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White Cross Offshore Windfarm Environmental Statement

Chapter 14: Water Resources and Flood Risk

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Glossary of Acronyms

Acronym	Definition
AONB	Area of Outstanding Natural Beauty
Applicant	Offshore Wind Limited
BGS	British Geological Survey
BNG	Biodiversity Net Gain
CEMP	Construction Environmental Management Plan
CEA	Cumulative Effect Assessment
CIRIA	Construction Industry Research and Information Association
CoCP	Code of Construction Practice
DMRB	Design Manual for Roads and Bridges
DrWPA	Drinking Water Protected Area
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
FRA	Flood Risk Assessment
FWMA	The Flood and Water Management Act
GEP	Good Ecological Potential
GES	Good Ecological Status
GIS	Geographical Information System
GPP	Guidance for Pollution Potential
ha	hectares
HDD	Horizontal Directional Drilling
IDB	Internal Drainage Board
IEMA	Institute of Environmental Management and Assessment
LLFA	Lead Local Flood Authority
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MW	Megawatt
NDC	North Devon Council
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Projects
WCOWL	White Cross Offshore Windfarm Limited

Acronym	Definition
PBDE	Polybrominated diphenyl ethers
PDE	Project Design Envelope
PPG	Pollution Prevention Guidelines
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SPA	Special Protected Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable drainage systems
UK	United Kingdom
WER	Water Environment Regulations

Glossary of Terminology

Defined Term	Description
Coastal catchment	Land which drains directly to the coastal or estuarine waters, rather than through a river water body – not part of a river water body catchment.
Cumulative effects	The effect of the Onshore Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Onshore Project.
Geomorphology	The study of landforms and the processes that shape them
Joint/jointing bay	Underground structures constructed at regular intervals along the Onshore Export Cable Corridor to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall (to MLWS)	Where the offshore export cables come ashore.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links.
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mitigation	A term used interchangeably with Commitment(s). Mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping).
Onshore Development Area	The onshore area above MLWS including the underground Onshore Export Cables connecting to the White Cross Onshore Substation and onward to the Grid Connection Point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from Landfall (to MLWS) to the White Cross Onshore Substation.
Onshore Export Cable Corridor	The proposed onshore area in which the onshore export cables will be laid, from Landfall (to MLWS) to the White Cross Onshore Substation.
Onshore infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the Grid Connection Point. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Project Design Envelope (PDE)	The PDE is the spatial extent and range of design parameters within which the proposed development will be contained, constructed and operated. This includes the offshore export cable, the Transition Joint Bay, the onshore export cable, the White Cross Onshore Substation

Defined Term	Description
	(and associated landscape planting and drainage), the Grid Connection Point, the temporary construction compounds, jointing bays, link boxes, access roads and haul roads, and the construction footprint relating to all of these.
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NG electrical requirements at the grid connection point at East Yelland.
Surface water flooding	Surface water flooding occurs when rainwater does not drain away through normal drainage systems or soak into the ground, but lies on or flows over the ground instead
Transition Joint Bay	Underground structures at the Landfall that house the joints between the offshore export cables and the onshore export cables.

14. Water Resources and Flood Risk

14.1 Introduction

1. This chapter of the Environmental Statement (ES) presents an assessment of the potential impacts of White Cross Offshore Windfarm Project (the Onshore Project) on Water Resources and Flood Risk. Specifically, this chapter considers the potential impact of the Onshore Project landward of Mean Low Water Springs (MLWS) during its construction, operation and maintenance, and decommissioning phases.

2. The ES has been finalised with due consideration of pre-application consultation to date (see **Chapter 7: Consultation**) and the ES will accompany the application to North Devon Council (NDC) for planning permission under the Town and Country Planning Act 1990.

3. The components of the White Cross Offshore Windfarm Project seaward of Mean High Water Springs (MHWS) ('the Offshore Project') are subject to a separate application for consent under Section 36 of the Electricity Act 1989, and for Marine Licences under the Marine and Coastal Access Act 2009. These applications are supported by a separate ES covering all potential impacts seaward of MHWS.

4. This assessment has been undertaken with specific reference to the relevant policy, legislation and guidance, which are summarised in **Section 14.2** of this chapter. Further information on the international, national and local planning policy and legislation relevant to the Onshore Project is provided in **Chapter 3: Policy and Legislative Context**.

5. Details of the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effect Assessment (CEA), are presented in **Section 14.3** of this chapter and **Chapter 6: EIA Methodology**.

6. This assessment has been informed by impacts assessed in Water Resources and Flood Risk and impacts assessed in this chapter inform the following linked ES chapters:

   - **Chapter 12: Ground Conditions and Contamination**
   - **Chapter 15: Land Use**
   - **Chapter 16: Onshore Ecology and Ornithology.**

7. This ES chapter:

   - Presents the existing environmental baseline established from desk studies, walkover survey, and consultation

- Presents the potential environmental effects on Water Resources and Flood Risk arising from the Onshore Project, based on the information gathered and analysis and assessments undertaken
- Identifies any assumptions and limitations encountered in compiling the environmental information
- Highlights any necessary mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

14.2 Policy, Legislation and Guidance

8. **Chapter 3: Policy and Legislative Content** describes the wider policy and legislative context for the Onshore Project. The principal policy and legislation used to inform the assessment of potential impacts on Water Resources and Flood Risk for the Onshore Project are outlined in this section.

14.2.1 National Planning Policy Framework

9. The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, updated July 2021) is the primary source of national planning guidance in England. Sections relevant to this aspect of the ES are summarised below in **Table 14.1**.

Table 14.1 Summary of NPPF Policy relevant to Water Resources and Flood Risk.

Summary	How and where this is considered in the ES
The National Planning Policy Framework (NPPF) sets out the UK Government planning policies for England and seeks to ensure that flood risk is considered at all stages of the planning and development process. Its policies aim to avoid inappropriate development in areas at highest risk of flooding, and to direct development away from these areas. NPPF provides clarification that all strategic policies/plans should apply a sequential, risk-based approach to the location of development taking into account all sources of flood risk (e.g. fluvial, coastal, surface water, groundwater, reservoir and sewer flooding). It also provides guidance on how this is to be considered in the context of the location of site-specific development. Further guidance, on the application of the Sequential Test and Exception Test is provided in the supporting Planning Practice Guidance (PPG) for Flood Risk and Coastal Change	Potential impacts related to changes to surface water runoff and flood risk related to construction, operation and maintenance, and decommissioning are discussed in **Sections 14.5**, **14.6** and **14.7**. A flood risk assessment can be found in **Appendix 14.C: Flood Risk Assessment**.

Summary	How and where this is considered in the ES
(Ministry of Housing, Communities and Local Government, 2021), which was updated on 25th August 2022. In the recent update to the PPG the guidance was extended to include clarification on the application of the Sequential Test for all sources of flood risk, not only fluvial and coastal/tidal flooding, as well as summarising an additional consideration with regard to the presence of flood risk management infrastructure. The National Planning Practice Guidance (NPPG) on Flood Risk and Coastal Change provides additional guidance on flood risk vulnerability classifications and managing residual risks in support of the NPPF. The NPPG uses the concept of Flood Zones, Vulnerability Classifications and Compatibility to assess the suitability of a specific site for a certain type of development. New development should not pose an unacceptable risk of water pollution, and it should help to improve local environmental conditions, including water quality and actions set out in the River Basin Management Plans. - **Section 14, paragraphs 152-169 and Section 15, paragraph 174**	

14.2.2 Local policies

10. This section considers local policies and their relevance to the Water Resources and Flood Risk assessment. A summary of the local policies is provided in Table 14.2.

Table 14.2 Summary of Local Policies relevant to Water Resources and Flood Risk

Policy Name	Summary	How and where this is considered in the ES
North Devon and Torridge Local Plan 2018-2031		
Policy ST02: Mitigating Climate Change	Development will be expected to make a positive contribution towards the social, economic and environmental sustainability of northern Devon and its communities while minimising its environmental footprint by:	Potential impacts on surface and groundwater are discussed **Sections 14.5, 14.6** and **14.7**

Policy Name	Summary	How and where this is considered in the ES
	(Paragraph f) reducing pressure on water resources and increasing their reuse through sustainable water management.	**Chapter 23: Climate Change** assesses climate change impacts in detail.
Policy ST03: Adapting to Climate Change and Strengthening Resilience	Development should be designed and constructed to take account of the impacts of climate change and minimise the risk to and vulnerability of people, land, infrastructure and property by: a) locating and designing development to minimise flood risk through: • avoiding the development of land for vulnerable uses which is or will be at risk from flooding • managing and reducing flood risk for development where that has wider sustainability or regeneration benefits to the community, or where there is no reasonable alternative site. b) reducing existing rates of surface water runoff within Critical Drainage Areas c) upgrading flood defences and protecting key transport routes from risks of flooding d) re-establishing functional flood plains in accordance with the Shoreline Management Plan, Flood Risk Management Plan and Catchment Action Plan e) locating development to avoid risk from current and future coastal erosion f) adopting effective water management including Sustainable Drainage Systems, water quality improvements, water efficiency measures and the use of rainwater.	Potential impacts on flood risk are assessed in **Sections 14.5, 14.6** and **14.7**. **Appendix 14.C: Flood Risk Assessment (FRA)** assesses flood risk from all sources and discusses sustainable drainage methods associated with the Onshore Project.
Braunton Parish Neighbourhood Plan		

Policy Name	Summary	How and where this is considered in the ES
Policy NE4 Protecting Devon Banks, Hedgerows and Trees	Devon banks, hedgerows and trees provide multiple benefits to our community, including filtering air pollution, reducing surface water runoff /contributing to sustainable drainage, providing wildlife habitats, improving water quality and the stabilising of soils and slopes.	Impacts on biodiversity /ecological receptors are discussed in **Chapter 16: Onshore Ecology and Ornithology**
Policy NE8 Watercourses and drainage	All new development should, where possible and appropriate, aim to protect and improve water (fluvial and groundwater table) quality across the Parish catchment basin. The use of open sustainable drainage systems (Open SuDS) as a viable and attractive alternative to more piped drainage systems (including water butts; permeable paving; a green roof; swales; detention basins; filter strips; and retention ponds) in development proposals will be supported. Open SuDS schemes should demonstrate how it will not only minimise flood risk but improve water quality as well as enhancing landscape for local residents and improve biodiversity and ecology. Development that is likely to degrade water quality will not be supported.	Impacts on water quality are assessed in **Section 14.5** and **Section 14.6**. The approach to drainage and use of SUDs is outlined in **Appendix 14.C: FRA**
Policy NE9 Provision of natural flood management	1. Natural Flood Management Schemes aimed at improving flood protection to properties, businesses and roads across the parish will be supported 2. These schemes should adopt the methods described in Environment Agency 's latest guidance on working appropriately with natural processes to reduce flood risk 3. Proposals that introduce the managed re-introduction of beavers on the upper reaches of the River Caen to help reduce flood risk and improve ecological flood risk will be particularly welcomed 4. Where possible and appropriate, development should aim to help reduce the overall level of flood risk in the area and beyond through the layout and form of the development and the appropriate application of natural flood management techniques and sustainable drainage techniques	Mitigation measures to control sediment and water runoff during construction, which may include the use of buffer strips adjacent to channels, are described in **Section 14.5**. The role of SUDs in reducing flood risk at the Onshore Substation is described in **Appendix 14.C**: **Flood Risk Assessment**

Policy Name	Summary	How and where this is considered in the ES
	5. Development using land management techniques such as riparian buffers alongside sustainable drainage techniques will be supported 6. Development proposals in Braunton the Parish that are located in areas of flood risk will only be supported where it is demonstrated that the risk can be appropriately managed after assessments made through both the sequential test and exception test, and a site specific flood risk assessment where appropriate (such as Flood Zones 2 and 3) 7. Where the proposed development site is in an area deemed Flood Zone 2 or 3, or is in an area with critical drainage development, advice on the scope of the flood risk assessment required in the area should be sought from the Environment Agency.	**Appendix 14.C**: **Flood Risk Assessment** assesses flood risk from all sources and discusses sustainable drainage methods associated with the Onshore Project
Devon Local Flood Risk Management Strategy 2021-2027	The main purpose of the Strategy is to set out how flood risk will be managed in Devon. It will identify who has responsibilities for what element, how they will work together and what will be done to reduce the risk. Throughout the document there is a set of Principles to guide flood risk management practitioners on what is expected of them and interactive links to relevant information outside of the Strategy.	Potential impacts on flood risk are assessed in **Sections 14.5**, **14.6** and **14.7**. **Appendix 14.C: Flood Risk Assessment (FRA)** assesses flood risk from all sources.

14.2.2.1 South West River Basin District: River Basin Management Plan (updated 2022)

11. RBMPs provide a framework for the protection and enhancement of the benefits provided by the water environment in each RBD and are produced to implement the Water Environment Regulations (WER). As water resources and land use are closely linked, RBMPs also inform decisions on land-use planning.

12. The RBMP for the South West RBD was finalised by the Department for the Environment, Food and Rural Affairs (Defra) and the Environment Agency in December 2015 and was published in 2016. The RBMP was updated in December

2022 (Cycle 3) (Environment Agency, 2022). It provides a baseline classification of the water environment in the South West RBD and highlights statutory objectives for protected areas, such as waters used for drinking water, bathing, and designated sites. It lays out the actions needed to improve the water environment and achieve the objectives of the WER.

14.2.3 National Policy Statement

13. National Policy Statements (NPS) are statutory documents which set out the government's policy on specific types of Nationally Significant Infrastructure Projects (NSIPs) and are published in accordance with the Planning Act 2008.

14. The assessment requirements for Water Resources and Flood Risk are set out within the overarching NPS for Energy (EN-1) (Department for Energy Security and Net Zero, 2023a) and NPS for Electricity Networks Infrastructure (EN-5) (Department for Energy Security and Net Zero, 2023a) and summarised in **Table 14.3**. NPS EN-3 is only relevant to offshore components and is not discussed further.

15. Although the Onshore Project is not an NSIP, it is recognised that due to its size of up to 100MW and its location in English waters, certain NPS are considered relevant to the Offshore Project and decision-making and are referred to in this ES.

Table 14.3 Summary of NPS EN-1 and EN-5 provisions relevant to Water Resources and Flood Risk.

NPS Requirement	How and where this is considered in the ES
EN-1 NPS for Energy (EN-1)	
"Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance (including those outside England), on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity, including irreplaceable habitats. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the Secretary of State consider thoroughly the potential effects of a proposed project." - **Section 5.4, paragraph 5.4.17**	Potential impacts on river channels, which provide physical habitats of importance for ecology, protected species and the conservation of biodiversity, are considered in **Sections 14.5**, **14.6** and **14.7**. Impacts on protected species and habitats are assessed in **Chapter 16: Onshore Ecology and Ornithology**.
"Development on land within or outside a Site of Special Scientific Interest (SSSI), and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be	SSSIs and other designated sites are considered in determining the sensitivity of each catchment receptor in **Section 14.4.1.7**

NPS Requirement	How and where this is considered in the ES
permitted. The only exception is where the benefits (including need) of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs." - **Section 5.4, paragraph 5.4.8**	and **Section 14.4.1.8** Impacts on protected species and habitats are assessed in full in **Chapter 16: Onshore Ecology and Ornithology**.
"A site-specific flood risk assessment should be provided for all energy projects in Flood Zones 2 and 3 in England or Zones B and C in Wales" - **Section 5.8, paragraph 5.8.13 to 5.8.35**	Potential impacts on flood risk are considered in **Sections 14.5**, **14.6** and **14.7** and an accompanying FRA can be found in **Appendix 14.C: Flood Risk Assessment.**
"Where the Onshore Project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment, as part of the ES or equivalent. The ES should in particular describe: • the existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges • existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Abstraction Licensing Strategies) and also demonstrate how proposals minimise the use of water resources and water consumption in the first instance • existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics • any impacts of the proposed project on water bodies or protected areas (including shellfish protected areas) under the Water Environment	Potential impacts on water quality, the physical characteristics of surface watercourses and the quality and quantity of groundwater (including designations (e.g. Drinking Water Protected Areas)) are considered in **Sections 14.5**, **14.6** and **14.7**. Potential impacts on compliance with the Water Environment Regulations 2017, including relevant water bodies and protected areas, are considered separately in **Appendix 14.B: Water Environment Regulations Compliance Assessment**. Climate change impacts are assessed in **Chapter 23: Climate Change**). Cumulative effects are assessed in **Section 14.8**.

NPS Requirement	How and where this is considered in the ES
(Water Framework Directive) (England and Wales) Regulations 2017 and **source protection zones (SPZs) around potable groundwater abstractions** • how climate change could impact any of the above in the future • any cumulative effects" - **Section 5.15, paragraph 5.15.2-3.**	
EN-5 NPS for Energy Networks Infrastructure (EN-5)	
"Section 4.9 of EN-1 sets out the generic considerations that applicants and the Secretary of State should take into account in order to ensure that electricity networks infrastructure is resilient to the effects of climate change. As climate change is likely to increase risks to the resilience of some of this infrastructure, from flooding for example, or in situations where it is located near the coast or an estuary or is underground, applicants should in particular set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to: • flooding, particularly for substations that are vital to the network • especially in light of changes to groundwater levels resulting from climate change • the effects of wind and storms on overhead lines • higher average temperatures leading to increased transmission losses • earth movement or subsidence caused by flooding or drought (for underground cables) • coastal erosion – for the Landfall (to MLWS) of offshore transmission cables and their associated substations in the inshore and coastal locations respectively. Section 4.9 of EN-1 advises that the resilience of the Onshore Project to the effects of climate change must be assessed in the ES accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see Sections 5.8 in EN-1)." - **Section 2.3, paragraphs 2.3.1, 2.3.3**	Flooding and the potential effects of climate change are considered in an FRA (**Appendix 14.C: Flood Risk Assessment**).

14.2.4 Legislation

16. In addition to the NPS, there are a number of pieces of legislation, policy and guidance applicable to the assessment of Water Resources and Flood Risk. These are described in the sections below.

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

17. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended) continue to enforce Directive 2000/60/EC *of the European Parliament and of the Council of 23rd October 2000 establishing a framework for Community action in the field of water policy* (known as the Water Framework Directive) following Britain's withdrawal from the European Union under the terms of the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

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

14.2.4.2 The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2017

19. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2017 set out the standards and thresholds used to determine the ecological and chemical status of water bodies. These are considered in terms of biological, hydromorphological, physico-chemical and chemical status for surface water bodies, and quantitative and chemical status for groundwater bodies.

14.2.4.3 Flood and Water Management Act (2010)

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

14.2.4.4 Land Drainage Act (1991)

21. The Land Drainage Act (1991) requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. The Act also establishes the internal drainage districts supervised by IDBs and prescribes the functions of IDBs and local authorities in relation to land drainage. It also sets out the financial and administrative aspects of IDBs.

14.2.5 Topic specific guidance

14.2.5.1 Standards for Highways: Design Manual for Roads and Bridges (DMRB)

22. The DMRB is used as standard for assessment of effects on water environment from road schemes. This standard sets out a well-established framework for environmental impact assessment that is approved by regulators and is widely applied by the industry with respect to linear infrastructure projects. As the Onshore Project is mainly a linear infrastructure project, the nature and scale of impacts with respect to construction activities and principles of assessments are similar and therefore considered applicable.

14.2.5.2 National Planning Policy Framework: Annex 3: Flood risk vulnerability classification

23. Provides classifications and definitions associated with flood risk vulnerability (highly vulnerable, more vulnerable, less vulnerable). Used in assessing receptor sensitivity (**Table 14.4**).

14.2.5.3 Pollution prevention guidance

24. Construction activities will adhere to industry good practice measures as detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (PPG1, PPG5, PPG8 and PPG21). Although EA PPG notes have been revoked, they have been updated as Guidance for Pollution Prevention (GPP notes) for use in Scotland and Northern Ireland (NetRegs, 2022) and can be used to establish best practice.

25. Construction Industry Research and Information Association (CIRIA) best practice (Control of water pollution from construction sites: Guidance for consultants and contractors (C532) (2001)) will also be adhered to.

14.3 Assessment Methodology

14.3.1 Study Area

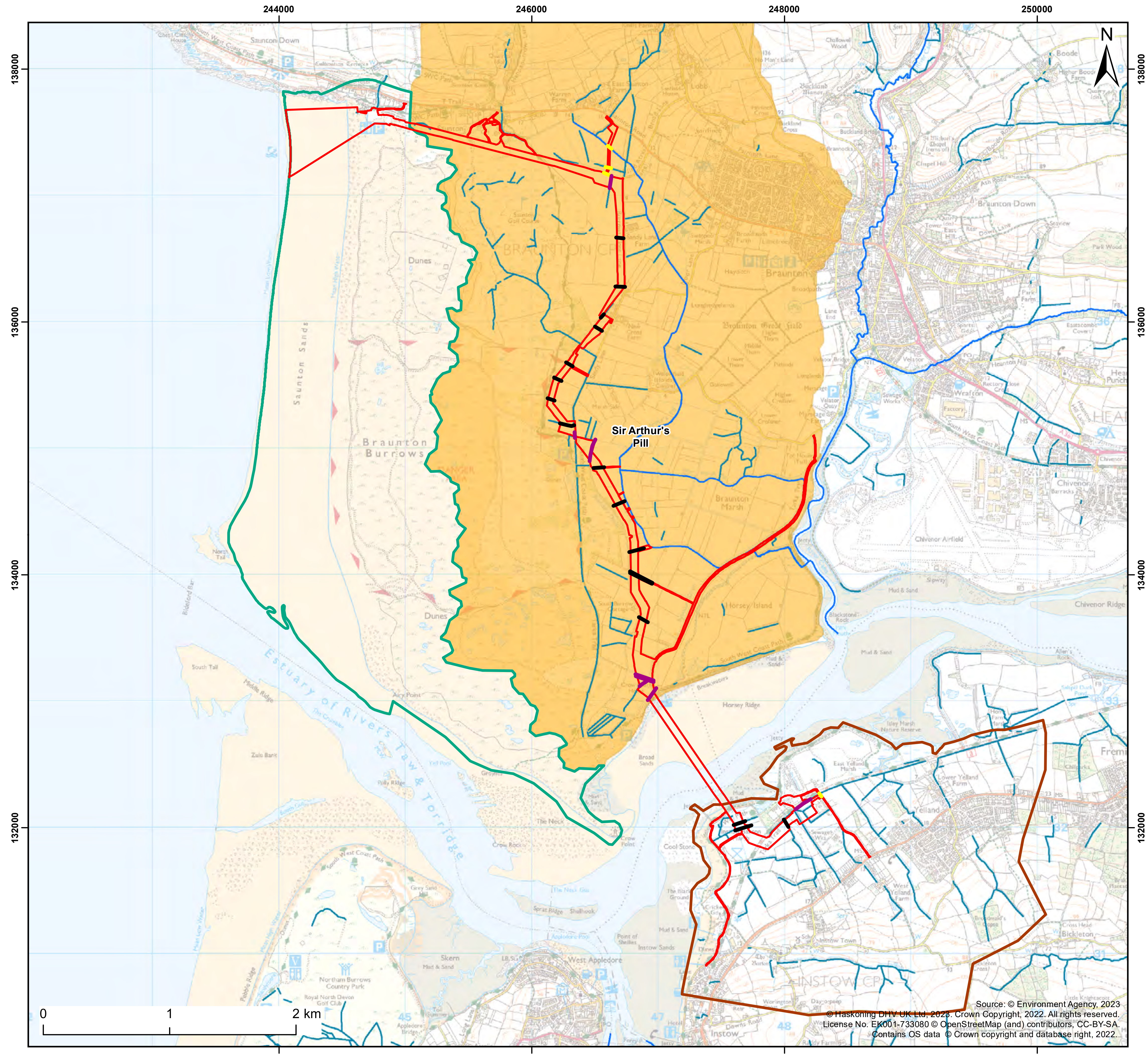
26. Details of the location of the Onshore Project and the onshore infrastructure are set out within **Chapter 5: Project Description**.

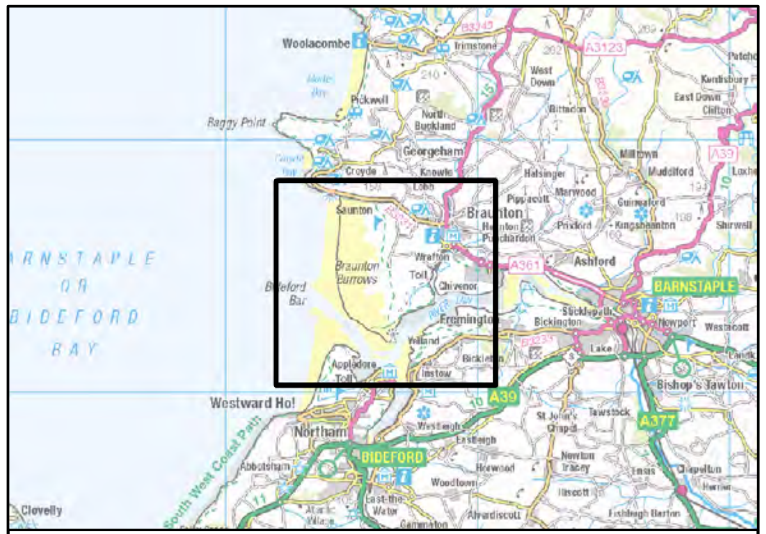
27. The Water Resources and Flood Risk study area is defined by the distance over which impacts on water resources from all of the Onshore Project infrastructure (i.e. Landfall (to MLWS), Onshore Export Cable Corridor and White Cross Onshore Substation) may occur, and by the location of any receptors that may be affected by those potential impacts.

28. As part of the South West RBMP, the Environment Agency has defined river water body catchments based on surface hydrological catchments with an area of greater than 5 km^2. The study area for Water Resources and Flood Risk has been defined based on these Environment Agency hydrological catchments. Catchments have been included within the study area if they are crossed by the Onshore Project, or hydrologically connected. Surface water features associated with the Onshore Project are shown in (**Figure 14.1**). The study area includes two onshore coastal catchments. These catchments comprise areas of land which drain directly to coastal or estuarine waters, rather than through a river water body.

When considering potential impacts to groundwater, the study area is limited to those groundwater bodies that lie directly beneath the Onshore Project. The majority of the Onshore Project is underlain by the River Taw and North Devon Streams groundwater catchment (**Figure 14.2**). A very short section of existing access road near Instow crosses into the Torridge and Hartland Streams groundwater catchment.

Figure 14.1 Surface Water Features





Legend:
- Onshore Development Area
- Ordinary watercourse
- Statutory Main River
- Braunton Burrows Coastal Catchment
- Instow Barton Marsh Coastal Catchment
- Taw Estuary Surface Water Catchment

Onshore Crossing Schedule
- HDD/Trenchless
- Open Cut
- Haul Road Crossing

Client: Offshore Wind Ltd.

Project: White Cross Offshore Windfarm

Title: Surface Water Features

Figure: 14.1 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0359

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P02	27/06/2023	AB	SF	A3	1:30,000
P01	07/06/2023	AB	SF	A3	1:30,000

Co-ordinate system: British National Grid

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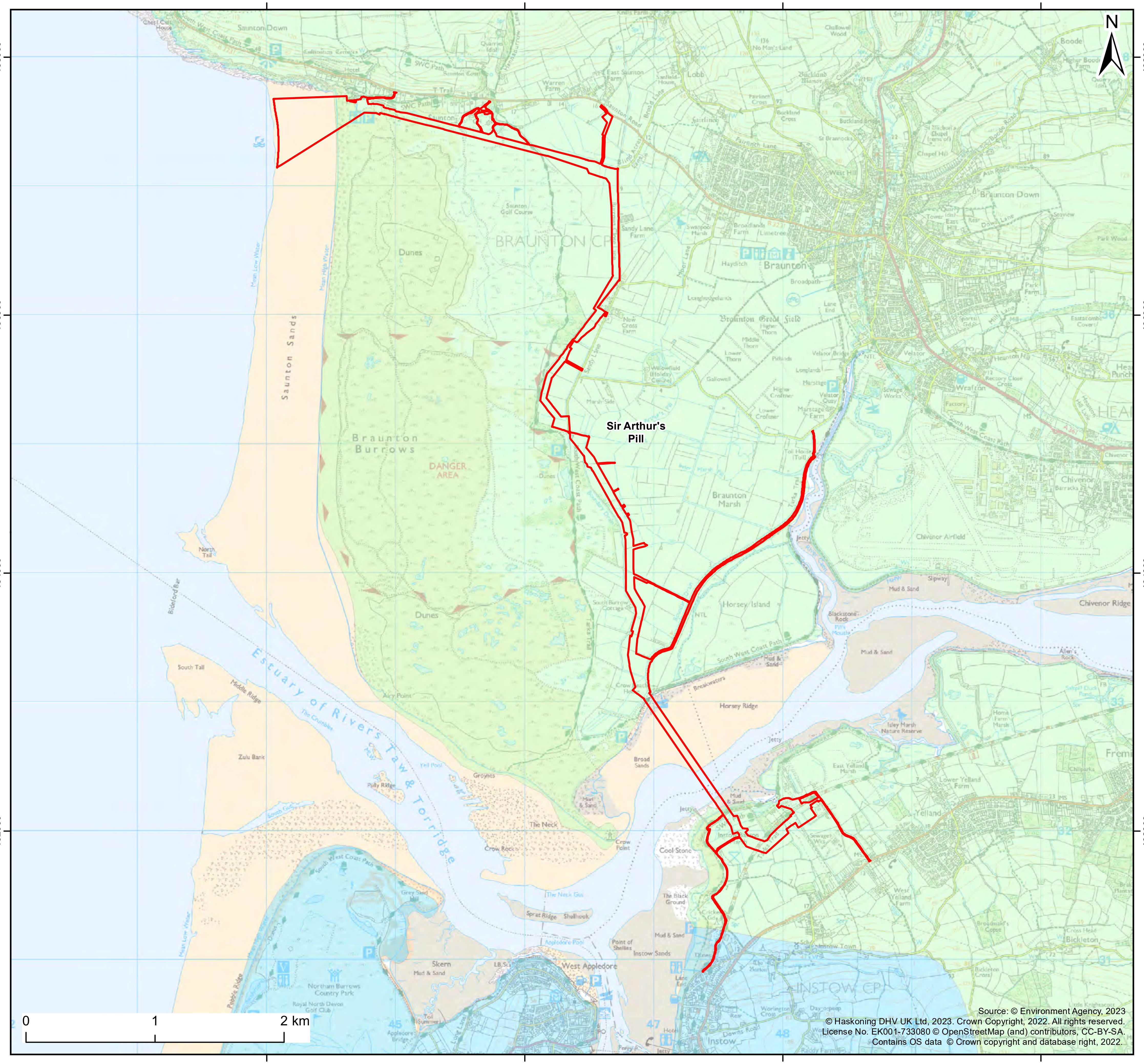
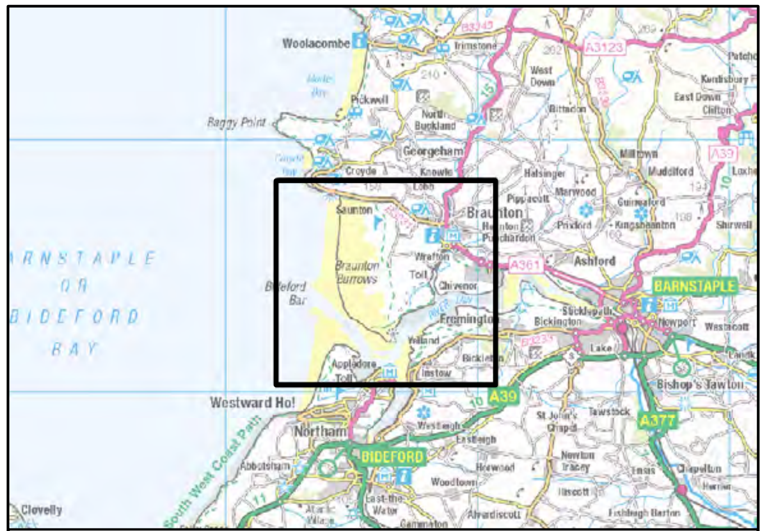
Figure 14.2 Groundwater Features





Legend:

- Onshore Development Area

Water Framework Directive Groundwater Bodies Cycle 2

- Torridge and Hartland Streams
- River Taw and North Devon Streams

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title: Groundwater Features

Figure: 14.2 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0359

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P03	27/06/2023	AB	SF	A3	1:30,000
P02	07/06/2023	AB	SF	A3	1:30,000

Co-ordinate system: British National Grid

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14.3.2 Approach to Assessment

29. **Chapter 6: EIA Methodology** provides a summary of the general impact assessment methodology applied to the Onshore Project. The following sections outline the methodology used to assess the potential effects on Water Resources and Flood Risk. The assessment methodology for Water Resources and Flood Risk is consistent with that presented in **Chapter 6: EIA Methodology**.

14.3.2.1 Definitions of receptor sensitivity/value

30. The sensitivity level of Water Resources and Flood Risk to each impact is justified within the assessment and is dependent on the following factors:

- Adaptability – The degree to which a receptor can avoid or adapt to an effect
- Tolerance – The ability of a receptor to accommodate temporary or permanent change without a significant adverse effect
- Recoverability – The temporal scale over and extent to which a receptor will recover
- Value – A measure of the receptor importance and rarity.

31. The terms used to define sensitivity/value are outlined in **Table 14.4**.

Table 14.4 Definition of terms relating to receptor sensitivity

Source	Summary
High	Receptor has no or very limited capacity to tolerate changes to hydrology, geomorphology, water quality or flood risk, and has little potential for substitution. Includes water resources which support human health and/or economic activity at a regional scale, or receptors with a high vulnerability to flooding. **Water resources** • Controlled waters with an unmodified, naturally diverse hydrological regime, a naturally diverse geomorphology with no barriers to the operation of natural processes, and good water quality • Supports habitats or species that are highly sensitive to changes in surface hydrology, geomorphology or water quality • Supports Principal Aquifer(s) with public water supply abstractions by provision of recharge • Site is within inner or outer Source Protection Zones (SPZs) • National (SSSI, NNR or equivalent) or international level (SPA, SAC or Ramsar) designations – this includes protected areas (e.g. Drinking Water Protected Area DrWPA).

<table>
<tr><th>Source</th><th>Summary</th></tr>
<tr><td></td><td>Flood risk
Highly Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021)
Land with more than 100 residential properties (after Standards for Highways, 2020).</td></tr>
<tr><td>Medium</td><td>Receptor has limited capacity to tolerate changes to hydrology, geomorphology, water quality or flood risk. Water resources which support human health and/or economic activity at a local scale. Receptors with a high vulnerability to flooding.

Water resources
Controlled waters with hydrology that sustains natural variations, geomorphology that sustains natural processes, and water quality that is not contaminated to the extent that habitat quality is constrained
Supports or contributes to habitats or species that are sensitive to changes in surface hydrology, geomorphology and/or water quality
Supports Secondary A or Secondary B Aquifer with water supply abstractions
Site is within a Catchment Source Protection Zone.
Flood risk
More Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021)
Land with between 1 and 100 residential properties or more than 10 industrial premises (after Standards for Highways, 2020).</td></tr>
<tr><td>Low</td><td>Receptor has moderate capacity to tolerate changes to hydrology, geomorphology and, water quality or flood risk. Water resources that support human health and/or economic activity at a neighbourhood (multiple property) scale. Receptors with a moderate vulnerability to flooding.

Water resources
Controlled waters with hydrology that supports limited natural variations, geomorphology that supports limited natural processes, and water quality that may constrain some ecological communities
Supports or contributes to habitats that are not sensitive to changes in surface hydrology, geomorphology or water quality
Supports Secondary A or Secondary B Aquifer without abstractions
Not designated but may contain habitats or populations/assemblages of species that appreciably enrich the local habitat resource (e.g. species rich hedgerows, ponds).</td></tr>
</table>

Source	Summary
	Flood risk • Less Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021) • Land with 10 or fewer industrial properties (after Standards for Highways, 2020).
Negligible	Receptor is generally tolerant of changes to hydrology, geomorphology, water quality or flood risk. Water resource that supports human health and/or economic activity at a single property scale. Receptors with a low vulnerability to flooding. **Water resources** • Controlled waters with hydrology that does not support natural variations, geomorphology that does not support natural processes, and water quality that constrains ecological communities • Aquatic or water-dependent habitats and/or species that are tolerant to changes in hydrology, geomorphology or water quality • Non-productive strata that does not support groundwater resources • Surface water not designated for relevant features. **Flood risk** • Water Compatible Land Use as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2021) • Land with limited constraints and a low probability of flooding of residential and industrial properties (after Standards for Highways, 2020).

14.3.2.2 Definitions of magnitude of impact

32. For each of the impacts assessed in this ES, a magnitude has been assigned. In doing so the spatial extent, duration, frequency and reversibility of the impact from the construction, operation and maintenance, or decommissioning phase of the Onshore Project have been considered, where applicable.

33. The terms used to define magnitude of impact are outlined in **Table 14.5**. In addition to the criteria listed in **Table 14.5**, three specific measures of magnitude are used for assessing Water Resources and Flood Risk:

- First, for construction impacts related to the direct disturbance of surface water bodies, magnitude of impact is defined in terms of the number of trenched crossings per water body catchment. Impact thresholds are defined in **Section 14.5.1**

- Second, for construction impacts related to increased sediment supply, magnitude of impact is defined in terms of the maximum estimated area of disturbed ground. For example, for the worst-case scenario it is assumed that the full width (30m) of the Onshore Export Cable Corridor could be disturbed, as well as the maximum dimensions for all other components (e.g. White Cross Onshore Substation and temporary construction compounds). The maximum estimated area of disturbed ground is also used to assess the magnitude of impact for the supply of contaminants to surface and groundwaters, and changes to surface and groundwater flows. Impact thresholds are defined in **Section 14.5.1**
- Third, the total estimated area of permanent infrastructure is used to estimate the potential for changes in surface runoff and flood risk during operation due to an increased area of impermeable surfaces. Impact thresholds are defined in **Section 14.6**.

34. Where the assessment identifies that there is no loss or alteration of characteristics, features or components, or no observable impact in either direction upon a given receptor or group of receptors from an impact (for example due to implication of embedded mitigation or through an assessment of the potential pathway), then the assessment for that impact upon those receptor(s) will be **No Change**.

35. Impacts assessed as **No Change** have no potential for a significant effect and therefore are not assessed further.

Table 14.5 Definition of terms relating to magnitude of an impact.

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

Source	Summary
	• Reduction in off-site flood risk within the local area due to the provision of a managed drainage system.
Low	Discernible temporary change over a minority of the receptor, and/or with minimal effect on usability, risk or value. Also potential discernible alteration to key features of the receptor's character or distinctiveness. **Water resources** • Short-term or local effects on water quality or availability • Short-term degradation of a water supply source • Habitat change over the short-term • No change to water body status. • Flood risk • Short-term temporary or minor change to existing flood risk • Localised increase in on-site or off-site flood risk due to increase in impermeable area • Passing of sequential and exception test.
Negligible	Temporary change, undiscernible over longer timescales, with no effect on usability, risk or value. Slight, or no, alteration to the characteristics or features of the receptor's character or distinctiveness. **Water resources** • Temporary impact on local water quality or availability • Temporary or no degradation of a water supply source • Very slight local changes to habitat that have no observable impact on dependent receptors. • Flood risk • Temporary or very minor change to existing flood risk • Highly localised increase in on-site or off-site flood risk due to increase in impermeable area.

14.3.2.3 Significance of effect

36. The potential significance of effect for a given impact, is a function of the sensitivity of the receptor and the magnitude of the impact (see **Chapter 6: EIA Methodology** for further details). A matrix is used (**Table 14.6**) as a framework to determine the significance of an effect. Definitions of each level of significance are provided in **Table 14.7**. Impacts and effects may be deemed as being either positive (beneficial) or negative (adverse).

37. In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

Table 14.6 Significance of an effect - resulting from each combination of receptor sensitivity and the magnitude of the effect upon it

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

Table 14.7 Definitions of effect significance

Magnitude	Definition
High	A significant, very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a national or population level because they contribute to achieving national, objectives or could result in exceedance of statutory objectives and/or breaches of legislation.
Medium	A noticeable and significant change in receptor condition, which are likely to be important considerations at a regional level.
Low	Small change in receptor condition, which may be raised as localised issues but are unlikely to be important in the decision-making process.
Negligible	No discernible change in receptor condition.
No change	No impact, therefore, no change in receptor condition.

38. Potential effects are described, followed by a statement of whether the effect is significant in terms of the EIA regulations. Potential effects identified within the assessment as major or moderate are regarded as significant in terms of the EIA regulations. Whilst minor effects (or below) are not significant in EIA terms in their own right, it is important to distinguish these, as they may contribute to significant effects cumulatively or through interactions.

39. Following initial assessment, if the effect does not require further mitigation (or none is possible), the residual effect will remain the same. If, however, further mitigation is proposed, there will be an assessment of the post-mitigation residual effect.

14.3.3 Worst-case Scenario

40. In accordance with the assessment approach to the 'Rochdale Envelope' set out in **Chapter 6: EIA Methodology**, the impact assessment for Water Resources and Flood Risk has been undertaken based on a realistic worst-case scenario of predicted impacts. The Onshore Project Design Envelope (PDE) for the Onshore Project is detailed in **Chapter 5: Project Description**.

41. Using the project design envelope approach means that receptor-specific potential effects draw on the options from within the wider envelope that represent the most realistic worst-case-scenario. It is also worth noting that under this approach the combination of project options constituting the realistic worst-case scenario may differ from one receptor to another and from one effect to another.

42. The realistic worst-case scenario (having the most impact) for each individual impact is derived from the Onshore PDE to ensure that all other design scenarios will have less or the same impact.

43. **Table 14.8** presents the realistic worst-case scenario elements considered for the assessment of Water Resources and Flood Risk.

Table 14.8 Definition of realistic worst-case scenario details relevant to the assessment of impacts in relation to Water Resources and Flood Risk

Impact	Realistic worst-case scenario	Rationale
Construction		
Impact 1: Direct disturbance of surface water bodies	Trenchless methods (e.g. Horizontal Directional Drilling (HDD) or Direct Pipe) to be used to cross the River Taw estuary (between MHWS on the northern edge to MHWS on the southern edge) up to 13 m below the channel bed. A mix of trenched (open cut) and trenchless methods will be used for all other watercourses. Detailed methods for each trenched watercourse crossings are not yet known. They may include: • Temporary dams and pumping during installation of cables • Open cut crossing depths to typically provide minimum 1m below true clean bottom of watercourses • Where the cable corridor crosses an open ditch or drain, and access for the haul road is required, an appropriately sized culvert or Bailey bridge may be installed inside the channel bed to avoid upstream impoundment. This would remain in place for the duration that the haul road is required.	Direct disturbance of surface water bodies will only occur due to the temporary damming and diversion of Ordinary Watercourses where the Onshore Export Cable Corridor and haul road crosses them. Minor disturbance will occur at haul road temporary crossing points. These parameters represent the worst-case scenario of the Onshore Export Cable Corridor.
Impact 2: Increased sediment supply	**Landfall (to MLWS)** • Maximum trenchless technique temporary compound works area 0.45 ha • Maximum number of transition bays: 1	These parameters represent the maximum footprint of disturbance and activities associated with the Onshore Project that could lead to the potential disturbance of sediment, contamination

Impact	Realistic worst-case scenario	Rationale
Impact 3: Supply of contaminants to surface and groundwaters **Impact 4: Changes to surface and groundwater flows and flood risk**	• Transition bay dimensions (l x w): 20m x 8m. **Onshore Export Cable Corridor** *Route, cables and trenches:* • Maximum route length: 6km • Working corridor width (inc. haul road): 30m • Haul road width: 5m • Haul road length: 6km • Maximum number of trenches: 2 • Cable trench width: 3m • Cable trench depth: 1.9m. *Compounds* • Main compound area (Saunton Road): 2,500m^2 (0.25 ha) • Number of secondary compounds: 3 • Secondary compound area: 1,800m^2 (0.18 ha) • Bellmouth parking area (number and area): 3 (400m^2 each). *Jointing bays:* • Maximum number of jointing bays: 30 • Maximum jointing bay dimensions (l x w): 12 x 4m • Depth to top of joint bay infrastructure: 0m (accessible from surface). *Link boxes:*	and alteration of surface and groundwater flows and flood risk.

