely to lead to a greater impact on the two groundwater bodies within the order boundary. A greater proportion of land disturbed at any one time to facilitate installation of both cables would place the highest pressure on both groundwater bodies. Under the sequential scenario, land exposed for the first project would be reinstated prior to commencement of the second project. This would reduce the potential for a deterioration in groundwater quality with less construction activity occurring at one time.

18.1.7.3.3 Control Measures

140. To mitigate against these potential impacts and to prevent deterioration in water body status, the following groundwater control measures will be implemented during construction phase, as set out in the **Outline Code of Construction Practice** (document reference 9.17):

- Use of best practice techniques and due diligence regarding the potential for pollution throughout all construction, operation and maintenance, and decommissioning activities. This provides a robust approach to managing pollution incidents on site to reduce the probability and impact of leaks and spills.

- Ground investigations and a hydrogeological risk assessment meeting the requirements of Groundwater Protection Guides (Environment Agency, 2017), will be undertaken at each HDD crossing location.
- A written scheme dealing with contamination of any land and groundwater will be submitted and approved by the Local Planning Authority before construction activities commence.
- No works will be undertaken in Source Protection Zone (SPZ) 1 areas to ensure there is no direct impact on sensitive potable abstractions.

141. There will be very low risk of deterioration in water body status or preventing GEP or GES being achieved in the future.

18.1.7.4 Coastal Water Bodies

18.1.7.4.1 Biology Quality Elements

142. The Norfolk East water body contains a chalk reef feature that is a higher sensitivity habitat which is designated under the Cromer Shoal Chalk Beds MCZ. The Norfolk North Waterbody contains a chalk reef feature however it is outside the SEP and DEP offshore export cable corridor and the Cromer Shoal Chalk Beds MCZ, and is more then 500m away from the SEP and DEP offshore export cable.

143. The SEP and DEP subtidal HDD exit point is 1000m offshore, and is approximately 300m further offshore than the chalk reef feature within the Norfolk East waterbody. There will be no cable installation or cable protection inshore of the HDD exit point and therefore there will be no direct overlap between cable installation and cable protection with the chalk reef feature.

144. The export cable installation will cause increased suspended sediment concentrations and sediment deposition, which has the potential to cause in-direct impacts to the chalk reef feature. **Chapter 6 Marine Geology, Oceanography and Physical Processes** of the ES states that although suspended sediment concentrations will be elevated due to cable installation and the HDD exit trench, they are likely to be lower than concentrations that would develop in the water column during storm conditions.

145. **Chapter 6 Marine Geology, Oceanography and Physical Processes** of the ES also determined that sediment transport is tidally driven where the cable installation and HDD exit trench installation will occur. Tidal ellipses move sediment in a south easterly to north westerly direction which is parallel to the coastline and net sediment transport is south easterly. Therefore, any increased suspended sediments are not expected to be transported in the direction of the chalk reef feature inshore of the HDD exit point.

146. Given the low increases of suspended sediments predicted, which would be lower than certain natural conditions, and given the direction of sediment transport is not expected to transport increases in suspended sediment inshore, no impacts are expected to the chalk reef higher sensitivity habitats of the Norfolk East or Norfolk North coastal water bodies.

18.1.7.5 Protected Areas

18.1.7.5.1 Nitrate Vulnerable Zones

147. The assessment shows that the onshore cable corridor will pass through numerous nitrate vulnerable zone (NVZ) boundaries. Impacts from foul drainage from construction and operational welfare facilities will be tankered off site for treatment or connected to a mains supply, thereby preventing impacts to NVZs. The construction site drainage systems will also prevent increasing nitrate volumes from entering the surface drainage network following soil excavations. The construction and operation activities are therefore unlikely to significantly alter nitrate concentrations in each NVZ.

18.1.7.5.2 Drinking Water Protected Areas

148. The WFD scoping assessment found three Drinking Water Protected Areas (DwPAs) potentially at risk within the onshore WFD scoping area. Given the control measures identified in Stage 3, which will prevent input of contaminants and foul water to river water and groundwater bodies, there will be no mechanism for impact on each DwPA.

18.1.7.5.3 Urban Waste Water Treatment Directive

149. The WFD scoping assessment found there to be two protected areas potentially at risk within the onshore WFD scoping area. Given the control measures identified in Stage 3, which will prevent input of contaminants and foul water to river water and groundwater bodies, there will be no mechanism for impact on each UWWTD protected area.

18.1.7.5.4 Habitats and Birds Directives

150. The WFD scoping assessment found several areas protected under the Habitats and Birds Directives that could potentially be at risk within the onshore WFD scoping area, including the River Wensum Special Area of Conservation (SAC). Given the control measures identified in Stage 3, which will reduce the input of contaminants, nutrients and fine sediment to river water and groundwater bodies to a level where there will be no discernible impacts, there will be no mechanism for impact on each protected area.

18.1.8 Stage 4: Summary of Assessment and Mitigation Requirements

151. The results of the WFD compliance assessment process are summarised in **Table 18.1-11~~Table 18.1-11~~**.

Table 18.1-11: Summary of WFD Compliance Assessment

Waters Water body	Stage 2	Stage 3	Deterioration in status	Prevent objectives being achieved
Norfolk East (Coastal);	✓	✓	×	×
Norfolk North (Coastal);	✓	✓	×	×