Impact	Realistic worst-case scenario	Rationale
	• Maximum number of link box locations: 30 • Maximum link box dimensions (l x w): 3 x 3m • Depth to top of joint bay infrastructure: 0m (accessible from surface). *Trenchless technique:* • Maximum number of trenchless technique locations: 3 (Landfall to MLWS, Saunton golf course, Taw estuary) plus minor trenchless techniques for water courses • Trenchless technique temporary compound dimensions: 4,500m^2 (Landfall to MLWS); 2,500m^2 (Saunton golf course and Taw estuary). *Duration and workers* • Onshore construction duration: 30months (Q2 2025 to Q3 2027) • Peak number of onshore construction workers: 60. **Onshore Substation:** • Construction compound dimensions (l x w): 100 x 50m (0.5 ha) • Access road width: 7.5m • Access road length: 250m • Length of open cut cable from substation to grid connection: 400m.	
Operation and Maintenance		
Supply of contaminants to surface and groundwater	**Onshore Substation**	These parameters represent the worst-case scenario for maintenance

Impact	Realistic worst-case scenario	Rationale
	Hazardous materials/substances: transformer oil – filled during construction, only topped up in the event of a leak. **Onshore Export Cable Corridor** Jointing bays and link boxes would require periodic access by technicians for inspection and testing during operation and maintenance. Activities are very unlikely to cause contamination.	requirements. The use of vehicles for maintenance activities is the main potential source of contaminants to surface and groundwater.
Changes to surface and groundwater flows and flood risk	**Landfall (to MLWS)** • Maximum number of transition bays: 1 • Transition bay dimensions (l x w): 20 x 8. **Onshore Export Cable Corridor** *Route, cables and trenches:* • Maximum route length: 6 km • Maximum number of export cables: 6 • Cable trench depth: 1.9 m. *Jointing bays:* • Maximum number of jointing bays: 30 • Maximum jointing bay dimensions (l x w): 12 x 4m • Depth to top of joint bay infrastructure: 0m (accessible from surface). *Link boxes:* • Maximum number of link box locations: 30 • Maximum link box dimensions (l x w x h): 3 x 3. **White Cross Onshore Substation** • Operational compound area: 6,400m^2	These parameters represent the worst-case scenario for impermeable ground and potential sources of disruption to surface and groundwater flows.

Impact	Realistic worst-case scenario	Rationale
	• Combined impermeable area (m^2): 5,760m^2 (assumed to be 90% of operational compound) • Hazardous materials/substances: transformer oil – filled during construction, only topped up in the event of a leak.	
Decommissioning		
Worst-case parameters are assumed to be no worse than those listed for construction.		

14.3.4 Summary of Mitigation

44. This section outlines the mitigation relevant to the Water Resources and Flood Risk assessment, which has been incorporated into the design of the Onshore Project. Further information is detailed in **Chapter 5: Project Description**.

14.3.4.1 Embedded Mitigation

45. The embedded mitigation measures are those defined in the IEMA guidance as either primary or tertiary mitigation. Those measures relevant to the Water Resources and Flood Risk assessment are summarised in **Table 14.9**.

46. As these measures have been embedded the assessment of effects is undertaken on the basis that these forms of mitigation will definitely be delivered. Therefore, any effects that might have arisen without these forms of mitigation do not need to be identified as 'potential effects', as there should be no potential for them to arise.

Table 14.9 Embedded mitigation measures relevant to the Water Resources and Flood Risk assessment.

Component/Activity	Mitigation embedded into the design of the Onshore Project
Overarching mitigation	
A Construction Environmental Management Plan (CEMP) will be developed for the Onshore Project. The CEMP will be developed and agreed with stakeholders to identify the measures needed to avoid, minimise or mitigate any construction effects on the environment. This will include measures to mitigate the effects associated with the parameters detailed below (i.e. watercourse crossings, disturbed ground, supply of contaminants, changes to surface water flows and flood risk, and groundwater quality and abstractions for public water supply). The CEMP will detail the procedures and methods that are to be followed by the construction workforce in order to minimise potential effects of construction on the site. An Outline Construction Environmental Management Plan is provided in **Appendix 5.C: Outline Construction Environmental Management Plan.**	
Watercourse crossings	
Cable crossings beneath watercourses	The River Taw estuary and Boundary Drain will be crossed using trenchless techniques, such as HDD or Direct Pipe, to avoid direct interaction with the channel and associated statutory designations (SSSI, SAC, Shellfish Waters).
Disturbed ground	
Sediment supply to watercourses	Under the flood risk activities permitting regime (e.g. Land Drainage Act 1991), any activities within 8m of a Main River or flood defence will need to be permitted; this increases to 16m if the Main River is tidal. In addition, a permit is also required for any "quarrying or excavation" within 16m of any Main River or flood defence. These buffer distances will be implemented to

Component/Activity	Mitigation embedded into the design of the Onshore Project
	avoid locating construction compounds, stockpiles and permanent infrastructure too close to a watercourse.
Supply of contaminants	
Storage of contaminants; accidental spillage or leakage	Operational drainage at the White Cross Onshore Substation would be developed according to the principles of the sustainable drainage system (SuDS) discharge hierarchy. The aim will be to discharge clean surface water runoff as high up the following hierarchy of drainage options as reasonably practicable: i) into the ground (infiltration); ii) to a surface water body; iii) to a surface water sewer, highway drain or another drainage system; or iv) to a combined sewer. This will include attenuation and hydrocarbon interceptors to prevent the supply of contaminants (including oils and fine sediment). 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 and transported off site for disposal at a licensed facility with appropriate treatment capacity within its existing permit. In addition, inert drilling fluid will be used for trenchless technique (bentonite) and cable ducting will be inert. Best practice guidance will also be followed: • Construction activities will adhere to industry good practice measures as detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (PPG1, PPG5, PPG8 and PPG21). Although EA PPG notes have been revoked, they have been updated as Guidance for Pollution Prevention (GPP notes) for use in Scotland and Northern Ireland (NetRegs, 2022) and can be used to establish best practice • Construction Industry Research and Information Association (CIRIA) best practice (Control of water pollution from construction sites: Guidance for consultants and contractors (C532) (2001)) will also be adhered to.
Changes to surface and groundwater flows and flood risk	
Surface water runoff	Changes in surface water runoff resulting from the increase in impermeable area following construction of the Onshore Export Cable Corridor, and particularly the White Cross Onshore Substation, would be attenuated and discharged at a controlled rate. The methodology will be developed in consultation with

Component/Activity	Mitigation embedded into the design of the Onshore Project
	the LLFA and the Environment Agency, and potentially South West Water (if a connection to their drainage infrastructure is required during construction of the White Cross Onshore Substation). A Construction Surface Water and Drainage Plan will be developed as part of the Code of Construction Practice (CoCP) in agreement with the relevant regulators. During construction, installation of the onshore export cables would be designed such that it will be bounded by parallel drainage channels (one on each side) to intercept drainage within the working width. Additional drainage channels would be installed to intercept water from the cable trench. This would be discharged at a controlled rate into local ditches or drains via temporary interceptor drains. Depending upon the precise location, water from the channels would be infiltrated or discharged into the existing drainage network. Construction drainage would be developed and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. If water enters the trenches during installation from surface runoff of groundwater seepage, this would 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.
Groundwater flows	Ground investigations and a hydrogeological risk assessment meeting the requirements of the Environment Agency's approach to groundwater protection (Environment Agency, 2018), will be undertaken at each trenchless technique 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. To protect groundwater bodies, excavation will be shallow (<2 m), except where below road or rail infrastructure and water bodies, where it may be deeper.

14.3.4.2 Further mitigation

47. Further mitigation measures that the Applicant has also committed to are detailed with reference to each specific impact in **Section 14.5** and **Section 14.6**. These

are measures identified within the IEMA guidance as secondary mitigation, and includes measures identified where potentially significant effects have been assessed. Further mitigation measures will be secured in a CoCP.

14.3.5 Baseline Data Sources

14.3.5.1 Desktop Study

48. A desk-based study was undertaken to obtain information on Water Resources and Flood Risk. Data were acquired within the study area through a detailed review of existing studies and datasets. Agreement was reached (at ETG 1 (**Table 14.14**)) with consultees that the data collected, and the sources used to define the baseline characterisation for Water Resources and Flood Risk, are fit for the purpose of the EIA.

49. The sources of information presented in **Table 14.10** were consulted to inform the Water Resources and Flood Risk assessment.

Table 14.10 Data sources used to inform the Water Resources and Flood Risk assessment.

Data Source	Date	Data Contents
Environment Agency	2019 (updated August 2022)	Catchment Data Explorer (https://environment.data.gov.uk/catchment-planning) provides information on River Basin Districts Management Catchments, Operational Catchments and water bodies.
	Undated	Flood Map for Planning showing the flood zones within the onshore scoping area (https://flood-map-for-planning.service.gov.uk/)
	Updated January 2023	The Water Quality Archive provides data on water samples taken at sampling points from coastal or estuarine waters, rivers, lakes, ponds, canals or groundwaters. (https://environment.data.gov.uk/water-quality/view/landing)
	Undated	Licensed abstraction data. Available on request from the Environment Agency.
LLFA and Environment Agency	Undated	Any previous site investigation data and public sewer records.
Department for Environment, Food and Rural Affairs (Defra)	Undated	MAGIC map (www.magic.defra.gov.uk) showing aquifer designations, groundwater vulnerability, Drinking Water Protected Areas and Safeguard, SPZs and designated sites.
British Geological Survey (BGS)	Undated	Bedrock and superficial geology.

Data Source	Date	Data Contents
Envirocheck Geographical Information System (GIS) Data	Undated	Historical maps, environmental sensitivity data, permitting records

14.3.5.2 Site Specific Survey

50. To inform the EIA, a site-specific geomorphological baseline survey was undertaken, as agreed with the statutory consultees. The purpose of the survey is outlined in **Table 14.11** and the detailed report is appended (**Appendix 14.A: Geomorphology Baseline Survey**).

Table 14.11 Summary of site-specific survey data.

Survey name and year	Summary
Geomorphological baseline survey	In order to provide site specific and up to date information on which to base the impact assessment, geomorphological walkover surveys were conducted in April and August 2022. Surveys characterised the physical characteristics of the major watercourses (Main Rivers, Ordinary Watercourses and water bodies) that would be crossed by the Onshore Project. This included an assessment of channel form, flow conditions, channel and floodplain substrates, floodplain characteristics, in-channel and riparian vegetation, and any evidence of channel modification/structures and pollution.

14.3.6 Data Limitations

51. This assessment is based on a range of publicly available information and data, which are considered to be robust. However, there is a level of uncertainty associated with their use in this impact assessment. For example, the known characteristics of the drainage network and attributes and conditions specific to water bodies have been used as a proxy to assign value and sensitivity to the wider catchment. This is a precautionary approach that ensures value and sensitivity have not been under-assessed within the assessment.

14.3.7 Scope

52. Upon consideration of the baseline environment, the Onshore Project description outlined in **Chapter 5: Project Description**, and Scoping Opinion (Case reference: EIA/2022/00002), potential impacts upon Water Resources and Flood

Risk are scoped in or out. These impacts are outlined, together with a justification for why they are, or are not, considered further, in **Table 14.12** and **Table 14.13**

Table 14.12 Summary of impacts scoped in relating to Water Resources and Flood Risk

Potential Impact	Justification
Construction	
Direct disturbance to surface water bodies	Trenched watercourse crossings and the use of temporary structures (e.g. culverts) to allow haul road access will directly disturb surface water bodies.
Increased supply of sediment	Construction activities will involve earthworks, piling, excavation and the tracking of construction machinery. This will create areas of bare ground and will increase the potential for soil erosion.
Supply of contaminants to surface and groundwaters	The use and storage of fuels, oils and lubricants associated with construction machinery will create the potential for accidental spillages or leakage of contaminants, which could contaminate surface and groundwaters. There is the potential to disturb contaminated land during construction, especially at the Onshore Substation, which could supply contaminants to surface and groundwater. Pollution from contaminated land is assessed fully in **Chapter 12: Ground Conditions and Contamination**.
Changes to surface water runoff and flood risk	Initial site preparation activities and construction works will alter surface drainage patterns and surface flows by changing the distribution and patterns of surface drainage in areas crossed by the Onshore Project.
Operation and maintenance	
Changes to surface water runoff, groundwater flows and flood risk	Permanent above ground infrastructure at the Landfall to MLWS, White Cross Onshore Substation and along the Onshore Export Cable Corridor, and any new permanent access tracks, will result in permanent changes. This may alter the movement of water and the surface and subsurface, and locally affect flood risk.

Table 14.13 Summary of impacts scoped out relating to Water Resources and Flood Risk.

Potential Impact	Justification
Operation and maintenance	
Direct disturbance of surface water bodies	Once operational, there is no mechanism for permanent infrastructure to directly disturb surface water bodies.
Supply of contaminants to surface and groundwaters	Chemicals will not be used in the operational phase. Any maintenance work will be highly localised and infrequent. Best practice mitigation will minimise the likelihood of an accidental release, or release of fine sediment, and put in place procedures for an effective response to any pollution event.
Increased supply of sediment (operation and maintenance)	Soil disturbance related to unplanned/unscheduled maintenance will be highly localised and infrequent and involve the use of best practice mitigation. Increased fine sediment supply from maintenance activities is assessed in the supply of contaminants to surface and groundwaters operational impact.
Transboundary impacts	No transboundary impacts have been identified.

14.3.8 Consultation

53. Consultation has been a key part of the development of the Onshore Project. Consultation regarding Water Resources and Flood Risk has been conducted throughout the EIA. An overview of the Onshore Project consultation process is presented within **Chapter 7: Consultation**.

54. A summary of the key issues raised during consultation specific to Water Resources and Flood Risk is outlined below in **Table 14.14**, together with how these issues have been considered in the production of this ES.

Table 14.14 Scoping opinion and Expert Topic Group (ETG) consultation responses

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
Marine Management Organisation (MMO)	30/05/2022 Scoping opinion	With regard to the objectives of the Water Environment Regulations, any new development must not cause deterioration from the present status. The MMO would expect the ES to demonstrate that the proposal will not cause deterioration in waterbody status.	**Appendix 14.B: Water Environment Regulations Compliance Assessment.**
		The MMO require the potential impact of the development on groundwater resources and groundwater quality to be assessed. This should include the appropriate measures to identify private water supplies along the corridor of the proposed cable route.	Baseline groundwater quality is described in **Section 14.1** and impacts from construction, operation and decommissioning of the Onshore Project are assessed in **Sections 14.5**, **14.6** and **14.7**. Abstraction data supplied by the Environment Agency are outlined in **Section 14.1**.
		All works near flood defences and any main river crossings should provide plans with supporting detail including engineering drawings and a detailed method statement.	The approach to works near flood defences and river crossings is outlined in **Chapter 5: Project Description**.
		Method statements and risk assessments should be produced for all watercourse crossing points along the Onshore Export Cable Corridor. Suitable methods should be employed (bunds, settlement lagoons/tanks, irrigation etc) to minimise soil run-off into watercourse at these sites. Stockpiles of sub-soil and top soil should be located and stored	Detailed methods for each watercourse crossing are not yet known. Best practice mitigation measures for trenched crossings and minimising sediment runoff are listed in **Table 14.9**.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		appropriately to minimise discoloured run-off. Downstream water quality monitoring should be put in place at these sites during operations.	Monitoring requirements (i.e. locations, timescale, frequency and parameters to be measured) will be formalised in a water quality monitoring protocol through discussions with the Environment Agency.
		An appropriate method statement and risk assessment should be prepared for the management of run-off from the sub-station construction area. Water quality monitoring of any adjacent watercourse should take place during the construction process. A sustainable urban drainage system should be put in place to deal with surface water flows from the site in the longer term, not just to manage flood risk but also to protect water quality.	Mitigation for surface runoff is outlined in **Table 14.9**. This includes an Operational Surface Water and Drainage Plan that will be developed in agreement with the relevant regulators. Monitoring requirements i.e. locations, timescale, frequency and parameters to be measured) will be formalised in a water quality monitoring protocol through discussions with the Environment Agency.
		If the Applicant intends to impound a watercourse, then it is likely an impounding licence from the Environment Agency is required. An impoundment is any dam, weir or other structure that can raise the water level of a water body above its natural level. 'O'-line' impoundments hold back water in rivers, stream, wetlands and estuaries, and consequently affect downstream flows, sediment transport and migration of fish.	Worst case scenarios for trenched crossings, including the use temporary dams during cable installation, are outlined in **Table 14.8**. An evaluation of all permits and licenses required by the Onshore Project is being undertaken as part of the wider consents strategy. These are listed in **Appendix 6.A: Mitigation Register.**
		All works near flood defences and any main river crossings should provide plans with supporting detail including engineering drawings and a detailed method statement. Please refer to the Environment	The approach to works near flood defences and river crossings is outlined in **Chapter 5: Project Description**.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		Agency's advice below regarding Environmental Permits.	
		The Environmental Permitting (England and Wales) Regulations 2016 require a permit or exemption to be obtained for any activities which will take place: • On or within 8m of a main river (16m if tidal) • On or within 8m of a flood defence structure or culverted main river (16m if tidal) • On or within 16m of a sea defence • Involving quarrying or excavation within 16m of any main river, flood defence (including a remote defence) or culvert • In a floodplain more than 8m from the river bank, culvert or flood defence structure (16m if a tidal main river) and the Onshore Project does not already have planning permission.	All permits and licenses required by the Onshore Project are listed in a separate consents strategy document.
Environment Agency		To help manage risks (i.e., any increased silt loads) to the water environment, the Environment Agency recommends that a Construction Environment Management Plan (CEMP) is developed. The CEMP should pull together and manage the pollution control and waste management requirements during the construction phase. It should ensure that adequate pollution prevention measures are included to protect controlled waters during construction. It is recommended that the CEMP is drafted using guidance in the Environment Agency's Pollution Prevention Guidelines (PPGs), in particular–PPG5 -	Embedded mitigation described in **Table 14.9** includes a CEMP. Specific measures, which reference EA PPG notes, to mitigate the potential for increased sediment supply are also listed in **Table 14.9**.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		Works and maintenance in or near water and–PPG6 - Working at construction and demolition sites.	
North Devon Council, NDC, North Devon AONB partnership	14/04/22 ETG 1	The Onshore Project was introduced and described, and a summary of key water resources receptors and mitigation was provided. Next steps were outlined (i.e. geomorphology baseline survey). A detailed summary of proposed construction mitigation measures was sent to stakeholders.	Embedded mitigation is described in **Table 14.9**.
Braunton Marshes IDB	20/03/2023 Meeting	Consultation with Braunton Marsh IDB indicated that during an average winter season Braunton Marshes are, as expected, generally saturated and waterlogged. The ground is extremely soft in places and standing or pooling water is extensive throughout the system. Routine maintenance is generally carried out from late Spring through to early Autumn when the ground is drier and firmer underfoot. Flooding on Braunton Marshes is seasonal, occurring mostly in the winter season following periods of sustained rainfall and higher water levels across the drainage ditch network.	Hydrology and surface water drainage is considered within **Appendix 14.C: Flood Risk Assessment.**
Environment Agency	16/05/2022 ETG 2	As the Environment Agency were unable to attend the first ETG meeting, the same information as described above was discussed.	Embedded mitigation is described in **Table 14.9**.
Environment Agency	26/05/2023 ETG 3	An update on the Onshore Project was provided, including the split consenting strategy and the updated red line boundary (compared to that described at ETG 2). Key points of discussion were the haul road crossing of Sir Arthur's Pill (Main River) and impact of trenched crossings. An updated list of	Impacts associated with the direct disturbance of surface water bodies, including trenched crossings and temporary haul road crossings, are assessed in **Section 14.5.1**.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		mitigation measures was sent to the Environment Agency.	Embedded mitigation measures are described in **Table 14.9** and further mitigation is described in **Section 14.5** and **14.6**.
Environment Agency, NDC	06/06/23 ETG 4	Key points discussed were: • Depth of Landfall to MLWS trenchless technique and associated flood risk/risk of sediment movement/disturbance • Water level management and flood risk on Braunton Marsh • Flood risk at the White Cross Onshore Substation.	Flood risk from all sources is assessed in **Appendix 14.C: Flood Risk Assessment.**

14.4 Existing Environment

55. This section describes the existing environment in relation to Water Resources and Flood Risk. It has been informed by a review of the sources listed in **Table 14.10**.

14.4.1 Current Baseline

14.4.1.1 Surface Water Drainage

56. Surface water drainage is considered in terms of water body catchments, as defined by the Environment Agency (**Section 14.3.1**). Receptors are those water bodies that are crossed by the Onshore Project. Surface water features are shown on **Figure 14.1**.

57. Infrastructure associated with the Onshore Project lies within two surface water catchments, which are part of the Environment Agency's Taw and North Devon operational catchment. These are:

- Taw Estuary (GB108050020000)
  - This is a freshwater river catchment without tidal influence. It is drained by Sir Arthur's Pill (Main River) and Ordinary Watercourses. To avoid confusion with the tidal estuary of the River Taw, this catchment is hereafter referred to as the 'Taw Estuary (Sir Arthur's Pill catchment)'
- Taw/Torridge (GB540805015500)
  - Estuarine waters of the River Taw and River Torridge that receive inflows from large areas of Torridge, Mid, West and North Devon.

58. The Onshore Export Cable Corridor also crosses areas of onshore coastal catchment (**Figure 14.1)**:

1. Land at Instow Barton Marsh (i.e. land south of the tidal estuary near the existing East Yelland substation) – hereafter referred to as 'coastal catchment (Instow Barton Marsh)'
2. Land between the western watershed of the Taw Estuary (Sir Artur's Pill catchment) and MLWS (i.e. Braunton Burrows) – hereafter referred to as 'coastal catchment (Braunton Burrows)'.

14.4.1.1.1 Taw Estuary (Sir Arthur's Pill catchment)

59. The majority of the Taw Estuary (Sir Arthur's Pill catchment) is characterised by flat pastures interspersed with numerous slow-flowing freshwater channels (Ordinary

Watercourses) that make up Braunton Marsh. This area was formerly inter-tidal marshland prior to embanking works in the 19th century.

60. Sir Arthur's Pill flows around the western side of Braunton Marsh and then in an easterly direction, before being joined by Boundary Drain. The lower course of Sir Arthur's Pill discharges to a channel at the edge of Horsey Island via a control structure (i.e. the Great Sluice). The Horsey Island channel then discharges to the River Caen and wider Taw-Torridge estuary.

61. Boundary Drain divides from Sir Arthur's Pill immediately west of Braunton Great Field and follows a southerly and then north-easterly direction around the perimeter of Braunton Marsh.

62. Inner Marsh Pill flows off Sir Arthur's Pill in an easterly direction through the centre of Braunton Marsh before joining Boundary Drain. The centre of Braunton Marsh is crossed by several straight, engineered channels that connect to the above-named watercourses.

63. Ordinary Watercourses that drain Braunton Marsh are managed by Braunton Marsh IDB.

64. In addition to the Main River (Sir Arthur's Pill) and Ordinary Watercourses of Braunton Marsh, Sir Arthur's Pill's catchment also includes several permanent freshwater ponds at its western boundary that have developed in the 'slacks' between the dunes of Braunton Burrows. The dune system rests on an estuarine clay layer which forms the base of a small rain-fed sand aquifer (Burden, 1998).

14.4.1.1.2 Taw/Torridge

65. The tidal River Taw widens appreciably downstream of Barnstaple (typically 400-850m wide). Below Appledore the Taw estuary is joined by the Torridge estuary and the combined water discharge to Barnstaple Bay. The usual range of the River Taw at Barnstaple tide gauge is approximately 4m. The Taw estuary has multiple designations (see **Designated Sites**).

14.4.1.1.3 Coastal catchment (Instow Barton Marsh)

66. The main area of onshore coastal catchment that will be crossed by the Onshore Project is Instow Barton Marsh, adjacent to the existing East Yelland substation. This area of land is characterised by a series of short, straight, artificial drains. The majority of drains flow to a small lake immediately north of the location of the proposed White Cross Onshore Substation, which discharges to the estuary via a control structure. There is also a culvert below a coastal embankment (flood defence) that takes higher flows to the foreshore.

14.4.1.1.4 Coastal catchment (Braunton Burrows)

67. In addition to the area of coastal catchment at Instow Barton Marsh there is a relatively small area of land between MLWS and the western watershed of the Taw Estuary (Sir Arthur's Pill catchment). There is only one short (~350m) watercourse in this catchment. It flows from the steep hillside above Saunton Sands car park and is then culverted below the car park, until it discharges onto the beach. In addition, the extent of the small sand aquifer that underlies Braunton Burrows is uncertain.

14.4.1.2 Geomorphology

68. The methodology and results of the geomorphological walkover survey undertaken in April and August 2022 are discussed in detail in **Appendix 14.A: Geomorphology Baseline Survey**. The main characteristics of each watercourse within the study area are summarised below:

- **Sir Arthur's Pill**: The channel (Main River) broadly follows the course of a large palaeochannel associated with the former inter-tidal marshland environment of Braunton Marsh. At the time of the survey, there was no evidence of flowing water or any bedforms. Upper reaches of the channel, upstream of Braunton Marsh, are narrow (~1.5-2 m width) with a trapezoidal cross-section indicative of channel maintenance (dredging/desilting). Within Braunton Marsh, the channel is wider (2-4m) and less incised. There are regular zones of floating and submerged aquatic vegetation. Channel bed and floodplain substrates are silts and clays and there is good channel-floodplain connectivity via a series of palaeochannels
- **Boundary Drain**: Similar to Sir Arthur's Pill, this Ordinary Watercourse follows the course of a large palaeochannel and there is no evidence of flowing water or any bedforms. Substrates are silts and clays, with similar vegetation as described for Sir Arthur's Pill. Several small sluice gates cross the channel, and banks are artificial where bridges cross the channel to allow agricultural vehicles to access to the marsh. The channel (2-4m in width) is trapezoidal in cross-section with evidence of dredging – old dredgings line the channel to form small embankments in places, which limits channel-floodplain connectivity
- **Inner Marsh Pill**: As described for Boundary Drain. In addition, the middle and lower reaches of the channel follow a sinuous palaeochannel. In contrast, the upper reach is entirely artificial and is formed by a straight/engineered cut that joins Inner Marsh Pill to Sir Arthur's Pill. In the upper (engineered) reach, old dredgings can be seen lining the banks, which limit channel-floodplain connectivity

- **Ordinary Watercourses near Saunton Golf Course**: An area characterised by several short, straight, incised channels. Their artificial form and location (set within arable farmland) suggests they are regularly maintained (by dredging/desilting). Channels are typically 1-1.5m and densely overgrown with riparian vegetation. Where water was visible, it was ponded, and some channels were dry. There was no evidence of bedforms. One channel at the southern end of Saunton golf course flows through woodland and appears to have a more natural form. Although dry at the time of survey, abundant in-channel wood and roots suggests flows may be more varied at this location
- **Braunton Burrows ponds**: These small ponds are not connected to the surface water drainage network and are linked to groundwater and rainfall. They are typically shallow (<1m) and surrounded at the water's edge by reeds and rushes. Banks are low (<0.5) and they have sandy beds. Riparian areas are typically surrounded by scrub and wet woodland. Bankside locations show signs of erosion associated with recreational use
- **Ordinary Watercourses at Instow Barton Marsh**: There are two main artificial channels at Instow Barton Marsh, one of which is cut into the course of a palaeochannel associated with the former inter-tidal marshland environment. The other is an engineered cut that connects to the aforementioned channel. Channels are typically trapezoidal in cross-section, indicative of maintenance (dredging), and there were no bedforms or evidence of flowing water during the survey. Channel bed and banks are characterised by silts and clays, and there is limited channel-floodplain connectivity owing to the artificial and incised nature of the watercourses. There are several sites of bank erosion associated with cattle poaching
- **Taw/Torridge estuary**: Estuarine waters characterised by sandy channel substrate and bedforms (dunes and ripples) at low water. At the point where the onshore export cables will be tunnelled below the estuary, the channel is ~1,000m wide and has a wetted channel width at low water of ~250m. Tidal range is ~8m at the estuary mouth and closer to ~4m just downstream of Barnstaple. Channel floodplain connectivity is restricted by flood defences on both banks. Control structures (sluices) on the foreshore discharge freshwater to the estuary.

14.4.1.3 Water Quality

69. A review of the Environment Agency's Catchment Data Explorer gives an indication of water quality across the catchments of interest.

70. The Taw Estuary water body (GB108050020000), which is classed as heavily modified, is at Moderate ecological potential. Significant water quality pressures are evidenced by a Bad classification for biological quality elements (invertebrates) and physico-chemical quality elements (dissolved oxygen). The water body is at Fail for chemical status due to high levels of some priority hazardous substances (mercury and its compounds and polybrominated diphenyl ethers (PBDE)).

71. Reasons for the water body not achieving a good status are physical modifications (flood protection) and pressure on flows (land drainage) – these factors are adversely affecting invertebrates and dissolved oxygen.

72. Water quality data sampled from the outflow of Braunton Marsh (monitoring site ID: 73010807) shows Good to High status for ammonia, phosphate and temperature, and poor for dissolved oxygen. Data from a site on Inner Marsh Pill (monitoring site ID: 73010807) was classed as poor for invertebrates.

73. The Taw/Torridge transitional water body (GB540805015500), which is also classed as heavily modified, is at Moderate ecological status. Water quality pressures are evidenced by Moderate physico-chemical elements (dissolved inorganic nitrogen). Supporting elements (surface water) are classed as Moderate or less. The water body's chemical status is also at Fail, due to high levels of priority hazardous substances (Benzo(g-h-i)perylene, mercury and its compounds, PBDE.

74. Reasons for the water body not achieving a good status relate to diffuse (poor livestock, soil and nutrient management, septic tanks) and point source (sewage discharge) pollution, and physical modifications (flood protection).

75. Water quality data from the Taw Estuary Shellfish monitoring site (ID 73010260) are Good to High for a range of metals (e.g. arsenic, lead, cadmium, copper) and other compounds (e.g. nonylphenol, trichloromethane).

76. The Onshore Project is underlain by two groundwater bodies (River Taw and North Devon Streams (GB40802G801000); Torridge and Hartland Streams (GB40802G800600) which are at Poor overall status. The water bodies are adversely affected by diffuse pollution from agriculture.

14.4.1.4 Flood Risk

77. A flood risk summary is provided below, and a full FRA can be found in **Appendix 14.C: Flood Risk Assessment.**

14.4.1.4.1 Flood risk from rivers and the sea

78. The Onshore Export Cable Corridor crosses three main areas of flood risk (**Figure 14.3**):

- Land from the main construction compound off Saunton Road and along the haul road to the Onshore Export Cable Corridor is in Flood Zone 3. Flood Zone 3 is defined as land that has a 1% or greater annual probability of river flooding, or a 0.5% or greater probability of flooding from the sea
- The Onshore Export Cable Corridor is located entirely withing Flood Zone 3 from the point where it crosses America Road and in southerly direction onto Braunton Marsh, until reaching the Taw estuary trenchless technique location. This includes the haul road and all other access tracks.
- South of the estuary the Onshore Export Cable Corridor and White Cross Onshore Substation are located in Flood Zone 3. Small sections of haul road and other access tracks cross Flood Zone 2. Flood Zone 2 is defined as land that has a 0.1% to 1% annual probability of river flooding, or a 0.1% to 0.5% annual probability of flooding from the sea.

79. A detailed assessment of flood risk from all sources can be found in **Appendix 14.C: Flood Risk Assessment**.

14.4.1.4.2 Surface water flood risk

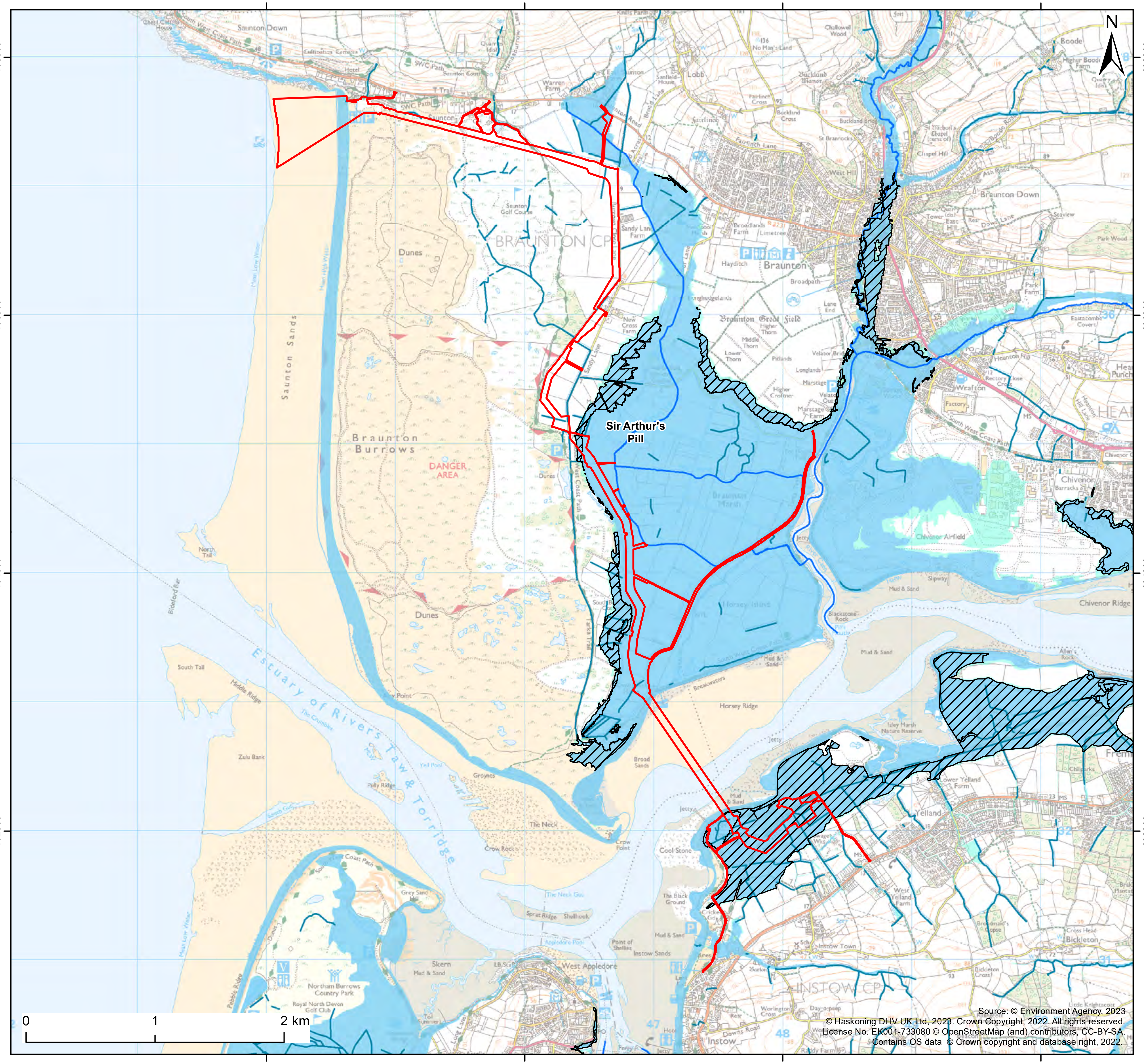
80. The Onshore Export Cable Corridor crosses land that is predominantly at very low risk of surface water flooding. There are several narrow surface water flow paths at medium to high risk associated with palaeochannels and drainage ditches where the route crosses the corner of Braunton Marsh near Boundary Drain and Sir Arthur's Pill.

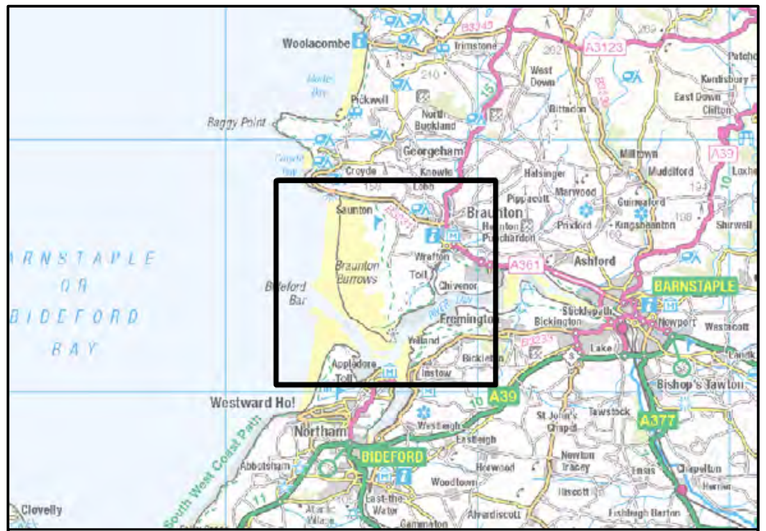
81. There are more extensive areas at medium to high risk of surface water flooding at Instow Barton Marsh either side of the Tarka Trail, and immediately north of the existing East Yelland substation and in the area of the White Cross Onshore Substation. The old railway embankment/Tarka Trail appears to block surface water flows to the north, creating a relatively large high risk area on the southern side of the embankment.

14.4.1.4.3 Reservoir flood risk

82. There is a risk of flooding associated with a dam or reservoir failure for a 'wet day' scenario (i.e. flooding expected if a river is already experiencing an extreme natural flood), although this is confined to the Taw-Torridge estuary between the flood embankments. This area will be tunnelled under using trenchless (HDD or Direct Pipe) methods.

Figure 14.3 Flood Risk





Legend:

- Onshore Development Area
- Statutory Main River
- Ordinary watercourse
- Areas Benefiting from Flood Defences
- Flood Zone 2
- Flood Zone 3

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title: Flood Risk

Figure: 14.3 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0243

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	06/06/2023	AB	SF	A3	1:30,000
P01	17/06/2022	AB	SF	A3	1:30,000

Co-ordinate system: British National Grid

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14.4.1.5 Groundwater

83. The majority of the Onshore Project north of the Taw/Torridge estuary is underlain by rocks of the Pilton Mudstone Formation. There are smaller areas underlain by rocks of the Doddiscombe Formation and Codden Hill Chert Formation, and the Ashton Mudstone Member and Crackington Formation, close to Crow Point car park. The latter formations underlie all of the Onshore Project south of the estuary (i.e. the White Cross Onshore Substation area). These strata support a Secondary A aquifer, which means it comprises permeable layers that can support local water supplies and may form an important source of base flow to rivers (Environment Agency, 2017).

84. Superficial deposits underlying the Onshore Project are characterised by blown sand (Braunton Burrows), tidal flat deposits (Braunton Marsh) and alluvium (Instow Marsh Barton) (British Geological Survey, 2022). From the Landfall (to MLWS) to Saunton Golf Course, these deposits support a Secondary A aquifer. The majority of the Onshore Export Cable Corridor, from Saunton golf course to Crow Point car park, crosses a Secondary (undifferentiated) aquifer – defined as aquifers where it is not possible to apply either a Secondary A or B definition because of variable rock type characteristics. These have only a minor value (Environment Agency, 2017) and correspond to negligible sensitivity (**Table 14.4**).

85. South of the estuary, at the White Cross Onshore Substation area/Instow Barton Marsh, alluvium supports Secondary A and Secondary (undifferentiated) aquifers.

86. Groundwater vulnerability maps show the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a single square kilometre. The Environment Agency's groundwater vulnerability maps indicate that from the Landfall (to MLWS) to Sandy Lane, the Onshore Project is located predominantly within a zone of medium-high vulnerability. From Sandy Lane to Crow Point car park, vulnerability is medium. South of the estuary, at the White Cross Onshore Substation area/Instow Barton Marsh, approximately half of the Onshore Project is within a zone of medium-high vulnerability, and the other half is medium vulnerability.

87. The Onshore Export Cable Corridor does not cross any source protection zones or drinking water safeguard zones.

14.4.1.6 Abstractions and Discharges

88. There are two abstraction licenses in the Onshore Development Area:

- New Cross Farm (spring fed excavation at NGR SS 471 357)

  - 27.3 m^3 per hour, 72.7 m^3 per day, with a total of 1,091m^3 during the period 1st April to 30th September each year – for spray irrigation. Located 390m east of the Onshore Export Cable Corridor.

- Saunton Golf Club (borehole at NGR SS 458 374)

  - Abstraction shall not exceed 9.09 m^3 per hour; 218.21 m^3 per day; with a total of 26,185.48 m^3 during the period 1st March to 31st October each year.

60. Some low risk water discharge and groundwater activities can be exempt from requiring a permit – most exceptions are for small sewage discharges. Environment Agency data shows there are two discharge exemptions within the Onshore Development Area. These are located:

- Beside the B3231 road in Saunton (Windy Ridge, EX33 1LG)
- Sandy Lane Farm (EX33 2NU).

89. There is a third exemption location very close (~5m) to the Onshore Export Cable Corridor, located at:

- Whitegates, Velator (EX33 2NU). Further details are available for this site which state that the discharge consists of sewage effluent into the ground of two cubic metres per day or less.

14.4.1.7 Designated Sites

90. Between the Landfall (to MLWS) and the point where the Onshore Export Cable Corridor turns south, near Saunton Golf Course, the Onshore Export Cable Corridor crosses part of Braunton Burrows SAC and SSSI, and North Devon AONB. These designated sites will be avoided using trenchless techniques to tunnel from the Landfall (MLWS) to beyond the boundary of the designated sites.

91. Braunton Burrows SAC and SSSI are designated primarily for their extensive dune system, but it is also important for its extensive system of variably flooded slacks, grassland and scrub. Last assessed in 2013 at mostly (68%) unfavourable recovering status.

92. In the catchment of Sir Arthur's Pill there are two other SSSIs adjacent to the watercourses of Braunton Marsh. These are:

- Greenaways and Freshmarsh, Braunton SSSI. This comprises two sites – one adjacent to Boundary Drain, and a second adjacent to Sir Arthur's Pill further into the marsh. This SSSI is of special interest for its herb-rich marshy grasslands and rich water-plant communities occurring in drainage ditches

These habitats are of particular importance as they now have a very restricted distribution in Devon. Last assessed in 2012/13 at mostly (68%) unfavourable recovering status

- Braunton and Swanpool SSSI. This site is important for its reedbed and herb-rich marshy grasslands habitats, which are rare in North Devon. Last assessed in 2012 at mostly (87%) favourable status.