Waters Water body	Stage 2	Stage 3	Deterioration in status	Prevent objectives being achieved
Blakeney Spit Lagoon (Coastal);	×	×	×	×
Glaven (River);	✓	✓	×	×
Scarrow Beck (River);	✓	×	×	×
Bure (u/s confluence with Scarrow Beck) (River);	✓	✓	×	×
Bure (Scarrow Beck to Horstead Mill) (River);	×	×	×	×
Blackwater Drain (Wensum) (River);	✓	×	×	×
Mermaid Stream (River);	✓	×	×	×
Swannington Beck (River);	✓	✓	×	×
Hevingham Watercourse (River);	×	×	×	×
Wensum US Norwich (River);	✓	✓	×	×
Wensum DS Norwich (River);	×	×	×	×
Tud (River);	✓	✓	×	×
Yare (u/s confluence with Tiffey – Lower) (River);	✓	✓	×	×
Yare (Tiffey to Wensum) (River);	✓	✓	×	×
Tiffey (River);	✓	✓	×	×
Intwood Stream (River);	✓	✓	×	×
Tas (Tasburgh to R. Yare) (River);	✓	×	×	×
Chet (River);	×	×	×	×
Costessey Pits (Lake);	×	×	×	×
North Norfolk Chalk (Groundwater);	✓	✓	×	×
Broadland Rivers Chalk and Crag (Groundwater); and	✓	✓	×	×
Cam and Ely Ouse Chalk (Groundwater).	×	×	×	×

152. Following the implementation of the outlined control measures during construction and operation, there will be no activities that have the potential to cause non-temporary effects to the status of any of the river and groundwater bodies assessed (i.e. effects that are not permanent but could last for the duration or beyond the current River Basin Planning Cycle). Construction and operation will also not prevent water body status objectives being achieved in the future. SEP and DEP are therefore considered to be compliant with the requirements of WFD.

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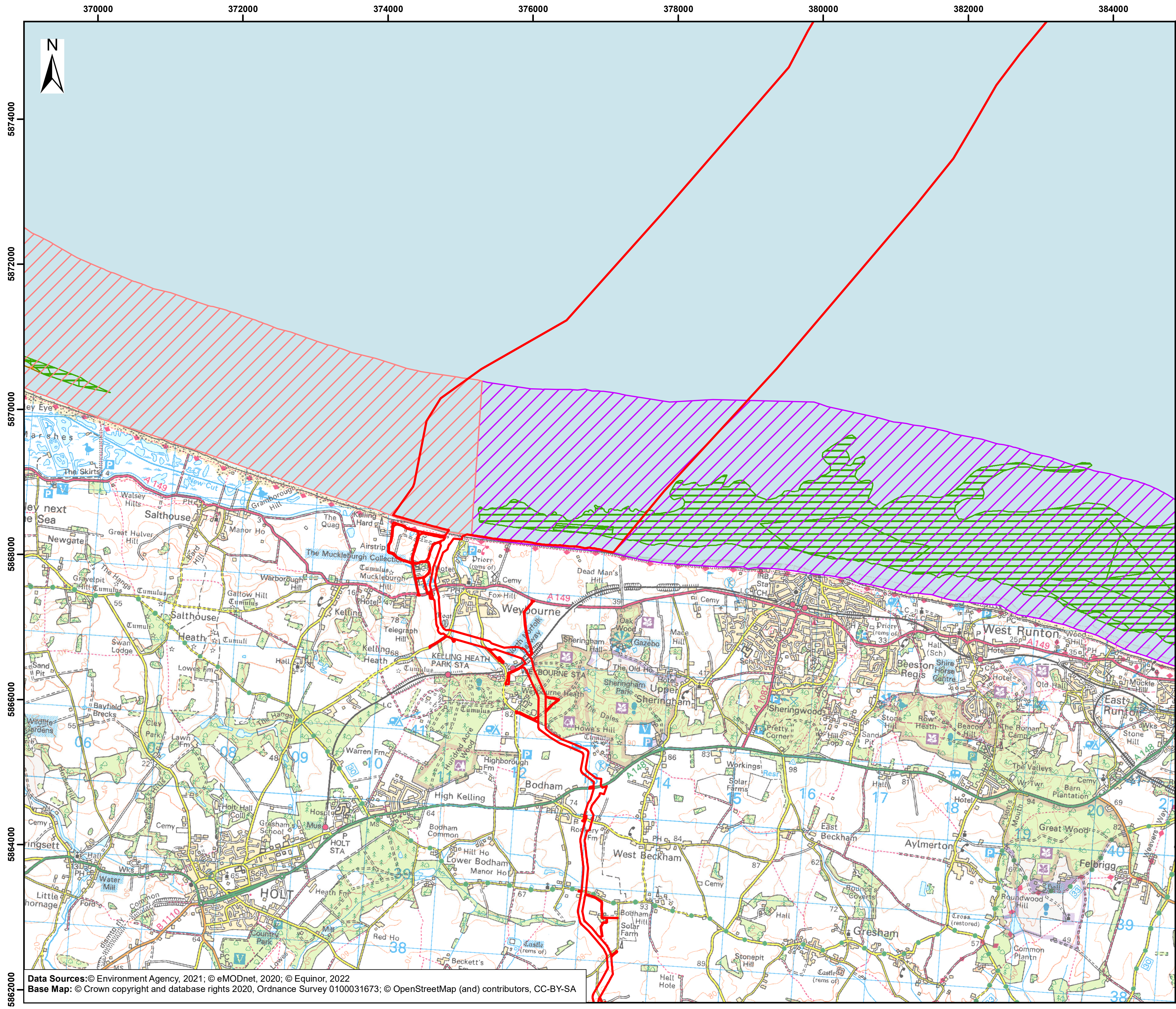
ANNEX 1: COASTAL WATER BODY INFORMATION

Parameter	Detail
WFD water body name	Norfolk East
Water body ID	GB650503520003
River basin district name	Anglian
Water body type (estuarine or coastal)	Coastal
Water body total area (km^2)	211.1677
Overall water body status (2015)	Moderate
Ecological status	Moderate
Chemical status	Good
Target water body status and deadline	Moderate by 2015
Hydromorphology status of water body	Not assessed
Heavily modified water body and for what use	Yes heavily modified. Coastal Protection and Flood Protection
Higher sensitivity habitats present	Chalk reef (2893.73ha)(also designated as Cromer Shoal Chalk MCZ), Polychaete reef (40.09ha). See **Figure 1** for habitats within the vicinity of the activities
Lower sensitivity habitats present	Cobbles, gravel and shingle (12971.88ha) Intertidal soft sediment (718.96ha), Subtidal rocky reef (2019.66ha) , Subtidal soft sediments (7840.13ha). See **Figure 2** for habitats within the vicinity of the activities
Phytoplankton status	Good
History of harmful algae	Not monitored
WFD protected areas within 2km	The Wash and North Norfolk Coast SAC, North Norfolk Coast SAC, North Norfolk Coast SPA, Greater Wash SPA (**Figure 3**)