93. The tidal estuary is designated as a SSSI (Taw-Torridge Estuary SSSI) because it is of major importance for its overwintering and migratory populations of wading birds. In addition, rare plants grow along its shores. Last assessed in 2011/12 at mostly (96%) favourable status.

94. The estuary is also designated as Shellfish Waters and a coastal sensitive area (eutrophic). Saunton Sands is a designated Bathing Water.

95. More detail relating to designated sites can be found in **Chapter 16: Onshore Ecology and Ornithology**.

14.4.1.8 Sensitivity of Receptors

96. As described in **Section 14.4.1.1** and **Section 14.4.1.5**, there is one river water body (Taw Estuary (i.e. Sir Arthur's Pill catchment)), one transitional water body (Taw/Torridge) and two groundwater bodies (River Taw and North Devon Streams, Torridge and Hartland Streams) crossed by the Onshore Project. Land outside the boundaries of river and transitional water bodies (e.g. Instow Barton Marsh) is classed as coastal catchment. The sensitivity of each catchment receptor has been set at catchment level and applied to all water courses therein.

97. The sensitivity of each surface water receptor has been defined in **Table 14.15** below and is based on the geomorphological, hydrological and water quality characteristics described in **Section 14.4.1**. The sensitivity of the groundwater body underlying the Onshore Project has been defined based on recorded water quality and water body use.

Table 14.15 Water Resources and Flood Risk receptor sensitivity.

Catchment receptor	Sensitivity	Justification
River and transitional catchments		
Taw Estuary (Sir Arthur's Pill catchment)	High	Watercourses comprise parts of a heavily modified river water body. Channels are largely engineered and resectioned with little or no flow diversity, no observable bedforms, and they are regularly maintained (desilted). Water quality is adversely affected by physical

Catchment receptor	Sensitivity	Justification
		modifications (flood protection) and pressure on flows (land drainage), which in turn are adversely affecting invertebrates and dissolved oxygen levels. Water levels are managed via a series of sluices. Even though the catchment is dominated by heavily modified (engineered) channels, sensitivity is high because the catchment includes part of Braunton Burrows SAC and SSSI, Greenaways and Freshmarsh, Braunton SSSI, and Braunton Swanpool SSSI.
Taw/Torridge	High	Heavily modified transitional water body suffering water quality issues due to diffuse (poor livestock, soil and nutrient management, septic tanks) and point source (sewage discharge) pollution, physical modifications (flood protection), and high levels of priority hazardous substances. Despite these water quality pressures, sensitivity is high because of SSSI and SAC designations (part of Braunton Burrows SAC overlaps the estuary). The estuary also supports designated shellfish waters and is classed as a coastal sensitive area (eutrophic).
Coastal catchment (Instow Barton Marsh)	High	Channels at Instow Barton Marsh are engineered and resectioned with no evidence of bedforms or flowing water. Water quality is adversely affected by diffuse (poor livestock, soil and nutrient management, septic tanks) and point source (sewage discharge) pollution, and physical modifications (flood protection). Sensitivity is high due to the presence of the Taw-Torridge Estuary SSSI, which hydrologically connected to the marsh as water discharges via culverts from the marsh to the estuary.
Coastal Catchment (Braunton Burrows)	High	There is only one short (~350m) watercourse in this catchment. It flows from the steep hillside above Saunton Sands car park and is then culverted below the car park, until it discharges onto the beach. The area of catchment crossed by the Onshore Export Cable Corridor may also be underlain by the small sand aquifer that contributes to the freshwater ponds within the dune 'slacks' of the SAC (the catchment is part of Braunton Burrows SAC and SSSI).

Catchment receptor	Sensitivity	Justification
Groundwater catchments		
Taw River and North Devon Streams	Medium	Groundwater vulnerability maps indicate that the Onshore Project is predominantly located within an area of medium to medium-high groundwater vulnerability. The groundwater body also supports a Secondary A aquifer. The Onshore Export Cable Corridor does not cross any source protection zones or drinking water safeguard areas. The nearest Drinking Water Protected Area is ~8.5 km upstream of the Onshore Export Cable Corridor. The closest source protection zone is ~4.2 km away at Croyde. The groundwater body is at Poor overall status. There are two small scale borehole abstractions within the Onshore Export Cable Corridor for spray irrigation.
Torridge and Hartland Streams	Medium	Groundwater vulnerability maps indicate that the Onshore Project is predominantly located within an area of medium groundwater vulnerability. The groundwater body also supports bedrock and superficial Secondary A aquifers. The groundwater body is at Poor overall status.

14.4.2 Do Nothing Scenario

98. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the ES (EIA Regulations, Schedule 4, Paragraph 3). From the point of assessment, over the course of the development and operational lifetime of the Onshore Project (operational lifetime anticipated to be a minimum of 50 years), long-term trends mean that the condition of the baseline environment is expected to evolve.

99. This section provides a qualitative description of the evolution of the baseline environment, on the assumption that the Onshore Project is not constructed, using available information and scientific knowledge of Water Resources and Flood Risk.

100. The Do Nothing scenario for the baseline environment is described below.

14.4.2.1 Surface Water Drainage

101. Surface water drainage associated with the Onshore Project is currently dominated by fluvial, as opposed to estuarine and coastal, processes. The embankment that formerly protected Horsey Island from inundation was breached in 2018, and the

area now floods with each high tide. This puts pressure on the embankment that defends the catchment of Sir Arthur's Pill (Braunton Marsh). Under a Do Nothing scenario, with a lack of embankment maintenance and continued sea level rise this century, large areas of Sir Arthur's Pill's catchment and Braunton Marsh would revert to drainage patterns associated with tidal influence, e.g. development of pools, creeks and saltmarsh (as is currently taking place at Horsey Island)). Similar environments and surface water drainage patterns could develop at Instow Barton Marsh, adjacent to the existing substation, if existing flood defences are not maintained.

14.4.2.2 Geomorphology

102. Main Rivers and Ordinary Watercourses crossed by the Onshore project do not support diverse geomorphological forms and processes, or a diversity of flows and associated aquatic habitat niches. This is because of extensive resectioning and regular maintenance (desilting). Ongoing measures to reduce existing pressures on geomorphology, as part of the implementation of the WER, are likely to improve watercourse condition over time – a steady improvement in the baseline condition is expected.

103. If the flood embankment that protects Braunton Marsh fails, the straight/engineered channels that characterise the marsh would be replaced by estuarine forms and processes (e.g. development of pools, creeks and salt marsh) associated with tidally influenced water levels.

104. A combination of existing initiatives (Dynamic Dunescapes) to reactivate the largely fossil dune system of Braunton Burrows, and increased winter storminess associated with climate change, may increase the area of active blown sand at Braunton Burrows. Sand dunes may encroach inland towards watercourses and their floodplains.

14.4.2.3 Water Quality

105. Ongoing initiatives are in place to reduce pressures on water bodies including increased regulation of agricultural chemicals, in order to achieve compliance with the WER. Various agri-environmental schemes and initiatives are also available that can help to improve water quality (e.g. Country Stewardship Scheme, Catchment Sensitive Farming). This would suggest that surface water quality and groundwater quality and quantity is likely to improve in the future.

14.4.2.4 Flood Risk

106. If the flood embankment that protects Braunton Marsh from coastal flooding fails, and sea levels continue to rise through the rest of this century, Braunton Marsh will revert to an area dominated by estuarine processes and flood risk controlled more by sea levels and coastal storms than the present situation (fluvial flooding from river water courses). As sea levels rise, more areas of the coastal catchment associated with the Taw/Torridge catchment will be at risk of flooding from the sea.

14.4.2.5 Abstractions

107. Due to climate change and associated warmer, drier summers, water resources associated with the Secondary A aquifer that characterises the Onshore Project may come under more pressure, due to more permits to abstract being sought. This could have associated impacts on surface and groundwater hydrology, water quality and designated sites.

108. However, ongoing initiatives are in place to reduce pressures on groundwater, including increased regulation of agricultural chemicals, in order to achieve compliance with the WER (Environment Agency, 2022). This would suggest that groundwater quality and quantity is likely to improve in the future, although this would occur over long timescales.

14.4.2.6 Designated Sites

109. Braunton Burrows SSSI is currently at unfavourable recovering status and initiatives to improve the dunes (Dynamic Dunescapes) by increasing areas of bare sand and removing scrub are likely to lead to a steady and continual improvement. A planning application has been approved to 'notch' some of the dunes to create larger areas of bare sand and more natural geomorphology (North Devon Council, 2022). SSSIs situated in Braunton Marsh (Greenaways and Freshmarsh, Braunton SSSI and Braunton and Swanpool SSSI) may be affected by a reversion to tidal processes. This would very likely eliminate features of interest in the freshwater ditch system. Water quality improvement in line with the WER would likely lead to an improvement in Shellfish Waters.

14.5 Potential impacts during construction

110. The potential impacts during construction of the Onshore Project have been assessed for Water Resources and Flood Risk. A description of the potential effect on Water Resources and Flood Risk caused by each identified impact is given in this section.

14.5.1 Impact 1: Direct disturbance of surface water bodies

111. The Taw/Torridge catchment will be crossed using trenchless techniques. Options for the river crossing are HDD or Direct Pipe. Trenchless technique entry and exit points would be located on the adjacent floodplains of the Taw Estuary (Sir Arthur's Pill catchment), and coastal catchment (Instow Barton Marsh). The cable would be installed up to 13 m below the channel bed – the depth of the drill path below the channel bed at the Taw Estuary Crossing (between MHWS on the northern edge to MHWS on the southern edge) will be confirmed following completion of hydrofracture calculations and geotechnical investigations (**Appendix 5.B: Braunton Burrows and Taw Estuary Crossing Method Statement**).

112. Although ground disturbance will occur at trenchless technique entry and exit points, there will be no direct disturbance in the Taw/Torridge catchment. Trenchless technique will also be used to cross some Ordinary Watercourses. Therefore, there is no direct mechanism for impacts to occur to the geomorphology, hydrology and physical habitats of any channels crossed using trenchless technique methods.

113. Direct disturbance of Ordinary Watercourses will occur at trenched crossings. Trenched crossings will involve installing temporary dams (composed of sand bags, straw bales and ditching clay, or another suitable technique) upstream and downstream of the crossing point. The cable trench is then excavated in the dry area of riverbed between the two dams with the river flow maintained using a temporary pump or flume.

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

115. In addition to the cable infrastructure itself, it may be necessary to install temporary structures to allow haul road access across watercourses where direct access is not readily available from both sides. Sir Arthur's Pill (Main River) will require one temporary crossing to allow haul road access to the Onshore Export Cable Corridor. At the point where it is crossed, Sir Arthur's Pill is an extensively resectioned channel with limited geomorphological function.

116. Temporary crossings may comprise an appropriately sized culvert installed within the channel with the haul road being installed over the top of the culvert. The culvert

would be installed beneath the channel bed to avoid the upstream impoundment of flows and sediment. Culverts 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, or sensitive rivers, temporary bridges (e.g. Bailey bridges or similar) may be installed to allow continuation of the haul road.

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

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

14.5.1.1 Magnitude of impact

119. For the purposes of this assessment, magnitude of impact is assumed to be proportional to the total number of trenched watercourse crossings within each river water body catchment, as shown in **Table 14.16** Magnitude of impact of trenched watercourse crossings**.** Impact thresholds for the direct disturbance of water bodies have been developed on the basis of professional judgement as used in other wind farm projects (Equinor, 2022).

120. The number of water body crossings in each surface water catchment is shown in **Table 14.17** Number of watercourse crossings in each water body catchment.. Based on the criteria presented in **Table 14.16** Magnitude of impact of trenched watercourse crossings., magnitude of impact will be **low** in the coastal catchment (Instow Barton Marsh) (three trenched crossings) and **medium** in the Taw Estuary (Sir Arthur's Pill catchment) (14 trenched crossings). Although there are a relatively high number of trenched crossings in the Taw Estuary (Sir Arthur's Pill catchment), over half of these (eight) are very minor artificial and ephemeral ditches beside hedgerows. They are not shown as permanent water features on detailed 1:10,000 mapping on Defra Magic. The remaining six ditches are artificial drainage features, but they do hold water and direct disturbance impacts would be more apparent in these six ditches. The only significant Ordinary Watercourse in terms of dimensions and containing flowing water is Boundary Drain, which will be crossed using trenchless techniques.

121. As a worst case, one trenched crossing (**negligible** impact) may be required in the coastal catchment (Braunton Burrows). An Ordinary Watercourse is culverted below Saunton Sands car park and the flows in an open drain adjacent to the existing access track to the beach. On the foreshore, flows become unconfined and the channel merges with the wider coastal environment. There could be some disturbance to this channel on the beach depending on the final position of the Onshore Export Cable Corridor on the foreshore. The position and dimensions of the channel on the foreshore change during very high tides.

122. No change is expected in the Taw/Torridge catchment as the estuary will be crossed via trenchless technique.

123. As well as direct disturbance from trenched crossings, there will be some highly localised disturbance associated with the installation of temporary crossing structures to allow the haul road to continue (i.e. culverts and Bailey bridges) in the Taw Estuary (Sir Arthur's Pill catchment) and coastal catchment (Instow Barton Marsh). As the watercourse in the coastal catchment (Braunton Burrows) is culverted, there will be no temporary crossings in this catchment.

Table 14.16 Magnitude of impact of trenched watercourse crossings.

Magnitude of impact	Number of trenched crossings per catchment
Negligible	1-4
Low	5-9
Medium	10-14
High	≥15

Table 14.17 Number of watercourse crossings in each water body catchment.

Water body catchment	Main River and estuary crossings (trenchless technique)	Ordinary Watercourse crossings	
		Trenchless technique	Trenched
Taw Estuary (Sir Arthur's Pill catchment)	0	6	14
Taw/Torridge	1	0	0
Coastal catchment (Instow Barton Marsh)	0	1	3
Coastal catchment (Braunton Burrows)	0	1	1

14.5.1.2 Sensitivity of the receptor

124. Receptor sensitivity is detailed in **Table 14.15**. Sensitivity is high in all surface water catchments due to statutory designations (SAC, SSSIs).

14.5.1.3 Significance of effect

125. Error! Reference source not found. assesses the significance of effect for direct disturbance of surface water bodies due to construction activities. No change is expected in the Taw/Torridge catchment as there are no trenched crossings or temporary watercourse crossings. Significance of effect is **minor adverse** in the coastal catchment (Braunton Burrows) and coastal catchment (Instow Barton Marsh).

126. Significance of effect is **major adverse** in the Taw Estuary (Sir Arthur's Pill catchment), although as described most of the trenched crossings relate to very minor, ephemeral hedgerow ditches. Although a major adverse effect encompasses the worst case scenario, in reality there are only six trenched crossings that hold permanent water, which gives a more realistic idea of effect (moderate adverse).

14.5.1.4 Further mitigation

127. Trenchless technique has been embedded into the scheme design for the Taw/Torridge catchment (i.e. the estuary), and trenchless technique will be used to cross some Ordinary Watercourses. This means there are no significant mechanisms for direct impacts to occur to the geomorphology, hydrology and physical habitat of these watercourses. Therefore, no further mitigation is proposed at trenchless technique locations.

128. Mitigation is especially relevant for the Taw Estuary (Sir Arthur's Pill catchment) (major adverse significance of effect), but the following measures will be applied to all catchments to ensure best practice is followed and any potential impacts are minimised. Mitigation would include:

- The amount of time that temporary dams are in place will be kept to a minimum
- Flumes or pumps would be adequately sized to ensure that flows downstream are maintained whilst minimising upstream impoundment
- 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
- Use adequately sized culverts to avoid impounding flows and ensure that there is no reduction in flow conveyance (including an allowance for potential increases in winter flows as a result of projected climate change)

- Install culverts below the active bed of the channel, so that sediment continuity and movement of fish and aquatic invertebrates can be maintained
- Where feasible Bailey Bridges will be used instead of culverts as the degree of disturbance is less (only channel banks as opposed to channel bed disturbance)
- At trenched crossing locations, the cable will be buried a minimum of 1.5m below the bed level. This will ensure that there is sufficient thickness of natural bed substrates to prevent geomorphological impacts (e.g. bed scour and channel instability) and avoid exposure during periods of higher energy flow where the bed could be mobilised (allowing for climate-related increases in fluvial flows and erosion in the future). Installation depths at watercourse crossings will be confirmed with the relevant drainage authority post-consent
- Sympathetic reinstatement of channel bed and banks. This means keeping any coarse substrate separate and reinstating on the bed and recreating a natural profile when the bed and banks are reinstated – this also applies to any temporary bridges and culverts that are required (e.g. haul road crossing of Sir Arthur's Pill (Main River))
- 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
- Prior to dewatering the area between the temporary dams, a fish rescue would be undertaken (if required)
- The Onshore Project is committed to assessing Biodiversity Net Gain (BNG) opportunities to restore and improve any habitat impacted as a result of the construction Where possible, localised improvements to the geomorphology and in-channel habitats will be considered where they are crossed using open cut techniques (e.g. by replacing resectioned banks with more natural profiles that are typical of the natural geomorphology of the watercourse). Note that any enhancements to directly affected watercourses would be limited to within the Onshore Project red line boundary.

14.5.1.5 Residual significance of effect

129. Mitigation will reduce the magnitude of impact from medium to low in the Taw Estuary (Sir Artur's Pill catchment). Despite a low magnitude of impact, sensitivity is high due to statutory designations in this catchment, which means the residual significance of effect is **moderate adverse**. However, as stated previously, this is a worst-case scenario as most of trenched crossings are small, artificial ephemeral ditches. It is also important to note that impacts resulting from temporary dams associated with trenched crossings would be restricted to the period in which the

impounding structures are in place. Any changes to the condition of each watercourse would be reversible once the structures have been removed and the reinstatement measures described above have been implemented. The natural hydrology would recover immediately upon structure removal, and geomorphology and associated physical habitats are also expected to recover rapidly. The use of these techniques is therefore not considered to result in significant adverse effects.

130. Further mitigation in coastal catchment Braunton Burrows and coastal catchment (Instow Barton Marsh) will not reduce the magnitude of impact below negligible, and therefore significance of effect will remain **minor adverse**. However, the further mitigation measures described above for direct disturbance will still be implemented as they are important in limiting any impacts.

131. It is considered likely that effects of direct disturbance will be of lesser magnitude than existing baseline conditions imposed by channel management techniques. For example, many channels in the Taw Estuary (Sir Arthur's Pill catchment) are regularly dredged over tens of metres, and old dredgings can be seen lining the banks (see **Appendix 14.A: Geomorphology Baseline Survey**).

Table 14.18 Significance of effect resulting from direct disturbance of surface water bodies

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect – pre-mitigation	Residual significance of effect
Taw Estuary (Sir Arthur's Pill catchment)	High	Although there are 14 trenched crossings in this catchment, most of these are small ephemeral ditches and the only Ordinary Watercourse of any significance in terms of width/depth and presence of flowing water (Boundary Drain) will be crossed using a trenchless technique. Mitigation will reduce the magnitude of impact from medium to low, and significance of effect from major to moderate adverse, although this is very much a worst-case scenario.	Medium	Major adverse	Moderate adverse
Taw/Torridge	High	The Taw-Torridge catchment will be crossed with trenchless techniques (up to 13 m below the channel bed). There will be no direct disturbance to the river channel.	No change	N/A	N/A
Coastal catchment (Instow Barton Marsh)	High	There are three trenched crossings in this catchment, all of which are relatively minor Ordinary Watercourses (ditches). Best practice mitigation will used to reduce any impacts, but this will not reduce impacts to less than negligible and significance of effect would remain minor adverse.	Negligible	Minor adverse	Minor adverse
Coastal catchment (Braunton Burrows)	High	Depending on the final position of the Onshore Export Cable Corridor there may be some disturbance of the small watercourse that is culverted below Saunton Sands car park as it flows across the foreshore. Flows are unconfined in this area and the channel is liable to shift position during very high tides.	Negligible	Minor adverse	Minor adverse

14.5.2 Impact 2: Increased sediment supply

132. The construction of the Landfall (to MLWS), Onshore Export Cable Corridor and White Cross Onshore Substation will involve earthworks, piling, excavation and the tracking of large construction machinery. A haul road will also be required. Construction activities will create areas of bare ground by removing vegetation cover and topsoil, increasing the potential for soil erosion. This could result in an increase in the supply of fine sediment (i.e. clays, silts and fine sands) to surface water bodies through surface runoff and the erosion of disturbed soils.

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

134. Additionally, temporary bridges may be used to maintain haul road access across water bodies. These crossings would provide a mechanism by which sediment could be produced close to the water bodies which they cross. Disturbed ground associated with trenched crossings also has the potential to increase sediment supply.

14.5.2.1 Magnitude of impact

135. **Table 14.19** shows the criteria used to assess the magnitude of impact associated with increased sediment supply resulting from disturbed ground in a water body catchment. Impact thresholds for increased sediment supply have been developed on the basis of professional judgement (Equinor, 2022).

Table 14.19 Magnitude of impact resulting from disturbed ground in a water body catchment.

Magnitude of impact	Area of disturbed ground during construction
Negligible	<1%
Low	1 - <6%
Medium	6 - <10%
High	>10%

136. Magnitude of impact is based on a 30m working corridor width and worst case dimensions for all compounds (temporary construction compounds, trenchless

technique and substation compounds). These figures provide a high-level proxy for the magnitude of impact for the maximum area of disturbed ground during construction in surface water catchments.

137. Areas of disturbed ground range from 0.02 to 0.16 km^2, which equates to 0.2 to 1% of catchments areas (**Table 14.20**). This means that magnitude of impact is **negligible** in all catchments except the Taw Estuary (Sir Arthur's Pill catchment) where it is **low**.

138. There will not be any disturbed ground in the Taw/Torridge catchment. The only activity in this catchment will be trenchless techniques, up to 13 m below the estuary bed. Trenchless technique entry and exit points will be located on adjacent floodplains (i.e. not in the Taw/Torridge catchment). However, as a worst scenario, allowance has been made for potential water and sediment runoff from these adjacent catchments to the estuary, as they are hydrologically connected. As a worst case, magnitude of impact has been assessed as negligible. Any impacts in the estuary would very likely be of lower magnitude than sediment deposition associated with turbid flows and floods following heavy rainfall/flooding.

Table 14.20 Estimated maximum area of disturbed ground in each catchment receptor

Water body catchment	Estimated area of disturbed ground during construction	
	km^2	%
Taw Estuary (Sir Arthur's Pill catchment)	0.16	1.0
Taw/Torridge	N/A	N/A
Coastal catchment (Instow Barton Marsh)	0.04	0.7
Coastal catchment (Braunton Burrows)	0.02	0.2

14.5.2.2 Sensitivity of the receptor

139. Receptor sensitivity is detailed in **Table 14.15**. Sensitivity is **high** in all surface water catchments due to statutory designations (SAC, SSSIs).

14.5.2.3 Significance of effect

140. **Table 14.21** assesses the significance of effect for increased sediment supply due to construction activities. Although areas and percentages of potentially disturbed ground are very small, all catchments are **high** sensitivity due to statutory designations. This means significance of effect in all catchments except the Taw Estuary (Sir Arthur's Pill catchment) is **minor adverse**. Significance of effect in the

Taw Estuary (Sir Arthur's Pill catchment) catchment is **moderate adverse**. Significance of effect in the Taw/Torridge catchment is **minor adverse** (although this is precautionary as there will be no disturbed ground at the surface in this catchment).

14.5.2.4 Further mitigation

141. Further mitigation will help to reduce sediment supply impacts from construction activity. Mitigation is especially relevant for the Taw Estuary (Sir Arthur's Pill catchment) (**moderate adverse** significance of effect), but the following measures will be applied to all catchments to ensure best practice is followed and any potential impacts are minimised:

- Minimising the amount of time stripped ground and soil stockpiles are disturbed
- Only removing vegetation from the area that needs to be disturbed in the near future
- Seeding or covering stockpiles
- Using geotextile silt fencing at the toe of the slope, to reduce the movement of silt – this should be installed before soil stripping has begun and vehicles start tracking over the site
- On-site retention of sediment to be maximised by routing all drainage through the site drainage system
- Include measures to intercept sediment runoff at source in the drainage system using suitable filters to remove sediment from water discharged to the surface drainage network
- Plant and wheel washing is carried out in a designated area of hard standing at least 10metres from any watercourse or surface water drain, rock outcrop (hard rock at surface)
- Traffic movements would be restricted to minimise surface disturbance
- Collect run-off in lagoons and allow suspended solids to settle before disposal
- Divert clean water away from the area of construction work in order to minimise the volume of contaminated water
- Routing the cable to avoid water resources receptors where possible. In locations where large areas of disturbed ground lie adjacent to watercourses, buffer strips of vegetation will be retained where possible to prevent runoff
- Temporary works areas (e.g. construction compounds and trenchless crossing areas) associated with the Onshore Project 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 disturbed area. This would minimise the area of open ground.

142. In addition, a piling risk assessment would be undertaken if piles are to be used in areas of potential contamination for the Onshore Substation area. This would be completed in line with 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention' (Environment Agency, 2001). The mitigation measures and monitoring requirements recommended by these assessments, would be implemented during construction works.

143. To monitor potential water quality impacts, a water quality monitoring protocol will be agreed with the Environment Agency. This will include key parameters to be samples (e.g. turbidity for increased sediment supply), locations, timescale, and frequency of sampling. It will also include trigger levels for agreed actions to be taken if a trigger threshold is crossed.

14.5.2.5 Residual significance of effect

144. Further mitigation means the magnitude of impact will be reduced in Taw Estuary (Sir Arthur's Pill catchment) from **low** to **negligible**, and significance of effect from moderate to **minor adverse**. In catchments where magnitude of impact is already negligible, best practice measures will still be followed to limit any impacts and magnitude of effect will remain **minor adverse**.

Table 14.21 Significance of effect for increased sediment supply due to construction activities

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect – pre mitigation	Residual significance of effect
Taw Estuary (Sir Arthur's Pill catchment)	High	Although the estimated percentage area of disturbed ground is relatively low (0.16 km^2 or 1%) sensitivity is high due to statutory designations, giving a moderate adverse effect. Further mitigation will reduce magnitude of impact from low to negligible, and significance of effect from moderate to minor adverse.	Low	Moderate adverse	Minor adverse
Taw/Torridge	High	No direct impacts (i.e. disturbed ground) are anticipated in the Taw/Torridge catchment as the channel will be crossed using trenchless techniques, and entry and exit points will be located on the adjacent floodplains of the Taw Estuary (Sir Artur's Pill catchment) and coastal catchment (Instow Barton Marsh). Sediment could be transferred to the estuary from adjacent catchments as they are hydrologically connected, although this is considered extremely unlikely due to further mitigation in these catchments. As a worst case assessment, residual significance of effect is minor adverse.	Negligible	Minor adverse	Minor adverse
Coastal catchment (Instow Barton Marsh)	High	Although the estimated percentage area of disturbed ground is very low (0.04 km^2 or 0.7%), sensitivity is high due to statutory designations, giving a minor adverse significance of effect. Further mitigation will	Negligible	Minor adverse	Minor adverse

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect – pre mitigation	Residual significance of effect
		not reduce magnitude of impact to less than negligible, but best practice measures will be followed to limit any impacts.			
Coastal catchment (Braunton Burrows)	High	This catchment will crossed by trenchless technique below the foreshore and trenchless technique from the Transition Joint Bay below Saunton golf course and SAC. The area of disturbed ground is very small (0.02 km^2) and relates to the Landfall (to MLWS) trenchless technique compound. Further mitigation will not reduce the magnitude of impact to less than negligible, but best practice measures will be followed to limit any impacts.	Negligible	Minor adverse	Minor adverse

14.5.3 Impact 3: Supply of contaminants to surface and groundwaters

145. During construction there is potential for the accidental release of lubricants, fuels and oils from construction machinery. This can 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. There is also potential for accidental leakages of foul water from welfare facilities, and construction materials (e.g. cement). Although trenchless technique fluid will be inert (bentonite), as it is a fine-grained (clay) mixture any breakouts could potentially smother channel bed habitats. Contaminants could enter surface waters and connected groundwaters through run-off, especially following rainfall.

146. A significant leakage or spillage has the potential to cause adverse impacts to water quality if contaminants enter the surface drainage network and can adversely affect the ecology of the water bodies, in particular fish and invertebrate species, if pollutant concentrations are sufficiently high.

147. Construction activities that disturb the ground and contaminated land (especially at the Onshore Substation), including excavation, piling and underground trenchless crossing techniques, can introduce contaminants into underlying groundwater bodies, particularly shallow aquifers. Therefore, these activities could adversely affect the quality of the underlying groundwater body and any licensed or unlicensed abstractions associated with it.

148. Additional impacts relating to ground and surface water quality are assessed in **Chapter 12: Ground Conditions and Contamination**.

14.5.3.1 Magnitude of impact

149. Magnitude of impact upon a surface water catchment or body of groundwater is proportional to the area of each catchment that would be affected by construction activities. As shown in **Table 14.20**, estimated areas of disturbed ground range from 0.02 to 0.16 km^2 (0.02 to 1% catchment area). This means that magnitude of impact is **negligible** in all catchments except the Taw Estuary (Sir Arthur's Pill catchment) where it is **low.**

150. No direct impacts (i.e. disturbed ground and potential contamination) are anticipated in the Taw/Torridge catchment as the channel will be crossed using trenchless methods (up to 13 m below the channel). Trenchless technique entry and exit points will be located on the adjacent floodplains of the Taw Estuary (Sir Arthur's Pill catchment) and coastal catchment (Instow Barton Marsh). However, for a worst-

case scenario assessment, there could be indirect impacts associated with accidental spills of fuels, oils or lubricants being transferred to the Taw/Torridge catchment from adjacent catchments. Magnitude of impact is therefore set to **negligible**. The majority of construction activity will overlie the Taw River and North Devon Streams groundwater body. The area occupied by construction activities equates to 0.05% of the catchment area and a **negligible** magnitude of impact.

151. A very short section (~350m) of early works access track (an existing access road) would be underlain by the Torridge and Hartland Streams body of groundwater. No drilling or trenching will be undertaken in this catchment, and plant will not use the access. Professional judgement has been used to set magnitude of impact to no change.

14.5.3.2 Sensitivity of the receptor

152. Receptor sensitivity is detailed in **Table 14.15**. Sensitivity is **high** in all surface water catchments due to statutory designations (SAC, SSSIs). Groundwater sensitivity is **medium**.

14.5.3.3 Significance of effect

153. **Table 14.22** assesses the significance of effect for increased sediment supply due to construction activities. Although areas and percentages of construction activity in each catchment are very small, all surface water catchments are **high** sensitivity due to statutory designations. This means significance of effect is **minor adverse** in all catchments, except the Taw Estuary (Sir Arthur's Pill catchment). Significance of effect in the Taw Estuary (Sir Arthur's Pill catchment) catchment is **moderate adverse.**

154. Significance of effect in the Taw/Torridge catchment is **minor adverse** (although this is precautionary as there will be no surface construction activity or disturbed ground at the surface in this catchment). Drilling will take below the estuary bed at a depth of up to 13 m. Drilling fluids will be inert (bentonite) and the depth of drilling through sediment and rock means the risk of breakouts affecting the surface water body are minimal.

155. Significance of effect in the River Taw and North Devon Streams groundwater catchment is **minor adverse.**

14.5.3.4 Further mitigation

156. Further mitigation will help to reduce impacts from construction activity. Mitigation is especially relevant for the Taw Estuary (Sir Arthur's Pill catchment) (moderate adverse significance of effect), but the following measures will be applied to all

catchments to ensure best practice is followed and any potential impacts are minimised. Specific measures include:

- Situating 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
- Potential contaminants will be stored under cover to prevent rainwater carrying pollutants away
- Potential contaminants will be stored in a safe place away from vehicles, to prevent collisions
- All machinery and vehicles used for operational maintenance activities will be maintained in a good condition to reduce the risk of fuel leaks
- Buffer strips of vegetation will be retained adjacent to water bodies where possible, to intercept any contaminated runoff.

157. A Pollution Environmental Management Plan (or similar) will also be in place. This mitigation will minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event.

158. To monitor potential water quality impacts, a water quality monitoring protocol will be agreed with the Environment Agency. This will include key parameters to be samples (e.g. hydrocarbons for the supply of contaminants), locations, timescale, and frequency of sampling. It will also include trigger levels for agreed actions to be taken if a trigger threshold is crossed.

14.5.3.5 Residual significance of effect

159. Further mitigation means the magnitude of impact will be reduced in Taw Estuary (Sir Arthur's Pill catchment) from low to negligible, and significance of effect from moderate to **minor adverse**. In surface and groundwater catchments where

magnitude of impact is already negligible, best practice measures will still be followed to limit any impacts and significance of effect will remain **minor adverse**.

Table 14.22 Significance of effect for supply of contaminants to surface and groundwaters due to construction activities.

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect – pre mitigation	Residual significance of effect
Taw Estuary (Sir Arthur's Pill catchment)	High	A very small area (0.16 km^2 (1%)) of the catchment will be affected by construction activities and the potential for accidental spills or leaks of contaminants. This will limit the potential for contaminant generation. Further mitigation will reduce magnitude of impact from low to negligible, and significance of effect from moderate to minor adverse.	Low	Moderate adverse	Minor adverse
Taw/Torridge	High	No direct impacts are anticipated in the Taw/Torridge catchment because the channel will be crossed using trenchless technique. Drilling at depth (up to 13 m) below the channel bed using inert material, e.g. bentonite and inert cable ducting. This means there is limited potential for impact in the surface water catchment. Contaminants could be transferred to the estuary from adjacent catchments as they are hydrologically connected, although this is considered extremely unlikely due to further mitigation in these catchments. As a worst case assessment, residual significance of effect is considered to be minor adverse.	Negligible	Minor adverse	Minor adverse
Coastal catchment (Instow Barton Marsh)	High	A very small area of the catchment will be affected by construction activities (0.04 km^2 or 0.7%) and the potential for accidental spills or leaks of contaminants. Further mitigation will not reduce magnitude of	Negligible	Minor adverse	Minor adverse

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect – pre mitigation	Residual significance of effect
		impact to less than negligible, but best practice measures will be followed to limit any impacts.			
Coastal catchment (Braunton Burrows)	High	A very small area of the catchment will be affected by construction activities (0.2%) and the potential for accidental spills or leaks of contaminants. Further mitigation will not reduce magnitude of impact to less than negligible, but best practice measures will be followed to limit impacts (e.g. spills or leaks at the Landfall (to MLWS) trenchless technique compound and access road).	Negligible	Minor adverse	Minor adverse
River Taw and North Devon Streams	Medium	Only a very small area (0.21 km^2; 0.02%) of the groundwater body catchment will be affected by construction activities. This means that only a very small area of the catchment could, potentially, be disturbed to contaminants. Trenches for the onshore export cables will be generally shallow (2m) and ground investigations will be undertaken at deeper trenchless technique crossings. Inert drilling fluids and inert cable ducting will be used.	Negligible	Minor adverse	Minor adverse
Torridge and Hartland Streams	Medium	This groundwater body will be crossed by a very short section (~350m) of existing access road. There will not be any drilling or trenching in this catchment, and the access will not be used to transport any plant. The only potential for contamination would come from very minor leaks from vehicles that	No change	N/A	N/A

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect – pre mitigation	Residual significance of effect
		would use this access (e.g. 4x4 vehicles). Considering the very small area of catchment affected and the fact that no construction work is taking place, professional judgement has been used to set magnitude of impact to no change.			

14.5.4 Impact 4: Changes to surface and groundwater flows and flood risk

160. Initial site preparation activities and construction works will alter surface drainage patterns and surface flows by changing the distribution of surface drainage across the Landfall (to MLWS), Onshore Export Cable Corridor and White Cross Onshore Substation. Infiltration will be reduced, and surface runoff increased, by a reduction in the proportion of impermeable surfaces in a drainage catchment caused by the compaction of soil by construction vehicles and the development of surface infrastructure. This can alter site runoff characteristics.

161. Temporary changes to surface flows due to trenched crossings of Ordinary Watercourses may also occur, particularly if the capacity of any pumps or flumes are exceeded. Any changes in surface flows associated with the Onshore Project can alter and/or increase flood risk.

162. Subsurface flow patterns can be altered because of changes to infiltration rates, surface flows and the installation of impermeable subsurface infrastructure.

163. Therefore, construction of the Onshore Project has the potential to increase surface water flows, resulting in increased discharge within watercourses and associated bed and bank scour, as well as in-wash of increased volumes of fine sediment related to the additional surface runoff. This could adversely affect hydrology and geomorphology of the surface drainage network.

14.5.4.1 Magnitude of impact

164. The majority of mitigation is embedded for impacts related to changes to surface and groundwater flows and flood risk (**Table 14.9**) and this is taken into account when determining the magnitude of impact.

165. The magnitude of impact upon a surface water catchment is proportional to the area of each catchment that would be affected by construction activities, which could alter land use, infiltration and runoff rates. As shown in **Table 14.20**, estimated areas of disturbed ground range from 0.02 to 0.16 km^2 (0.02 to 1% catchment area). This means that magnitude of impact is **negligible** in all catchments.

166. There will not be any disturbed ground at the surface in the Taw/Torridge catchment. The only activity in this catchment will be trenchless techniques, up to 13 m below the estuary bed. Trenchless technique entry and exit points will be located on adjacent floodplains (i.e. not in the Taw/Torridge catchment). However, as a worst scenario, allowance has been made for potential runoff from these

adjacent floodplains to the estuary, as they are hydrologically connected. As a worst case, magnitude of impact has been assessed as **negligible**.

167. The majority of onshore construction activity will overlie the Taw River and North Devon Streams groundwater body. The area affected by construction is 0.21 km^2, which equates to 0.02% of the catchment area and a **negligible** magnitude of impact.

168. A very short section of early works access road, which follows an existing road/track (~350m) would be underlain by the Torridge and Hartland Streams body of groundwater. There will be no groundworks in this area, and plant will not use the track. Given the small area and the fact that an existing road/track will be used, professional judgement has been used to set magnitude of impact to no change.

14.5.4.2 Sensitivity of the receptor

169. Receptor sensitivity is detailed in **Table 14.15**. Sensitivity is **high** in all surface water catchments due to statutory designations (SAC, SSSIs). Groundwater sensitivity is **medium**.

14.5.4.3 Significance of effect

170. **Table 14.23** assesses the significance of effect for increased surface water runoff and flood risk due to construction activities. Although areas and percentages of construction activity in each catchment are very small, all surface water catchments are **high** sensitivity due to statutory designations. This means significance of effect is **minor adverse** in all catchments.

171. Significance of effect in the River Taw and North Devon Streams groundwater catchment is **minor adverse.**

14.5.4.4 Further mitigation

172. Along the Onshore Export Cable Corridor, temporary culverts will be adequately sized to avoid impounding flows (including allowing for increased winter flows as a result of climate change).

173. Further details on mitigation measures for flood risk are included in **Appendix 14.C: Flood Risk Assessment.**

14.5.4.5 Residual significance of effect

174. As the magnitude of impact is negligible in all catchments, significance of effect will remain **minor adverse** in all catchments. Best practice mitigation of using

appropriately sized and correctly set culverts to accommodate flows and avoid impoundment will be used to minimise and impacts.

Table 14.23 Significance of effect for changes to surface water runoff and flood risk

Water body catchment	Sensitivity		Magnitude	Significance of effect – pre mitigation	Residual significance of effect
Taw Estuary (Sir Arthur's Pill catchment)	High	Although only a very small proportion of the catchment (0.16 km^2 (1%)) will be directly affected by construction activities with the potential to temporally affect land use and runoff, sensitivity is high. Some minor dewatering may be necessary, especially where the Onshore Export Cable Corridor crosses Braunton Marsh. In the context of the total catchment area, construction activities are unlikely to lead to an appreciable change in surface water drainage or flood risk. With embedded best practice mitigation in place for construction drainage along the cable corridor (**Section 14.3.4**), magnitude of impact is negligible, and significance of effect is assessed as minor adverse. Further best practice mitigation will involve making sure temporary culverts are adequately sized to avoid impounding flows (including allowing for increased winter flows as a result of climate change).	Negligible	Minor adverse	Minor adverse
Taw/Torridge	High	The Taw/Torridge catchment will be crossed using trenchless techniques up to 13 m below the channel bed. There will not be any initial site preparation activities or construction works that could alter surface drainage patterns and surface flows in this catchment. However, there could be indirect	Negligible	Minor adverse	Minor adverse

Water body catchment	Sensitivity		Magnitude	Significance of effect – pre mitigation	Residual significance of effect
		impacts from runoff generated in the adjacent catchments, which drain to the estuary. This is considered extremely unlikely given that embedded mitigation that will be in place for the surface runoff (**Section 14.3.4**). As a worst case assessment, magnitude of impact is negligible and significance of effect minor adverse.			
Coastal catchment (Instow Barton Marsh)	High	Although only a relatively small proportion of the catchment (0.04 km^2 (0.7%%)) will be directly affected by construction activities with the potential to increase the area of impermeable surfaces, sensitivity is high. In the context of the total catchment area, construction activities will not lead to an appreciable change in surface water drainage or flood risk. With embedded mitigation in place (**Section 14.3.4**), especially at the White Cross Onshore Substation, significance of effect is assessed as minor adverse. Further best practice mitigation will involve making sure temporary culverts are adequately sized to avoid impounding flows (including allowing for increased winter flows as a result of climate change).	Negligible	Minor adverse	Minor adverse
Coastal catchment (Braunton Burrows)	High	Although only a relatively small proportion of the catchment (0.02 km^2 (0.2%)) will be directly affected by construction activities with the potential to increase the area of	Negligible	Minor adverse	Minor adverse

Water body catchment	Sensitivity		Magnitude	Significance of effect – pre mitigation	Residual significance of effect
		impermeable surfaces, sensitivity is high. In the context of the total catchment area, construction activities will not lead to an appreciable change in surface water drainage or flood risk. Runoff could be generated from activities at the trenchless technique compound and haul/access roads, but with embedded mitigation in place (**Section 14.3.4**), significance of effect is assessed as minor adverse. Temporary watercourse crossings are not required in this catchment.			
River Taw and North Devon Streams	Medium	A very small proportion the groundwater body would be affected by construction activities (0.02%). Subsurface excavations will generally be shallow (<2m). Although deeper drilling will take place at trenchless technique crossings, pilot hole dimensions (~0.2m) will be narrow, which will limit any potential impact on groundwater flows. This means any impacts on groundwater flows would be negligible and significance of effect is assessed as minor adverse.	Negligible	Minor adverse	Minor adverse
Torridge and Hartland Streams	Medium	This groundwater body will be crossed by a very short section (~350m) of existing access road. There will not be any drilling or trenching in this catchment and the access will not be used to transport any plant. The only potential for contamination would come from very minor leaks from vehicles that would use this access (e.g. 4x4	No change	N/A	N/A

Water body catchment	Sensitivity		Magnitude	Significance of effect – pre mitigation	Residual significance of effect
		vehicles). Taking into account the very small area of catchment affected and the fact that no construction work is taking place, professional judgement has been used to set magnitude of impact to no change.			