Parameter	Detail
WFD water body name	Norfolk North
Water body ID	GB640503300000
River basin district name	Anglian
Water body type (estuarine or coastal)	Coastal
Water body total area (km^2)	167.118
Overall water body status (2015)	Moderate

Parameter	Detail
Ecological status	Moderate
Chemical status	Fail
Target water body status and deadline	Moderate by 2015
Hydromorphology status of water body	Not assessed
Heavily modified water body and for what use	Yes – Flood protection use, Coast protection use
Higher sensitivity habitats present	Chalk reef (6430.65ha); polychaete reef (8.78ha), mussel beds (10.77ha), saltmarsh (319.46ha). See **Figure 1**.
Lower sensitivity habitats present	Cobbles, gravel and shingle (193.00ha); Intertidal soft sediment (3281.88); Subtidal soft sediments (37098.82ha); Subtidal rocky reef (0.16ha). See **Figure 2**.
Phytoplankton status	Moderate
History of harmful algae	Not monitored
WFD protected areas within 2km	The Wash and North Norfolk Coast SAC, North Norfolk Coast SPA, Greater Wash SPA (**Figure 3**).

ANNEX 1: FIGURES



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Sheringham Shoal and Dudgeon Extension Projects

Title:

Figure 18.1.1 Higher Sensitivity Habitat within Norfolk East and Norfolk North WFD Water Body

Document:

Environmental Statement (ES)
Annex 1 Appendix 18.1 WFD Compliance Assessment

Application Doc. no.: 6.3.18.1

Legend:

- Order Limits

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

WFD Habitats: Higher Sensitivity

- Peat and clay exposures (HOCI 15)
- Subtidal chalk (HOCI 20)

Coordinate Reference System: WGS 1984 UTM Zone 31N
Transformation WGS84: OSGB_1936_To_WGS_1984_7

0 500 1,000 1,500 2,000 2,500 3,000 Metres
0 500 1,000 1,500 2,000 2,500 3,000 Yards

Scale: 1:50,000 Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00077
RHDHV Doc. no.: PB8164-RHD-ZZ-OF-DR-Z-0100

REV	DATE	STATUS	DRW	CHK	APR
B	28/07/2022	Second Issue	JT	HW	SM
A	29/04/2022	First Issue	AZ	HW	SM

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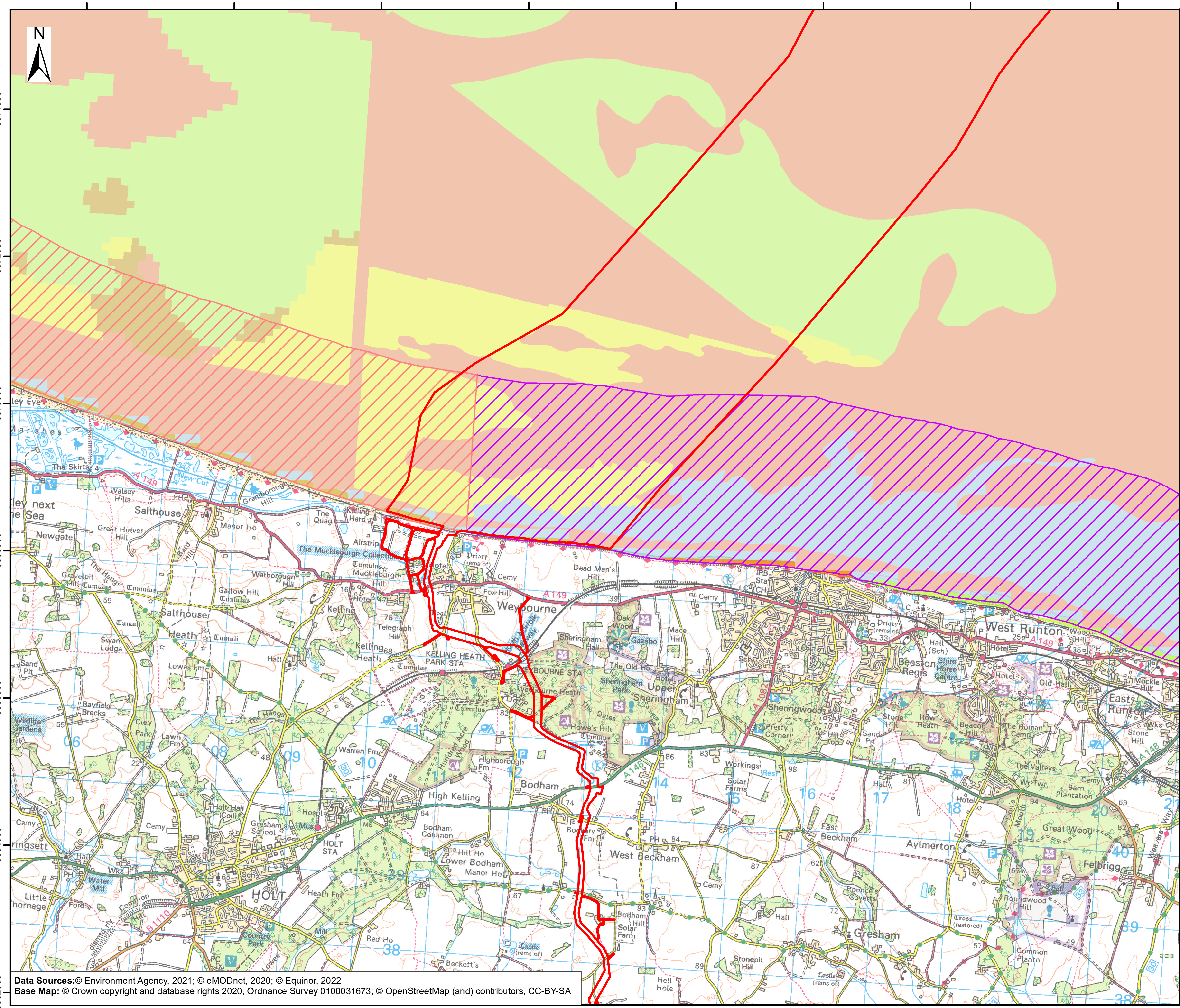

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Sheringham Shoal and Dudgeon Extension Projects

Title:

Figure 18.1.2 Lower Sensitivity Habitat within Norfolk East and Norfolk North WFD Water Body

Document:

Environmental Statement (ES)
Annex 1 Appendix 18.1 WFD Compliance Assessment

Application Doc. no.: 6.3.18.1

Legend:

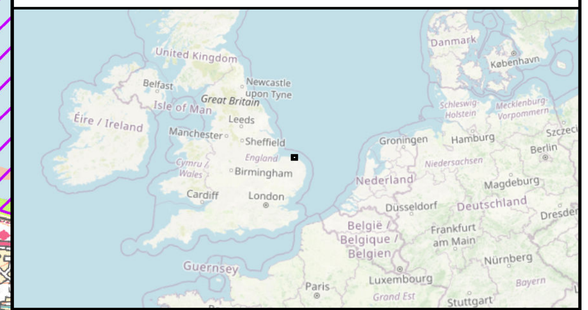
- Order Limits

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

WFD Habitats: Lower Sensitivity

- Intertidal coarse sediment (A2.1)
- Intertidal mud (A2.3)
- Intertidal mixed sediments (A2.4)
- Subtidal coarse sediment (A5.1)
- Subtidal sand (A5.2)
- Subtidal mud (A5.3)
- Subtidal mixed sediments (A5.4)



Coordinate Reference System: WGS 1984 UTM Zone 31N
Transformation WGS84: OSGB_1936_To_WGS_1984_7

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0 500 1,000 1,500 2,000 2,500 3,000 Yards

Scale: 1:50,000 Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00077
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B	28/07/2022	Second Issue	JT	HW	SM
A	29/04/2022	First Issue	AZ	HW	SM

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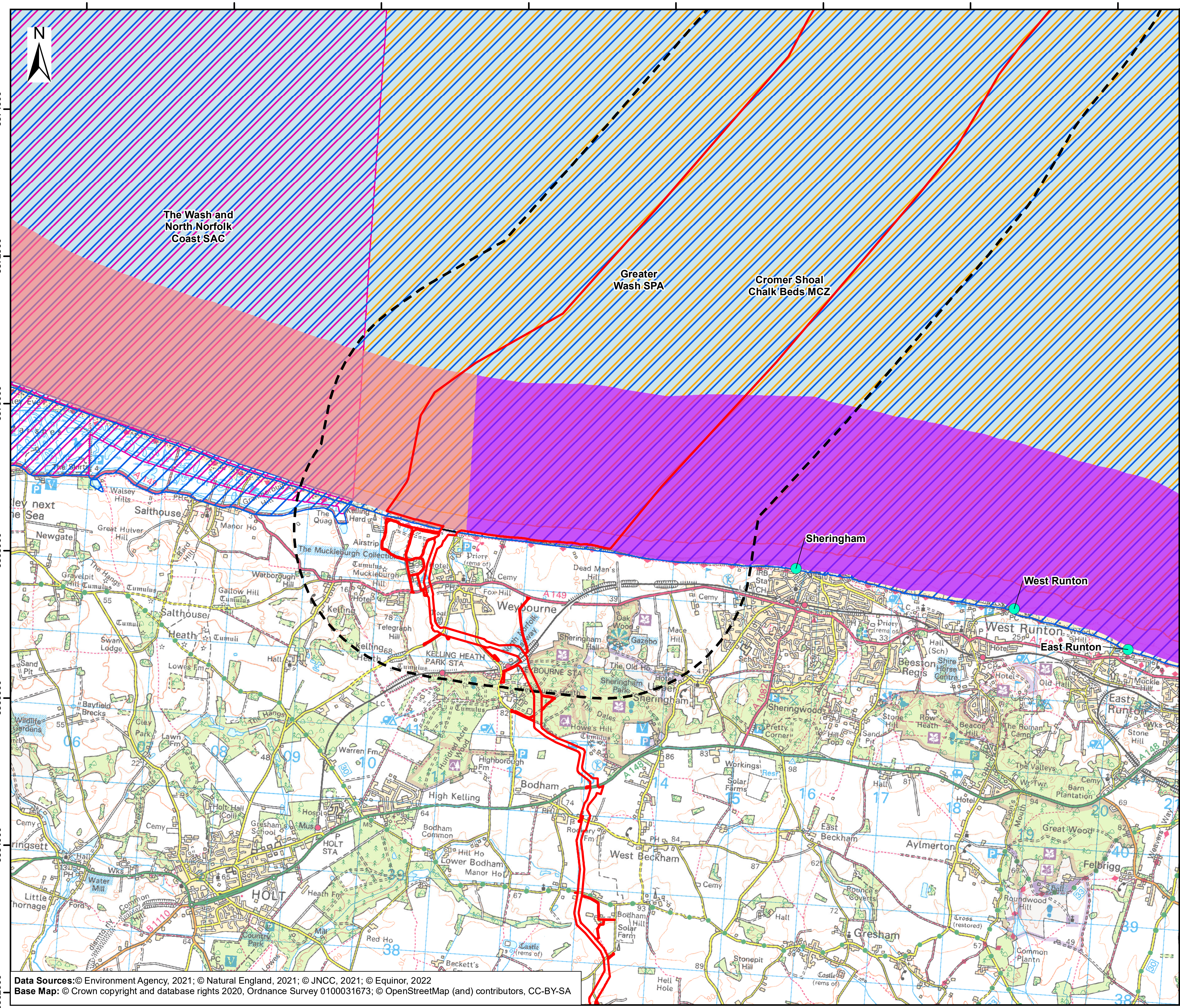