14.6 Potential impacts during operation and maintenance

175. The potential impacts of the operation and maintenance of the Onshore Project on Water Resources and Flood Risk have been assessed. A description of the potential effects caused by each identified impact is given in this section.

14.6.1 Impact 5: Changes to surface and groundwater flows and flood risk

176. Permanent above ground infrastructure (Landfall to MLWS, White Cross Onshore Substation and Onshore Export Cables) and the new (permanent) access road will result in permanent changes to land use. Although permeable surface treatments will be used where possible, permanent features will include jointing pits along the Onshore Export Cable Corridor. This change in land use will result in an increase in impermeable land area, although this will be very minor in the context of the wider catchments affected.

177. The presence of the buried cable ducting along the Onshore Export Cable Corridor may impact upon subsurface flow corridors as it will introduce an impermeable barrier which may change subsurface flow patterns. This may force water to move upwards towards the surface, or downwards away from the surface. Buried cable ducting may also impact upon the level of recharge and distribution of groundwater within the aquifers underlying the Onshore Project. However, the relatively shallow depth of the cable infrastructure means that any impacts are likely to be highly localised and confined to shallow near-surface groundwater bodies.

178. An increase in the impermeable area in a catchment may result in a reduced rate of infiltration and therefore a potential increase in surface runoff. However, given the very small percentage area of each catchment affected, it is unlikely that changes in surface water runoff and subsurface flows will be sufficient to impact upon the hydrology of the surface water system (e.g. by increasing surface water volumes, runoff rates and associated geomorphological process and in-channel habitats).

179. Ground disturbance during installation of the cable trench may change the transmissivity of the ground which overlays the cable infrastructure after reinstatement and may therefore become a preferential corridor for subsurface water flow.

14.6.1.1 Magnitude of impact

180. The area of permanent installed infrastructure (above ground or buried) has been used as a proxy to indicate the extent of potential impact on surface and groundwater flows in each catchment (**Table 14.24**). This is based on:

- Area of the Transition Joint Bay at the Landfall (to MLWS)
- Area occupied by the onshore export cables. As a precautionary approach this figure has been estimated based on the trench width (3 m) within which the onshore export cables will be located
- Area of joint bays and link boxes
- Operational area of the White Cross Onshore Substation and new permanent access road.

Areas of permanent infrastructure are very low and range from 0.01 to 0.22% for surface water catchments. This means magnitude of impact is **negligible** in all surface water catchments. A very small proportion of the total area of the groundwater catchment (0.003%) will be occupied by permanent infrastructure. This is likely to have a minimal impact on subsurface flows and the potential to cause flood risk. Given the shallow depth of trenching (<2 m), impacts are not anticipated on the Secondary A aquifer or on the two small scale abstractions at Saunton Golf Course and New Cross Farm. Magnitude of impact is **negligible**.

Table 14.24 Estimated total area of onshore permanent development for White Cross Offshore Windfarm

Surface/groundwater catchment	Permanent infrastructure (km^2)	Permanent infrastructure (%)
Taw Estuary (Sir Arthur's Pill catchment)	0.019	0.12
Taw/Torridge	0.001	0.01
Coastal catchment (Instow Barton Marsh)	0.012	0.22
Coastal catchment (Braunton Burrows)	0.003	0.04
River Taw and North Devon Streams	0.036	0.003
Torridge and Hartland Streams	N/A	N/A

14.6.1.2 Sensitivity of the receptor

181. Receptor sensitivity is detailed in **Table 14.15**. Sensitivity is **high** in all surface water catchments due to statutory designations (SAC, SSSIs). Sensitivity of the River Taw and North Devon Streams body of groundwater is **medium**.

14.6.1.3 Significance of effect

182. Significance of effect for changes to surface water runoff, groundwater flows and flood risk is assessed in **Table 14.25**. As all catchments have **medium** to **high** sensitivity and **negligible** magnitude of impact, significance of effect is **minor adverse** in all catchments.

14.6.1.4 Further mitigation

183. Mitigation measures for changes to surface and groundwater flows and flood risk are embedded into the Onshore Project design (**Section 14.3.4**). No further mitigation is recommended.

14.6.1.5 Residual significance of effect

184. As all catchments have **medium** to **high** sensitivity, residual significance of effect will remain **minor adverse** in all surface and groundwater catchments.

Table 14.25 Significance of effect for changes to surface water runoff, groundwater flows and flood risk during operation and maintenance.

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect	Residual significance of effect
Taw Estuary (Sir Arthur's Pill catchment)	High	Due to the very limited extent of permanent infrastructure along the cable corridor, potential effects on surface water runoff, groundwater flows and flood risk are unlikely. The maximum area of permanent infrastructure is located in the coastal catchment (Instow Barton Marsh), due to the presence of the White Cross Onshore Substation. However, even in this small catchment, permanent infrastructure will only occupy 0.22% of the catchment area. For all other catchments this figure is ≤0.12%.	Negligible	Minor adverse	Minor adverse
Coastal catchment (Instow Barton Marsh)	High		Negligible	Minor adverse	Minor adverse
Coastal catchment (Braunton Burrows)	High		Negligible	Minor adverse	Minor adverse
Taw/Torridge	High	Permanent infrastructure will consist of the onshore export cables. As a worst case the larger pilot hole for the direct pipe method has been assumed (1.42 m). As the onshore export cables will be located up to 13 m below the channel bed, impacts on flows at the surface are considered extremely unlikely. However, there could be negligible impacts (increased runoff to the estuary) from operation and maintenance activities in the adjacent catchments where permanent infrastructure is	Negligible	Minor adverse	Minor adverse

Water body catchment	Sensitivity	Assessment	Magnitude	Significance of effect	Residual significance of effect
		located. However, with embedded mitigation in place for operational drainage, this is considered extremely unlikely.			
Taw River and North Devon Streams	Medium	A very small proportion of the total area of the groundwater catchment (0.003%) will be occupied by permanent infrastructure. This is likely to have a minimal impact on subsurface flows and the potential to cause flood risk. Given the shallow depth of trenching (<2 m) and limited trenchless technique drills, impacts are not anticipated on the Secondary A aquifer or on the two small scale abstractions at Saunton Golf course and New Cross Farm.	Negligible	Minor adverse	Minor adverse

14.7 Potential impacts during decommissioning

185. No decision has been made regarding the final decommissioning policy for the Onshore Project as it is recognised that industry best practice, rules and legislation change over time.

186. The anticipated decommissioning activities are outlined in **Section 14.3.3**. The potential impacts of the decommissioning of the Onshore Project have been assessed for Water Resources and Flood Risk on the assumption that decommissioning methods will be similar or of a lesser scale than those deployed for construction. The types of impact would be comparable to those identified for the construction phase:

- Impact 1: Direct disturbance of surface water bodies
- Impact 2: Increased sediment supply
- Impact 3: Supply of contaminants to surface and groundwaters
- Impact 4: Changes to surface and groundwater flows and flood risk.

187. The magnitude of impact would be comparable to or less than those identified for the construction phase. Accordingly, it is anticipated that the impacts, effects and residual effects set out in **Table 14.21**, **Table 14.22** and **Table 14.23** be valid for the decommissioning phase regardless of the final decommissioning methodologies.

14.8 Potential cumulative effects

188. The approach to cumulative effect assessment (CEA) is set out in **Chapter 6: EIA Methodology**. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CEA. Projects which are sufficiently implemented during the site characterisation for the Onshore Project have been considered as part of the baseline for the EIA. Where possible, White Cross Offshore Windfarm Ltd (WCOWL) has sought to agree with stakeholders the use of as-built project parameter information (if available) as opposed to consented parameters to reduce over-precaution in the cumulative assessment. The scope of the CEA was therefore be established on a topic-by-topic basis with the relevant consultees.

189. The cumulative impact assessment for Water Resources and Flood Risk was undertaken in two stages. The first stage was to consider the potential for the impacts assessed as part of the Onshore Project to lead to cumulative effects in conjunction with other projects. The first stage of the assessment is detailed in **Table 14.26**.

190. Only potential impacts assessed in **Section 14.5** and **Section 14.6** as **negligible** or above are included in the CEA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

191. The second stage of the CEA is to evaluate the Onshore Projects considered for the CEA to determine whether a cumulative impact is likely to arise. The list of considered projects (identified in **Chapter 6: EIA Methodology** (**Section 6.6.11**) and their anticipated potential for cumulative effects are summarised in **Table 14.27**. Only projects within the assessed surface water catchments have been included. For the large Taw/Torridge catchment, a radius of 2 km from the estuary crossing has been used to identify other projects. This distance is the same as used in WER compliance assessment (**Appendix 14.B: Water Environment Regulations Compliance Assessment)** to assess potential impacts on water dependant protected areas.

14.8.1 Assessment of cumulative effects

192. Having established the potential for cumulative effects associated with the Onshore Project (**Table 14.26**), along with the other relevant plans, projects and activities (**Table 14.27**), the following sections provide an assessment of the level of impact that may arise. The only project taken forward for further assessment is Yelland Quay.

Table 14.26 Potential cumulative effects on Water Resources and Flood Risk.

Impact	Potential cumulative impact	Rationale
Construction		
Impact 1: Direct disturbance of surface water bodies	Yes	Impacts to surface water bodies could act cumulatively with other projects if these cause direct disturbance to the same water bodies, particularly if there is a temporal or spatial overlap. The likelihood of a temporal overlap may increase with the sequential scenario where construction will take place over a longer period of time.
Impact 2: Increased sediment supply	Yes	Other projects being constructed within 1 km of the onshore construction area may also cause an increase in sediment supply to the surface water drainage system which could act cumulatively.
Impact 3: Supply of contaminants to surface and groundwaters	Yes	Other projects being constructed within 1 km of the onshore construction area may act cumulatively to reduce surface and groundwater quality if they cause a supply of contaminants to be released into the surface water drainage system.
Impact 4: Changes to surface water runoff and flood risk	Yes	Any project involving construction within 1 km of the Onshore Project infrastructure could also cause changes in surface flow patterns, compaction and an increase in impermeable area. This could act cumulatively to cause further changes to surface water runoff and flood risk.
Operation and maintenance		
Impact 1: Changes to surface water runoff, groundwater flows and flood risk	Yes	As a result of the limited spatial extent of permanent impermeable development along the cable corridor, the effect is considered to be limited and highly localised and therefore unlikely to act cumulatively with other projects. However, the greater area of impermeable ground at the substation could result in cumulative effects with other projects in the same catchments (coastal catchment (Instow Barton Marsh).
Decommissioning		
As described for construction.		

Table 14.27 Projects considered in the cumulative impact assessment on Water Resources and Flood Risk.

Project	Status	Distance from windfarm site (km)	Included in the CEA?	Rationale
White Cross Offshore Windfarm (the Offshore Project)		Offshore Export Cable Corridor meets the Onshore Export Cable Corridor at the Landfall (to MLWS)	No	No mechanisms have been identified that would allow offshore infrastructure to act cumulatively with the following onshore impacts for any phases of the Onshore Project: • Direct disturbance of surface water bodies • Increased sediment supply • Supply of contaminants • Changes to surface and groundwater flows and flood risk The only theoretical risk would be increased sediment supply and supply of contaminants from offshore entering estuarine waters of the River Taw. However, onshore there will not be any construction work in the estuary (due to trenchless crossing methods and construction compounds being located on adjacent floodplains). A CEMP and Pollution Environmental Management Plan will be in place for both Onshore and Offshore Projects. This means the that potential cumulative effects can be screened out from further assessment.

Project	Status	Distance from windfarm site (km)	Included in the CEA?	Rationale
Yelland Quay	Approved	Within Onshore Export Cable Corridor	Yes	The development at Yelland Quay will result in the construction of 250 dwellings with further retail and employment space. The total development is 38.5 hectares (0.39 km^2), and activities will include the demolition of existing buildings and site clearance, followed by groundworks for the new development. There is the potential for the direct disturbance of water courses, increased sediment supply, the supply of contaminants to surface and groundwaters, and changes to surface and groundwater flows and flood risk.
Land at Yelland Road	Approved	0.6km to White Cross Onshore Substation red line boundary	No	Outline application for erection of residential development for 80 dwellings with some matters reserved (appearance, landscaping, layout and scale). The proposed development is located at the eastern boundary of the coastal catchment (Instow Barton Marsh), which has very limited surface water connectivity to White Cross Onshore Substation area (i.e. a single small artificial ditch beside the Tarka Trail). The majority of watercourses that could be affected by the Onshore Project drain to the lake north of the existing East Yelland Substation – the ditch that flows to the proposed development does not connect to the lake.

Project	Status	Distance from windfarm site (km)	Included in the CEA?	Rationale
				Natural England have specified that for construction of the proposed housing development, best practice water quality mitigation measures should be secured via a CEMP to ensure there is no risk of contamination or increase in nutrient/ sediment load to the estuary. A CEMP will also be in place for the Onshore Project. Given the limited connectivity to the proposed development, and with mitigation in place, cumulative effects are not expected.
Land at Braunton Burrows	Approved	1.5km to Onshore Export Cable Corridor red line boundary	No	Works comprise: • The excavation of six 'notches' along the frontal dune ridge in the south-west sector of Braunton Burrows • The excavation of three additional notches of the corresponding first inland ridge of dunes, above Doughnut Slack • The excavation of intervening low sand dune hummocks on the intervening, largely level, dry dune 'plains', to ensure the uninterrupted flow of wind across the sand field to the wet slacks inland • Re-profiling of manmade banks and piles, and removal of manmade islands, left in Doughnut Slack from

Project	Status	Distance from windfarm site (km)	Included in the CEA?	Rationale
				ponds and scrape work carried out in the 1990s to restore the slack to a more natural and typical slack geomorphology. The proposed works are located in the coastal catchment (Braunton Burrows) 4.4 km from the only watercourse in this catchment at Saunton Sands car park (i.e. the Landfall (to MLWS) area). There is no connectivity between the two locations. There is no pathway for cumulative effects to occur.

14.8.1.1 Yelland Quay: Construction

14.8.1.1.1 Cumulative Impact 1: Direct disturbance of surface water bodies

193. The majority of the Yelland Quay development is peripheral to the Onshore Project (being located to the eastern side of the coastal catchment (Instow Barton Marsh)). There is very limited potential for the Yelland Quay development to disturb watercourses as there are only two minor ditches on the site of the former oil refinery, and these do not appear to connect to any other watercourses. Residual significance of effect for the direct disturbance of water bodies for the Onshore Project has been assessed as minor adverse for the coastal catchment (Instow Barton Marsh). Chapter 9 (Flood Risk Assessment including Water Quality and Water Resources) of the Yelland Quay ES does not assess the direct disturbance of water bodies, although as stated, there appears to be very limited potential for channels to be disturbed at Yelland Quay.

194. Taking into account the proposed CEMP for Yelland Quay, which will contain measures to manage and control all ground works, and the limited potential for Yelland Quay to directly disturb channels, it is anticipated that cumulative effects will not be significant in EIA terms.

14.8.1.1.2 Cumulative Impact 2: Increased sediment supply

195. The Yelland Quay development will involve the demolition of existing buildings and site clearance, followed by groundworks for the new development. These activities will involve soil stripping, vegetation clearance and development of temporary construction compounds and access tracks, and the use of heavy machinery. All of these activities have the potential to create disturbed ground, cause soil erosion and increase sediment supply to adjacent watercourses.

196. Taking into account Onshore Project mitigation measures, effects related to increased sediment supply associated with construction activities in the coastal catchment (Instow Barton Marsh) have been assessed as minor adverse.

197. Following the implementation of mitigation (i.e. the CEMP), the Yelland Quay ES has assessed the significance of effect associated with the potential risk of contamination of surface and groundwater, which includes fine sediment, as negligible. With best practice mitigation in place for both projects, it is anticipated that cumulative effects would not be significant in EIA terms.

14.8.1.1.3 Cumulative Impact 3: Supply of contaminants to surface and groundwaters

198. Construction activities at Yelland Quay could lead to the contamination of surface water runoff with heavy metals, hydrocarbons, suspended solids and construction materials, which could subsequently enter the surrounding surface water features

and migrate to groundwaters. The storage of the construction materials and hazardous substances (diesel) has the potential to impact on surface and groundwater quality if appropriate mitigation measures are not adopted. However, as noted for Impact 1, there are no connecting watercourses to allow the transfer of contaminants from one project to the other.

199. Taking into account Onshore Project mitigation measures, effects related to the supply of contaminants associated with construction activities in the coastal catchment (Instow Barton Marsh) have been assessed as minor adverse.

200. The CEMP for Yelland Quay will contain measures outlining the management of wastewater and the storage of fuel and chemicals. All construction activities will be undertaken in accordance with the Government's Pollution Prevention Guidelines. With mitigation measures in place, the Yelland Quay ES has assessed the significance of effect associated with the potential risk of contamination of surface and groundwater as negligible.

201. With best practice mitigation in place for both projects, it is anticipated that cumulative effects would not be significant in EIA terms.

14.8.1.1.4 Cumulative Impact 4: Changes to surface water runoff and flood risk

202. Construction activities at Yelland Quay, such as topsoil stripping, vegetation clearance and vehicular movements are likely to result in soil compaction and a reduction in water attenuation on site by vegetation and within the unsaturated soil matrix. This means the volume and rate of surface water run-off may increase posing a localised flood risk.

203. Taking into account Onshore Project mitigation measures, effects related to changes to surface and groundwater flows and flood risk associated with construction activities in the coastal catchment (Instow Barton Marsh) have been assessed as minor adverse.

204. The Yelland Quay ES has assessed the effect of increased surface water run-off. Proposed mitigation includes use of a temporary surface water drainage network, including appropriately sized detention basins, to provide on-site attenuation for surface water flows during construction activities. Surface run-off will be disposed of appropriately, either tankered off-site or discharged following agreement with the appropriate authority. With these mitigation measures in place, significance of effect for increased surface water run-off has been assessed as negligible.

205. With best practice mitigation in place for both projects, it is anticipated that cumulative effects would not be significant in EIA terms.

14.8.1.2 Operation

14.8.1.2.1 Cumulative Impact 1: Impact 1: Changes to surface water runoff, groundwater flows and flood risk

206. The Yelland Quay ES has assessed the potential for increased surface water runoff during the operational phase of the Onshore Project. A surface water strategy has been developed to ensure that surface water runoff can be attenuated on site for the 1 in 100 year + 40% (climate change) rainfall event. The surface water drainage strategy will comprise a network of:

- Adoptable and non-adoptable underground pipework
- Detention ponds
- Rain gardens
- Hydraulic controls
- Overland exceedance measures.

207. With these mitigation features in place, significance of effect has been assessed as moderate positive for increased surface water runoff. As significance of effect has been assessed as negligible for changes to surface and groundwater flows and flood risk for the Onshore Project, it is not anticipated that cumulative effects are likely to be significant in EIA terms.

14.9 Potential transboundary impacts

208. The Onshore Project Scoping Report identified that there was no potential for significant transboundary effects on Water Resources and Flood Risk receptors from the Onshore Project upon the interests of other EEA States and this is not discussed further.

14.10 Inter-relationships

209. Inter-relationship impacts are covered as part of the assessment and consider impacts from the construction, operation or decommissioning of the Onshore Project on the same receptor (or group). A description of the process to identify and assess these effects is presented in **Chapter 6: EIA Methodology**. The potential inter-relationship effects that could arise in relation to Water Resources and Flood Risk include both:

- Project lifetime effects: Effects arising throughout more than one phase of the Onshore Project (construction, operation, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation

- Receptor led effects: Assessment of the scope for all relevant effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

210. Water receptors (including surface waters and groundwater) are intrinsically linked to:

- Ground conditions, which influence the quality of groundwater, how it moves through subsurface strata, and how it interacts with surface waters
- Ecology, which is to some extent controlled by the availability of habitat niches, and therefore the hydrology, geomorphology and chemical quality of surface waters and the distribution and quality of groundwater.

211. **Table 14.28** serves as sign-posting for inter-relationships.

Table 14.28 Water Resources and Flood Risk inter-relationships.

Topic and description	Related chapter	Where addressed in this Chapter	Rationale
Construction, operation and maintenance			
Impacts on the quality and quantity of groundwater	**Chapter 12: Ground Conditions and Contamination**	**Sections 14.5.3, 14.5.4, 14.6.1**	Potential changes to ground conditions (including chemical quality and physical properties such as transmissivity) could affect the quality and quantity of groundwater and hydrologically-connected surface water receptors
Impacts on water-dependent habitats and designated sites	**Chapter 16: Onshore Ecology and Ornithology**	**Sections 14.5.1, 14.5.3, 14.5.4, 14.6.1**	Potential changes to the hydrology, geomorphology and water quality of designated sites could impact upon water-dependent biological communities (including the designated interest features)
Decommissioning			
Impacts associated with the decommissioning phase would be no greater than those identified for the construction phase.			

212. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The areas of interaction between impacts are presented in **Table 14.29**

and **Table 14.30**, along with an indication as to whether the interaction may give rise to synergistic impacts. This provides a screening tool for which impacts have the potential to interact.

213. **Table 14.31** then provides an assessment for each receptor (or receptor group) related to these impacts in two ways. Firstly, the impacts are considered within a development phase (i.e. construction, operation, maintenance or decommissioning) to see if, for example, multiple construction impacts could combine. Secondly, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across development phases. The magnitude of each individual impact is determined by the sensitivity of the receptor and the significance of effect; the sensitivity is constant whereas the magnitude may differ. Therefore, when considering the potential for impacts to be additive it is the magnitude of effect which is important – the magnitudes of the different effects are combined upon the same sensitivity receptor.

Table 14.29 Interaction between impacts during construction.

Construction	Impact 1: Direct disturbance to surface water bodies	Impact 2: Increased supply of sediment	Impact 3: Supply of contaminants to surface and groundwaters	Impact 4: Changes to surface water runoff and flood risk
Impact 1: Direct disturbance to surface water bodies		Yes	Yes	Yes
Impact 2: Increased supply of sediment	Yes		Yes	Yes
Impact 3: Supply of contaminants to surface and groundwaters	Yes	Yes		No
Impact 4: Changes to surface water runoff and flood risk	Yes	Yes	No	

Table 14.30 Interaction between impacts during decommissioning.

Decommissioning	Impact 1: Direct disturbance to surface water bodies	Impact 2: Increased supply of sediment	Impact 3: Supply of contaminants to surface and groundwaters	Impact 4: Changes to surface water runoff and flood risk
Impact 1: Direct disturbance to surface water bodies		Yes	Yes	Yes
Impact 2: Increased supply of sediment	Yes		Yes	Yes
Impact 3: Supply of contaminants to surface and groundwaters	Yes	Yes		No
Impact 4: Changes to surface water runoff and flood risk	Yes	Yes	No	

Table 14.31 Potential interactions between impacts on Water Resources and Flood Risk

Highest level significance					
Receptor	Construction	Operation and Maintenance	Decommissioning	Phase Assessment	Lifetime Assessment
Surface waters	Moderate adverse	Negligible	Moderate adverse	**No greater than individually assessed impact** The proposed mitigation will minimise the potential for the direct disturbance of watercourses, the direct (from in-channel works) and indirect (from activities in the vicinity of the channel) supply of fine sediment and contaminants, and changes to surface hydrology and flow patterns during the construction phase. There will be no direct disturbance during operation, and further measures will be in place to prevent the supply of contaminants or changes to flow patterns during operation. It is therefore considered that there will therefore be no pathway for interaction to exacerbate the potential impacts associated with these activities during or	**No greater than individually assessed impact** The greatest significance of effect will occur during the construction of trenched watercourse crossings. Once this disturbance impact has ceased, all further impact during construction and operation will be small scale, highly localised and episodic. It is therefore considered that over the Onshore Project lifetime these impacts would not combine to increase the significance level of any impacts identified in this assessment.

Highest level significance					
				between any of the Onshore Project phases.	
Groundwater	Minor adverse	Negligible	Minor adverse	**No greater than individually assessed impact** The proposed mitigation will minimise the potential for the introduction of contaminants to groundwater. The inert nature of the cables will prevent contamination during operation. Furthermore, the small scale and relative shallowness of the permanent infrastructure means that impacts on groundwater flows during operation are minimal. It is therefore considered that there will therefore be no pathway for interaction to exacerbate the potential impacts associated with these activities during or between any of the Onshore Project phases.	**No greater than individually assessed impact** The greatest significance of effect will occur as a result of subsurface excavations during the construction phase. Once this disturbance impact has ceased, any further impact will be small scale, highly localised and episodic. It is therefore considered that over the Onshore Project lifetime these impacts would not combine to increase the significance level of any impacts identified in this assessment.

14.11 Summary

214. This chapter has investigated the potential effects on Water Resources and Flood Risk receptors arising from the Onshore Project. The range of potential impacts and associated effects considered has been informed by the Scoping Opinion, consultation, and agreed through ETG Meetings, as well as reference to existing policy and guidance. The impacts considered include those brought about directly as well as indirectly.

215. The baseline environment has been assessed with reference to surface water drainage, geomorphology, water quality, abstractions and discharges, designated sites and receptor sensitivity.

216. Surface water drainage is achieved primarily by Ordinary Watercourses which have been engineered (resectioned) and appear to be maintained be desilting/dredging. As a result, natural and diverse geomorphological forms and processes are very limited. Water quality is under pressure from diffuse and point source pollution and high levels of some priority hazardous substances. Water resources are also associated with a range of designated sites, including SSSIs, an SAC, shellfish waters, bathing waters and a coastal sensitive area (eutrophic). Protected sites are typically at unfavourable recovering status. Receptor sensitivity is high where catchments include designated areas.

217. **Table 14.32** presents a summary of the impacts assessed within this ES chapter, any commitments made, mitigation required and effects. The Landfall (to MLWS), Onshore Export Cable Corridor and Onshore Substation do not interact on a large scale with surface or groundwater water resources, or areas of flood risk. Magnitude of impact for construction, operation and maintenance, and decommissioning across catchments crossed by the Onshore Project is assessed as medium to negligible. The highest residual significance of effect level for construction, operation and maintenance and decommissioning activities across all water bodies is moderate adverse, although this is precautionary based on a relatively high number of trenched crossings for very minor, artificial and ephemeral drainage ditches.

218. The assessment of cumulative effects from the Onshore Project and other developments and activities concluded that cumulative effects are not anticipated – it is not anticipated that cumulative effects are likely to be significant in EIA terms.

Table 14.32 Summary of potential impacts for Water Resources and Flood Risk during construction, operation, maintenance and decommissioning of the Onshore Project

Potential impact	Receptor	Sensitivity	Magnitude	Residual significance	Potential mitigation measure
Construction					
Impact 1: Direct disturbance to surface water bodies	Taw Estuary (Sir Arthur's Pill catchment)	High	Medium	Moderate adverse	See **Section 14.3.4**
	Taw/Torridge	High	No change	N/A	
	Coastal catchment (Instow Barton Marsh)	High	Negligible	Minor adverse	
	Coastal catchment (Braunton Burrows)	High	Negligible	Minor adverse	
Impact 2: Increased supply of sediment	Taw Estuary (Sir Arthur's Pill catchment)	High	Low	Minor adverse	See **Section 14.3.4**
	Taw/Torridge	High	Negligible	Minor adverse	
	Coastal catchment (Instow Barton Marsh)	High	Negligible	Minor adverse	
	Coastal catchment (Braunton Burrows)	High	Negligible	Minor adverse	
Impact 3: Supply of contaminants to	Taw Estuary (Sir Arthur's Pill catchment)	High	Low	Minor adverse	See **Section 14.3.4**

Potential impact	Receptor	Sensitivity	Magnitude	Residual significance	Potential mitigation measure
surface and groundwaters	Taw/Torridge	High	Negligible	Minor adverse	
	Coastal catchment (Instow Barton Marsh)	High	Negligible	Minor adverse	
	Coastal catchment (Braunton Burrows)	High	Negligible	Minor adverse	
	River Taw and North Devon Streams	Medium	Negligible	Minor adverse	
	Torridge and Hartland Streams	Medium	Negligible	Minor adverse	
Impact 4: Changes to surface and groundwater flows and flood risk	Taw Estuary (Sir Arthur's Pill catchment)	High	Low	Minor adverse	See **Section 14.3.4**
	Taw/Torridge	High	Negligible	Minor adverse	
	Coastal catchment (Instow Barton Marsh)	High	Negligible	Minor adverse	
	Coastal catchment (Braunton Burrows)	High	Negligible	Minor adverse	
	River Taw and North Devon Streams	Medium	Negligible	Minor adverse	

Potential impact	Receptor	Sensitivity	Magnitude	Residual significance	Potential mitigation measure
	Torridge and Hartland Streams	Medium	Negligible	Minor adverse	
Operation and Maintenance	**Receptor**	**Sensitivity**	**Magnitude**	**Residual significance**	**Potential mitigation measure**
Impact 1: Changes to surface water runoff, groundwater flows and flood risk	Taw Estuary (Sir Arthur's Pill catchment)	High	Negligible	Negligible	See **Section 14.3.4**
	Taw/Torridge	High	Negligible	Negligible	
	Coastal catchment (Instow Barton Marsh)	High	Negligible	Negligible	
	Coastal catchment (Braunton Burrows)	High	Negligible	Negligible	
	River Taw and North Devon Streams	Medium	Negligible	Negligible	
	Torridge and Hartland Streams	Medium	No change	N/A	
Decommissioning		**Receptor**	**Sensitivity**	**Magnitude**	**Residual significance**
Impact 1: Direct disturbance to surface water bodies	Taw Estuary (Sir Arthur's Pill catchment)	As for construction			
	Taw/Torridge				

Potential impact	Receptor	Sensitivity	Magnitude	Residual significance	Potential mitigation measure
Impact 2: Increased supply of sediment **Impact 3: Supply of contaminants to surface and groundwaters** **Impact 4: Changes to surface water runoff and flood risk**	Coastal catchment (Instow Barton Marsh)				
	Coastal catchment (Braunton Burrows)				
	River Taw and North Devon Streams				
	Torridge and Hartland Streams				
Cumulative (Yelland Quay)		**Receptor**	**Sensitivity**	**Magnitude**	**Residual significance**
Impacts 1 to 4 for construction and 1 for operation	Coastal catchment (Instow Barton Marsh); River Taw and North Devon Streams	High (surface water), medium (groundwater)	The majority of the housing development is peripheral to coastal catchment (Instow Barton Marsh). A CEMP will be in place for Yelland Quay to manage potential impacts. Cumulative impacts are not anticipated.		

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Appendix 14.A: White Cross Geomorphology Baseline Survey

WHITE CROSS

White Cross Offshore Windfarm Environmental Statement

Chapter 14.A: Geomorphology Baseline Survey

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Approved by Client :	OG	*Electronic Signature*

Version Number	Reason for Issue / Major Changes	Date of Change
00	For Issue	08/08/2023

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Acronyms

Defined Terms	Description
AOD	Above Ordnance Datum
BGS	British Geological Survey
EA	Environment Agency
ES	Environmental Statement
LiDAR	Light Detection and Ranging
MLWS	Mean Low Water Springs
WER	Water Environment Regulations
WFD	Water Framework Directive

Glossary of Terminology

Defined Terms	Description
Onshore Project	All infrastructure located above Mean Low Water Springs (MLWS). This includes the Landfall, Onshore Export Cable Corridor, onshore export cables and White Cross Onshore Substation.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from Landfall (to MLWS) to the White Cross Onshore Substation
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NG electrical requirements at the grid connection point at East Yelland.
Fine sediment (<2 mm)	Sand, silts and clays.
Incised channel	A channel that is largely disconnected from the adjacent floodplain. In lowland agricultural settings on small watercourses this is often due to channel maintenance (dredging/desilting).
LiDAR	Light Detection and Ranging — is a remote sensing method used to examine the surface of the Earth
Main river	Main rivers are usually larger rivers and streams. The Environment Agency carries out maintenance, improvement or construction work on main rivers to manage flood risk.
Ordinary watercourse	Watercourses not classed as main rivers. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on ordinary watercourses.
Riffle	Areas of shallow water created by deposition of coarse sediment.

1. Introduction

1. The aim of the geomorphology baseline survey is to characterise the geomorphological baseline conditions of watercourses and water bodies that will be crossed by the Onshore Project. Baseline information gathered during the survey has been used to inform the assessments presented in **Chapter 14: Water Resources and Flood Risk** of the Environmental Statement (ES), and **Appendix 14.B: Water Environment Regulations Compliance Assessment**.

2. Characterising the geomorphology of watercourses provides information on their physical form and the processes that may influence this form (e.g. sediment transport and deposition). Baseline information has been used to determine how watercourses are likely to respond to the construction, operation and decommissioning of the Onshore Project. Baseline conditions will also be used to inform the detailed design, construction and monitoring phases of the Onshore Project. This will ensure the geomorphological and ecological integrity of watercourses crossed by the Onshore Project are maintained and will also inform any potential biodiversity net gain opportunities.

2. Methodology

3. Water bodies and watercourses surveyed are detailed in **Table 2.1**, **Figure 2.1** and **Figure 2.2**. Results are presented for each surface water catchment using the same naming system as in **Chapter 14: Water Resources and Flood Risk** (Taw Estuary (Sir Arthur's Pill catchment), coastal catchment (Instow Barton Marsh), coastal catchment (Braunton Burrows, Taw/Torridge).

4. The following best-practice guidance for geomorphological characterisation and monitoring was followed:

- Environment Agency (2003): River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual
- Environment Agency (2007): Geomorphological Monitoring Guidelines for River Restoration Schemes
- River Restoration Centre (2011): Practical River Restoration Appraisal Guidance for Monitoring Option.

5. Surveys were undertaken on 29th April 2022 and 17th August 2022 by an experienced fluvial geomorphologist. A visual inspection was undertaken along watercourses that will be crossed by the Onshore Project, as well as watercourses in the wider surface water catchments that are hydrologically linked to areas crossed by the Onshore

Project. All terminology used for the survey was consistent with the latest standard for hydromorphology (CEN, 2018).

6. The main characteristics of each watercourse were carefully recorded from the bank top, which included detailed photographs and locations of key features of each watercourse, including:

- Channel form, including planform, width and depth variation, bank form and condition, substrate types and the type and presence of bed forms such as pools, riffles and bars
- Flow conditions, including dominant flow types and the degree of variability within each reach
- Floodplain characteristics, including connectivity to the river channel, and the structure of the riparian zone
- In-channel/riparian vegetation, cross-checked against the results of ecological surveys
- Evidence of channel modification, including enlargement and re-sectioning, artificial bank protection, embankments and in-channel structures.

7. The survey aimed to identify any visual watercourse contamination (e.g., excessive sedimentation/smothering, hydrocarbons, sewage fungus, discoloration), as well as any operating discharges/pipes (e.g. outflows). This would help to identify any evidence of contamination or local sources of pollution.

Table 2.1 Details of surveyed catchments and watercourses

Surface water catchment	Surveyed watercourses
Taw Estuary (Sir Arthur's Pill catchment)	Sir Arthur's Pill Boundary Drain Inner Marsh Pill Ordinary watercourses (unnamed) Freshwater ponds
Coastal catchment (Instow Barton Marsh)	Ordinary watercourses (unnamed)
Coastal catchment (Braunton Burrows)	Freshwater ponds
Taw/Torridge	River Taw Estuary

2.1 Survey limitations

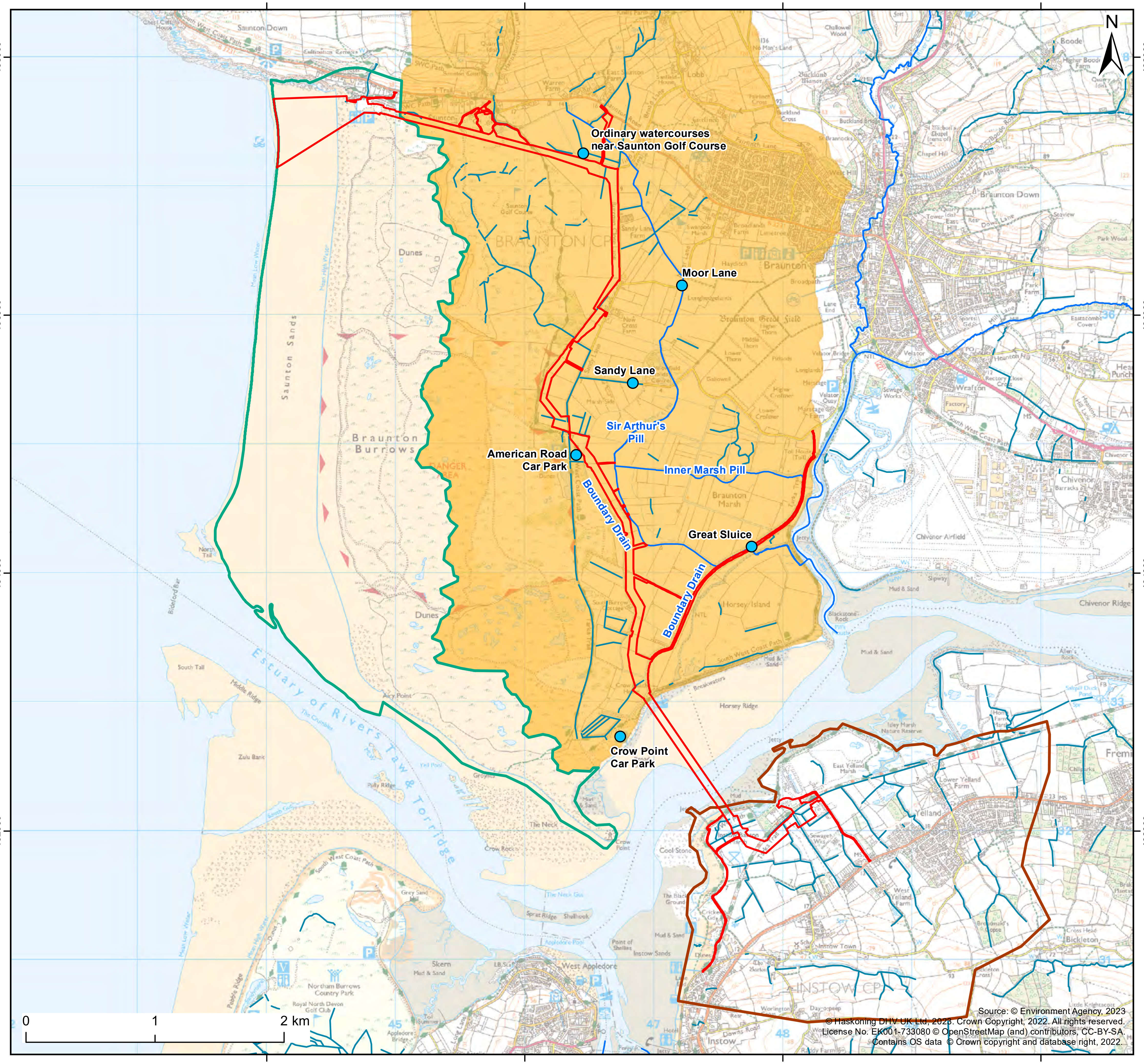
8. Access to parts of Sir Arthur's Pill catchment (i.e. Braunton Marsh) was restricted at the time of the surveys. However, it was possible to access a large proportion of most watercourses. Several small artificial drains north of the Tarka Trail could not be accessed because of very dense scrubby undergrowth. From what could be seen on the ground, and using a range aerial photographs, these small drains are

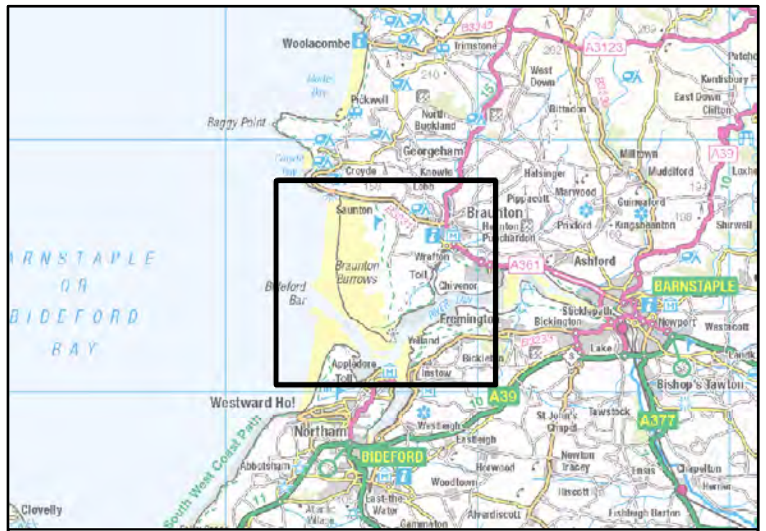
assumed to be of a similar nature to those surveyed in adjacent fields at Instow Barton Marsh.

9. Although water levels were low, some watercourses on Braunton Marsh are flanked by wide (~5m) marshy zones, making close inspection of channels difficult. Field observations were validated against aerial photography in inaccessible areas. These limitations are not considered to have limited the geomorphological characterisation of watercourses.

10. Due to prolonged dry weather in 2022, some channel sections were dry (August survey). Dry sections were recorded on watercourses near Saunton Golf Course. Where this was the case, the channel bed was inspected for evidence of bedforms, and expert judgement used to evaluate the likely flow types resulting from the configuration of channel bed and banks.