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Sheringham Shoal and Dudgeon Extension Projects

Title:

Figure 18.1.3 Protected Areas within 2km of Landfall and the Offshore Cable Corridor

Document:

Environmental Statement (ES)
Annex 1 Appendix 18.1 WFD Compliance Assessment

Application Doc. no.: 6.3.18.1

Legend:

- Order Limits
- Offshore Cable Corridors
- Offshore Cable Corridor 2km Buffer

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

Designated sites

- Special Protection Areas (SPA)
- Special Area of Conservation (SAC)
- Marine Conservation Zones (MCZ)

Bathing Water Monitoring Location

Classification

- Excellent

Coordinate Reference System: WGS 1984 UTM Zone 31N
Transformation WGS84: OSGB_1936_To_WGS_1984_7

0 500 1,000 1,500 2,000 2,500 3,000 Metres
0 500 1,000 1,500 2,000 2,500 3,000 Yards

Scale: 1:50,000 Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00077
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ANNEX 2: SCOPING OF COASTAL WATER BODIES FOR CONSTRUCTION AND OPERATIONAL ACTIVITIES

Construction Activities: Subtidal HDD exit point and Offshore Cable Construction

WFD	Scoping question	Yes	No	Notes
Norfolk East (GB650503520003)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.
	Could significantly impact the hydromorphology of any water body		✓	No, the export cables would be brought ashore and jointed to the onshore cables within transition pits using horizontal directional drilling (HDD) and duct installation. The HDD would then be drilled from an onshore construction compound and will exit the sea bed in an exit pit approximately 1km (0.5 nautical miles) from the coast. Given the use of HDD, effects inshore are not predicted. With respect to cable installation between the transition and the boundary of the WFD water body, a number of techniques could potentially be used but cables would be installed and buried where possible to ensure that the cables are protected from damage by external factors. As a result, whilst there would be temporary effects on suspended solid concentrations, these are predicted to be small scale and localised to the cabling activity. Additionally once the cables are installed, all effects would cease (see **Chapter 6 Marine Geology, Oceanography and Physical Processes** for further detail).
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.
Biology (Habitats)	Is the footprint of the activity $0.5km^2$ or larger		✓	The export cable corridor currently covers an area of $4.1557km^2$ in the WFD water body which is larger than $0.5km^2$. However, the actual cable footprint of disturbance is likely to be in the region of $0.011km^2$ (calculated using a trench width of 3m for 852m per cable) once cable locations have been confirmed via geophysical survey work. The HDD exit pit would also be within the WFD water body. The footprint of

WFD	Scoping question	Yes	No	Notes
				disturbance due to the HDD exit pit trench would be 978m^2 for SEP or DEP in isolation or 1356m^2 for both SEP and DEP. Taking both the export cable trench and HDD exit trench, the activity is 0.004km^2 and smaller than 0.5km^2.
	Is the area of either activity greater than 1% or more of the water body's area		✓	The export cable corridor currently covers an area of 4.1557km^2 in the WFD water body. However, the actual cable footprint of disturbance is likely to be in the region of 0.011km^2 (calculated using a trench width of 3m for 852m per cable) once cable locations have been confirmed via geophysical survey work. The HDD exit pit would also be within the WFD water body. The footprint of disturbance due to the HDD exit pit trench would be 978m^2 for SEP or DEP in isolation or 1356m^2 for both SEP and DEP. The export cable and HDD exit point cable protection equates to 0.0018% of the WFD. If multiplied by 1.5 as required by the Clearing the Waters for All guidance, the area still does not exceed 1% of the WFD water body.
	Within 500m of any higher sensitivity habitat	✓		Yes, the offshore export cable will pass through chalk reef habitat (designated as Cromer Shoal Chalk Beds MCZ).
	1% or more of any lower sensitivity habitat		✓	No. The area to be affected by subtidal HDD exit point and cable installation is likely to very small given that the first 1000m would be installed using HDD. The habitat potentially at risk is subtidal coarse sediment. Given there is 130km^2 of this habitat within the WFD water body and that material would be used as backfill to create a level sea bed where possible, the cable installation is unlikely to impact on greater than 1% of this WFD water body.
Biology (Fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	No. The project is not located within or close to a transitional water body. There will be an increase in suspended sediment concentrations as a result of the transition pit works associated with subtidal HDD exit point and cable burial techniques to facilitate cable installation however this effect will be short-lived and likely to be within natural baselines already experienced in the water body (see **Chapter 6 Marine Geology,**

WFD	Scoping question	Yes	No	Notes
				Oceanography and Physical Processes for further detail). Effects on fish are therefore not predicted (see **Chapter 9 Fish Ecology**).
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)			No. The area of construction work within the water body would be small scale and would occur in an open area of coastline. This would therefore not create a physical barrier to fish. These activities would also have minimal impact to water and sediment quality and would not affect fish behaviour through changes in water chemistry. Changes to morphology from cable installation would be minimal and temporary, resulting in no permanent change to depth or flow.
	Could cause entrainment or impingement of fish		✓	No risk from these activities.
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	See summary of conclusions in the Fish section above.
	Is in a water body with a phytoplankton status of moderate, poor or bad		✓	No – status is good
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so, are they on the Environmental Quality Standards Directive (EQSD) list		✓	No chemicals to be released during either activity.