Figure 2.1 Baseline study area showing the Taw Estuary (Sir Arthur's Pill catchment) and coastal catchment (Braunton Burrows))





Legend:

- Onshore Development Area
- Braunton Burrows Coastal Catchment
- Instow Barton Marsh Coastal Catchment
- Taw Estuary River Water Body
- Geomorphology Walkover Reference Point
- Statutory Main River
- Ordinary watercourse

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title: Taw Estuary/Braunton Marsh

Figure: 2.1 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0254

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	09/06/2023	AB	SF	A3	1:30,000
P01	01/07/2022	LB	SF	A3	1:300,000

Co-ordinate system: British National Grid

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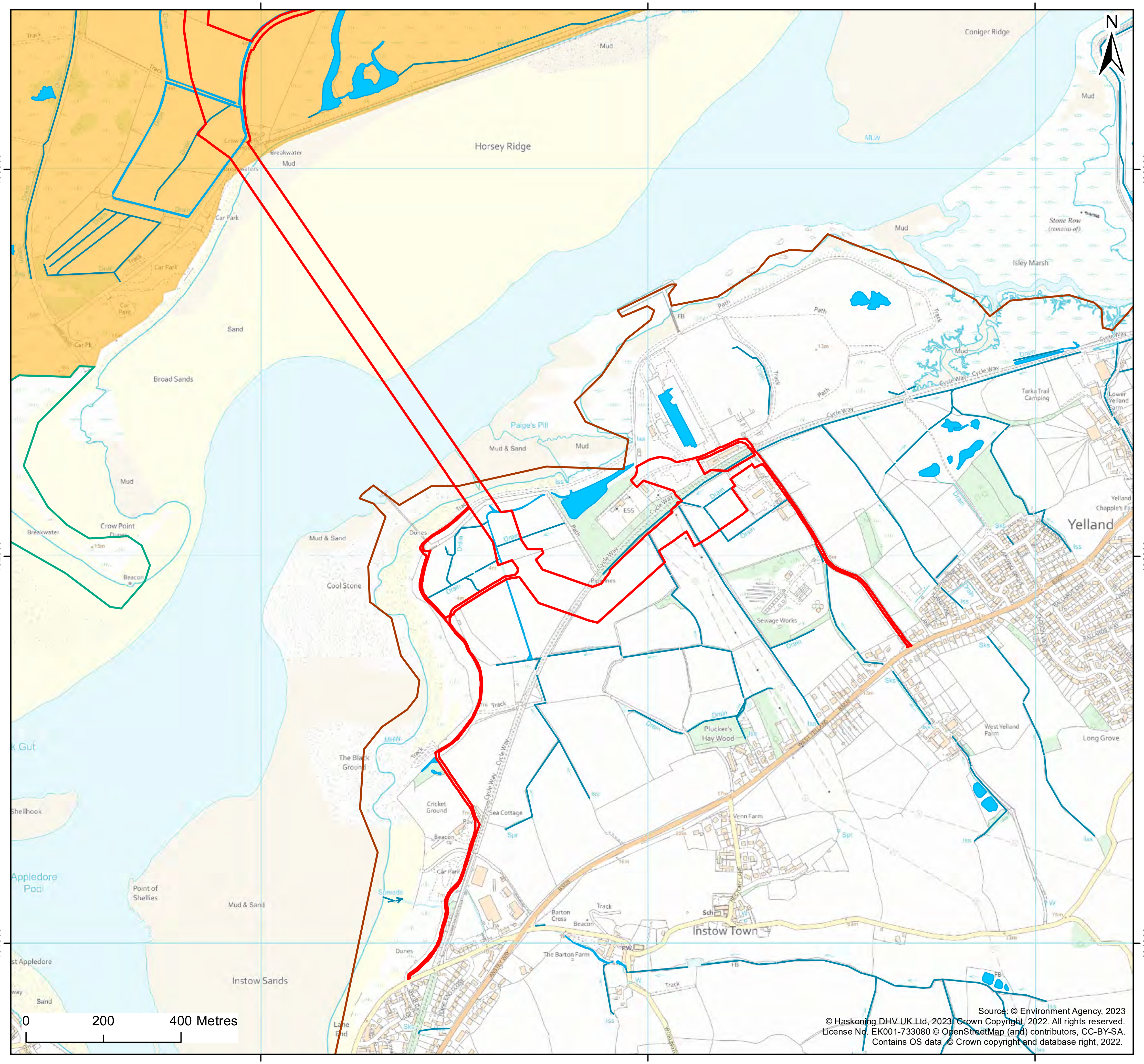
Figure 2.2 Baseline study area showing the coastal catchment (Instow Barton Marsh)



Legend:

- Onshore Development Area
- Braunton Burrows Coastal Catchment
- Instow Barton Marsh Coastal Catchment
- Taw Estuary River Water Body
- Lake
- Ordinary watercourse

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title: Instown Barton Marsh

Figure: 2.2 Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0255

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	09/06/2023	AB	SF	A3	1:10,000
P01	01/07/2022	LB	SF	A3	1:10,000

Co-ordinate system: British National Grid

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3. Results

3.1 Taw Estuary (Sir Arthur's Pill catchment)

3.1.1 Sir Arthur's Pill

11. Sir Arthur's Pill is the only main river crossed by the Onshore Project. The main river is the primary hydrological feature of Braunton Marsh, which is a low-lying area of pastoral fields crossed by relatively straight artificial channels. Water levels are managed through numerous sluices and water exits the marsh via the Great Sluice, which drains to Horsey Island and the wider estuarine environment. Braunton Marsh was originally an area of inter-tidal creeks and saltmarsh that was embanked and drained between 1811 and 1815 (Manning, 2007). Many of the existing artificial channels follow the courses of these former inter-tidal channels or 'guts'.

3.1.1.1 Channel form

12. The upper reach of Sir Arthur's Pill at Moor Lane (**Plate 3.1**) is typically straight with evidence of resectioning and a trapezoidal cross-section. The channel is ~1-2 m wide at bank top and 0.75-1.0 m at bank base – bankfull depth is ~1 m. Bank bases show some signs of being maintained (vertical scarps associated with desilting/dredging). The haul road will cross the upper reaches of Sir Arthur's Pill via a flume/culvert in this area.

13. In its middle reaches, at Sandy Lane and near America Road Car Park (**Plate 3.2, Plate 3.3**), Sir Arthur's Pill is ~2-3 m wide at bank top and similar at bank base. The channel is much less incised at these locations and there is no evidence of recent desilting/dredging. Near America Road car park (**Plate 3.3**) the channel has a gently sinuous planform (as it follows a pre-drainage palaeochannel), and the channel is flanked by a ~5 m wide marshy margin dominated by yellow iris (*iris pseudacorus*). Bankfull depth is ~1.5 m.

14. At its downstream reach (**Plate 3.4, Plate 3.5**), where it forms a confluence with Boundary Drain, Sir Arthur's Pill has a wider channel (~3-4 m at bank top and similar at bank base). The channel is also noticeably deeper (the channel bed could not be seen despite low water levels). Where Boundary Drain joins Sir Arthur's Pill, the channel is flanked by a ~15-20 m wide marshy zone (**Plate 3.5**) – LiDAR data indicates this marshy area forms the limits of a pre-drainage intertidal channel.

<table>
<tr><td>Plate 3.1 Sir Arthur's Pill looking upstream at Moor Lane.</td><td>Plate 3.2 Sir Arthur's Pill looking downstream near Sandy Lane.</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Plate 3.3 Sir Arthur's Pill looking downstream near America Road Car Park.</td><td>Plate 3.4 Sir Arthur's Pill – Boundary Drain confluence (Boundary Drain flows from left to right).</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Plate 3.5 Wide marshy zone at the Sir Arthur's Pill – Boundary Drain confluence</td><td></td></tr>
<tr><td></td><td></td></tr>
</table>

3.1.1.2 Flow conditions

15. In all reaches there were no bedforms and in most reaches there was no discernible flow. Submerged vegetation could be seen moving in a very gentle current, although this flow was not evident at the surface. Where tributaries join the main channel via sluices, there was evidence of turbulent water associated with freefalls over these structures. At the most upstream reach (Moor Lane), there was evidence of shallow riffles where flows were constricted by a small road bridge.

3.1.1.3 Soils and substrates

16. There are very few bank exposures along Sir Arthur's Pill as the channel is often well-lined with vegetation. However, given the uniform nature of the floodplain that characterises Braunton Marsh, it is unlikely that soils differ greatly from one site to another across the marsh. Where there are exposures, often alongside Boundary Drain where it has been desilted or poached by cattle (**Plate 3.6**), exposures show alluvial silts and clays with surficial layers of angular clasts. The latter appear to have been laid to provide a firm surface where cattle create muddy bankside conditions. In the middle reaches, where Sir Arthur's Pill runs alongside Boundary Drain, the latter had old dredgings along its banks – these were a dark grey/black colour which suggests the marshy bankside zone is probably rich in organic material or even peaty.

Plate 3.6 Typical bank exposure on Braunton Marsh characterised by silts and clays.

17. Apart from the upper reach at Moor Lane, where there was some evidence of flowing water and patches of very coarse sand (1-2 mm) and granules (2-4 mm), the bed of Sir Arthur's Pill is covered in fines (silts and clay). This material is most likely sourced from cultivated arable fields at the top of the catchment and from bank erosion due to cattle poaching.

3.1.1.4 Floodplain characteristics

18. In the upper reach at Moor Lane, there is little or no channel-floodplain connectivity due to the trapezoidal nature of the channel (**Plate 3.1**). In the middle and lower reaches connectivity is better with lower banks (**Plate 3.2, Plate 3.3**). There are numerous palaeochannels beside Sir Arthur's and they characterise the wider floodplain of Braunton Marsh – they are readily identified by their sinuous form and are typically filled with yellow iris. The lower reaches are similarly well-connected but are also constrained by water level management procedures.

19. Although the floodplain of Sir Arthur's Pill and the wider area of Braunton Marsh comprise a series of relatively flat, featureless fields, criss-crossed by engineered drains, LiDAR data (**Plate 3.7**) clearly shows the pre-reclamation geomorphology and water environment of Braunton Marsh. Sir Arthur's Pill and Inner Marsh Pill follow the courses of two former intertidal creeks that probably drained a saltmarsh environment. The wide marshy and reed filled areas at confluence zones with Boundary Drain show the former extent of these channels.

20. LiDAR data also picks out characteristic floodplain drainage 'grips' (**Plate 3.8**) that help remove water from the reclaimed marshland. There are also larger cross-cutting floodplain drainage channels – these are typically shallow (~0.2 m deep, ~1-2 m wide) features that do appear to not hold permanent flowing water (**Plate 3.9**). They tend to follow the course of former intertidal creeks and in some areas, they hold standing water with discoloured sediment (**Plate 3.10**).

Plate 3.7 LiDAR imagery (1 m) of Braunton Marsh. Sir Arthur's Pill and Inner Marsh Pill follow the courses of a former intertidal creeks.

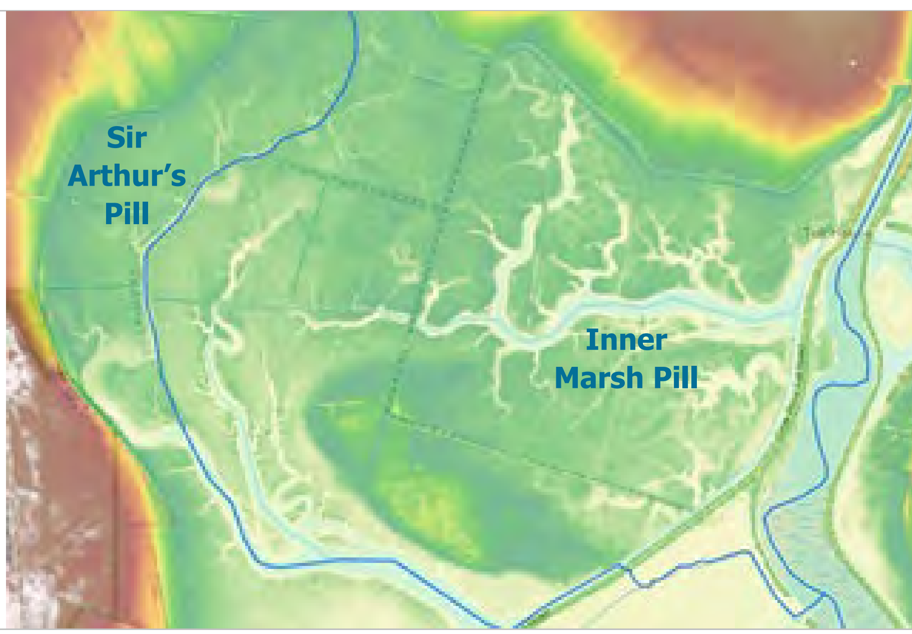

Plate 3.8 Floodplain drainage 'grips' adjacent to Sir Arthur's Pill. Pre-embankment intertidal creeks are also clear.	*Plate 3.9 Shallow floodplain drainage channels.*
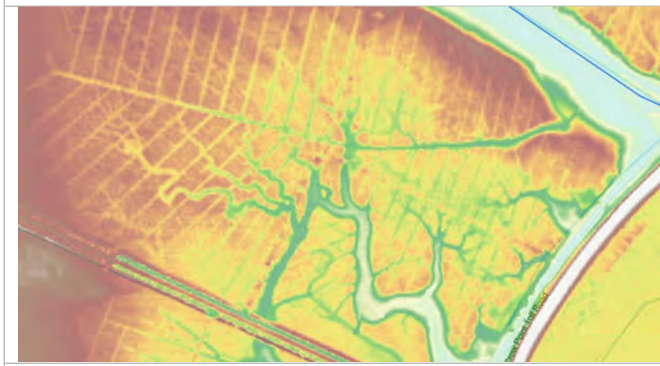	
Plate 3.10 Standing discoloured water.	
	

3.1.1.5 In-channel riparian vegetation

21. In the upper reaches the channel is largely obscured and choked by bankside vegetation (**Plate 3.1**). In the middle and lower reaches there are frequent areas of yellow iris and rushes at the confluence with Boundary Drain. Other marginal and emergent vegetation included soft rush (*juncus effusus*), hard rush (*juncus inflexus*), water parsnip (*sium latifolium*) and water dropwort (*oenanthe crocata*). Where the channel bed was visible, weeds could be seen growing, and in many cases the movement of these was the only sign of flowing water.

3.1.1.6 Modifications/structures

22. Reinforced banks were evident where the channel is crossed by road bridges in the upper reaches and small agricultural bridges on the marsh. Banks are artificial at these locations (concrete or stone blockwork). Banks are also artificial where tributary junctions are formed by sluices.

3.1.2 Boundary Drain

23. Boundary Drain follows the perimeter of Braunton Marsh and divides from Sir Arthur's Pill ~300 m upstream of Sandy Lane. Boundary Drain receives water from watercourses that drain the interior of Braunton Marsh and discharge to Horsey Island and the wider River Taw Estuary via the Great Sluice (**Plate 3.11** and **Plate 3.12**).

Plate 3.11 Boundary Drain on upstream side of the Great Sluice.	*Plate 3.12 Downstream side of the Great Sluice. Water from Braunton Marsh discharges to Horsey Island.*
	

3.1.2.1 Channel form

24. Channel form is typically straight with evidence of resectioning, near vertical banks and trapezoidal cross-section (**Plate 3.13**). At the western margin of Braunton Marsh, Boundary Drain is a single thread channel that transitions to a pair of parallel ditches downstream of a sluice (**Plate 3.14**) – after this ~180 m reach, Boundary Drain reverts back to a single channel. There is extensive evidence of recent dredging in the form of bankside accumulations of sediment mixed with typical channel margin vegetation (yellow iris) (**Plate 3.15, Plate 3.16**). Channel width appears to be relatively consistent at all reaches (~2-3 m at bank top and ~1.5-2 m at bank base). Bankfull depth is typically 1-1.5 m. Overall, the channel has a box like appearance relating to its artificial nature.

Plate 3.13 Over deepened trapezoidal shaped channel associated dredging (near America Road car park).

Plate 3.14 Parallel channels on Boundary Drain near Crow Point car park.

Plate 3.15 Recent bankside dredgings near America Way car park.

Plate 3.16 Recent bankside dredgings near Crow Point car park.

3.1.2.2 Flow conditions

25. Bedforms were not evident and there was no discernible flow in the channel apart from immediately downstream of sluices. In one location, at a drain confluence, boils and surges were evident on the surface as water was channelled (and constricted) underneath a sluice gate. In some locations submerged vegetation was moving in a very gentle current, although this was not evident at the surface.

3.1.2.3 Soils and substrates

26. As described for Sir Arthur's Pill, there are very few bank exposures anywhere on Braunton Marsh, including Boundary Drain. Channel banks tend to be well vegetated, which obscures any exposures. Where visible, or where old dredgings are visible on the floodplain, these indicate alluvium characterised by silt and clay

with occasional angular clasts. Bank dredgings are typically dark grey/black colour, which suggests organic or even peaty material derived from marshy areas adjacent to the channel.

27. Where visible the channel bed is characterised by fines (silt and clay) with occasional large clasts (cobble to boulder size (**Plate 3.17**)). These appear to have been laid on the bankside to stabilise areas eroded by cattle poaching and some of them have ended up in the channel. Fines are probably sourced from a combination of topsoil erosion from cultivated land north of Braunton Marsh and bank erosion due to cattle poaching.

Plate 3.17 Channel bed covered in fines with occasional large clasts; evidence of cattle poaching.

3.1.2.4 Floodplain characteristics

28. Channel-floodplain connectivity is restricted due to the artificial trapezoidal nature of the channel in many places (**Plate 3.13**, **Plate 3.14**, **Plate 3.15, Plate 3.16**). Dredgings left immediately adjacent to the channel increase bank height and also limit connectivity (**Plate 3.15**, **Plate 3.16**). Water levels are managed through a series of sluices that can be used to increase or decrease water levels, which will also impact potential hydraulic connectivity.

29. In the southwest corner of Braunton Marsh, close to Boundary Drain, a ~1.5 m high embankment runs for ~30-40 m across the floodplain and connects to a high alluvial unit (terrace) ~1.5 m above the modern floodplain. The embankment limits connectivity in this corner of the site (**Plate 3.18**).

Plate 3.18 Floodplain embankment (indicated by white arrow).

3.1.2.5 In-channel/riparian vegetation

30. Throughout the length of Boundary Drain there are frequent areas of yellow iris growing at the channel margin. Similar to Sir Arthur's Pill, marginal and emergent vegetation includes soft rush, hard rush, yellow iris, water parsnip and water dropwort. In many locations there are also extensive areas of floating and submerged vegetation (**Plate 3.19**, **Plate 3.20**).

Plate 3.19 Submerged in-channel vegetation near Crow Point car park.

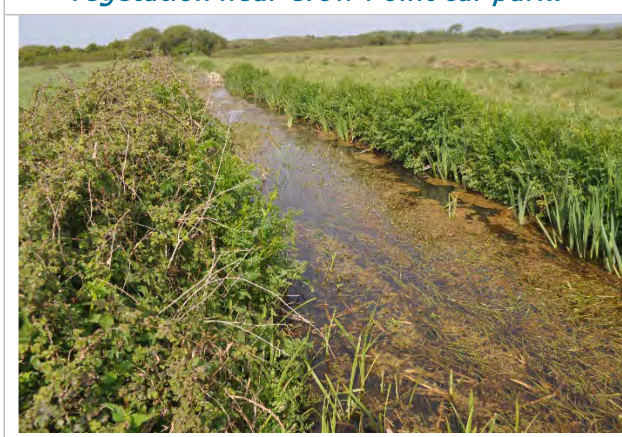

Plate 3.20 Extensive rafts of floating vegetation near Sandy Lane.

3.1.2.6 Modifications/structures

31. Where the channel is crossed by small bridges to allow agricultural vehicles access to the marsh, banks are artificial (concrete (**Plate 3.21**)). Sluices also cross the channel in many places (**Plate 3.22**, **Plate 3.23**). At the outflow of Boundary Drain

(i.e. the Great Sluice), banks are artificial (stone blockwork). The right bank of a minor drain that joins Boundary Drain near Crow Point Car Park is faced with stone (**Plate 3.24**).

Plate 3.21 Bridge and sluice crossing Boundary Drain.

Plate 3.22 Sluice on Boundary Drain.

Plate 3.23 Sluice on Boundary Drain.

Plate 3.24 Stone facing on a drain that joins Boundary Drain near Crow Point Car Park.

3.1.3 Inner Marsh Pill

32. Most of the channel's slightly sinuous course follows the line of a former inter-tidal creek (**Plate 3.7**). The upper reach, however, is entirely artificial and follows a straight engineered course that connects to Sir Arthur's Pill. Access restrictions meant that Inner Marsh Pill could only be surveyed at its upper and lower limits.

3.1.3.1 Channel form

33. At its upstream junction with Sir Arthur's Pill the channel has a straight planform and trapezoidal cross-section related to dredging – old dredgings were visible on

the banks (**Plate 3.25**). The channel is ~2 m wide at bank top and ~1.5 m at bank base. Bankfull depth is ~1.0-1.2 m. Downstream, where it joins Boundary Drain, the channel has a slightly sinuous planform and is ~3-4 m wide with a bankfull depth of ~1.5 m. Similar to Sir Arthur's Pill, Inner Marsh Pill has a wide (~15-20 m) reed and rush filled margin which marks the extent of the former (pre-embankment) inter-tidal channel (**Plate 3.26**).

Plate 3.25 Upstream reach, at the junction between Inner Marsh Pill and Sir Arthur's Pill.

Plate 3.26 Downstream confluence of Inner Marsh Pill with Boundary Drain.

3.1.3.2 Flow conditions

34. Although areas of Inner Marsh Pill were inaccessible, where the channel was visible, there were no bedforms or discernible flow, which is consistent with conditions observed on Sir Arthur's Pill and Boundary Drain. Analysis of maps and aerial imagery shows numerous drains join Inner Marsh Pill and it is likely that some of these are controlled by sluices, similar to the other surveyed channels – there will be flowing water in these locations.

3.1.3.3 Soils and substrates

35. As described for Sir Arthur's Pill, there are very few bank exposures anywhere on Braunton Marsh. Based on observations at other points in the survey area, typically where cattle have poached the banks, Inner Marsh Pill's floodplain will be composed of silty-clay alluvium. Marshy areas adjacent to the channel are likely to be rich in organic material and possibly peaty in nature. Where visible, the channel bed was comprised of fines (silts and clay) typical of the low energy environment.

3.1.3.4 Floodplain characteristics

36. Similar to other areas on the Braunton Marsh, floodplain areas are relatively flat with numerous shallow reed-filled palaeochannels. At the upstream reach near Sir Arthur's Pill, the channel is artificial and maintained through dredging (**Plate 3.25**), which limits hydrological connectivity. Dredgings line bank tops in a linear fashion which has created a small embankment, which will also limit channel-floodplain connectivity.

3.1.3.5 In-channel/riparian vegetation

37. The channel is lined with yellow iris and rushes and floating aquatic vegetation was evident at the confluence with Boundary Drain. Similar to other channels, marginal and emergent vegetation included soft rush, hard rush, yellow iris, water parsnip and water dropwort. Where the channel bed was visible there were weeds growing.

3.1.3.6 Modifications/structures

38. Although no structures were observed on the accessible areas of Inner Marsh Pill, aerial imagery shows a private L-shaped road that crosses the centre of Braunton Marsh and Inner Marsh Pill – at these locations channel banks are very likely artificial (concrete).

3.1.4 Ordinary watercourses near Saunton Golf Course

39. In the area to the immediate north east and south east of Saunton Golf Course there are several ordinary watercourses that fall within the Onshore Export Cable Corridor (**Figure 2.1**). Most of these channels appear to be artificial drainage ditches, and they are also tributaries of Sir Arthur's Pill.

3.1.4.1 Channel form

40. Channels are typically trapezoidal in cross-section and deeply incised in places (up to 2 m) (**Plate 3.27**) – it is quite likely these channels are maintained through regular dredging. The exception to this is a channel at the south east corner of Saunton Golf Course that flows through scrub and woodland (**Plate 3.28**). This channel has a more natural, slightly sinuous planform and is less incised (~0.5 m). Bankfull depth ranges from 0.5 to 1.0 m.

3.1.4.2 Flow conditions

41. All of these minor channels were dry during the survey except for several small areas of standing water. This was due to the sandy, freely draining nature of this part of the catchment, and dry summer weather. Despite the lack of water, and similar to other channels in the catchment, there was no evidence of any bedforms

that would produce diverse flows (e.g. pools, riffles, glides). The exception to this is the channel at the south east corner of the golf course. At this location there is abundant woody material in the channel and large roots extending from the banks (**Plate 3.28**). When water is flowing, these features will probably create more diverse flows compared to the other channels near the golf course.

Plate 3.27 Typical incised drainage channel crossing arable fields near Saunton Golf Course.	*Plate 3.28 Woodland channel at the south east corner of Saunton Golf Course.*
	

3.1.4.3 Soils and substrates

42. Given the proximity of these watercourses to Braunton Burrows sand dunes, floodplain soils are typically sandy silts. Channel bed sediments, where visible, are similar (sandy silt). Given that maize is grown close to a lot of channels in this area, there are likely to be issues with runoff and high fine sediment loads. This is because maize is typically harvested in mid-to-late autumn when weather conditions are likely to be wet, which in combination with heavy machinery, causes soil erosion.

3.1.4.4 Floodplain characteristics

43. The majority of floodplains in this part of the catchment are used for arable agriculture (maize at the time of survey).

3.1.4.5 In-channel riparian vegetation

44. All channel banks are heavily overgrown with dense, scrubby vegetation (typically grasses, cow parsley, brambles, bindweed) and a range of wild flowers in more open locations. The channel at the south east corner of Saunton Golf Course is lined by woody scrub characterised by downy birch, hazel and beech. The roots of these often line the channel banks (**Plate 3.28**).

3.1.4.6 Modifications/structures

45. In some locations culvert bridges allow farm vehicles access across watercourses. In these locations channel banks are artificial. Where public footpaths cross channels there are footbridges supported on stone block supports which line the bank.

Braunton Burrows freshwater ponds

46. At the western edge of Sir Arthur's Pill catchment there are a series of permanent freshwater ponds (**Plate 3.29**, **Plate 3.30**). They are similar to other freshwater ponds located within Braunton Burrows which are linked to a small sand aquifer that underlies the dunes. The water table of the aquifer is domed within Braunton Burrows, being entirely rain fed, with a maximum elevation of 7 or 8 m AOD in winter beneath the centre of the dome (Allen et al., 2012). The ponds are not connected to the surface water drainage network as they are not linked to, or fed by, watercourses.

Plate 3.29 Pond at the inland margins of Braunton Burrows, surrounded by scrub with large areas of floating vegetation.

Plate 3.30 Wet scrubby woodland surrounding the inland dune ponds.

47. The ponds are well vegetated on the banks and typically surrounded by scrub and relatively mature wet woodland (commonly stands of goat willow (**Plate 3.30**). There are extensive areas of marginal (reeds and rushes) and floating vegetation. In some locations there is evidence of bankside erosion related to recreational use. Bed substrates are typically sandy silts.

3.2 Coastal catchment (Instow Barton Marsh)

48. Instow Barton Marsh comprises a series of fields adjacent to the existing East Yelland substation (**Figure 2.2**). Drainage is achieved primarily by a single, straight

artificial channel (drain) that runs south-north across the marsh. A series of smaller (more ephemeral) ditches run perpendicular to this drain. At the northern boundary of the site, adjacent to the coastal flood defence, there is a west-east running (slightly sinuous) channel that receives water from all of the other channels at Instow Barton Marsh. This channel then flows to a lake immediately north of East Yelland substation.

49. It was not possible to access several very minor drains close to the proposed White Cross Onshore Substation during the survey. Analysis of aerial photography and maps shows these are all narrow (<1 m in width) artificial features that form a grid pattern close to the proposed White Cross Onshore Substation. For the purposes of this report, it is assumed they are similar in nature to the watercourses described below.

3.2.1 Channel form

50. Channels are typically trapezoidal in cross-section due to their artificial nature and evidence of maintenance (**Plate 3.31**, **Plate 3.32**). Channel widths are relatively consistent (1.0-1.5 m at bank top and 0.75-1.0 m at bank base) across the site. Bankfull depth is typically ~ 1.0-1.5 m. The only deviation from this is in areas where cattle use the channel to drink and cross (**Plate 3.33**). At these locations (mainly on channel that runs roughly parallel to the coastal flood defence), widths are up to ~4-5 m at bank top and bank base – bankfull depth is ~1.0 m. There are several shallow ephemeral ditches which are typically 0.3-0.4 m deep and ~1 m wide. They were dry apart from in depressions caused by cattle poaching, where there were small stagnant pools.

3.2.2 Flow conditions

51. Channels are artificial with trapezoidal cross-sections and lower scarp banks indicative of dredging/desilting. As a result, channels appeared largely stagnant with no bedforms or evidence of flowing water. Submerged weeds did provide evidence of very gentle currents, although these were not evident at the surface.

3.2.3 Soils and substrates

52. There are very few bank exposures on Instow Barton Marsh. Where the banks were visible due to cattle poaching, floodplain soils are typically alluvium characterised by silt and clay with occasional angular clasts, sometimes forming a layer near the surface (**Plate 3.34**). It is likely that this angular gravel has been placed to provide a more solid base in muddy/eroded areas where cattle access channels.

Plate 3.31 The main drainage channel that cuts through the middle of Instow Barton Marsh.

Plate 3.32 Near vertical lower slopes with exposed sediment indicative of mechanical maintenance, although there were no signs of recent desilting/dredging.

Plate 3.33 Over-widened channel due to cattle poaching.

Plate 3.34 Floodplain alluvium of silts and clays with superficial gravel layer.

53. Where visible the channel bed is characterised by fines (silt and clay). This material is most likely sourced from cultivated arable fields south of the Tarka Trail and bank erosion due to cattle poaching.

3.2.4 Floodplain characteristics

54. Channel-floodplain connectivity is limited due to the incised nature of drains that characterise the site. Where banks are lower due to poaching there is better potential connectivity. As well as the main drainage features, there are a series of shallow ditches that do not hold water permanently (**Plate 3.35**). Similar to Braunton Marsh, the floodplain of Instow Barton Marsh is characterised by numerous sinuous palaeochannels (**Plate 3.36**) related to the pre-

drainage/embankment inter-tidal environment. Water from Instow Barton Marsh drains to a lake immediately north of East Yelland.

Plate 3.35 Typical shallow floodplain drainage ditch.

Plate 3.36 Sinuous palaeochannel – the existing East Yelland substation is behind woodland on the horizon.

3.2.5 In-channel riparian vegetation

55. In some locations submerged weeds could be seen growing on the channel bed and there are areas of floating vegetation and rushes growing at the channel margin (**Plate 3.37**). Marginal and emergent vegetation includes soft rush, hard rush, yellow iris, water parsnip and water dropwort.

Plate 3.37 Floating vegetation and channel margin rushes in the channel close to the coastal flood embankment.

Plate 3.38 Small culvert on the main drainage channel.

3.2.6 Modifications/structures

56. Where the channel is crossed by small bridges (culverts) to allow agricultural vehicles to access the marsh, banks are artificial (concrete) (**Plate 3.38**).

3.3 Coastal catchment (Braunton Burrows)

57. A single watercourse flows from the high ground to the north of Saunton Sands and is then culverted below the Saunton Sands Car Park. The channel then flows in an open culvert beside the car park until it emerges onto the beach and flows in an unconfined nature across the foreshore (**Plate 3.39**). At high tides the position and form of channel shift slightly. On the beach the channel is ~1 m wide and very shallow. Halfway down the beach towards Mean Low Water Springs (MLWS) the freshwater drains into the sands.

58. Within the coastal catchment (Braunton Burrows) there are a series of freshwater ponds connected to a small sand aquifer that underlies the dunes (as described in **Section 3.1**). The ponds are situated outside of the Onshore Export Cable Corridor, although the extent of the underlying sand aquifer is uncertain.

59. The ponds are often located in deep 'slacks' between the dunes that intercept the groundwater body (**Plate 3.40**). Typically, they are shallow (<0.5 m) with low sandy banks (0.2-0.3 m) and sandy bed substrate, and they are fringed by aquatic vegetation and marram grass (*ammophila*). There is evidence of erosion along the banks associated with recreational use.

Plate 3.39 Culverted watercourse that discharges onto Saunton Sands

Plate 3.40 Freshwater pool formed in a 'slack' between the dunes of Braunton Burrows

3.4 Taw/Torridge

3.4.1 Channel form

60. The estuary channel has an asymmetrical cross-section at low tide. On the northern side of the estuary there is a narrow channel adjacent to the bank, which gives way to a wide (~450 m) sandy shoal (**Plate 3.41**). This transitions to the main channel of the estuary at low tide, which is ~250 m wide. From the water's edge the low water bank rises gently to the coastal embankment that protects the existing substation and Instow Barton Marsh.

Plate 3.41 The Taw Estuary at the point it is crossed by the Onshore Export Cable Corridor.

3.4.2 Flow conditions

61. At low water flows are typically smooth glides although there are areas of slackwater in back channels and near the channel margins that are more sluggish in nature.

3.4.3 Soils and substrates

62. Channel bed substrates are sandy in the main channel with finer silts in lower energy areas.

3.4.4 Floodplain characteristics

63. The estuary floodplain encompasses the floodplains of Sir Arthur's Pill (described in **Section 3.1**) and floodplain of the coastal catchment (Instow Barton Marsh) (described in **Section 3.2**). These floodplains are protected from inundation by

embankments and are therefore disconnected from estuarine inundation on high tides.

3.4.5 In-channel riparian vegetation

64. Saltmarsh vegetation includes glasswort, sea-blite, sea purslane, sea lavender and sea spurrey.

3.4.6 Modifications/structures

65. On the southern side of the estuary, there is a ~160 m long jetty that is perpendicular to the main flow of the estuary which projects into the channel. A large concrete outfall is located on the southern foreshore – this is the outflow from the lake that receives water from Instow Barton Marsh.

4. Summary

66. Watercourses in the baseline study area are dominated by the deposition of fines, which make up the floodplain and channel beds. As a result, and to maintain effective drainage, channels appear to be regularly maintained by dredging/desilting and water levels are managed through a series of sluices. All channels are low gradient and low energy with little or no evidence of bedforms or flowing water. There is little evidence of natural geomorphic process operating. Due to their artificial nature and water management measures, there is limited floodplain connectivity, especially where dredgings line bank tops to create low embankments. Due to the presence of numerous sluices, modified (artificial) channel banks are common.

67. Channel banks are generally well-vegetated (except where recently dredged/desilted) with yellow iris. In places there are extensive banks or floating aquatic vegetation and other in-channel vegetation. Freshwater ponds at the western edge of the Taw Estuary (Sir Arthur's Pill catchment) and in Braunton Burrows are fed by a small sand aquifer, but they are not connected to the surface water drainage network.

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Appendix 14.B: Water Environment Regulations Compliance Assessment

White Cross Offshore Windfarm Environmental Statement

Chapter 14.B: Water Environment Regulations Compliance Assessment

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Glossary of Acronyms

Acronym	Definition
AONB	Area of Outstanding Natural Beauty
Cefas	Centre for Environment, Fisheries and Aquaculture
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
DCO	Development Consent Order
EIA	Environmental Impact Assessment
ES	Environmental Statement
EQSD	Environmental Quality Standards Directive
ETG	Expert Topic Group
EU	European Union
GEP	Good Ecological Potential
GES	Good Ecological Status
GPP	Guidance for Pollution Prevention
HDD	Horizontal Directional Drilling
HMWB	Heavily Modified Water Body
IDB	Internal Drainage Board
INNS	Invasive Non-native Species
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
NVZ	Nitrate Vulnerable Zone
PBDE	Priority Hazardous Substances
PINS	Planning Inspectorate
PPG	Pollution Prevention Guidance
RIAA	Report to Inform Appropriate Assessment
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SPZ	Source Protection Zone
TJB	Transition Joint Bay
WER	Water Environment Regulations
WFD	Water Framework Directive
ZoI	Zone of Influence

Glossary of Terminology

Defined Terms	Description
Coastal catchment	Land which drains directly to the coastal or estuarine waters, rather than through a river water body – not part of a river water body catchment.
Export Cable Corridor	The area in which the export cables will be laid, from the Offshore Substation Platform to the White Cross Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cables Corridor.
Grid Connection Point	The point at which the White Cross Offshore Windfarm connects into the distribution network at the National Grid's East Yelland Substation and the distributed electricity network. From East Yelland Substation electricity is transmitted to Alverdiscott where it enters the national transmission network.
Jointing bay	Underground structures constructed at regular intervals along the Onshore export cables Corridor to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	Where the offshore export cables come ashore.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links.
Main River	Usually, larger rivers and streams. The Environment Agency carries out maintenance, improvement or construction work on Main Rivers to manage flood risk.
Onshore Export Cables	The cables which bring electricity from Mean Low Water Springs (MLWS) at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the NG grid connection point at East Yelland. The onshore infrastructure will form part of a separate planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Ordinary Watercourse	Non Main Rivers are called 'Ordinary Watercourses'. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on Ordinary Watercourses.
Transition Joint Bay	Underground structures at the Landfall that house the joints between the offshore export cables and the onshore export cables.

Defined Terms	Description
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with National Grid electrical requirements at the Grid Connection Point at East Yelland.

Water Environment Regulations Compliance Assessment

1. Project Overview

1. This report assesses whether the Onshore Project is compliant with the requirements of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ('the Water Environment Regulations' (WER)). The Onshore Project for the Town and Country Planning application includes all infrastructure landward of Mean Low Water Springs (MLWS) (hereafter referred to as 'the Onshore Project'). This includes infrastructure at the Transition Joint Bays (TJB) and all infrastructure associated with the onshore export cables and White Cross Onshore Substation.

2. The elements of the White Cross Offshore Windfarm Project seaward of Mean High Water Springs (MHWS) ('the Offshore Project') are subject to a separate application for consent under Section 36 of the Electricity Act 1989, and for Marine Licences under the Marine and Coastal Access Act 2009. These applications are supported by a separate Environmental Statement (ES) and separate WER compliance assessment covering all potential impacts seaward of MHWS.

3. Above MHWS at the Landfall, the offshore export cables will be connected to the onshore export cables via a TJB located in Saunton Sands Car Park. The onshore export cables travel inland approximately 8km at its maximum, to a new White Cross Onshore Substation. This will be constructed to accommodate the connection of the Offshore Project to the existing National Grid onshore substation and National Grid Connection Point.

2. The Water Environment Regulations

4. The purpose of this report is to determine whether the Onshore Project is compliant with the requirements of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended). The Regulations continue to enforce *Directive 2000/60/EC of the European Parliament and of the Council of 23rd October 2000 establishing a framework for Community action in the field of water policy* ('the Water Framework Directive') following Britain's withdrawal from the European Union under the terms of the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

5. The WER require the competent authorities in England and Wales to prevent deterioration and protect and enhance the status of aquatic ecosystems. This means that these authorities 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 WER apply to all bodies of water, including those that are artificial.

6. There are two separate components used to classify the status of surface water bodies (rivers, lakes, estuaries and coastal waters); ecological and chemical. As the Onshore Project extends down to MLWS, this assessment includes transitional and coastal water bodies, as well as river and groundwater bodies.

7. The ecological status of a surface water body is assessed according to the condition of:

- 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
- Hydromorphological quality elements, including morphological conditions, hydrological regime and tidal regime.

8. 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 classification objectives. The overall environmental objective of reaching Good Ecological Status (GES) applies to these water bodies.

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

10. 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.

11. This assessment forms part of the wider Environmental Impact Assessment (EIA) for **Chapter 14: Water Resources and Flood Risk.** Potential impacts on habitats and species are considered in detail in the separate Report to Inform Appropriate Assessment (RIAA).

3. Consultation

12. Consultation has been a key part of the development of the Onshore Project. Consultation regarding Water Resources and Flood Risk has been conducted throughout the EIA. An overview of the Onshore Project consultation process is presented within **Chapter 7: Consultation**.

13. A summary of the key issues raised during consultation specific to Water Resources and Flood Risk is outlined below in **Table 3.1**.

Table 3.1 Consultation summary

Consultee	Date, Document, Forum	Comment	Where addressed in the WER compliance assessment and Chapter 14 Water Resources and Flood Risk of the ES
Marine Management Organisation (MMO)	30/05/2022 Scoping opinion	With regard to the objectives of the Water Environment Regulations, any new development must not cause deterioration from the present status. The MMO would expect the ES to demonstrate that the proposal will not cause deterioration in water body status.	This WER Compliance Assessment (**Appendix 14.B**) evaluates the potential of the Onshore Project to cause a deterioration water body status. Impacts related to the construction, operation and decommissioning of the Onshore Project are assessed in **Sections 14.5**, **14.6** and **14.7** of the ES.
		The MMO require the potential impact of the development on groundwater resources and groundwater quality to be assessed. This should include the appropriate measures to identify private water supplies along the corridor of the proposed cable route.	Baseline groundwater quality is described in **Section 14.4.1.5** of the ES and impacts from construction, operation and decommissioning of the Onshore Project are assessed in **Sections 14.5, 14.6 and 14.7**. Abstraction data supplied by the Environment Agency are outlined in **Section 14.4.1.6** of the ES Groundwater bodies are assessed in this compliance assessment in **Sections 6**, **7** and **8**.
		All works near flood defences and any main river crossings should provide plans with supporting detail including engineering drawings and a detailed method statement.	The approach to works near flood defences and river crossings is outlined in **Chapter 5: Project Description** of the ES. Detailed engineering plans will be developed post consent.
		Method statements and risk assessments should be produced for all watercourse crossing points along the cable corridor. Suitable methods should be employed (bunds, settlement lagoons/tanks, irrigation etc) to	Detailed methods for each watercourse crossing are not yet known. Best practice mitigation measures for trenched crossings and minimising sediment runoff are listed in **Section 8** of this

Consultee	Date, Document, Forum	Comment	Where addressed in the WER compliance assessment and Chapter 14 Water Resources and Flood Risk of the ES
		minimise soil run-off into watercourse at these sites. Stockpiles of sub-soil and topsoil should be located and stored appropriately to minimise discoloured run-off. Downstream water quality monitoring should be put in place at these sites during operations.	WER compliance assessment and **Section 14.5** of the ES. Monitoring requirements (e.g. locations, timescale, frequency and parameters to be measured) will be formalised in a water quality monitoring protocol through discussions with the Environment Agency.
		An appropriate method statement and risk assessment should be prepared for the management of run-off from the sub-station construction area. Water quality monitoring of any adjacent watercourse should take place during the construction process. A sustainable urban drainage system should be put in place to deal with surface water flows from the site in the longer term, not just to manage flood risk but also to protect water quality.	Potential impacts on flows are assessed in **Sections 7** and **8** of this WER compliance assessment. A Construction Surface Water and Drainage Plan will be developed as part of the Code of Construction Practice (CoCP) in agreement with the relevant regulators. Mitigation for surface runoff is also outlined in **Section 14.5** of the ES. Monitoring requirements (e.g. locations, timescale, frequency and parameters to be measured) will be formalised in a water quality monitoring protocol through discussions with the Environment Agency.
		If the Applicant intends to impound a watercourse, then it is likely an impounding licence from the Environment Agency is required. An impoundment is any dam, weir or other structure that can raise the water level of a water body above its natural level. 'On-line' impoundments hold back water in rivers, stream, wetlands and estuaries, and	An evaluation of all permits and licenses required by the Onshore Project is being undertaken as part of the wider consents strategy.

Consultee	Date, Document, Forum	Comment	Where addressed in the WER compliance assessment and Chapter 14 Water Resources and Flood Risk of the ES
		consequently affect downstream flows, sediment transport and migration of fish.	
		All works near flood defences and any main river crossings should provide plans with supporting detail including engineering drawings and a detailed method statement. Please refer to the Environment Agency's advice below regarding Environmental Permits.	The approach to works near flood defences and river crossings is outlined in **Chapter 5: Project Description** of the ES.
		The Environmental Permitting (England and Wales) Regulations 2016 require a permit or exemption to be obtained for any activities which will take place: • On or within 8 m of a main river (16 m if tidal) • On or within 8 m of a flood defence structure or culverted main river (16 m if tidal) • On or within 16 m of a sea defence • Involving quarrying or excavation within 16 m of any main river, flood defence (including a remote defence) or culvert • In a floodplain more than 8 m from the river bank, culvert or flood defence structure (16 m if it's a tidal main river) and the Onshore Project does not already have planning permission.	All permits and licenses required by the Onshore Project are listed in a separate consents strategy document.
Environment Agency		To help manage risks (i.e., any increased silt loads) to the water environment, the Environment Agency recommends that a	A CEMP forms part of the overarching embedded mitigation for the Onshore Project, including pollution prevention measures. PPGs that will be

Consultee	Date, Document, Forum	Comment	Where addressed in the WER compliance assessment and Chapter 14 Water Resources and Flood Risk of the ES
		Construction Environment Management Plan (CEMP) is developed. The CEMP should pull together and manage the pollution control and waste management requirements during the construction phase. It should ensure that adequate pollution prevention measures are included to protect controlled waters during construction. It is recommended that the CEMP is drafted using guidance in the Environment Agency's Pollution Prevention Guidelines (PPGs), in particular PPG5 - Works and maintenance in or near water and PPG6 - Working at construction and demolition sites.	referred to are listed in **Section 8** of this WER compliance assessment.
Devon County Council, North Devon District Council, North Devon AONB partnership	14/04/22 Expert Topic Group (ETG) 1	The Onshore Project was introduced and described, and a summary of key water resources receptors and mitigation measures were provided. Next steps were outlined (i.e. geomorphology baseline survey). A detailed summary of proposed construction mitigation measures was sent to stakeholders.	Mitigation measures are listed in **Section 8** of this WER compliance assessment.
Environment Agency	16/05/2022 ETG 2	As the Environment Agency were unable to attend the first ETG meeting, the same information as described above was discussed.	Mitigation measures are listed in **Section 8** of this WER compliance assessment.
Environment Agency	26/05/2023 ETG 3	An update on the Onshore Project was provided, including the split consenting strategy and the updated red line boundary (compared to that described at ETG 2). Key points of discussion were the haul road crossing of Sir Arthur's Pill (Main River) and impact of trenched crossings. An updated list of	Impacts associated with the direct disturbance of surface water bodies, including trenched crossings and temporary haul road crossings, are assessed in **Section 8** of this WER compliance assessment and **Section 14.5** of the ES.