WFD	Scoping question	Yes	No	Notes
	Will the activity disturb sediment with contaminants above Cefas Action Level 1		✓	No. All sediment samples located in or near to the water body did not record any exceedances of Action Level 1 (**Chapter 7 Marine Water and Sediment Quality**).
Protected areas	Is the activity within 2km of any WFD protected area	✓		Yes. However, whilst European Designated sites are located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) (see **Habitat Regulation Assessment**). The HRA does not identify any Likely Significant Effects on the North Norfolk Coast SAC, SPA and Ramsar resulting from SEP & DEP.
Invasive non-native species	Could the activity introduce or spread INNS		✓	Any of the proposed construction and operation activities which use equipment that has been used on another site where INNS species are located could potentially be at risk of spreading INNS. Contractors responsible for the construction and operation of SEP and DEP will undertake a biosecurity risk assessment and a management plan put in place to avoid potentially facilitating the spread of non-native species during construction.
Norfolk North (GB640503300000)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.
	Could significantly impact the hydromorphology of any water body		✓	No, the export cables would be brought ashore and jointed to the onshore cables within transition pits using horizontal directional drilling (HDD) and duct installation. The HDD would then be drilled from an onshore construction compound and will exit the sea bed in an exit pit about 1,000m from the coast. Given the very small overlap with this WFD water body inshore where HDD would occur, effects are not predicted.
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.

WFD	Scoping question	Yes	No	Notes
Biology (Habitats)	Is the footprint of the activity 0.5km^2 or larger		✓	No, the footprint of the cable corridor in this water body is 0.14m^2.
	Is the area of either activity greater than 1% or more of the water body's area		✓	No, the footprint of the cable corridor in this water body is 0.14m^2 which equates to 0.08% of the WFD water body.
	Within 500m of any higher sensitivity habitat	✓		Yes, the offshore cable will pass through chalk reef habitat (designated as Cromer Shoal Chalk Beds MCZ).
	1% or more of any lower sensitivity habitat		✓	No. The cable corridor area of overlap within this WFD water is very small and installation is likely to be via HDD inshore. As a result, effects are not predicted.
Biology (Fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	No. The project is not located within or close to a transitional water body. There will be an increase in suspended sediment concentrations as a result of the transition pit works associated with the subtidal HDD exit point, and cable burial techniques to facilitate cable installation. This effect will be short-lived and likely to be within natural baselines already experienced in the water body (see **Chapter 6 Marine Geology, Oceanography and Physical Processes** for further detail). Effects on fish are therefore not predicted (see **Chapter 11 Fish and Shellfish Ecology**).
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)			
	Could cause entrainment or impingement of fish		✓	No risk
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	See summary of conclusions in the Fish section above.
	Is in a water body with a phytoplankton status of moderate, poor or bad	✓		Whilst the status is moderate, the proposed activities are unlikely to impact on phytoplankton given the temporary and small scale effects

WFD	Scoping question	Yes	No	Notes
				predicted on water quality (see **Chapter 7 Marine Water and Sediment Quality**) and use of HDD in the inshore.
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so are they on the Environmental Quality Standards Directive (EQSD) list		✓	No chemicals to be released during either activity.
	Will the activity disturb sediment with contaminants above Cefas Action Level 1		✓	No. All sediment samples located in or near to the water body did not record any exceedances of Action Level 1 (**Chapter 7 Marine Water and Sediment Quality**).
Protected areas	Is the activity within 2km of any WFD protected area	✓		Yes. However, whilst European Designated sites are located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) (see **Habitat Regulation Assessment**). The HRA does not identify any Likely Significant Effects on the North Norfolk Coast SAC, SPA and Ramsar resulting from SEP & DEP.
Invasive non-native species	Could the activity introduce or spread INNS		✓	Any of the proposed construction and operation activities which use equipment that has been used on another site where INNS species are located could potentially be at risk of spreading INNS. Contractors responsible for the construction and operation of SEP and DEP will undertake a biosecurity risk assessment and a management plan put in place to avoid potentially facilitating the spread of non-native species during construction.

Operational Activity: Cable Protection

WFD	Scoping question	Yes	No	Notes
Norfolk East (GB650503520003)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.
	Could significantly impact the hydromorphology of any water body		✓	Estimates are for 100m of cable protection for each cable in the Marine Conservation Zone (MCZ) so 2x100m for both projects, with a width of 6m equating to an area of 600m^2 for SEP or DEP in isolation and 1,200m^2 for both SEP and DEP. The HDD exit pit will also require cable protection equating to an area of 300m^2 for SEP or DEP in isolation and 600m^2 for both SEP and DEP. Therefore, there will be a total of 900m^2 of cable protection in the MCZ for SEP or DEP and 1,800m^2 for both SEP and DEP. The MCZ boundary however stretches further offshore than the 1 nautical mile therefore the area requiring cable protection within the WFD water body is likely to be considerably less. The main effects identified in **Chapter 6 Marine Geology, Oceanography and Physical Processes** primarily relate to the potential for interruption of sediment transport processes and the footprint they present on the sea bed. In recognition of these potential effects, considerable effort has been given to selecting an appropriate export cable corridor within the offshore cable corridor to minimise sediment transport effects as far as practicably achievable. Additionally, a commitment has also been made to install the export cable using HDD techniques, thus minimising disturbance and avoiding the need for cable protection in the intertidal and shallowest nearshore zones. It is likely that the HDD pop-out location would be in water depths of approximately 9-10m below LAT. Hence, there would be no interruption to sediment transport pathways close to the coast because the export cables would be buried. Significant effects on hydromorphological parameters of the WFD water body are therefore not predicted.