Consultee	Date, Document, Forum	Comment	Where addressed in the WER compliance assessment and Chapter 14 Water Resources and Flood Risk of the ES
		mitigation measures was sent to the Environment Agency.	
Environment Agency, North Devon District Council	06/06/23 ETG 4	Key points discussed were: • Depth of Landfall Horizontal Directional Drilling (HDD) and associated flood risk/risk of sediment movement/disturbance • Water level management and flood risk on Braunton Marsh • Flood risk at the White Cross Onshore Substation.	Flood risk from all sources is assessed in **Appendix 14.C FRA**.

4. Methodology

14. There is no detailed published methodology to assess whether projects are compliant with the requirements of the WER and supporting UK legislation. There are, however, several sets of guidance that have been developed to support these assessments at project level in the different water body types, predominantly written by the Environment Agency. The following are the most relevant to the Onshore Project (note that some of these documents refer to the Water Framework Directive (WFD) rather than WER as they were published prior to the UK's exit from EU; they remain relevant in this context, however):

- Environment Agency (2017) Clearing the waters for all. Outlines a detailed methodology for assessing impacts on transitional and coastal water bodies
- Planning Inspectorate (2017) Advice Note 18: The WFD. This document provides an overview of the WFD and an outline methodology for considering WFD as part of the Development Consent Order (DCO) process. Although the Onshore Project is not an NSIP and does not require a DCO application, the advice note has been followed for other non-DCO projects and is of relevance to the Onshore Project consent application
- Environment Agency (2016) WFD risk assessment: How to assess the risk of your activity. Guidance for bodies planning to undertake activities that would require a flood risk activity permit.

15. 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 projects in all types of water bodies. The assessment process therefore covers the following stages, which are described in more detail in the subsequent sections:

- Stage 1: Screening assessment
- Stage 2: Scoping assessment
- Stage 3: Detailed compliance assessment (if required).

4.1 Data sources

16. Data were acquired to inform the EIA and WER compliance assessment through a desktop review of existing studies and datasets (**Table 4.1**). To further inform the baseline, a geomorphology baseline survey was undertaken. Details are provided in **Table 4.2**.

Table 4.1 Data sources used to inform the assessment

Data Source	Date	Data Contents
Environment Agency	2019 (updated August 2022)	Catchment Data Explorer (https://environment.data.gov.uk/catchment-planning) provides information on River Basin Districts Management Catchments, Operational Catchments and water bodies.
	Updated January 2023	The Water Quality Archive provides data on water samples taken at sampling points from coastal or estuarine waters, rivers, lakes, ponds, canals or groundwaters. (https://environment.data.gov.uk/water-quality/view/landing)
	Undated	Licensed abstraction data. Available on request from the Environment Agency.
Department for Environment, Food and Rural Affairs (Defra)	Undated	MAGIC map (www.magic.defra.gov.uk) showing aquifer designations, groundwater vulnerability, Drinking Water Protected Areas and Safeguard, Source Protection Zone (SPZ) and designated sites.

Table 4.2. Summary of site-specific survey data

Survey name and year	Summary
Geomorphological baseline survey	In order to provide site specific and up to date information on which to base the impact assessment and WER compliance assessment, a geomorphological baseline survey was conducted in April and August 2022. Surveys characterised the physical characteristics of the major watercourses (Main Rivers, Ordinary Watercourses and water bodies) that would be crossed by the Onshore Project. This included an assessment of channel form, flow conditions, channel and floodplain substrates, floodplain characteristics, in-channel and riparian vegetation, and any evidence of channel modification/structures and pollution.

4.2 Data limitations

17. Data used to inform the assessment is part of the River Basin Management Planning Cycle 3, accessed through the Environment Agency Catchment Data Explorer. The most recent data and classifications date from 2019 (updated in 2022). It is assumed that these data are robust for this assessment. This limitation is not considered to significantly affect the certainty or reliability of the impact assessments presented.

4.3 Stage 1: Screening

18. This stage consists of an initial screening exercise to identify the zone of influence (ZoI) and relevant water bodies associated with the Onshore Project. The ZoI has been defined using the following criteria, with reference to the South West River Basin Management Plan (RBMP), as presented in the online Catchment Data Explorer (Environment Agency, 2022):

- All surface water bodies that could potentially be directly impacted by the Onshore Project (i.e. they are crossed by the Onshore Project)
- Any surface water bodies that have direct connectivity (e.g. upstream and downstream) that could potentially be affected by the Onshore Project
- The Onshore Project considers all impacts down to MLWS, which includes the coastal water body (Barnstaple Bay). In line with Clearing the Waters for All guidance, activities in the marine environment are assessed out to one nautical mile offshore.

4.4 Stage 2: Scoping

19. This stage identifies whether there is potential for deterioration in water body status or failure to comply with objectives for any of the water bodies identified in Stage 1. Scoping determines whether there is the:

- Potential for impacts of the Onshore Project on water body quality elements
- Potential for temporary and non-temporary impacts on water body improvement and mitigation measures
- Potential for impacts on protected areas and critical habitats
- Potential for impacts on invasive non-native species.

20. The water body and activity under assessment will be progressed to Stage 3 (detailed compliance assessment) if potential impacts on quality elements cannot be ruled out. Conversely, if sufficient information can be provided at this stage to demonstrate that impacts on quality elements would not occur, the quality element is scoped out of further assessment.

4.5 Stage 3: Detailed Compliance Assessment

21. 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 quality elements at water body level. For priority substances, the process requires the assessment to consider whether the activity is likely to prevent the quality element achieving a good chemical status.

22. If it is established that an activity or project component is:

    1. Likely to affect a water body (by causing deterioration or preventing achievement of objectives and the implementation of mitigation measures for HMWBs), or
    2. 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.

23. 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 The Onshore Project and the nature of any impacts. Note that this stage is referred to as an Impact Assessment in the Planning Inspectorate guidance (PINS, 2017). Note that although this is not a DCO application, the PINS (2017) guidance remains an authoritative source of guidance on how compliance with the WER should be assessed, and is complementary to the 'Clearing the waters for all' guidance (Environment Agency, 2017).

4.6 Approach to decommissioning

24. No decision has yet been made regarding the final decommissioning policy for infrastructure associated with the Onshore Project. It is recognised that legislation and industry best practice change over time. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the Offshore Project so as to be in line with current guidance, policy and legalisation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning could be subject to a separate consenting approach.

25. Options for decommissioning the Onshore Project are as follows:

    - The White Cross Onshore Substation site may be kept operational and upgraded accordingly for other potential electrical use or fully decommissioned (performed in the reverse of the construction works utilising similar types of equipment).

To decommission the White Cross Onshore Substation, all electrical plant would be removed from their foundations and transported to a facility for processing for reuse, recycling, or disposal. The foundations may be pulled out and disposed of and any holes refilled with earth, if required. The control building can be demolished, and all materials removed.

- Strategy states that the default position for decommissioning should be full removal unless there are strong reasons for any exceptions (see **ES Chapter 3: Policy and Legislation**).

26. For the purposes of this assessment, it is assumed that:

- The same water bodies screened into the assessment for construction and operation (**Section 6**) would also be affected during decommissioning - no additional water bodies would be screened in.
- Scoping answers would be the same for decommissioning as for construction and operation (**Section 7**) – no additional quality elements for river, transitional, coastal or groundwater bodies would be scoped in or out. Therefore, decommissioning is not discussed further in this assessment.

4.7 Article 4.7

27. In the unlikely event that no suitable measures can be identified to mitigate potential adverse impacts of the Onshore Project, it may be necessary to present a case for a derogation under Article 4.7. It should be noted that the Onshore Project would look to prevent deterioration in water body status in the first instance (e.g. through project design and, where necessary, the adoption of further mitigation measures) therefore avoiding the need for an application for an exemption under Article 4.7.

28. To determine the scope of any assessment required to demonstrate compliance with the requirements of Article 4.7, consultation with the Environment Agency would be required. However, at this stage, it is envisaged that this assessment would include an assessment of whether:

- The Onshore Project can be classified as being of imperative overriding public interest and whether the benefits to society resulting from The Onshore Project outweigh the local impacts of WER implementation
- All practicable steps to avoid adverse impacts have been taken. These steps are defined as those that are technically feasible, not disproportionately costly, and compatible with the overall requirements of the Onshore Project

- The Onshore Project can be delivered by an alternative, environmentally better option (as discussed in the PINS guidance). This option will need to be technically feasible and not disproportionately costly.

5. Project Description

5.1 Construction activities

5.1.1 Landfall

29. The offshore export cables make Landfall at Saunton Sands Car Park. The offshore export cables will be connected to the onshore export cables in a TJB, having been installed in the intertidal zone using either open-trenching or a trenchless technique.

30. A temporary onshore compound will be required to accommodate the drilling rigs, ducting and welfare facilities. The temporary Landfall compound will be set within Saunton Sands Car Park and would be up to 50 m long by 50 m wide. Each drill would start from the Landfall compound, travel beneath the beach, and will exit in the subtidal zone at a suitable water depth. The drill will be of sufficient depth below the beach to have no effect on coastal erosion.

31. The offshore and onshore export cables will be joined together in one TJB located onshore within the Landfall compound. This would comprise an excavated area of up to 20 m x 8 m, with a reinforced concrete floor to allow winching during cable pulling and a stable surface to allow jointing.

32. Following cable pulling and joining activities, the joints would be buried to a depth of up to 2 m using stabilised backfill, pre-excavated material or a concrete box. The remainder of the TJB will be backfilled with the pre-excavated material and returned to the pre-construction condition, so far as is reasonably possible.

5.1.2 Onshore Export Cable Corridor and cable installation

33. A full description of the onshore cable installation is given in **ES Chapter 5 Project Description**. Key parameters for this assessment are summarised as follows:

    - The working width of the Onshore Export Cable Corridor will typically be 30m. This includes the trench or trenches, stored excavated material (split into segregated subsoil and topsoil) and a haul road (5 m width). Cable corridor widening (up to 60 m width) may be required to accommodate access or specialist equipment associated with trenchless techniques or micro-tunnelling

- The onshore underground cable system will be installed in one or two trenches consisting of one 132kV or two 66kV cables and one fibre optical cable. The trench holding the circuit may be up to 4 m wide
- A trench up to a maximum of 1.9 m depth would be excavated for each circuit.
- The primary cable installation method will be open cut trenching, with cable ducts installed within the trenches and backfilled with soil. Cables would then be pulled though the pre-laid ducts at a later stage in the construction programme
- Ducts would be buried to 1.2 m (from top of duct to surface) and installed using two methods:
    - Hand laying of ducts, which is suited to short and/or complicated sections
    - The use of a ducting trailer or trenching machine for longer uninterrupted trenching sections.
- The cable duct will be installed in sections of up to 1 km at a time, with a typical construction presence of up to four weeks along each 1 km section
- The installation of the onshore export cables is expected to take up to 15 months in total.

5.1.2.1 Crossings

- No Main Rivers will be crossed by the Onshore Export Cable Corridor. The Taw Estuary (Taw/Torridge water body) will be crossed using HDD or Direct Pipe. Larger Ordinary watercourses, such as Boundary Darin, will be crossed using HDD.
- To minimise the impacts of crossing sensitive features such as hedgerows and watercourses, the working width would be reduced to the haul road and cable trenching areas only
- When crossing main rivers or Internal Drainage Board (IDB) maintained watercourses, the cable entry and exit pits will be at least 9 m from the banks of the watercourse, and the cable will be at least 2 m below the channel bed
- Where minor watercourses, which are not maintained by IDB, such as field drains, are to be crossed, the approach will be open cut trenching combined with temporary damming and diverting of the watercourse. The suitability of this method would be agreed at detailed design.

5.1.2.2 Haul road

- A haul road will be required of up to 5 m width (and up to 8 m wide at passing bay locations), and as a realistic worst-case it is assumed it may be required along the full length of the cable corridor

- The haul road will be formed of protective matting (e.g. bog mats where ground conditions are wet), temporary metalled road or permeable gravel aggregate dependant on the ground conditions, vehicle requirements and any necessary protection for underground services
- At ditches, culverts would be required to allow the haul road to continue. Culverts would be set into the channel bed to avoid impound, and dimensions would accommodate worst case flows and volumes
- Culverts may remain in place for the duration of the cable duct installation and subsequent cable pull, i.e., up to 15 months total
- At larger crossings, temporary bridges (e.g. Bailey Bridge) may be employed to allow continuation of the haul road
- When cable duct installation is completed the haul road would be removed and the ground reinstated using the stored topsoil. Some sections of haul road may need to be retained or reinstated to maintain access for the subsequent cable pulling stage.

5.1.2.3 Joint bays and link boxes

- Joint bays would be formed on completion of the duct installation before the cables are installed and would typically be up to 10 m long and 2 m wide
- Joint Bays would be needed every 600 to 1000 m, and link boxes (3 x 3 m) every 1000 m
- At joint bay locations, a proportion of the originally excavated soils that would be surplus and may require removal from site, would be managed through the development and adoption of a CL:AIRE (Contaminated Land: Applications in Real Environments) Industry Code of Practice for the re-use and disposal of excavated soils on site.

5.1.2.4 Pre-construction drainage

34. A detailed drainage strategy will be developed post-consent by a specialist drainage contractor, taking into account existing land drainage and will include details of header drains, outfall locations and cross-easement interconnections (if applicable). A soakaway drainage pit/outfall may be required if no suitable outfall to a nearby watercourse is possible. This strategy will include the following measures and will be prepared in consultation with the landowners and the Braunton Marsh Drainage Board (if within the IDB area).

35. Drainage for site yard, mobilisation areas and off easement accesses will be installed by a specialist sub-contractor in accordance with the design developed by the drainage engineer.

36. Surface water drainage will be installed along the edge of the working width of the cable trench to intercept surface water, to minimise water within the trench and to ensure the construction works do not increase the risk of flooding to surrounding land.

37. The cable corridor will be bounded by parallel drainage channels (one on each side) to intercept drainage within the working width. Additional drainage channels will be installed to intercept water from the cable trench. This will be discharged at a controlled rate into local ditches or drains via temporary interceptor drains. Depending upon the precise location, water from the channels will be infiltrated or discharged into the existing drainage network.

5.1.2.5 Dewatering

38. To ensure safe working conditions, certain areas along the cable route may require point dewatering depending upon ground conditions and water levels. Pipes will be sunk to a depth dictated by the ground conditions and water pumped out in advance of the works to temporarily lower the surrounding groundwater level. The groundwater produced will be pumped to an adjacent watercourse downstream of the works and outline pipes will be installed to prevent scouring and disturbance of the watercourse bed. The watercourse will be monitored for sediment disturbance and rate of flow with additional mitigation measures being put in place if required.

39. For the removal of water in the trench or localised ponding on the right of way, the Foreman will be notified of the land are agreed as suitable to pump the water on to. Where any further locations are required as the work continues, these will be directed through the lands Liaison Officer and agreed with the landowners and the client.

40. Where surrounding land is not available for discharging water, then excess water will pass through a filtration system, such as temporary settlement lagoons, with straw bales and silt netting filtration and then into a watercourse.

41. A water management scheme may also be installed which is formed from a number of lined lagoons with interconnecting spill ways in order to manage any ground water encountered during the dewatering or run off. This water would need testing for contaminants prior to discharge into any adjacent watercourses, if a permit is obtainable from the relevant authorities.

5.1.3 White Cross Onshore substation

42. The onshore export cables will connect to the White Cross Onshore Substation, then to the existing National Grid Onshore Substation, where it would connect the Onshore Project to the transmission grid.

43. The maximum parameters for the temporary construction compound and operational footprint are:

- Construction compound area (temporary works): 0.5 ha
- Permanent substation footprint: 0.34 ha
- New permanent access road: 250 m long by 7.5 m wide.

44. Construction methods include:

- The site would be stripped, and the ground levels graded as required by the final design
- Deeper soils would be excavated from areas where the ground profile needs to be lowered (cut) and moved into the areas where the ground level needs to be raised (fill). Where the specification of the existing soils is not up to the required load bearing standard, additional material may need to be imported to the site
- After grading of the site is complete, a stoned platform will be constructed, and excavations would then proceed associated with the laying of foundations, trenches and drainage. At this stage it is not known whether the foundations would be ground bearing or piled
- The cables from the White Cross Onshore Substation to the National Grid Onshore Substation would be typically installed within ducts. This method will require a trench to be excavated between the White Cross Onshore Substation and the National Grid Onshore Substation for the cables to be laid, before being reinstated. The working width, trench depth, trenchless crossing width, and other dimension for the installation would be the same as those described for the main cable duct installation.

5.1.3.1 Drainage

45. An draft operational drainage strategy been developed for the Onshore Substation (Royal HaskoningDHV, 2023) and will be further developed through detailed designs. It is assumed that surface water discharge methods using infiltration techniques are deemed unsuitable for this site due to cohesive ground conditions. It is proposed that surface water drainage from approximately 0.62 ha of impermeable surfaces are routed via a proprietary treatment system, into an attenuation pond providing a storage volume of approximately 433 m^3. Peak surface water run-off will be restricted via a hydro-brake flow control device to the maximum

greenfield run-off rate of 3.87 l/s for the 1 in 100-year rainfall event, including climate change allowances. Restricted surface water outflow will be directed into existing land drains located northwest of the development.

46. The Onshore Substation will be unmanned. This means for there will not be a requirement foul drainage.

6. Screening

47. The first stage of screening consists of an initial exercise to identify the individual activities associated with the construction and operation and maintenance of the Onshore Project that could potentially impact on compliance parameters (**Section 6.1**). The relevant water bodies that could be affected by the Onshore Project are then identified (**Section 6.2**). The baseline characteristics of each water body are presented, and each water body is assessed for inclusion into the scoping assessment. Protected areas within 2 km of the Onshore Project are also screened for inclusion into Stage 2 (**Table 6.3**).

6.1 Identification of activities

48. **Table 6.1** provides a summary of the construction and operation and maintenance activities described in **Section 5** that pose potential risks to compliance with the WER.

Table 6.1. Summary of construction and operation activities for consideration in Stage 2 scoping

Phase	Activity	Potential impact on water bodies	Compliance parameter potentially at risk
Coastal water bodies			
Construction	Landfall (down to MLWS)	Increased sediment supply associated with the sub-tidal HDD exit pit. Increased sediment supply from construction work at the TJB and Landfall compound (these are located in an onshore coastal catchment that drains to Barnstaple Bay coastal water body). Ground disturbance is unlikely as the TJB will be located in an existing area of hardstanding. Potential accidental spills or leaks of fuels, oils or lubricants from construction work at the TJB and Landfall compound.	Hydromorphology, physico-chemistry, biology and priority substances.
Operation		Potential for disturbed ground/increased sediment supply associated with maintenance activities at the TJB. Potential for accidental spills or leaks of fuels, oils or lubricants supply associated with maintenance activities at the TJB.	Hydromorphology, physico-chemistry, biology and priority substances.
River water bodies			
Construction	Installation of onshore export cables	Increased sediment supply from open cut trenching. Potential accidental spills or leaks of fuels, oils or lubricants from machinery and stores within the onshore export cable corridor and construction compounds.	Hydromorphology, physico-chemistry, biology, and priority substances.
	Construction of the White	The White Cross Onshore Substation is located in an onshore coastal catchment that drains to	Hydromorphology, physico-chemistry, biology, and priority substances.

Phase	Activity	Potential impact on water bodies	Compliance parameter potentially at risk
	Cross Onshore Substation	the Taw/Torridge transitional water body. There is the potential for increased sediment supply due to construction work at the Onshore Substation. Potential accidental spills or leaks of fuels, oils or lubricants from machinery and stores at the White Cross Onshore Substation and construction compound.	
Operation	Presence of onshore export cables and associated infrastructure	Altered surface and groundwater flows; potential accidental spills or leaks of fuels, oils or lubricants and supply of fine sediment from localised and infrequent emergency repairs.	Hydromorphology, physico-chemistry, biology, and priority substances.
	Drainage at the White Cross Onshore Substation	Altered surface and groundwater flows.	Hydromorphology, physico-chemistry
Transitional water bodies			
Construction	River Taw estuary cable crossing using trenchless technique (HDD or Direct Pipe method)	The onshore export cables will be installed up to 13 m below the estuary bed. Impacts at the surface are not expected and no other construction work will take place in the transitional water body. There is the potential for indirect impacts from constrcution activities in the adjacent river and onshore coastal catchments.	Hydromorphology, physico-chemistry
Operation	Presence of the onshore export cables	The onshore export cables will be located up to 13 m below the estuary bed. Invasive maintenance is not planned along the cable duct at the trenchless crossing. It would only occur in the event of an accident – such as the cable being dug through or damaged in some way. No impacts are anticipated, and no compliance parameters would be at risk. There is the potential	

Phase	Activity	Potential impact on water bodies	Compliance parameter potentially at risk
		for indirect impacts from operation/maintenance activities in the adjacent river and onshore coastal catchments.	
Groundwater bodies			
Construction		Accidental spills or leaks of fuels, oils and lubricants transferring from surface to groundwater.	Overall status Chemical status
Operation		Altered groundwater flow patterns due to the presence of permanent infrastructure – potential impacts on flood risk	Overall status Quantitative status

6.2 Identification of water bodies

49. The status, characteristics and overall objectives of water bodies that could potentially be impacted by the construction and operation and maintenance of the Onshore Project are summarised in **Table 6.2** and shown in **Figure 6.1**.

50. Water bodies were identified using the Environment Agency's Catchment Data Explorer (Environment Agency, 2022). Water bodies have been screened into the assessment in response to the proposed works being close to and/or hydrologically connected to those water bodies (as described in **Section 4.3**).

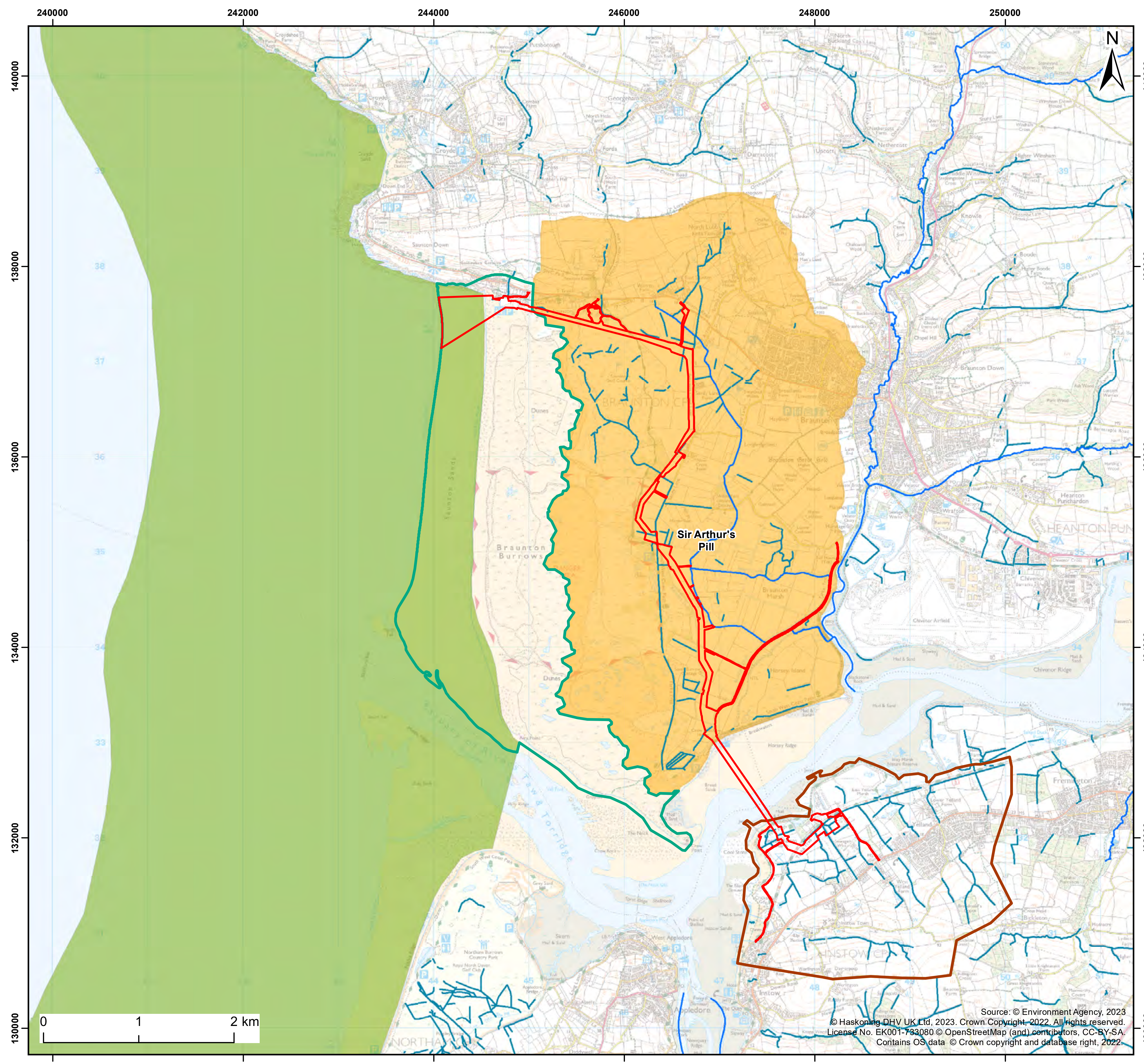
51. Protected areas associated with each water body that has been screened into the assessment are shown in **Table 6.3**.

Table 6.2 Water bodies screening assessment

Surface water body	Type and designation	Ecological status/potential	Chemical status		Objectives	Screened in to Stage 2?
Taw Estuary (GB108050020000)	River Heavily modified	Moderate potential Bad invertebrate status; Bad dissolved oxygen.	Fail High levels of some priority hazardous substances (PBDE and mercury and its compounds).		No overall objective beyond 2015.	Yes. Screened in because the majority of the Onshore Project will be located in this catchment.
Taw/Torridge (GB540805015500)	Transitional Heavily modified	Moderate potential Moderate dissolved inorganic nitrogen and Moderate supporting elements (surface water).	Fail Failure in 2019 was due to high levels of benzo(g-h-i)perylene, polybrominated diphenyl ethers (PBDE) and mercury and its compounds. The water body was also at Fail for chemical status in 2013, 2014, due to high levels of tributyltin compounds and fluoranthene.		No overall water body objective beyond 2015.	Yes. Screened in because components of the Onshore Project will be located within the catchment of this water body.
Coastal water body	**Type**	**Ecological status/potential**	**Chemical status**		**Objectives**	**Screened in to Stage 2?**
Barnstaple Bay (GB610807680003)	Coastal Not designated artificial or heavily modified	Good ecological status	Fail High levels of some priority hazardous substances (PBDE and mercury and its compounds).		No overall water body objective beyond 2015.	Yes. Screened in because the Onshore Project extends to MLWS.
Groundwater body	**Type**	**Overall status**	**Quantitative status**	**Chemical status**	**Objectives**	**Screened in to Stage 2?**
River Taw and North Devon Streams (GB40802G801000)	Groundwater	Poor	Good	Poor	No overall objective	Screened in because the majority of the

Surface water body	Type and designation	Ecological status/potential	Chemical status		Objectives	Screened in to Stage 2?
				Upward trend assessment caused by agricultural (diffuse) pollution Diffuse agricultural pollution impacts on Drinking Water Protected Area	beyond 2021	Onshore Project will be underlain by this water body.
Torridge and Hartland Streams (GB40802G800600)	Groundwater	Poor	Good	Poor Upward trend assessment (sector under investigation)	No overall objective beyond 2021	No. Screened out because the only activity which overlies this groundwater body is use of an existing access track. The section of track is short (~350 m) and will only be used for early works access (e.g. 4x4 vehicles). Plant will not be moved along this access and there will be not drilling or excavation.

Figure 6.1 Surface Water Bodies.



Legend:
- Onshore Development Area
- Braunton Burrows Coastal Catchment
- Instow Barton Marsh Coastal Catchment
- Taw Estuary River Water Body
- Barnstaple Bay Coastal Water Body
- Statutory Main River
- Ordinary watercourse

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title: WER Surface Water Bodies

Figure: 6.1 Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0242

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	09/06/2023	AB	SF	A3	1:40,000
P01	25/10/2022	ND	SF	A3	1:40,000

Co-ordinate system: British National Grid

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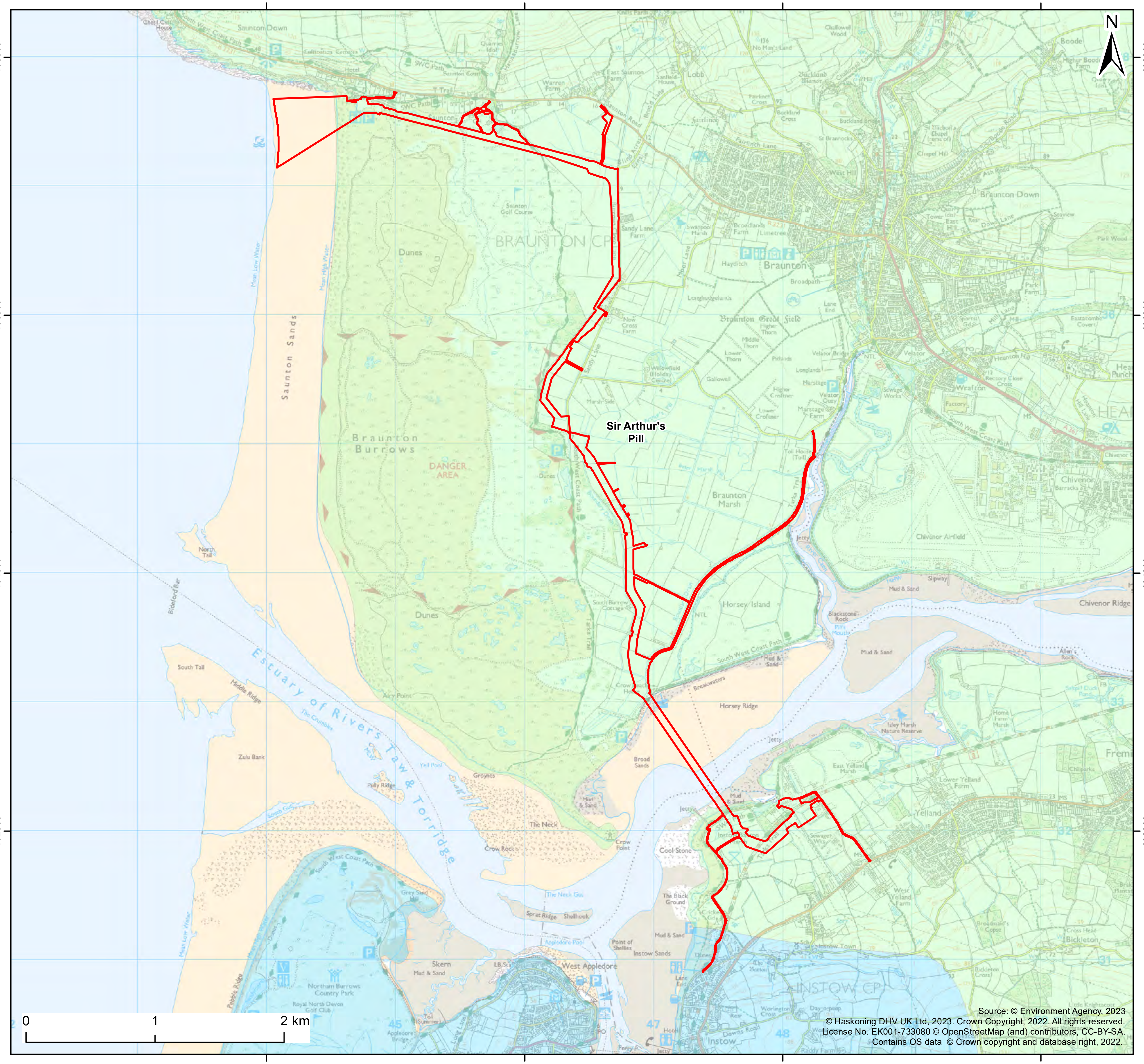
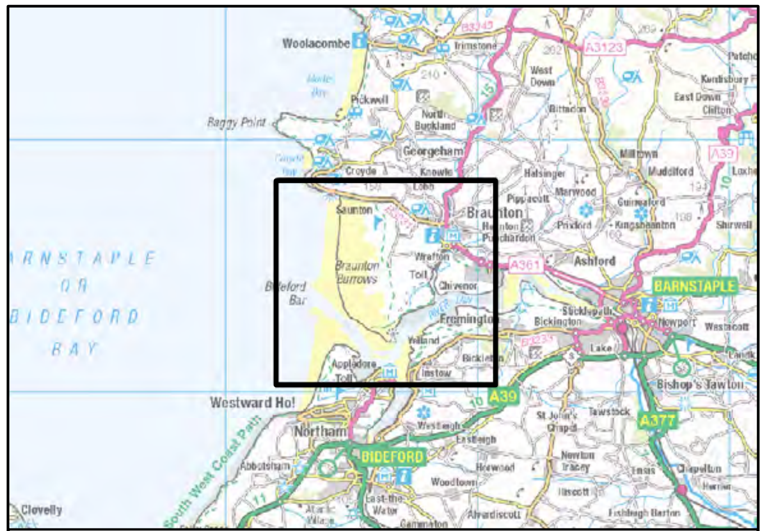
Figure 6.2 Groundwater Bodies





Legend:

Onshore Development Area

Groundwater Bodies

Torridge and Hartland Streams

River Taw and North Devon Streams

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title: WER Groundwater Bodies

Figure: 6.2 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0358

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	07/06/2023	AB	SF	A3	1:30,000
P01	25/10/2022	ND	SF	A3	1:30,000

Co-ordinate system: British National Grid

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Table 6.3 Water dependent protected areas within 2 km of the Offshore Project screened into the assessment

Water body/protected area	ID	Directive	Current status
Taw Estuary (GB108050020000)			
Taw Estuary ET6	ET6	Nitrates Directive	Not known.
Braunton Burrows SAC	UK0012570	Habitats and Species Directive	Favourable: 22.6% Unfavourable recovering: 68% Unfavourable declining: 9.4%
Taw/Torridge (GB540805015500)			
Taw Estuary ET6	ET6	Nitrates Directive	Not known
Taw Estuary	UKSW80	Shellfish Water Directive	Monitoring of shellfish waters is undertaken at two sites in the estuary (Environment Agency IDs: SW-73010147, SW-73010260). Most recent data from 2015 and 2016 are either good or greater (high).
Torridge Estuary	UKSW81		
Taw-Torridge Estuary	UKSW79		
Braunton Burrows SAC	UK0012570	Habitats Directive	See Taw Estuary (GB108050020000) above.
Taw Estuary	UKENCA52	Urban Waste Water Treatment Directive	Not known.
Barnstaple Bay (GB610807680003)			
Braunton Burrows SAC	UK0012570	Habitats Directive	See comment above for the Taw/Torridge (GB540805015500) water body.
Taw-Torridge Estuary	UKSW79	Shellfish Water Directive	As above. See comment Taw/Torridge (GB540805015500) water body.
Saunton Sands	UK34100	Bathing Water Directive	Most recent water quality classification (2022) is excellent. Water quality also excellent 2018-2021.
Croyde Bay	UK34200	Bathing Water Directive	Most recent water quality classification (2022) is excellent. Water quality was good from 2019 to 2021, and excellent in 2018.

Water body/protected area	ID	Directive	Current status
River Taw and North Devon Streams (GB40802G801000)			
River Taw and North Devon Streams	UKGB40802G801000	Drinking Water Protected Area	Poor
Braunton Burrows	UK0012570	Special Area of Conservation	See Taw Estuary (GB108050020000) above.
Taw Estuary	ET6	Nitrates Directive	Not known.

7. Scoping

52. The scoping assessment determines:

- The potential impacts of the Onshore Project on water body quality elements
- Impacts on protected areas and critical habitats
- Impacts on invasive non-native species
- The potential temporary and non-temporary impacts on improvement and mitigation measures.

7.1 Impacts on water body quality elements

The aim of this section is to highlight the water body quality elements that have the potential to be impacted by the proposed construction and operation activities screened into the assessment (**Table 6.1**). This stage will determine the scope of a detailed compliance assessment, if it is required for the Onshore Project.

53. The results of the scoping assessment for the identified river, transitional, coastal and groundwater body quality elements are presented in **Table 7.1**, **Table 7.2**, **Table 7.3** and **Table 7.4**. Scoping questions for transitional and coastal water bodies in this assessment are taken directly from the Environment Agency's scoping template for estuarine and coastal waters (Environment Agency, 2017) and adapted for other water body types based on similar principles.

54. Protected areas are assessed in detail in **Table 7.5** and potential temporary and non-temporary impacts on improvement and mitigation measures are assessed in **Table 7.6**.