WFD	Scoping question	Yes	No	Notes
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.
Biology (Habitats)	Is the footprint of the activity 0.5km^2 or larger		✓	As outlined above, estimates are for 100m of cable protection for each cable in the MCZ so 2x100m for both projects equating to an area of 600m^2 for SEP or DEP in isolation and 1,200m^2 for both SEP and DEP. The HDD exit pit will also require cable protection equating to an area of 300m^2 for SEP or DEP in isolation and 600m^2 for both SEP and DEP. Therefore, there will be a total of 900m^2 of cable protection in the MCZ for SEP or DEP and 1,800m^2 for both SEP and DEP. The MCZ boundary however stretches further offshore than the 1 nautical mile therefore the area requiring cable protection within the WFD water body is likely to be considerably less.
	Is the area of either activity greater than 1% or more of the water body's area		✓	The WFD water body area is 4.16km^2. The area of cable protection for both SEP and DEP is 0.0018km^2 which equates to 0.001% of the WFD water body
	Within 500m of any higher sensitivity habitat	✓		Yes, cable protection could be located within 500m of an area of high sensitivity Chalk reef habitat.
	1% or more of any lower sensitivity habitat		✓	No, as outlined above, the area to be affected is very small and therefore unlikely to represent 1% or more of lower sensitivity habitats located within the WFD water body.
Biology (Fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	No. SEP and DEP is not located within or close to a transitional water body. Given the relatively small scale effects outlined in hydromorphology, effects on environmental parameters that could impact on fish are not predicted.
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical			

WFD	Scoping question	Yes	No	Notes
	change or a change in depth or flow)			
	Could cause entrainment or impingement of fish		✓	No risk identified.
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	No - the presence of cable protection will not impact on water quality.
	Is in a water body with a phytoplankton status of moderate, poor or bad		✓	No – status is good.
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so are they on the Environmental Quality Standards Directive (EQSD) list		✓	No chemicals are to be released.
	Will the activity disturb sediment with contaminants above Cefas Action Level 1			No. The presence of cable protection would not significantly disturb sediments.
Protected areas	Is the activity within 2km of any WFD protected area	✓		Yes. However, whilst there are European Designated sites located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) to the PEIR (see **Habitat Regulation Assessment**). The HRA does not identify any Likely

WFD	Scoping question	Yes	No	Notes
				Significant Effects on the North Norfolk Coast SAC, SPA and Ramsar resulting from SEP & DEP.
Invasive non-native species	Could the activity introduce or spread INNS		✓	To be controlled via measures to ensure INNS are not introduced or spread within the marine environment.
Norfolk North (GB640503300000)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.
	Could significantly impact the hydromorphology of any water body		✓	Cable protection unlikely to be required in this water body given the very small overlap with the cable corridor.
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.
Biology (Habitats)	Is the footprint of the activity 0.5km^2 or larger		✓	Cable protection unlikely to be required in this water body given the very small overlap with the cable corridor.
	Is the area of either activity greater than 1% or more of the water body's area			
	Within 500m of any higher sensitivity habitat			
	1% or more of any lower sensitivity habitat			
Biology (Fish)	Is in an estuary and could affect fish in the estuary,		✓	

WFD	Scoping question	Yes	No	Notes
	outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary			Cable protection unlikely to be required in this water body given the very small overlap with the cable corridor.
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)			
	Could cause entrainment or impingement of fish			
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	No -the presence of cable protection will not impact on water quality.
	Is in a water body with a phytoplankton status of moderate, poor or bad		✓	No – status is good.
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so are they on the EQSD list		✓	No chemicals are to be released.

WFD	Scoping question	Yes	No	Notes
	Will the activity disturb sediment with contaminants above Cefas Action Level 1		✓	No - the presence of cable protection will not impact on water quality.
Protected areas	Is the activity within 2km of any WFD protected area	✓		Yes. However, whilst there are European Designated sites located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) to the PEIR (see **Habitat Regulation Assessment**). The HRA does not identify any Likely Significant Effects on the North Norfolk Coast SAC, SPA and Ramsar resulting from SEP & DEP.
Invasive non-native species	Could the activity introduce or spread INNS		✓	Control measures to be put in place.

ANNEX 3: SCOPING OF RIVER WATER BODIES FOR CONSTRUCTION AND OPERATIONAL ACTIVITIES

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	Construction	Yes. Ground disturbance for cable trenching (open-cut and HDD) and changes to land use from construction of a haul road, temporary construction areas and an onshore substation could potentially alter the hydrological regime of river water bodies screened into the assessment. Greater impermeable surfaces and disturbed ground could alter surface water drainage pathways throughout each catchment, resulting in changes to volume, energy or distribution of flows. Watercourse crossings (i.e. bailey bridges or similar to enable haul road construction) could also impact upon flow conveyance and distribution due to disturbance of the banks during construction.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	Operation	The permanent onshore infrastructure could change surface water drainage patterns which has the potential to affect the hydrological regime of nearby WFD water bodies.	

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	Construction	Yes. Ground disturbance for cable trenching (open-cut and HDD) and changes to land use from construction of a haul road, temporary construction areas and an onshore substation are likely to increase fine sediment input into water bodies which could impact on morphology. The installation of temporary watercourse crossings (i.e. bailey bridges or similar to enable haul road construction) could also increase fine sediment input and alter the bank conditions. This impact could alter the morphology of the WFD water bodies along the cable corridor. An increase in surface runoff also has the potential to increase localised scour to the bed and banks.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	Operation	The permanent onshore infrastructure could change surface water drainage patterns have the potential to affect the morphological conditions of nearby WFD water bodies through increased bed and bank erosion. Morphology of water bodies could also be impacted by increased sediment supply via runoff from any planned or unplanned operational maintenance activities.	

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	Construction	No. There will be no permanent barriers to river continuity.	None, there is no potential for permanent effects on water body status from this quality element.
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	Operation		
Physico -chemical				
General	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	Construction	Yes, there is potential for increased sediment supply to the WFD water bodies which could impact on turbidity levels and oxygenation within the water body. There will also be increased risk of contaminant supply to water bodies, from accidental spillage or leakage of fuel oils or lubricants from construction vehicles. This has potential to impact on physico chemistry.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
		Operation	Yes, maintenance of the onshore cable infrastructure (cable corridor and onshore substation) at operational sites could increase sediment supply to the water bodies. There is also a risk of contaminants and spillage from vehicles during operation.	• Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
Specific pollutants	Could the activity release dangerous chemicals into the water body?	Construction	Yes. Onshore construction activities could potentially release dangerous chemicals from construction materials (e.g. concrete) and construction machinery (e.g. fuels and lubricants) into river water bodies.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Specific pollutants	Could the activity release dangerous chemicals into the water body?	Operation	Yes. Onshore construction activities could potentially release dangerous chemicals from construction materials (e.g. concrete) and construction machinery (e.g. fuels and lubricants) into river water bodies.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
Biology				
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Construction	Yes. Impacts from haul road construction temporary construction compounds and an onshore substation could have potential impacts to morphology and the hydrological regime. Increased fine sediment in the water body could smother bed habitats and reduce light penetration. This could lead to loss or modification of aquatic flora communities. Changes to physico chemistry from proposed onshore area construction activities could also lead to loss or modification of habitats for aquatic plants.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Operation	Yes. Impacts from operational maintenance activities could have potential impacts to morphology and the hydrological regime. Increased fine sediment via surface runoff to the water body could smother bed habitats and reduce light penetration. This could lead to loss or modification of aquatic flora communities. Changes to physico chemistry from proposed onshore area construction activities could also lead to loss or modification of habitats for aquatic plants.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	Construction	Yes. Impacts from haul road construction, temporary construction compounds and an onshore substation could have potential impacts to morphology and the hydrological regime. Increased fine sediment in the water body could smother bed habitats and reduce light penetration. This could lead to the loss or modification of habitats which support benthic invertebrates. Changes to physico-chemistry from onshore area construction activities could also lead to loss or modification of aquatic invertebrate habitat.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	Operation	Yes. Impacts from operational maintenance activities could have potential impacts to morphology and the hydrological regime. Increased fine sediment via surface runoff to the water body could smother bed habitats and reduce light penetration. This could lead to loss or modification of aquatic invertebrate communities. Changes to physico chemistry from proposed onshore area construction activities could also lead to loss or modification of habitats for benthic invertebrates.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Construction	Yes. Impacts from construction of the haul road, temporary construction areas and an onshore substation could have potential impacts to morphology and the hydrological regime. Increased turbidity and alteration of niche habitat could subsequently lead to the loss or modification of shelter, feeding and spawning habitats for fish. Furthermore, potential changes to physico-chemistry could also reduce the capacity of the water body to support feeding and spawning fish.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Operation	Yes. Impacts from operational maintenance activities could have potential impacts to morphology and the hydrological regime. Increased turbidity and alteration of niche habitat could subsequently lead to the loss or modification of shelter, feeding and spawning habitats for fish. Furthermore, potential changes to physico-chemistry could also reduce the capacity of the water body to support feeding and spawning fish.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

ANNEX 4: SCOPING OF GROUNDWATER WATER BODIES FOR CONSTRUCTION AND OPERATIONAL ACTIVITIES

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Groundwater quantity			
Groundwater dependent terrestrial ecosystems (GWDTEs)	Could the activity change groundwater levels, affecting GWDTEs or dependent surface water features?	During construction of the onshore cable corridor, the subsurface HDD method used to traverse watercourses, could have localized changes to groundwater flows. There may be local changes to infiltration rates into the groundwater bodies due to installation of buried infrastructure causing alterations to subsurface flow routes. However, these changes are not expected to have permanent impacts on GEDTEs or dependent surface water features.	None due to potential for only minimal, localized impacts. The size of the cable ducting in comparison to the size of the groundwater bodies which underlie SEP and DEP will result in an insignificant impact upon infiltration rates, groundwater flows, subsurface flow routes and alterations in the distribution of groundwater
Saline intrusion	Could the activity lead to saline intrusion?	No construction or operational activities will abstract any water from the groundwater bodies identified, and therefore will not result in saline intrusion.	None, as no abstraction will occur.
Groundwater abstraction	Could the level of proposed groundwater abstraction (dewatering) exceed recharge at a water body scale?	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.
Additional surface water body	Could the activity lead to an additional surface water body that will become non-compliant and lead to failure of the	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
	Dependent Surface Water test?		
Additional abstraction	Could the activity result in additional abstraction that will exceed any groundwater body scale headroom between the fully licensed quantity and the limit imposed by the total recharge?	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.
Groundwater quality			
Water body scale pollution	Could the activities have the potential to result in or exacerbate widespread diffuse pollution at a water body scale?	No. If any pollution from project construction (onshore cable corridor, temporary construction areas and substation) and operation does occur, this will be limited to a small proportion of both groundwater bodies identified.	None, as potential impacts will be highly localized.
GWDTEs	Could the activities have the potential to result in pollution of GWDTEs or other dependent surface water features?	The activities such as HDD and open cut trench excavations to construct the 60km onshore cable corridor could potentially introduce contaminants into the groundwater bodies identified, which could subsequently be transferred to GWDTEs.	North Norfolk Chalk, Broadland Rivers Chalk and Crag

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Saline intrusion	Could the activity lead to saline intrusion?	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.
Deterioration in water quality	Could the activities have the potential to cause deterioration in the quality of a drinking water abstraction?	Yes. Construction of the onshore export cable from open cut trench excavations and HDD could potentially introduce contaminants into groundwater. This could lead to an increase in pollutant concentrations affecting the quality of licensed and unlicensed abstractions.	North Norfolk Chalk, Broadland Rivers Chalk and Crag
Increasing pollutant concentrations	Could the activities have the potential to result in increasing trends in pollutant concentrations or reduce the ability of the water body being able to reverse significant trends in groundwater pollutants?	Yes. Construction of the onshore export cable from open cut trench excavations and HDD could potentially introduce contaminants into groundwater. This could lead to an increase in pollutant concentrations within the groundwater bodies identified	North Norfolk Chalk, Broadland Rivers Chalk and Crag