Table 7.1 Scoping assessment for the Taw Estuary (GB108050020000) river water body

Parameter	Scoping question	Scoping assessment	Scoping decision
Taw Estuary (GB108050020000)			
Project components assessed: Onshore export cables			
Hydromorphology	Could the activity change the volume, energy or distribution of flows in the water body?	**Construction** Ground disturbance for cable installation and changes to land use from temporary construction areas could potentially alter the hydrological regime of river water bodies screened into the assessment. Changes to land cover and disturbed ground could alter surface water drainage pathways, resulting in changes to the volume, energy or distribution of flows.	In
		Operation As assessed in the EIA (**Chapter 14 Water Resources and Flood Risk**) permanent infrastructure in the Taw Estuary river water body will occupy a very small area of the total catchment (0.12%). Although there may be some very localised changes in surface water flows in the vicinity of the onshore export cables, joint bays and link boxes, it is considered unlikely these will be of sufficient magnitude to change the volume, energy or distribution of flows in the wider water body. Any maintenance work would be so localised and infrequent that impacts on the wider water body are considered unlikely.	Out
	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	**Construction** Ground disturbance for cable installation and changes to land use at temporary construction areas could increase fine sediment input to water bodies, which could have impacts on hydromorphology. Any increase in surface runoff has the potential to increase scour to the bed and banks.	In
		Operation As assessed in the EIA (**Chapter 14 Water Resources and Flood Risk**) permanent infrastructure in the Taw Estuary river water body will occupy a very small area of the total catchment (0.12%). Although there may be some very localised changes in surface water flows in the vicinity of the onshore export cables, joint bays and link boxes, it is considered	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		unlikely these will be of sufficient magnitude to change the width, depth, bank conditions, bed substrates and structure of the riparian zone. Any maintenance work would be so localised and infrequent that impacts on the wider water body are considered unlikely.	
	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	**Construction** Although temporary barriers to river continuity may be required during construction (e.g. to facilitate trenched watercourse crossings), they would be removed following construction and any effects would be reversed. Onshore infrastructure will not create a permanent barrier to the downstream movement of water or sediment, or the upstream movement of fish.	Out
		Operation All permanent infrastructure at watercourse crossings will be buried below the channel bed. Burial depths at each crossing point are not yet known. Onshore infrastructure will not create a permanent barrier to the downstream movement of water or sediment, or the upstream movement of fish.	Out
Physio-chemistry and chemistry	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	**Construction** There is potential for increased sediment supply associated with construction and activities, which could impact on turbidity levels and oxygenation within the water body. There will also a risk of contaminant supply to water bodies from direct disturbance (e.g. trenched crossings), and from accidental spillage or leakage of fuel oils or lubricants from construction vehicles. This has the potential to impact on physico chemistry.	In
		Operation As assessed in the EIA (**Chapter 14 Water Resources and Flood Risk**) permanent infrastructure in the Taw Estuary river water body will occupy a very small area of the total catchment (0.12%). Although there may be some very localised changes in surface water flows in the vicinity of the onshore export cables, joint bays and link boxes, it is considered unlikely these will be of sufficient magnitude to change temperature, pH,	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		oxygenation, salinity or nutrient concentrations in the wider water body. Any maintenance work would be so localised and infrequent that impacts on the wider water body are considered unlikely.	
	Could the activity introduce dangerous chemicals into the water body?	**Construction** Construction machinery working in or adjacent to watercourses has the potential to accidentally release lubricants, fuels and oils into a surface water body. This could also be caused by spillage, leakage and in-wash from vehicle storage areas following rainfall, accidental release of foul waters (e.g. from welfare facilities) and construction materials, such as cement and inert drilling fluids from trenchless crossings.	In
		Operation Any operational maintenance activities will be so localised and infrequent in nature that the introduction of dangerous chemical to any surface water body are considered unlikely.	Out
Biology (habitats)	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** Impacts from ground disturbance for cable installation (including use of a temporary haul road) and construction of the White Cross Onshore Substation could increase the amount of fine sediment in the water bodies. This could smother bed habitats and reduce light penetration. This could also lead to the loss or modification of aquatic flora communities. Changes to physico chemistry from proposed onshore construction activities could also lead to loss or modification of habitats for aquatic plants.	In
		Operation As assessed in the EIA (**Chapter 14 Water Resources and Flood Risk**) permanent infrastructure in the Taw Estuary river water body will occupy a very small area of the total catchment (0.12%). Although there may be some very localised changes in surface water flows in the vicinity of the onshore export cables, joint bays and link boxes, it is considered unlikely these will be of sufficient magnitude to change hydromorphology and/or physico-chemistry, or lead to the direct loss or modification of habitats for aquatic plants in the wider water body. Any maintenance	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		work would be so localised and infrequent that impacts on the wider water body are considered unlikely.	
	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** Increased fine sediment inputs to the water body originating from ground construction activities 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 construction activities could also lead to loss or modification of aquatic invertebrate habitat.	In
		Operation As assessed in the EIA (**Chapter 14 Water Resources and Flood Risk**) permanent infrastructure in the Taw Estuary river water body will occupy a very small area of the total catchment (0.12%). Although there may be some very localised changes in surface water flows in the vicinity of the onshore export cables, joint bays and link boxes, it is considered unlikely these will be of sufficient magnitude to change hydromorphology and/or physico-chemistry or lead to the direct loss or modification of habitats for aquatic invertebrates in the wider water body. Any maintenance work would be so localised and infrequent that impacts on the wider water body are considered unlikely.	Out
Biology (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** Increased turbidity due to increased fine sediment loads from onshore construction activities could alter niche habitats and 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.	In

Parameter	Scoping question	Scoping assessment	Scoping decision
		Operation As assessed in the EIA (**Chapter 14 Water Resources and Flood Risk**) permanent infrastructure in the Taw Estuary river water body will occupy a very small area of the total catchment (0.12%). Although there may be some very localised changes in surface water flows in the vicinity of the onshore export cables, joint bays and link boxes, it is considered unlikely these will be of sufficient magnitude to change 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 the wider water body. Any maintenance work would be so localised and infrequent that impacts on the wider water body are considered unlikely.	Out
Invasive Non Native Species	Could introduce or spread Invasive non-native species (INNS)?	**Construction** and **operation** Himalayan balsam (*Impatiens glandulifera*) has been recorded in the Taw Estuary water body. Construction and operational maintenance works have the potential to release invasive species if materials and equipment used in the process have not been properly cleaned after use at a previous location that may have had invasive species present. However, good practice measures will be employed to ensure all equipment is cleaned and checked before use.	Out
Protected areas	Is the activity within 2 km of any protected area?	**Construction** and **operation** The Onshore Project is within 2 km of protected areas designated under the Habitats Directive and Nitrates Directive (**Table 6.3**). Potential impacts on protected areas are assessed separately **Section 7.2** No mechanism for impact has been identified.	Out

Table 7.2 Scoping assessment for the Taw/Torridge (GB540805015500) transitional water body

Parameter	Scoping question	Scoping assessment	Scoping decision
Construction activities: HDD/Direct Pipe cable crossing of the River Taw estuary Operation and maintenance activities: Onshore export cables; White Cross Onshore Substation			
Hydromorphology	Could the activity change the hydrological regime or morphological conditions of the water body, or create a permanent barrier to upstream continuity, of a water body at high status?	**Construction** The Taw/Torridge transitional water body will not experience any direct disturbance during construction because a trenchless technique (HDD or Direct Pipe) will be used to cross the estuary up to 13 m below the channel bed. Although ground disturbance will occur at trenchless crossing entry and exit points, these will be located in the adjacent river water body catchment and onshore coastal catchment. For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. installation of the onshore export cables and construction of the White Cross Onshore Substation), which drains to the transitional water body, have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). For all construction activities, a Construction Environmental Management Plan (CEMP) will be developed and agreed with stakeholders to identify the measures needed to avoid, minimise or mitigate any construction effects on the environment. As a result of this mitigation, indirect impacts on the hydrological regime and morphological condition of the transitional water body as a result of construction in the onshore coastal catchment are considered unlikely.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		Operation Detailed geotechnical investigations will be conducted to characterise ground conditions at the estuary crossing, to establish the chemical and mechanical properties of the ground, map water depths and topography of the river bed and identify the hydrology and hydrogeology of the crossing site. With these assessments made, the presence of the export cables up to 13 m below the estuary bed is not expected to impact the hydrological regime or morphological conditions of the water body. Magnitude of impact for all operational activities in the onshore coastal catchment that is hydrologically connected to the transitional water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). As a result, indirect impacts on the hydrological regime and morphological condition of the transitional water body as a result of operation and maintenance activities in the onshore coastal catchment are considered unlikely.	Out
	Could significantly impact the hydromorphology of any water body	**Construction** The Taw/Torridge transitional water body will not experience any direct disturbance during construction because a trenchless technique (HDD or Direct Pipe) will be used to cross the estuary up to 13 m below the channel bed. Although ground disturbance will occur at trenchless crossing entry and exit points, these will be located in the adjacent river water body catchment and onshore coastal catchment. For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. installation of the onshore export cables and construction of the White Cross Onshore Substation), which drains to the transitional water body, have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). For all construction activities, a CEMP will be developed and agreed with stakeholders to identify the measures needed to avoid, minimise or mitigate any construction effects on the environment. As a result of this mitigation, impacts on the hydromorphology of any water body, as a	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		result of construction in the onshore coastal catchment, are considered unlikely.	
		Operation Detailed geotechnical investigations will be conducted to characterise ground conditions at the estuary crossing, to establish the chemical and mechanical properties of the ground, map water depths and topography of the river bed and identify the hydrology and hydrogeology of the crossing site. With these assessments made, the presence of the export cables up to 13 m below the estuary bed is not expected to impact the hydrological regime or morphological conditions of the water body. Magnitude of impact for all operational activities in the onshore coastal catchment that is hydrologically connected to the transitional water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). As a result, indirect impacts on the hydromorphology of any water body as a result of operation and maintenance activities in the onshore coastal catchment are considered unlikely.	Out
	Is the activity in a water body that is heavily modified for the same use as the activity?	**Construction and operation** No. The water body is designated heavily modified for flood protection.	Out
Physio-chemistry and chemistry	Could the activity change water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring	**Construction** The Taw/Torridge transitional water body will not experience any direct disturbance during construction because a trenchless technique (HDD or Direct Pipe) will be used to cross the estuary up to 13 m below the channel bed. Although ground disturbance will occur at trenchless crossing entry and exit points, these will be located in the adjacent river water body catchment and onshore coastal catchment.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	neap tidal cycle (c. 14 days)?	For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. installation of the onshore export cables and construction of the White Cross Onshore Substation), which drains to the transitional water body, have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). For all construction activities, a CEMP will be developed and agreed with stakeholders to identify the measures needed to avoid, minimise or mitigate any construction effects on the environment. As a result, indirect impacts on water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle, as a result of construction in the onshore coastal catchment, are considered unlikely.	
		Operation Detailed geotechnical investigations will be conducted to characterise ground conditions at the estuary crossing, to establish the chemical and mechanical properties of the ground, map water depths and topography of the river bed and identify the hydrology and hydrogeology of the crossing site. With these assessments made, the presence of the export cables up to 13 m below the estuary bed is not expected to impact the water quality of the water body. Magnitude of impact for all operational activities in the onshore coastal catchment that is hydrologically connected to the transitional water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). As a result, indirect impacts on the water quality of the transitional water body as a result of operation and maintenance activities in the onshore coastal catchment are considered unlikely.	Out
	Is the activity in a water body with a phytoplankton status of moderate, poor or bad?	**Construction and operation** Phytoplankton status is Good.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	Is the activity in a water body with a history of harmful algae?	**Construction** The water body has a history of harmful algae. However, as described above, the Taw/Torridge transitional water body will not experience any direct disturbance during construction because trenchless techniques will be used to cross the estuary. Construction in the adjacent onshore coastal catchment will not affect algae in the estuary. This means there is no mechanism for impact on algae (e.g., entrained algae can promote new algal growth by causing nutrient enrichment within the sediment).	Out
		Operation The presence of the onshore export cables up to 13 m below the estuary bed, and operation of the White Cross Onshore Substation in the adjacent coastal catchment, will not have any impacts on algae in the estuary. All operational impacts at the White Cross Onshore Substation have been assessed as **negligible** in the accompanying ES.	Out
	Does the activity use or release chemicals? If so, are they on the Environmental Quality Standards Directive (EQSD) list?	**Construction** An inert drilling fluid (bentonite) will be used for the trenchless crossing. A Pollution Environmental Management Plan (or similar) and CEMP will be in place for the Onshore Project (including the adjacent onshore coastal catchment). This mitigation will minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event.	Out
		Operation The presence of the onshore export cables up to 13 m below the estuary bed, and operation of the White Cross Onshore Substation in the adjacent coastal catchment, will not release chemicals into the estuary. All operational impacts at the White Cross Onshore Substation have been assessed as **negligible** in the accompanying ES.	Out
	Will the activity disturb sediment with contaminants above Centre for Environment,	**Construction** The Taw/Torridge transitional water body will not experience any direct disturbance during construction because trenchless techniques will be used to cross the estuary (up to 13 m below the channel bed). This means there that estuarine sediments will not be disturbed.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	Fisheries and Aquaculture (Cefas) Action Level 1?	**Operation** The presence of the onshore export cables up to 13 m below the estuary bed will not disturb estuarine sediments. All operational impacts at the White Cross Onshore Substation have been assessed as **negligible** in the accompanying ES.	Out
Biology (habitats)	Will the footprint of the activity cover an area of 0.5km^2 or larger?	**Construction** The Taw/Torridge transitional water body will not experience any direct disturbance during construction because the onshore export cables will be installed up to 13 m below the bed of the watercourse. If HDD is used, the pilot hole will be ~0.31m in diameter over a distance of ~1.3km – this equates to an area significantly less than 0.5km^2. A larger Direct Pipe installation (1.42m diameter) would still be less than 0.5km^2 (0.002 km^2)	Out
		Operation During operation, the onshore export cables will occupy an area significantly less than 0.5 km^2.	Out
	Is the area of either activity greater than 1% or more of the water body's area?	**Construction** Construction activity will consist of HDD and cable installation (~0.31m diameter pilot hole) below the bed of the estuary over approximately 1.3km. As the water body measures 14.4 km^2, this equates to significantly less than 1% of the water body's area. For a larger Direct Pipe installation (1.42 m diameter) the figure is 0.013%.	Out
		Operation The presence of the onshore export cables below the estuary will affect significantly less than 1% of the water body's area.	Out
	Will the footprint of the activity be within 500m of any higher sensitivity habitat?	**Construction** Although the Onshore Export Cable Corridor is within 500 m of two higher sensitivity habitats (saltmarsh (A2.5) and mussel beds (A1.22, A2.72, A5.62, A4.24, A3.361), the Taw/Torridge transitional water body will not experience any direct disturbance during construction because trenchless techniques will be used to cross the estuary. The onshore export cables will be installed up to 13 m below the bed of the estuary and there is no mechanism for impact.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		For construction, magnitude of impact for all activities in the onshore coastal that is hydrologically connected to the transitional water body has been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). This means that activity in the adjacent onshore coastal catchment is unlikely to affect the higher sensitivity habitats in the estuary.	
		Operation The presence of the onshore export cables up to 13 m below the estuary, or operation of the White Cross Onshore Substation in the adjacent coastal catchment, bed will not have an impact on higher sensitivity habitats at the surface. Runoff at the White Cross Onshore Substation will be managed through an operational drainage plan.	Out
	Will the footprint of the activity cover 1% of lower sensitivity habitats in the water body?	**Construction and operation** Two lower sensitivity habitats characterise the transitional water body where it is crossed by the Onshore export cables (sub tidal soft sediment (A5.2, A5.3, A5.4) and rocky shore (A1). However, the Taw/Torridge transitional water body will not experience any direct disturbance during construction or operation because trenchless techniques will be used to cross the estuary. The export cables will be installed up to 13 m below the bed of the estuary. For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. construction of the Onshore export cables Corridor and White Cross Onshore Substation) that is hydrologically connected to the transitional water body have been assessed as **negligible** in the accompanying EIA (**Chapter 14 Water Resources and Flood Risk**). This means that activity in the adjacent onshore coastal catchment is unlikely to affect the lower sensitivity habitats in the estuary.	Out
		Operation The presence of the onshore export cables up to 13 m below the estuary, or operation of the White Cross Onshore Substation in the adjacent coastal catchment, bed will not have an impact on lower sensitivity	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		habitats at the surface. Runoff at the White Cross Onshore Substation will be managed through an operational drainage plan.	
Biology (fish)	Is the activity in an estuary and could it affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary?	**Construction** HDD/Direct Pipe installation of the Onshore export cables up to 13 m below the estuary bed means there is no mechanism for impact on fish migration in the estuary.	Out
		Operation The presence of the onshore export cables up to 13 m below the estuary bed means there is no mechanism for impact on fish migration in the estuary.	Out
	Could the activity 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)?	**Construction** HDD/Direct Pipe installation of the onshore export cables up to 13 m below the estuary bed means there is no mechanism for impact on normal fish behaviour in the estuary. For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. construction of the Onshore Export Cable Corridor and White Cross Onshore Substation) that is hydrologically connected to the transitional water body have been assessed as **negligible** in the accompanying EIA (**Chapter 14 Water Resources and Flood Risk**). This means that activity in the adjacent onshore coastal catchment is unlikely to affect fish behaviour in the estuary.	Out
		Operation The presence of the onshore export cables up to 13 m below the estuary bed will not affect the normal behaviour of fish in the estuary. All operational impacts at the White Cross Onshore Substation have been assessed as **negligible** in the accompanying ES – no mechanism for impact on fish in the estuary has been identified.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	Could the activity cause entrainment or impingement of fish?	**Construction** HDD/Direct Pipe installation of the onshore export cables up to 13 m below the estuary bed means there is no mechanism for fish impingement in the estuary.	Out
		Operation The presence of the Onshore export cables up to 13 m below the estuary bed will not cause fish impingement in the estuary.	Out
Invasive Non-Native Species	Could introduce or spread INNS?	**Construction** Works have the potential to release invasive species if materials and equipment used in the process have not been properly cleaned after use at a previous location that may have had invasive species present. However, good practice measures will be employed to ensure all equipment is cleaned and checked before use.	Out
		Operation The presence of the onshore export cables up to 13 m below the estuary bed and operation of the White Cross Onshore Substation will not enable the spread of INNS. No mechanism for impact has been identified.	Out
Protected areas	Is the activity within 2 km of any protected area?	**Construction** The Onshore Project is within 2 km of protected areas designated under the Habitats Directive, Urban Waste Water Treatment Directive, Nitrates Directive, Bathing Waters Directive and Shellfish Water Directive (**Table 6.3**). Potential construction impacts on protected areas are assessed separately in **Table 7.5**. No mechanism for impact has been identified.	Out
		Operation The Onshore Project will operate within 2 km of the protected areas listed for construction. Potential operation and maintenance impacts are assessed separately in **Table 7.5**. No mechanism for impact has been identified.	Out

Table 7.3. Scoping assessment for Barnstaple Bay (GB610807680003) coastal water body

Parameter	Scoping question	Scoping assessment	Scoping decision
Construction activities: Landfall **Operation and maintenance activities: maintenance and repair of the onshore export cables**			
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status?	**Construction** The water body is not artificial or heavily modified and is at good ecological status. The Hydromorphological Supporting Elements status is high. The area of the water body occupied by the Onshore Project (i.e. between MLWS and MHWS) will be crossed using HDD, so there will not be any disturbance at the surface. Out to one nautical mile, any sediment generated by activity at the sub tidal HDD exit pit would be rapidly mobilised and reconfigured on the seabed and beach close to its original morphology before installation (including re-formation of subtidal sand waves). For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. construction of the TJB) that is hydrologically connected to the coastal water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). This means that activity in the adjacent onshore coastal catchment is unlikely to affect the hydromorphology of the coastal water body.	Out
		Operation The total length of cable that could be exposed and replaced in any one repair event is unlikely to exceed 200m. As such, no significant effects on hydromorphology are anticipated. All operational impacts in the onshore coastal catchment that is hydrologically connected to the coastal water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources**	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		and Flood Risk). There is no direct mechanism for impact on hydromorphology.	
	Could significantly impact the hydromorphology of any water body?	**Construction** The area of the water body occupied by the Onshore Project (i.e. between MLWS and MHWS) will be crossed using HDD, so there will not be any disturbance at the surface. Out to one nautical mile, any sediment generated by activity at the sub tidal HDD would be rapidly mobilised and reconfigured on the seabed and beach close to its original morphology before installation (including re-formation of subtidal sand waves). For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. construction of the TJB) that is hydrologically connected to the coastal water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). This means that activity in the adjacent onshore coastal catchment is unlikely to affect any water body.	Out
		Operation The total length of cable that could be exposed and replaced in any one repair event is unlikely to exceed 200m. As such, no significant effects on hydromorphology are anticipated. All operational impacts in the onshore coastal catchment that is hydrologically connected to the coastal water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). There is no direct mechanism for impact on the hydromorphology of any water body.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	Is in a water body that is heavily modified for the same use as your activity?	**Construction and operation** No – the water body is not designated artificial or heavily modified.	Out
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)?	**Construction** There will be an increase in suspended sediment concentrations because of transition pit works associated with the subtidal trenchless crossing exit point. These activities could increase turbidity and alter oxygen and nutrient levels. Particle size analysis of sediment samples show that the mud content increases closer to land, which would increase the proportion of finer sediments released into the water. However, it is predicted that increases for both sand and mud would be short in duration (lasting the maximum duration of cable installation), temporary and likely to be within natural baselines already experienced in the water body. Out to one nautical mile, any sediment generated by activity at the sub tidal HDD would be rapidly mobilised and reconfigured on the seabed and beach close to its original morphology before installation (including re-formation of subtidal sand waves). Impacts on water quality are not expected. For construction, magnitude of impact for all activities in the onshore coastal catchment (i.e. construction of the TJB) that is hydrologically connected to the coastal water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). This means that activity in the adjacent onshore coastal catchment is unlikely to affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		Operation The total length of cable that could be exposed and replaced in any one repair event is unlikely to exceed 200m. As such, no significant effects on hydromorphology are anticipated. All operational impacts in the onshore coastal catchment that is hydrologically connected to the coastal water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). There is no direct mechanism for impact on the hydromorphology of any water body.	Out
	Is in a water body with a phytoplankton status of moderate, poor or bad?	**Construction and operation** No – status is good.	Out
	Is in a water body with a history of harmful algae?	**Construction and operation** Not monitored.	Out
	Could the activity release chemicals that are on the Environmental Quality Standards Directive (EQSD) list?	**Construction** There is a risk that a pollution event could occur through the accidental release of pollutants into the water column which could have a detrimental effect on marine water and sediment quality. A Pollution Environmental Management Plan (or similar) will be in place. A CEMP will also be put in place for the Onshore Project to ensure all works are undertaken in line with best practice for working in the marine environment. This mitigation will minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		Operation Any routine or unplanned maintenance would employ similar best practice mitigation measures as described for construction. Such measures will minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event.	Out
	It disturbs sediment with contaminants above Cefas Action Level 1?	**Construction and operation** The preliminary benthic characterisation report (Ocean Ecology, 2022) shows that sediments are not contaminated above Cefas Action Level 1 within the coastal water body.	Out
Biology (habitats)	Is the footprint of the activity 0.5km^2 or larger?	**Construction** The footprint of the Onshore Project with Barnstaple Bay water body down to MLWS is 0.27 km^2.	Out
		Operation For operational activities, the footprint of permanent infrastructure down to MLWS equates to 0.0005 km^2.	Out
	Is the area of either activity greater than 1% or more of the water body's area?	**Construction** The water body measures 111.1 km^2 and the construction footprint is equal to 0.31%.	Out
		Operation The water body measures 111.1 km^2 and the operational footprint is significantly less than 0.1%.	Out
	Within 500m of any higher sensitivity habitat?	**Construction** At the northern end of Saunton Sands, along the rocky shoreline, the Onshore Project would be within 500 m of a small area (~120m^2) of polychaete reef. However, within the vicinity of the beach the export cables will be installed using trenchless technology. There will be an increase in suspended sediment concentrations because of transition pit	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
		works associated with the subtidal trenchless crossing exit point and cable burial techniques to facilitate cable installation. These activities could increase turbidity and alter oxygen and nutrient levels. However, particle size analysis of sediment samples taken within the Onshore export cables Corridor show the sediments are dominated by sand and mud therefore, dispersion of fine sediment from these areas would be very low, short in duration (lasting the maximum duration of cable installation), temporary and likely to be within natural baselines already experienced in the water body.	
		Operation Once operational, there is no mechanism for impact whereby the Onshore Project could impact the higher sensitivity habitat. Any maintenance activities would result in localised impacts no worse, and very likely less, than would occur during construction.	Out
	1% or more of any lower sensitivity habitat?	**Construction** The Onshore Project crosses an area of lower sensitivity intertidal soft sediment between MLWS and MHWS. This area will be crossed using HDD so there will be no disturbance.	Out
		Operation The export cables will be buried below the lower sensitivity habitat, meaning there will be no disturbance. Any maintenance activities would result in localised impacts no worse, and very likely less, than would occur during construction.	Out
Biology (fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or	**Construction** The works are not within an estuary, and they are 3.8 km north of the Taw-Torridge estuary mouth. There will be an increase in suspended sediment concentrations because of transition pit works associated with subtidal trenchless exit point, but this effect will be minor and temporary,	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	prevent fish entering it or could affect fish migrating through the estuary?	and unlikely to impact the estuary given the distance involved. No mechanism for impact has been identified	
		Operation The export cables will be installed using HDD. During operation the cables will be buried and will not affect fish.	Out
	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)?	**Construction** 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.	Out
		Operation The export cables will be installed using HDD. During operation the cables will be buried and will not affect fish.	Out
	Could cause entrainment or impingement of fish?	**Construction** No mechanism for fish entrainment or impingement has been identified for during construction.	Out
		Operation No mechanism for fish entrainment or impingement has been identified for during operation.	Out
Invasive Non Native Species	Could introduce or spread Invasive	**Construction** Works have the potential to release invasive species if materials and equipment used in the process have not been properly cleaned after use	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	non-native species (INNS)?	at a previous location that may have had invasive species present. However, good practice measures will be employed to ensure all equipment is cleaned and checked before use.	
		Operation The export cables will be installed using HDD. Any routine or unplanned maintenance work will use good practice measures to ensure all equipment is cleaned and checked before use.	Out
Protected areas	Is the activity within 2 km of any protected area?	**Construction** The Onshore Project is within 2 km of protected areas designated under the Habitats Directive, Bathing Waters Directive and Shellfish Water Directive (**Table 6.3**). Potential construction impacts on protected areas are assessed separately in **Table 7.5**.	Out
		Operation The Onshore Project will operate within 2 km of the protected areas listed for construction. Potential operation and maintenance impacts are assessed separately in **Table 7.5**. No mechanism for impact has been identified.	Out

Table 7.4 Scoping assessment for the River Taw and North Devon Streams (GB40802G801000) groundwater body

Parameter	Scoping question	Scoping assessment	Scoping decision
Groundwater body assessed: River Taw and North Devon Streams (GB40802G801000)			
Project components assessed: Landfall, Onshore export cables, White Cross Onshore Substation			
Groundwater quantity	Will the activity change groundwater levels affecting Groundwater Dependent Terrestrial Ecosystems (GWDTEs) or dependent surface water features?	**Construction** During construction activities could cause localised changes to groundwater flows. There may be local changes to infiltration rates into the groundwater body due to installation of buried infrastructure causing alterations to subsurface flow routes. However, these small scale changes are not expected to have permanent impacts on GWDTEs or dependent surface water features.	Out
		Operation There may be localised changes to flow paths and directions of groundwater in the vicinity of buried/near surface infrastructure. However, these small scale changes are unlikely to impact GWDTEs or dependent surface water features.	Out
	Will the level of proposed groundwater abstraction exceed recharge at a water body scale?	**Construction** No consumptive abstraction is planned, and there will be no mechanism for impact on groundwater recharge. Any groundwater abstraction would be limited to localised dewatering of near-surface groundwaters during subsurface excavations in the construction phase.	Out
		Operation Operation of the Onshore Project will not involve any groundwater abstraction.	Out
	Could the activity lead to an additional surface water body that will become noncompliant and lead to failure of the dependent surface water test?	**Construction** Construction activities will not abstract any water from the groundwater body. This means there is no mechanism for impact on any dependant surface waters.	Out
		Operation Operation activities will not abstract any water from the groundwater body. This means there is no mechanism for impact on any dependant surface waters.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	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?	**Construction** No consumptive abstraction is planned, and there will be no mechanism for impact on groundwater recharge. There may be some localised dewatering, but this will not affect total recharge.	Out
		Operation No consumptive abstraction is planned, and there will be no mechanism for impact on groundwater recharge. There may be some localised dewatering, but this will not affect total recharge.	Out
Groundwater quality	Will the activities have the potential to result in or exacerbate widespread diffuse pollution at a water body scale?	**Construction** Should pollution during construction accidently occur, this will be limited to a very small proportion of both groundwater bodies identified (highly localised) and will not have an impact on diffuse pollution at the water body scale. A Pollution Environmental Management Plan (or similar) will also be in place. This mitigation will minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event.	Out
		Operation No mechanism for impact has been identified whereby widespread diffuse pollution could be created or exacerbated once the Onshore Project is operational.	Out
	Will the activities have the potential to result in pollution of GWDTEs or cause deterioration in the quality of a drinking water abstraction?	**Construction** Activities such as open cut trench excavations to construct the Onshore export cables Corridor could potentially introduce contaminants into the groundwater bodies identified. This could lead to an increase in pollutant concentrations affecting the quality of licensed and unlicensed abstractions.	In
		Operation No mechanism for impact has been identified whereby GWDTEs could be polluted, or the quality of drinking water compromised once the Onshore Project is operational.	Out

Parameter	Scoping question	Scoping assessment	Scoping decision
	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?	**Construction** Construction of the onshore export cables 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.	In
		Operation No mechanism for impact has been identified whereby pollutant trends could increase once the Onshore Project is operational.	Out
	Will the activity lead to saline intrusion?	**Construction** Although there may be some very localised increases in salinity in the vicinity of the Landfall HDD bore, there will not be any consumptive abstraction of groundwater during construction or operation, which would cause a drawdown in the underlying aquifer. As the Landfall is above mean sea level, the head difference will also limit any minor changes in salinity.	Out
		Operation Once the Onshore Project is operational there will be no mechanism whereby saline intrusion could occur into the underlying groundwater body/aquifer.	Out
Protected areas	Is the activity within 2 km of any protected area?	**Construction** and **operation** The Offshore Project is within 2 km of a Drinking Water Protected Area and protected areas designated under the Habitats Directive, (**Table 6.3**). Potential construction impacts on protected areas are assessed separately in **Table 7.5**. No mechanism for impact has been identified.	Out

7.2 Impacts on protected areas

55. Water-dependent protected areas identified in the screening assessment (**Table 6.3**) are assessed below (**Table 7.5**).

Table 7.5 Scoping assessment of protected areas within 2 km of the Onshore Project

Protected area name	Directive	ID	Water body	Assessment
Taw Estuary	Nitrates Directive	ET6	Taw/Torridge	Foul drainage from construction and operational welfare facilities will be tankered off-site for treatment, preventing impacts to Nitrate Vulnerable Zones (NVZs). Construction site drainage systems will also prevent increasing nitrate volumes from entering the surface drainage network following soil excavations. Construction and operation activities are therefore unlikely to significantly alter NVZ nitrate and nutrient concentrations. Impacts on NVZs and urban wastewater are scoped out of the assessment.
	Urban Waste Water Directive	UKENCA52		
Taw-Torridge Estuary	Shellfish Water Directive	UKSW79	Taw/Torridge; Barnstaple Bay	The Taw/Torridge transitional water body will not experience any direct disturbance during construction because a trenchless technique (HDD or Direct Pipe) will be used to cross the estuary. Where trenchless methods are used, the export cables will be installed up to 13 m below the bed of the watercourse. Although ground disturbance will occur at trenchless crossing entry and exit points, these are not located in the transitional water body. For construction and operation, the magnitude of impacts for all activities in the onshore coastal catchment that is hydrologically connected to the transitional water body have been assessed as **negligible** in the accompanying ES (**Chapter 14 Water Resources and Flood Risk**). This means
Taw Estuary		UKSW80	Taw/Torridge	
Torridge Estuary		UKSW81	Taw/Torridge	

Protected area name	Directive	ID	Water body	Assessment
				there is no mechanism for impact on shellfish waters in the estuary.
Saunton Sands	Bathing Water Directive	UK34100	Barnstaple Bay	The Landfall is located within the Saunton Sands Bathing Water area, and it is 1.8 km to the south of Croyde Bay Bathing Water. The risk of accidental spills or leaks occurring during construction is adequately mitigated through the production and adherence to a CEMP. Impacts from sediment or contaminant plumes are considered to be short-term and temporary, lasting for the duration of the works only. Work on the foreshore, between MLWS and MHWS, will take place outside of the bathing water season (before May). As such, bathing waters are scoped out of the assessment.
Croyde Bay		UK34200		
Braunton Burrows SAC	Habitats Directive	UK0012570	Taw/Torridge; Barnstaple Bay	Although the Onshore Project crosses Braunton Burrows SAC, the RIAA does not identify any Likely Significant Effects on Braunton Burrows SAC alone or in-combination with the Offshore Project. This is because the SAC will be tunnelled under from the Landfall and avoided with a buffer as the Onshore Export Cable Corridor Impacts on the SAC are therefore scoped out.
River Taw and North Devon Streams	Drinking Water Protected Area	UKGB40802G801000	Poor	The aim of Drinking Water Protected Areas is to avoid a deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. There is the potential for impacts on water quality in the groundwater body DWPA (**Table 7.4**), therefore the DWPA is scoped into the assessment and discussed further in **Section 8.2**.

7.3 Impacts on RBMP improvement and mitigation measures

56. The Environment Agency has not published any details of improvement measures that are required to improve the status water bodies that have been screened in. However, the Environment Agency has identified the mitigation measures that are required to achieve Good Ecological Potential in the Taw Estuary (GB108050020000) river water body and Taw/Torridge (GB540805015500) transitional water body. These are listed in **Table 7.6**.

57. Measures in the Taw/Torridge transitional water body are intended to address physical modification pressures associated with flood protection use (i.e., the reason why the water body was designated as heavily modified). The Onshore Project involves a trenchless crossing (HDD or Direct Pipe) of the Taw/Torridge water body. This means there is no mechanism to affect the proposed measures which are not yet in place in this catchment. Construction activities in the adjacent onshore coastal catchment will not affect measures not yet in place in the transitional water body.

58. Measures in the Taw Estuary river water body are intended to address physical modification pressures associated with both flood protection use and land drainage. Although the Onshore Project involves construction work within the water body, any impacts will be temporary and will not affect the proposed measures which are not yet in place.

Table 7.6: Measures identified in the RBMP for the Taw Estuary and Taw/Torridge water bodies.

Measure	Status	Water body
Realign flood defence	Not in place	Taw/Torridge
Remove obsolete structure	Not in place	Taw/Torridge Taw Estuary
Enhance ecology	Not in place	Taw/Torridge Taw Estuary
Flood bunds	Not in place	Taw Estuary
Set-back embankments	Not in place	Taw Estuary
Floodplain connectivity	Not in place	Taw Estuary
Fish passes	Not in place	Taw Estuary
Reduce fish entrainment	Not in place	Taw Estuary
Remove obsolete structure	Not in place	Taw Estuary
Changes to locks etc	Not in place	Taw Estuary
Selective vegetation control	Not in place	Taw Estuary
Vegetation control	Not in place	Taw Estuary
Vegetation control timing	Not in place	Taw Estuary

Measure	Status	Water body
Invasive species techniques	Not in place	Taw Estuary
Retain habitats	Not in place	Taw Estuary
Sediment management strategy	Not in place	Taw Estuary
Maintenance - minimise habitat impact	Not in place	Taw Estuary
Remove or soften hard bank	Not in place	Taw Estuary
Maintenance - prevent sediment transfer	Not in place	Taw Estuary
Water level management	Not in place	Taw Estuary
Align and attenuate flow	Not in place	Taw Estuary
Preserve or restore habitats	Not in place	Taw Estuary
Educate landowners	Not in place	Taw Estuary
In-channel morph diversity	Not in place	Taw Estuary
Re-opening culverts	Not in place	Taw Estuary
Alter culvert channel bed	Not in place	Taw Estuary
Educate landowners	Not in place	Taw Estuary

7.4 Stage 2 summary

59. Stage 2 scoping has established that construction activities associated with The Onshore Project in the following water bodies should be taken forward to Stage 3 Detailed Compliance Assessment:

- River water body (all quality elements)
  - Taw Estuary (GB108050020000)
- Groundwater body (only groundwater quality element)
  - River Taw and North Devon Streams (GB40802G801000)
- Protected areas: DWPA UKGB40802G801000

8. Stage 3: Detailed compliance assessment

60. This section presents the results of the impact assessment undertaken on the water bodies scoped in for further assessment. This assessment determines whether elements of The Onshore Project brought forward from Stage 2 would cause deterioration of the water bodies and protected areas listed in **Section 7.4**, and whether such deterioration would have a significant non-temporary effect on the status of one or more quality elements at a water body level.

8.1 Taw Estuary (GB108050020000) river water body

8.1.1 Hydromorphology (hydrological regime and morphological conditions)

8.1.1.1 Construction activities

61. 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 and temporary compound areas could change flow conveyance pathways. This may result in localised changes to the 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.

62. Greater levels of fine sediment could be released directly into the watercourses, predominantly from ground disturbance and vegetation cover removal associated with construction. This could result in increased sediment deposition and smothering of existing substrates. However, all of the water bodies surveyed during the geomorphological baseline survey (**Chapter 14 Water Resources and Flood Risk**; **Appendix 14.A**) are low energy environments and bed substrates are typically fine (silts and clays) – none of the surveyed watercourses have clean gravel substrates. In all water bodies there was evidence of significant baseline disturbance in the form of dredging and bank erosion, and fine sediment deposition associated with cattle poaching.

63. The maximum area of disturbed ground during construction has been calculated based on a 30 m construction corridor (which includes the haul road) and maximum dimensions for construction and HDD compounds. For the Taw Estuary water body this equates to a very small area of potentially disturbed ground (0.16 km (1.0% of the catchment area)). Such a small area of disturbance is unlikely to have a significant or permanent impact of the hydromorphology of the water body, especially in the context of typical baseline channel management techniques (dredging over tens of metres of channel length).

64. In addition to sediment supply from disturbed ground during construction, open cut trenching methods will be used to cross some Ordinary Watercourses. Multiple trenched crossings in a water body catchment could alter the flow regime, disrupt coarse sediment transport patterns and increase the input of fine sediment into the water body, impacting upon its morphological condition. In the Taw Estuary water body, 14 trenched crossings will be required. However, over half of these (eight) are very minor artificial and ephemeral ditches beside hedgerows. They are not shown as permanent water features on detailed 1:10,000 mapping (i.e. Defra Magic). The remaining six ditches are artificial drainage features, but they do hold water and direct disturbance impacts could be more apparent in these six ditches. The only significant Ordinary Watercourse in terms of dimensions and containing flowing water is Boundary Drain, which will be crossed using HDD.

65. In addition, temporary culverts and Bailey bridges will be required at Ordinary Watercourse crossing points. One temporary crossing will also be required on Sir Arthur's Pill (Main River) to allow haul road access from the main construction compound to the Onshore export cables Corridor. Sir Arthur's Pill will be crossed with a temporary crossing (Bailey bridge) in the headwater area where it has the form of a narrow (<2 m), straightened and resectioned ditch.

66. Installation of temporary culverts associated with the haul road 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 culverts and Bailey bridges following construction could also increase sediment supply into the water body.

8.1.1.2 Construction stage control measures

67. Control measures will be in place to reduce impacts on hydromorphology. These include:

- Trenched crossings
  - The amount of time that temporary dams are in place will be kept to a minimum
  - Prior to dewatering the area between the temporary dams, a fish rescue would be undertaken
  - Flumes or pumps would be adequately sized to ensure that flows downstream are maintained whilst minimising upstream impoundment
  - 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

  - Sympathetic reinstatement of channel and banks.

- Temporary crossings:

  - Temporary culverts will be adequately sized to avoid impounding flows (including allowing for increased winter flows as a result of climate change)
  - Sympathetic reinstatement of channel and banks (if necessary).

- Sediment supply:

  - Guidance documents

    - Construction activities will adhere to industry good practice measures as detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (PPG1, PPG5, PPG8 and PPG21). Although EA PPG notes have been revoked in England, they have been updated as Guidance for Pollution Prevention (GPP notes) for use in Scotland and Northern Ireland (NetRegs, 2022)
    - Construction Industry Research and Information Association (CIRIA) best practice (Control of water pollution from construction sites: Guidance for consultants and contractors (C532) (2001)) will also be adhered to.

  - Specific measures:

    - Minimising the amount of time stripped ground and soil stockpiles are exposed. Topsoil would be stripped from the entire width of the onshore cable corridor for the length of the work front, then stored and capped to minimise erosion from wind and rain
    - Only removing vegetation from the area that needs to be exposed in the near future
    - Seeding or covering stockpiles
    - Using geotextile silt fencing at the toe of the slope, to reduce the movement of silt – this should be installed before soil stripping has begun and vehicles start tracking over the site
    - On-site retention of sediment to be maximised by routing all drainage through the site drainage system
    - Include measures to intercept sediment runoff at source in the drainage system using suitable filters to remove sediment from water discharged to the surface drainage network
    - Plant and wheel washing is carried out in a designated area of hard standing at least 10 m from any watercourse or surface water drain

- Traffic movements would be restricted to minimise surface disturbance
- Collect run-off in lagoons and allow suspended solids to settle before disposal
- Divert clean water away from the area of construction work in order to minimise the volume of contaminated water
- Routing the cable to avoid water resources and flood risk receptors where possible. In locations where large areas of exposed ground lie adjacent to watercourses, buffer strips of vegetation will be retained where possible to prevent runoff
- Limiting the extent of open excavations along the onshore cable corridor to short sections at any one time (work fronts). Topsoil would be stripped from the entire width of the onshore cable corridor for the length of the work front, then stored and capped to minimise erosion from wind and rain; and
- Temporary works areas (e.g., construction compounds and trenchless crossing areas) associated with the Onshore Project 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.

68. With the implementation of these control measures to manage the direct disturbance of surface water bodies and sediment supply, combined with the small scale of direct impacts to the water body, onshore construction activities cannot be considered likely to cause a deterioration in the status of hydromorphological quality elements or the prevention of achieving GEP.

8.1.2 Physico-chemistry (general, priority substances)

8.1.2.1 Construction activities

69. Construction activities, especially those associated with the direct disturbance of surface water bodies (e.g. trenched crossings) 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. cement) located near water bodies. Vehicle and construction material storage areas could be an additional source of leaks and spills. Accidental spillages are considered unlikely because a Pollution Environmental Management Plan (or similar) and CEMP will be in place for the Onshore Project. This mitigation will minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event.

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

71. During construction the presence of temporary culverts and use of open cut trenching methods across Ordinary Watercourses could increase the conveyance of pollutants and fine sediment to the water body, impacting on overall dissolved oxygen, pH and temperature. However, the maximum potential area of disturbed ground that could increase sediment supply is very low (0.16 km (1.0% of the catchment area)) and unlikely to have a significant impact on the water body, especially in the context of typical baseline channel management techniques (dredging).

72. Although 14 trenched crossings will be required in the Taw Estuary water body, over half of these (eight) are very minor artificial and ephemeral ditches beside hedgerows. They are not shown as permanent water features on detailed 1:10,000 OS mapping. The remaining six ditches are artificial drainage features, but they do hold water and direct disturbance impacts would be more apparent in these six ditches. The only significant Ordinary Watercourse in terms of dimensions and containing flowing water is Boundary Drain, which will be crossed using HDD. It is therefore likely that the above impacts on Ordinary Watercourses will not have a significant or permanent cumulative physico-chemical impact the Taw Estuary water body.

8.1.2.2 Construction stage control measures

73. Control measures listed in **Section 8.1.1** will reduce impacts from disturbed ground and trenched crossings. To prevent the activities from impacting upon both 'general' and 'priority substances' parameters, the Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C650) and CIRIA – SuDS Manual (CIRIA, 2015), and other control measures will be applied. These include:

- Situating concrete and cement mixing and washing areas at least 10 m 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 10 m 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
- 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 and transported off site for disposal at a licensed facility with appropriate treatment capacity within its existing permit
- During construction, the onshore cable installation will be designed such that it will be bounded by parallel drainage channels (one on each side) to intercept drainage within the working width. Additional drainage channels will be installed to intercept water from the cable trench. This will be discharged at a controlled rate into local ditches or drains via temporary interceptor drains. Depending upon the precise location, water from the channels will be infiltrated or discharged into the existing drainage network
- Construction drainage will be developed and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. If water enters the trenches during installation from surface runoff of groundwater seepage, this will be pumped via settling tanks, sediment basins or mobile treatment facilities to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains. Existing land drains will be reinstated following construction
- Potential contaminants will be stored under cover to prevent rainwater carrying pollutants away
- Potential contaminants will be stored in a safe place away from vehicles, to prevent collisions
- Buffer strips of vegetation will be retained adjacent to water bodies where possible, to intercept any contaminated runoff.

74. With the implementation of these control measures, onshore construction activities cannot be considered likely to cause a deterioration in the status of physico-chemical quality elements or the prevention of achieving GEP.

8.1.3 Biology (aquatic flora, benthic invertebrates, fish)

8.1.3.1 Construction activities

75. Construction activities could impact on aquatic flora, benthic invertebrates and fish fauna based on potential impacts to the hydromorphological and physico-chemical 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.

76. During construction open cut trenching methods across ordinary watercourses could increase conveyance of pollutants and fine sediment to the Taw Estuary water body, impacting on species and habitat populations.

77. The maximum potential area of disturbed ground that could increase sediment supply is very low (0.16 km (1.0% of the catchment area)) and unlikely to have a significant impact on the biology of the water body, especially in the context of typical baseline channel management techniques (dredging).

78. Although 14 trenched crossings will be required in the Taw Estuary water body, over half of these (eight) are very minor artificial and ephemeral ditches beside hedgerows. They are not shown as permanent water features on detailed 1:10,000 mapping (i.e. Defra Magic). The remaining six ditches are artificial drainage features, but they do hold water and direct disturbance impacts would be more apparent in these six ditches. The only significant Ordinary Watercourse in terms of dimensions and containing flowing water is Boundary Drain, which will be crossed using HDD. It is therefore likely that the above impacts on Ordinary Watercourses will not have a significant or permanent cumulative biological impact on the Taw Estuary water body.

8.1.3.2 Construction stage control measures

79. The proposed control measures that will be implemented to prevent construction impacts to hydromorphology and physico-chemistry (**Section 8.1.1**, **Section 8.1.2**) will indirectly reduce impacts to biological quality elements. These control measures will prevent contaminants reaching watercourses and limit fine sediment production and transfer to surface waters. It is unlikely that construction activities will cause a deterioration in biology or the prevention of achieving GEP.

80. Detailed assessments undertaken in **Sections 8.1.1**, **8.1.2**, and **8.1.3** show there will be no deterioration in hydromorphology, physico-chemistry or biology quality elements that were scoped into the assessment. This means there will not be a deterioration in the status of the water body.

8.2 River Taw and North Devon Streams (GB40802G801000) groundwater body

8.2.1 Groundwater quality (GWDTEs, deterioration in water quality, increasing pollution concentrations

8.2.1.1 Construction activities

81. There is a risk that excavations to facilitate trenchless crossings could potentially introduce contaminants to the River Taw and North Devon Streams groundwater body. Accidental release of lubricants, fuels and oils from construction machinery could occur due to 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 pollutant concentrations could subsequently lead to an overall deterioration in groundwater quality. These contaminants could then be transferred to GWDTEs via subsurface flow routes.

8.2.1.2 Construction stage control measures

82. As assessed in **Chapter 14 Water Resources and Flood Risk** of the ES, a very small area of the groundwater body (0.21 km^2; 0.02% of the catchment area) would be directly affected by construction activities for the Landfall, Onshore Export Cables Corridor and White Cross Onshore Substation. This means the opportunity for contamination to occur and affect the water body will be limited. Control measures that will be in place to reduce the risk of groundwater contamination include:

- Use of best practice techniques and due diligence regarding the potential for pollution throughout all construction, operation and maintenance, and decommissioning activities. This includes control measures listed in **Section 8.1.2** (physico-chemistry). These measures provide 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, 2018), 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.

83. Given the very small area of the groundwater body that will be affected by construction activities, and with control measures in place, there will be a very low

risk of deterioration in water body status, or risk of the water body not achieving a good overall status in the future. In addition, no impacts on the groundwater Drinking Water Protected Area associated with the River Taw and North Devon Streams water body are anticipated.

9. Summary of the compliance assessment

84. Results of the WER compliance assessment process are summarised in **Table 9.1**.

Table 9.1 Summary of WER Compliance Assessment.

Water body	Stage 2	Stage 3	Deterioration in status	Prevent objectives being achieved	Compliant with the WER
Taw Estuary (GB108050020000)	✓	✓	×	×	✓
Barnstaple Bay (GB610807680003)	✓	×	×	×	✓
River Taw and North Devon Streams (GB40802G801000)	✓	✓	×	×	✓
Torridge and Hartland Streams (GB40802G800600)	×	×	×	×	✓
Drinking Water Protected Area	✓	✓	×	×	✓

85. The implementation of outlined control measures during the construction phase of the Onshore Project means there will be no activities that have the potential to cause non-temporary effects (i.e. effects that are not permanent, but could last for the duration or beyond the current River Basin Planning Cycle) to the status of any of the assessed water bodies. Construction will not prevent water body status objectives being achieved in the future. The Onshore Project is therefore considered to be compliant with WER.

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Appendix 14.C: Flood Risk Assessment

White Cross Offshore Windfarm Environmental Statement

Chapter 14.C: Flood Risk Assessment

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Glossary of Acronyms

Acronym	Definition
AOD	Above Ordnance Datum
ADA	Association of Drainage Authorities
AP	Annual Probability
AStGWF	Areas Susceptible to Groundwater Flooding
BGS	British Geological Survey
BP	Before Present
CDA	Critical Drainage Areas
CEMP	Construction Environmental Management Plan
CFB	Coastal Flood Boundary
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
DEFRA	Department for Food & Rural Affairs
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
FFL	Finished Floor Levels
FRA	Flood Risk Assessment
HAT	Highest Astronomical Tide
HV	High Voltage
HVAC	High Voltage Alternating Current
IDB	Internal Drainage Board
IDD	Internal Drainage District
km	Kilometre
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
m	Metre
m^3	Cubic metres
mm	Millimetres
mAOD	Metres above Ordnance Datum
MHWS	Mean High Water Springs
ML	Marine Licences
MLWS	Mean Low Water Springs
MW	Megawatts
NDC	North Devon Council
NPPF	National Planning Policy Framework
NPS	National Policy Statement

Acronym	Definition
NSIP	Nationally Significant Infrastructure Projects
OCEMP	Outline Construction Environmental Management Plan
WCOWL	White Cross Offshore Windfarm Limited
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SoP	Standard of Protection
TCPA	Town and Country Planning Act
UK	United Kingdom
UKCP09	UK Climate Projections 2009
UKCP18	UK Climate Projections 2018
WFD	Water Framework Directive

Glossary of Terminology

Defined Term	Description
Applicant	White Cross Offshore Windfarm Limited
Aquifer	Geological strata that hold water.
Coastal / tidal flooding	When high tide events overtop the shoreline to cause flooding to land behind.
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and decommissioning.
Fluvial flooding	When flows within watercourses exceed the capacity of the watercourse causing out of bank flows.
High Voltage Alternating Current	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Landfall	Where the offshore export cables come ashore.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links.
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: • Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA • Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant effects. Additional mitigation is therefore subsequently adopted by OWL as the EIA process progresses.
National Grid Onshore Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of the electrical transformers.

Defined Term	Description
National Grid Connection Point	The point at which the White Cross Offshore Windfarm connects into the distribution network at East Yelland substation and the distributed electricity network. From East Yelland substation electricity is transmitted to Alverdiscott where it enters the national transmission network.
the Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all elements offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (up to MHWS) including the cables and associated cable protection (if required).
Offshore Substation Platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the NG grid connection point at East Yelland. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the offshore export cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
White Cross Offshore Windfarm Ltd	White Cross Offshore Windfarm Ltd (WCOWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd.
the Project	The Project is a proposed floating offshore windfarm called White Cross located in the Celtic Sea with a capacity of up to 100MW. It encompasses the project as a whole, i.e. all onshore and offshore infrastructure and activities associated with the Project.
Transition joint bay	Underground structures at the Landfall that house the joints between the offshore export cables and the onshore export cables.

Defined Term	Description
Transition piece	The transition piece includes various functionalities such as access for maintenance, cable connection for the energy of the turbine and the corrosion protection of the entire foundation.
White Cross Offshore Windfarm	Up to 100MW capacity offshore windfarm including associated onshore and offshore infrastructure.
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NG electrical requirements at the grid connection point at East Yelland.

1. Flood Risk Assessment

1.1 Introduction

1. White Cross Offshore Windfarm is a proposed floating offshore windfarm located in the Celtic Sea with a capacity of up to 100MW. This Flood Risk Assessment (FRA) has been developed to support the Environmental Statement (ES) for the 'Onshore Project', entailing all components of the Onshore Project landward of Mean Low Water Springs (MLWS) during its construction, operation and maintenance and decommissioning phases.

2. The components of the White Cross Offshore Windfarm Project seaward of Mean High Water Springs (MHWS) ('the Offshore Project') are subject to a separate application for consent under Section 36 of the Electricity Act 1989 and for Marine Licences (ML) under the Marine and Coastal Access Act 2009. These applications are supported by a separate ES covering all potential impacts seaward of MHWS.

3. The Onshore Project comprises the following key infrastructure. Above MHWS at Landfall, the Offshore Export Cable will be connected to the Onshore Export Cable via a Transition Joint Bay located in Saunton Sands Car Park. The Onshore Export Cable travels approximately 8km at its maximum inland to a high voltage alternating current (HVAC) onshore substation. This will include a crossing below the Taw Estuary via trenchless technology. A new White Cross Onshore Substation will be constructed to accommodate the connection of the Offshore Project to the existing East Yelland substation and Grid Point of Connection.

4. The FRA has been finalised with due consideration of pre-application consultation to date (see **Chapter 7: Consultation**) and the ES will accompany the application to North Devon Council (NDC) for planning permission under the Town and Country Planning Act (TCPA) 1990.

5. This assessment has been undertaken with specific reference to the relevant policy, legislation and guidance, which are summarised in **Section 1.2** of this chapter. Further information on the international, national and local planning policy and legislation relevant to the Onshore Project is provided in **Chapter 3: Policy and Legislative Context**.

6. The final design and micro-siting related to key elements of the Onshore Project infrastructure will be confirmed through the detailed engineering design that will be undertaken post-planning consent. In order to provide a precautionary yet robust assessment at this stage of the planning process, a worst-case scenario has been considered in terms of the potential flood risk impact that may arise.

7. This document is an FRA to support **Chapter 14: Water Resources and Flood Risk** of the ES.

8. The aim of this FRA is to provide sufficient justification to regulators and other stakeholders involved in the planning process that the Onshore Project is appropriate and that it is in accordance with planning and national policy requirements regarding the consideration of flood risk.

9. The aims of this FRA are:

- To establish whether the Onshore Project is likely to be affected by current and future flooding from any source of flood risk
- To assess and identify the potential for the Onshore Project to increase flood risk elsewhere i.e. off-site receptors
- To provide recommendations on potential measures required to reduce flood risk, if applicable
- To provide information required to support the ES with regards to flooding, supported by the application of the Sequential Test and, where necessary, the Exception Test.

1.2 Policy, Legislation and Guidance

10. **Chapter 3: Policy and Legislative Context** describes the wider policy and legislative context for the Onshore Project. The principal policy and legislation used to inform the potential flood risk impacts for the Onshore Project are outlined in this section.

11. This FRA has been prepared in accordance with the methodology and guidance set out in National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government, 2021), Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (Ministry of Housing, Communities & Local Government, 2022) and the Environment Agency's climate change allowance guidance (Environment Agency, 2022). It has also been considered within the context of the relevant National Policy Statements.

12. A summary of the relevant policy and guidance documents referenced in this FRA are set out in **Table 1.1**.

Table 1.1 Summary of policy and guidance documents relevant to this FRA

Policy or Guidance Document	Author / Produced on behalf of	Year Published
EN-1 Overarching National Policy Statement for Renewable Energy Infrastructure	Department of Energy & Climate Change	2011, draft update in 2021
National Planning Policy Framework (NPPF)	Ministry of Housing, Communities and Local Government	2012, updated 2021
Planning Practice Guidance (PPG) for Flood Risk and Coastal Change	Ministry of Housing, Communities & Local Government	2014, updated 2022
Flood risk assessments: climate change allowances guidance	Environment Agency	2016, latest update in May 2022
UK Climate Projections	Met Office	2018
North Devon and Torridge Local Plan 2011 - 2031	North Devon and Torridge District Councils	Adopted October 2018
Devon Local Flood Risk Management Strategy (LFRMS)	Devon County Council	January 2021
Preliminary Flood Risk Assessment (PFRA)	Devon County Council	May 2011
North Devon and Torridge Level 1 Strategic Flood Risk Assessment	North Devon and Torridge District Councils	February 2009
Barnstaple Area Level 2 Strategic Flood Risk Assessment	North Devon Council	July 2010
North Devon Catchment Flood Management Plan (CFMP) – Summary Report	Environment Agency	June 2012
North Devon and Somerset Shoreline Management Plan (SMP2)	North Devon and Somerset Coastal Advisory Group	October 2010

1.2.1 National Planning Policy Framework

13. The NPPF (Ministry of Housing, Communities and Local Government, 2021), PPG for Flood Risk and Coastal Change (Ministry of Housing, Communities and Local Government, 2021) and 'Flood risk assessments: climate change allowances guidance' (Environment Agency, 2022) provide direction on how flood risk should be considered at all stages of the planning and development process.

14. The planning system should ensure that new development is safe and not exposed unnecessarily to the risks associated with flooding. This FRA sets out the planning and wider context within which the Onshore Project needs to be considered along with the flood risk to the Onshore Development Area.

15. The revised NPPF (2021) provides clarification that all strategic policies / plans should apply a sequential, risk-based approach to the location of development taking into account all sources of flood risk. It also provides guidance on how this is to be considered in the context of the location of site-specific development.

16. Further guidance, on the application of the Sequential Test and Exception Test is provided in the supporting PPG for Flood Risk and Coastal Change (Ministry of Housing, Communities and Local Government, 2022) in terms of all sources of flood risk, Flood Zones and Vulnerability Classification relevant to the development.

17. Within the supporting PPG (Paragraph 027), it is noted that:

    "*For nationally or regionally important infrastructure the area of search to which the Sequential Test could be applied will be wider than the local planning authority boundary.*"

18. The 2022 update to the PPG (published 25th August 2022) requires the Sequential Test to assess the flood risk from all sources, in terms of development vulnerability from reasonably alternative sites.

19. For the purposes of the FRA, based on the indicative flood risk issues associated with the Onshore Project, the application of a sequential approach has been considered specifically with regard to the White Cross Onshore Substation and not the Onshore Export Cable Corridor.

20. This assessment has sought to consider the potential flood risk from all sources in greater detail with the aim of sequentially locating it, wherever possible, to avoid the risk.

1.2.2 North Devon & Torridge Local Plan 2011 – 2031

21. The North Devon and Torridge Local Plan was adopted in October 2018. The most relevant part of the Local Plan is contained within Policy ST03, found under the Sustainable Development section: Adapting to Climate Change and Strengthening Resilience.

22. Policy ST03 notes that:

"*Development should be designed and constructed to take account of the impacts of climate change and minimise the risk to and vulnerability of people, land, infrastructure and property by:*

(a) locating and designing development to minimise flood risk through:

(i) avoiding the development of land for vulnerable uses which is or will be at risk from flooding, and

(ii) managing and reducing flood risk for development where that has wider sustainability or regeneration benefits to the community, or where there is no reasonable alternative site

(b) reducing existing rates of surface water runoff within Critical Drainage Areas

(c) upgrading flood defences and protecting key transport routes from risks of flooding

(d) re-establishing functional flood plains in accordance with the Shoreline Management Plan, Flood Risk Management Plan and Catchment Action Plan

(e) locating development to avoid risk from current and future coastal erosion

(f) adopting effective water management including Sustainable Drainage Systems, water quality improvements, water efficiency measures and the use of rainwater

(g) ensuring development is resilient to the impacts of climate change through making effective use of renewable resources, passive heating and cooling, natural light and ventilation

(h) ensuring risks from potential climate change hazards, including pollutants (of air and land) are minimised to protect and promote healthy and safe environments

(i) conserving and enhancing landscapes and networks of habitats, including cross-boundary green infrastructure links, strengthening the resilience of biodiversity to climate change by facilitating migration of wildlife between habitats and improving their connectivity

(j) protecting and integrating green infrastructure into urban areas, improving access to natural and managed green space

(k) promoting the potential contribution from ecosystem services that support adaptation to climate change.

23. It also notes that:

"*North Devon and Torridge Strategic Flood Risk Assessments indicate that northern Devon will be liable to increased flooding in a number of locations. Principally, this will be by fluvial flooding along the main river valleys, tidal flooding along the Taw-Torridge estuary and along the coastline. More localised cases of flooding will be from high surface water run-off and inadequate land and highway drainage. Level 2 Strategic Flood Risk Assessments are available for Barnstaple, Bideford and Northam which identify those areas at greatest risk from flooding.*

The types of development that can take place in areas with different degrees of flood risk will be informed by additional detailed flood risk assessments. These will determine the appropriate nature and siting of development in areas that are at known flood risk, most significantly in respect of opportunities for development in Barnstaple and Bideford where sustainability benefits will include regeneration objectives."

24. In addition, of relevance to the Onshore Project is Policy FRE02: Yelland Quay which under Section 10.199 of the Local Plan states:

"*Yelland Quay is at risk of tidal flooding. Flood risks will be managed by raising ground levels to reduce the extent and severity of flood risks both on site and elsewhere in the Taw estuary in accordance with Policy ST03: Adapting to Climate Change and Strengthening Resilience. Development will need to be designed to provide a safe means of escape from the site.*"

25. The above policies have been considered within the context of assessing flood risk to the Onshore Project.

1.2.3 National Policy Statement

26. The assessment of potential flood risk impacts has been made with specific reference to the relevant National Policy Statement (NPS). NPSs are statutory documents which set out the government's policy on specific types of Nationally Significant Infrastructure Projects (NSIPs) and are published in accordance with the Planning Act 2008.

27. Although the Offshore Project is not an NSIP, it is recognised that due to its size of up to 100MW and its location in English waters, certain NPS are considered relevant to the Offshore Project. Therefore, to align with the approach to the assessment of the Offshore Project, certain NPS will also be considered as part of the Onshore Project.

28. Of relevance to this FRA is the Overarching NPS for Energy (EN-1). It is noted that the NPS for Energy (EN-1) is in the process of being revised. A draft version was published for consultation in September 2021 (Department for Business Energy and Industrial Strategy). A review of the draft version has been undertaken in the context of this FRA.

29. The Draft EN-1 Overarching NPS for Energy (2021) comprises an update to the EN-1 Overarching National Policy Statement (NPS) for Energy (2011). It includes policy related to flood risk in Section 2.8 of the document, including the requirement for a site-specific Flood Risk Assessment for all energy projects in Environment Agency designated Flood Zones 2 and 3.

30. It is noted that the policy set out within the Draft EN-1 Overarching NPs for Energy (2021) is aligned with the guidance set out in NPPF and the supporting PPG, which were current at the time of its publication.

31. The Draft EN-1 NPs states in Paragraph 5.8.5 that:

"The aims of planning policy on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to steer new development to areas with the lowest risk of flooding. Where new energy infrastructure is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and, where possible, reducing flood risk overall. It should also be designed and constructed to remain operational in times of flood."

32. It provides guidance on the decision-making process to be adopted by the local planning authority, application of the Sequential Test (and Exception Test where required) as well as a summary on the need for appropriate mitigation measures.

33. This assessment has sought to consider the policy with regards to flood risk as set out in the Draft EN-1 Overarching NPS for Energy (2021), wherever possible, to mitigate the impact of flood risk both to and from the Onshore Project.

1.2.4 Preliminary Flood Risk Assessment

34. The most recent Preliminary Flood Risk Assessment (PFRA) for the county of Devon was published by Devon County Council in May 2011 (Devon County Council, 2011) to assist in its duties to manage local flood risk and deliver its requirements under the Flood Risk Regulations 2009.

35. The PFRA provides a high-level overview of the potential risk of flooding from local sources and identifies areas at flood risk which may require more detailed studies. The PFRA is used to inform the development of the Local Flood Risk Management Strategy (LFRMS).

1.2.5 Devon Local Flood Risk Management Strategy

36. Devon County Council produced the original LFRMS in 2014. In line with guidance this requires a review after 6 years. As such, it was reviewed and an updated version of the LFRMS was published in 2021 (Devon County Council, 2021). This document outlines the aims and objectives of the Council in their role as the Lead Local Flood Authority (LLFA) for Devon and provides policies based on these aims.

37. The Town and Country Planning (Consultation) (England) Direction 2021 notes that flood risk areas include areas which are located within "*Flood Zone 1 which have critical drainage problems, and which have been notified for the purpose of article 10 of the Order to the local planning authority by the Environment Agency*."

38. These areas are identified by the Environment Agency as Critical Drainage Areas (CDAs). There are 23 CDAs identified across Devon; however, a review of the online Devon County Council Environment Viewer indicates that none of the Onshore Infrastructure is located within a CDA.

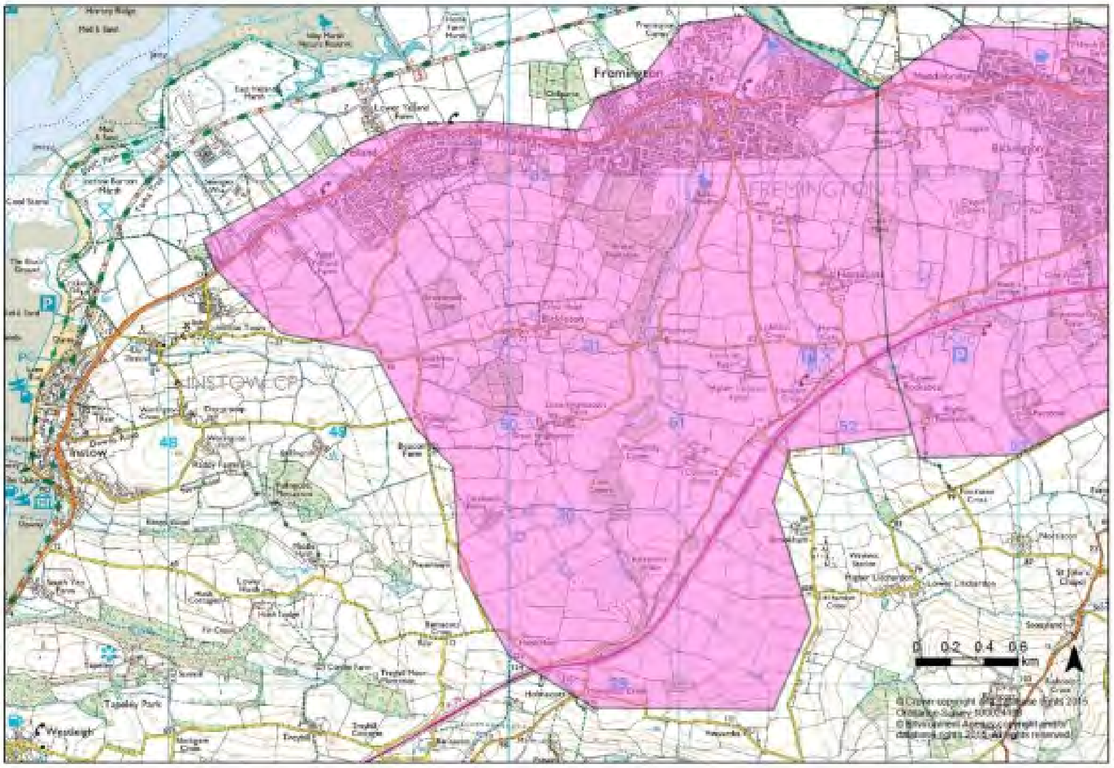
39. There is an area to the south of the Onshore Substation, around Yelland and along the B3233, that is located within the Fremington Yelland CDA, as shown on **Figure 1.1**. However, this does not interact with either the Onshore Substation or the Onshore Export Cable Corridor.

40. The Onshore Project overlaps a small area of the Fremington Yelland CDA at the point where the existing access road, which will be used to gain access into the Onshore Substation, connects with the B3233. This is discussed further in **Section 1.6.4**.

1.2.6 Strategic Flood Risk Assessment

41. A Strategic Flood Risk Assessment (SFRA) is a high-level strategic document produced by the local planning authority to provide a comprehensive and robust appraisal of the extent and nature of flood risk from all sources of flooding, at present and in the future. The SFRA takes into consideration the impacts of climate change and assesses the impact that land uses changes and developments are likely to have on flood risk at the present and in the future.

Figure 1.1 Extract taken from the list of Devon County Council Critical Drainage Areas showing the extent of the Fremington Yelland CDA



42. North Devon Council and Torridge District Council produced the joint North Devon and Torridge Level 1 SFRA in 2009. In addition, Level 2 SFRAs are available for defined areas that have been identified as at greatest risk from flooding.

43. A Level 2 SFRA has been produced, by North Devon Council, for the Barnstaple Area and includes an area known as BAR13 located between the village of Yelland and the River Taw. The proposed Onshore Substation is partially located within the area defined by the site allocation 'BAR13', which was allocated for Mixed Use development.

44. Development potential with regard to Planning Policy Statement 25 (relevant at the time of the production of the SFRA) Flood Risk Vulnerability Classification in relation to fluvial and / or tidal flood risk indicates that BAR13 has:

"No fluvial hazard. Tidal hazard restricted to area of site along N boundary. All uses acceptable where site in Environment Agency Flood Zone 1. Along N of site by Tarka trail no residential development should be promoted due to tidal flood risk in 2115 unless Exception Test passed to ensure development safe for its lifetime."

45. In addition, key findings of the Level 2 SFRA note that:

"For the remaining potential development sites outside the town centre (H1E1 to H11B, BAR12 and BAR13) no major constraints were identified due to the low fluvial or tidal flood risk experienced by the sites. Some sites have minor watercourses running either through or adjacent to the site therefore the Sequential Test should be applied as noted above."

1.2.7 Catchment Flood Management Plan

46. Catchment Flood Management Plans (CFMPs) consider all types of inland flooding including from rivers, groundwater, surface water and tidal flooding. Flooding directly from the sea (coastal flooding) is covered in Shoreline Management Plans (SMPs). CFMPs consider the likely impacts of climate change, the effects of how we manage the land and how areas can be developed sustainably to establish flood risk management policies which will deliver sustainable flood risk management for the long term.

47. The Onshore Development Area is covered by the North Devon CFMP which was published by the Environment Agency in 2012. The Onshore Export Cable Corridor is covered by Sub-area 6 Ilfracombe and Braunton and the Onshore Substation appears to be covered by Sub-area 7 Barnstaple and Bideford.

48. The policy for both Sub-area 6 and Sub-area 7 is Policy Option 5 which is classed as '*areas of moderate to high flood risk where were we can generally take further action to reduce flood risk*'.

49. The North Devon CFMP indicates the main source of flood risk within both of these Sub-areas is tidal flooding from the Celtic Sea and the Taw / Torridge estuary.

1.2.8 Shoreline Management Plan

50. Shoreline Management Plans (SMPs) are non-statutory plans for coastal defence management planning. They aim to identify the best ways to manage flood risk and erosion and develop an 'intent of management' for the shoreline.

51. The Onshore Development Area is covered by SMP18: Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head, which was published by the North Devon and Somerset Coastal Advisory Group in 2010.

52. Specifically, the Landfall section is located within Policy Unit 7c30: Braunton Burrows and Saunton Down.

53. The Onshore Export Cable Corridor is located within Policy Unit 7c28: Taw Estuary.

54. The Onshore Substation Area is located within Policy Unit 7c17: Instow to Yelland.

55. Given that the Onshore Substation would be the only permanent above ground infrastructure the policy for Policy Unit 7c17: Instow to Yelland has been considered.

56. The preferred policy for the short term (present day – 2025) is to continue to maintain existing embankment defences under a 'hold the line' policy; in the medium term (2025 – 2055) it is a combination of implementing managed realignment and hold the line policy. The preferred policy for the long term (2055 – 2105) is 'hold the line of the defence to continue to reduce the risk of flooding'.

1.3 Assessment Methodology

1.3.1 Study Area

57. Details of the location of the Onshore Project and the onshore elements are set out within **Chapter 5: Project Description**.

58. The Onshore Development Area has been considered based on the flood risk impact both to and from all the onshore project elements (i.e. Landfall, Onshore Export Cable Corridor, Compounds, Access Routes and Onshore Substation).

59. As noted previously, the FRA has been prepared in accordance with the methodology and guidance set out in NPPF (Ministry of Housing, Communities & Local Government, 2021), PPG for Flood Risk and Coastal Change (Ministry of Housing, Communities & Local Government, 2022) and the Environment Agency's climate change allowance guidance (Environment Agency, 2022).

60. Due to the scale of the Onshore Project, whereby it passes through an area of land to the rear of the coastal frontage, under the Taw Estuary and comprises landward elements to the southern side of the Taw Estuary, it is noted that the flood risk varies throughout the Onshore Development Area.

61. As such, to aid in this assessment, the Onshore Development Area has been sub-divided into two key sections within this document.

62. The flood risk at the Landfall and to the Onshore Export Cable Corridor to the north of the Taw Estuary comprises Section 1 of the assessment.

63. Section 2 of the Onshore Export Cable Corridor comprises the Onshore Export Cable Corridor located to the south of the Taw Estuary as well as the White Cross Onshore Substation.

64. This FRA has been structured to introduce all relevant policies and guidance for the production of FRAs, for the Onshore Project, and subsequently identifies the flood risk associated with the various elements of the Onshore Development Area.

65. Following the identification of the flood risk to each element of the Onshore Project, mitigation measures related to the construction and operation of these are then discussed to ensure there is no increase in flood risk either to, or as a result of, the Onshore Project.

1.3.2 Flood Risk Stakeholders and Consultation

66. The Onshore Development Area is located within the authority area of Devon County Council, as the Lead Local Flood Authority (LLFA), and North Devon Council.

67. Under the Flood and Water Management Act 2010, LLFAs are responsible for managing flooding from surface water, groundwater and Ordinary Watercourses. Among other responsibilities, LLFAs are required to deliver a strategy for local flood risk management in their respective areas, to investigate flooding and report incidents and to maintain a register of flood risk assets.

68. As the LLFA, Devon County Council is also responsible for consenting works that affect the flow of an Ordinary Watercourse under the terms of the Flood and Water Management Act 2010, Land Drainage Act 1991 and Water Resources Act 1991.

69. A review of mapping provided by the Association of Drainage Authorities (ADA) website has confirmed that the Onshore Development Area, specifically the Onshore Export Cable Corridor, passes through an Internal Drainage District (IDD). In this case the relevant drainage authority is the Braunton Marsh Internal Drainage Board (IDB).

70. Due to the coastal proximity of the Onshore Project and as the Onshore Export Cable Corridor will pass under a Main River, the Environment Agency is also a key flood risk stakeholder in the Onshore Project.

71. Consultation with regards to flood risk and drainage has been undertaken with key stakeholders, comprising the Environment Agency and Braunton Marsh IDB, as part of the development of the Onshore Project.

72. In addition, to reliably ascertain potential flood risk to the Onshore Project, a Product 4, 5 and 8 data request was submitted to the Environment Agency for all the information held on flooding from all sources in the Onshore Development Area.

73. The Environment Agency provided the Product 4 and 5 data package on 6th September 2022 and supplementary information on 20th September 2022.

74. The Environment Agency noted in their response that they were unable to provide Product 8 breach modelling for this area as they do not hold any detailed 2D modelling for this location.

75. An overview of the project consultation process is presented within **Chapter 7: Consultation** and a summary of the Expert Topic Group (ETG) meetings is included in **Chapter 14: Water Resources and Flood Risk.** In summary, ETG meetings were held with key stakeholders on 14th April 2022, 16th May 2022, 26th May 2023 and 6th June 2023.

76. In addition, the Environment Agency provided a Scoping Response, dated 6th April 2022 (Ref: DC/2022/122540/01-L01), which has been reviewed as part of this assessment to ensure that flood risk comments and concerns raised are addressed within the FRA.

77. A summary of the comments related to flood risk within the Scoping Response is provided as follows:

- The Environment Agency noted the scoping in of flood risk issues and the intention to develop a FRA for the development (for which this FRA fulfils that requirement)
- Any works near flood defences and any main river crossings should provide plans with supporting detail including engineering drawings and a detailed method statement
- Coastal change including geomorphological uncertainties related to future evolution of the coastline and estuary, development or future development of intertidal habitats and flood defences. To aid in understanding this context the Scoping Response recommended consideration should be given to the Shoreline Management Plan.

78. The Scoping Response provided by the Environment Agency did not raise any specific concerns related to flood risk, beyond those that identified above and those that would require assessment in a standard FRA.

79. A review of the Scoping Response provided by Devon County Council, as the LLFA for the Onshore Development Area, dated 17th March 2022 did not include any comments on sections within the Scoping Report related to either flood risk or drainage.

80. Further to the above, a meeting was also held with Braunton Marsh IDB on 20th March 2023 to obtain background information on drainage and flood risk concerns within the IDD. This meeting included a discussion about drainage and ground

conditions, maintenance (including vegetation and ditch clearance), seasonal operation of structures within the IDD and recent upgrade works that have been undertaken. The information obtained during the meeting with Braunton Marsh IDB has been considered and a summary included within this assessment, where relevant, to inform the conclusions.

1.3.3 Potential Permitting / Consenting Requirements

81. Any works, either temporary or permanent, which will alter the flow of the water along a watercourse or require the erection of a culvert, bridge or modification to the channel will require consent form the corresponding relevant authorities such as the Environment Agency, LLFA or IDB.

82. For consents to be obtained from the Environment Agency, as set out in the Environmental Permitting (England and Wales) Regulations 2016, a permit or exemption is required for any activities which will take place:

- On or within 8 metres (m) of a Main River (16m, if the Main River is tidal)
- On or within 8m of a flood defence structure or culverted main river (16m, if Main River is tidal)
- Any activity within 16m of a sea defence structure
- Quarrying or excavation within 16m of any Main River, flood defence (including a remote defence) or culvert
- Activities carried out on the floodplain of a Main River, more than 8m from the riverbank, culvert or flood defence structure (or 16m, if the Main River is tidal) and planning permission has not already been obtained.

83. Given that the Onshore Development Area will pass under both the Landfall and Taw Estuary using trenchless techniques, it is concluded that there will be no requirement for an Environmental Permit from the Environment Agency for these elements. However, if the design in these locations were to change then it is recommended this is confirmed with the Environment Agency.

84. It is understood that the entry or exit pits for the trenchless crossing and / or any temporary construction compounds are located over 16m from the Taw Estuary and therefore it is unlikely that an Environmental Permit would be required.

85. Where the proposed access road for the Onshore Export Cable Corridor crosses over Sir Arthur's Pill, which is Main River in this location, there is likely to be a requirement to apply for an Environmental Permit from the Environment Agency for the temporary works.

86. In addition, any works that may affect Ordinary Watercourses within the Braunton Marsh IDD would require consent under the Land Drainage Act 1991 from Braunton Marshes IDB or for Ordinary Watercourses outside the extent of the IDD this would require consent from Devon County Council, in their role as the LLFA.

87. If the design of the Onshore Project were to change it is recommended that the above indicative permitting requirements are reviewed and confirmation obtained from the Environment Agency, Braunton Marshes IDB and Devon County Council, as appropriate.

1.3.4 Probability of Flooding – Flood Zones

88. **Table 1.2** defines each flood zone and associated probability, taken from Table 1 of the PPG for Flood Risk and Coastal Change (Ministry of Housing, Communities and Local Government, 2022).

89. The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites:

- Within medium risk areas
- Then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas.

90. Initially, the presence of existing flood risk management infrastructure should be ignored, as the long-term funding, maintenance and renewal of this infrastructure is uncertain. Climate change will also impact upon the level of protection infrastructure will offer throughout the lifetime of development. The Sequential Test should then consider the spatial variation of risk within medium and then high flood risk areas to identify the lowest risk sites in these areas, ignoring the presence of flood risk management infrastructure.

91. The Exception Test requires two additional elements to be satisfied (as set out in paragraph 164 of the National Planning Policy Framework) before allowing development to be allocated or permitted in situations where suitable sites at lower risk of flooding are not available following application of the sequential test.

Table 1.2 Summary of Flood Zone Definitions

Flood Zone	Probability of Flooding	Description
1	Low	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
2	Medium	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)
3a	High	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
3b	High – Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

92. It should be demonstrated that:

- development that has to be in a flood risk area will provide wider sustainability benefit to the community that outweigh flood risk
- the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

93. The Exception Test is not a tool to justify development in flood risk areas when the Sequential Test has already shown that there are reasonably available, lower risk sites, appropriate for the proposed development. It would only be appropriate to move onto the Exception Test in these cases where, accounting for wider sustainable development objectives, application of relevant local and national

policies would provide a clear reason for refusing development in any alternative locations identified.

94. Flood Zones are informed by modelling undertaken by the Environment Agency and refer to the probability of fluvial or tidal / coastal flooding, ignoring the presence of defences.

95. The extent of the modelling includes all designated Main Rivers. Any watercourse that is not classified as a Main River is referred to as an Ordinary Watercourse. This covers streams, drains, ditches and passages through which water flows that do not form the network of main rivers.

96. Some larger Ordinary Watercourses (including IDB maintained watercourses) are also included in the Environment Agency's modelling and may therefore be included within the extent of the Flood Zone datasets.

97. It is important that FRAs also identify and mitigate against risks from all identified sources of flooding. The Environment Agency provides national datasets on surface water flood risk, classified into four categories: 'Very Low', 'Low', 'Medium' and 'High', as summarised in **Table 1.3**.

Table 1.3 Summary of Surface Water Flood Risk Definitions

Probability of Flooding	Description
Very Low	Each year the area has a chance of flooding of less than 1 in 1,000 (0.1%)
Low	Each year the area has a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)
Medium	Each year the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
High	Each year the area has a chance of flooding of greater than 1 in 30 (3.3%)

1.4 Baseline Environment

98. This section describes the existing environment in relation to flood risk associated with the Onshore Project. It has been informed by a review of the documents and sources listed in **Section 1.2**.

1.4.1 Hydrology / Surface Water Drainage

99. Surface water drainage is considered in terms of water body catchments, as defined by the Environment Agency. Receptors are those water bodies that are crossed by the Onshore Project. Infrastructure associated with the Onshore Project lies within

two surface water catchments, which are part of the Environment Agency's Taw and North Devon operational catchment. These are:

- Taw Estuary (GB108050020000)
    - This is a freshwater river catchment without tidal influence. It is drained by Sir Arthur's Pill (Main River) and Ordinary Watercourses. To avoid confusion with the tidal estuary of the River Taw, this catchment is hereafter referred to as the 'Taw Estuary (Sir Arthur's Pill catchment)'.
- Taw/Torridge (GB540805015500)
    - Estuarine waters of the River Taw and River Torridge that receive inflows from large areas of Torridge, Mid, West and North Devon.

100. The Onshore Export Cable Corridor also crosses areas of onshore coastal catchment:

- Land at Instow Barton Marsh (i.e. land south of the tidal estuary near the existing East Yelland substation) – hereafter referred to as 'coastal catchment (Instow Barton Marsh)'
- Land between the western watershed of the Taw Estuary (Sir Artur's Pill catchment) and MLWS (i.e. Braunton Burrows) – hereafter referred to as 'coastal catchment (Braunton Burrows)'.

1.4.1.1 Taw Estuary (Sir Arthur's Pill catchment)

101. The majority of the Taw Estuary (Sir Arthur's Pill catchment) is characterised by flat pastures interspersed with numerous slow-flowing freshwater channels (Ordinary Watercourses) that make up Braunton Marsh. This area was formerly inter-tidal marshland prior to embanking works in the 19th century.

102. Sir Arthur's Pill flows around the western side of Braunton Marsh and then in an easterly direction, before being joined by Boundary Drain. The lower course of Sir Arthur's Pill discharges to a channel at the edge of Horsey Island via a control structure (i.e. the Great Sluice). The Horsey Island channel then discharges to the River Caen and wider Taw-Torridge estuary.

103. Boundary Drain divides from Sir Arthur's Pill immediately west of Braunton Great Field and follows a southerly and then north-easterly direction around the perimeter of Braunton Marsh.

104. It is understood that the Boundary Drain carries some of the water diverted off Sir Arthur's Pill, via a sluice gate control, around to land along the western and eastern boundary extents of the Marshes as well as draining the same land during wetter

periods and following significant rainfall events when runoff from the land is increased.

105. Inner Marsh Pill flows off Sir Arthur's Pill in an easterly direction through the centre of Braunton Marsh before joining Boundary Drain. The centre of Braunton Marsh is crossed by several straight, engineered channels that connect to the above-named watercourses.

106. Ordinary Watercourses that drain Braunton Marsh are managed by Braunton Marsh IDB.

107. The Braunton Marsh is now an extensive network of drainage ditches, field drains and ordinary watercourses with one Main River, Sir Arthur's Pill, flowing north to south before discharging into the River Taw estuary via the Great Sluice structure.

108. Consultation with Braunton Marsh IDB indicated that during an average winter season Braunton Marsh are, as expected, generally saturated and waterlogged. The ground is extremely soft in places and standing or pooling water is extensive throughout the system.

109. Routine maintenance is generally carried out from late Spring through to early Autumn when the ground is drier and firmer underfoot.

110. Flooding on Braunton Marsh is seasonal, occurring mostly in the winter season following periods of sustained rainfall and higher water levels across the drainage ditch network.

1.4.1.2 Taw / Torridge

111. The tidal River Taw widens appreciably downstream of Barnstaple (typically 400-850m wide). Below Appledore the Taw estuary is joined by the Torridge estuary and the combined water discharge to Barnstaple Bay. The usual range of the River Taw at Barnstaple tide gauge is approximately 4m.

1.4.1.3 Coastal catchment (Instow Barton Marsh)

112. The main area of onshore coastal catchment that will be affected by the Onshore Project is Instow Barton Marsh, adjacent to the existing East Yelland substation. This area of land is characterised by a series of short, straight, artificial drains.

113. The majority of drains flow to a small lake immediately north of the proposed White Cross Onshore Substation, which discharges to the estuary via a control structure. There is also a culvert below a coastal embankment (flood defence) that takes higher flows to the foreshore.

1.4.1.4 Coastal catchment (Braunton Burrows)

114. In addition to the area of coastal catchment at Instow Barton Marsh there is a relatively small area of land between MLWS and the western watershed of the Taw Estuary (Sir Arthur's Pill catchment).

115. There is only one short (~350m) watercourse in this catchment. It flows from the steep hillside above Saunton Sands car park and is then culverted below the car park, until it discharges onto the beach. In addition, the extent of the small sand aquifer that underlies Braunton Burrows is uncertain.

116. The area of the Onshore Project located to the north of the Taw Estuary is protected by the Inner Bank sea defence and the Great Sluice.

117. The entire system is protected from sea water inundation during tidal floods by the Inner Bank, a sea defence that runs adjacent to the Toll Road, and one way flap valves installed on the Great Sluice structure. It is understood that the Great Sluice is controlled by Braunton Marsh IDB but maintained by the Environment Agency.

1.4.2 Geomorphology

118. A geomorphological walkover survey was undertaken in April and August 2022. The main characteristics of each watercourse within the study area are summarised below:

- **Sir Arthur's Pill**: The channel (Main River) broadly follows the course of a large palaeochannel associated with the former inter-tidal marshland environment of Braunton Marsh. At the time of the survey, there was no evidence of flowing water or any bedforms. Upper reaches of the channel, upstream of Braunton Marsh, are narrow (~1.5-2 m width) with a trapezoidal cross-section indicative of channel maintenance (dredging/desilting). Within Braunton Marsh, the channel is wider (2-4m) and less incised. There are regular zones of floating and submerged aquatic vegetation. Channel bed and floodplain substrates are silts and clays and there is good channel-floodplain connectivity via a series of palaeo-channels
- **Boundary Drain**: Similar to Sir Arthur's Pill, this Ordinary Watercourse follows the course of a large palaeo-channel and there is no evidence of flowing water or any bedforms. Substrates are silts and clays, with similar vegetation as described for Sir Arthur's Pill. Several small sluice gates cross the channel, and banks are artificial where bridges cross the channel to allow agricultural vehicles to access to the marsh. The channel (2-4m in width) is trapezoidal in cross-

section with evidence of dredging – old dredgings line the channel to form small embankments in places, which limits channel-floodplain connectivity

- **Inner Marsh Pill**: As described for Boundary Drain. In addition, the middle and lower reaches of the channel follow a sinuous palaeo-channel. In contrast, the upper reach is entirely artificial and is formed by a straight/engineered cut that joins Inner Marsh Pill to Sir Arthur's Pill. In the upper (engineered) reach, old dredgings can be seen lining the banks, which limit channel-floodplain connectivity
- **Ordinary Watercourses near Saunton Golf Course**: An area characterised by several short, straight, incised channels. Their artificial form and location (set within arable farmland) suggests they are regularly maintained (by dredging/desilting). Channels are typically 1-1.5m and densely overgrown with riparian vegetation. Where water was visible, it was ponded, and some channels were dry. There was no evidence of bedforms. One channel at the southern end of Saunton golf course flows through woodland and appears to have a more natural form. Although dry at the time of survey, abundant in-channel wood and roots suggests flows may be more varied at this location
- **Braunton Burrows ponds**: These small ponds are not connected to the surface water drainage network and are linked to groundwater and rainfall. They are typically shallow (<1m) and surrounded at the water's edge by reeds and rushes. Banks are low (<0.5) and they have sandy beds. Riparian areas are typically surrounded by scrub and wet woodland. Bankside locations show signs of erosion associated with recreational use
- **Ordinary Watercourses at Instow Barton Marsh**: There are two main artificial channels at Instow Barton Marsh, one of which is cut into the course of a palaeo-channel associated with the former inter-tidal marshland environment. The other is an engineered cut that connects to the aforementioned channel. Channels are typically trapezoidal in cross-section, indicative of maintenance (dredging), and there were no bedforms or evidence of flowing water during the survey. Channel bed and banks are characterised by silts and clays, and there is limited channel-floodplain connectivity owing to the artificial and incised nature of the watercourses. There are several sites of bank erosion associated with cattle poaching
- **Taw/Torridge estuary**: Estuarine waters characterised by sandy channel substrate and bedforms (dunes and ripples) at low water. At the point where the onshore export cables will be tunnelled below the estuary, the channel is ~1,000m wide and has a wetted channel width at low water of ~250m. Tidal range is ~8m at the estuary mouth and closer to ~4m just downstream of Barnstaple. Channel floodplain connectivity is restricted by flood defences on

both banks. Control structures (sluices) on the foreshore discharge freshwater to the estuary.

1.4.3 Geology and Hydrogeology

119. The British Geological Survey (BGS) 1:50K scale bedrock and superficial geology geological mapping has been reviewed for the onshore project area.

120. As would be expected from a linear project of this nature, the geological conditions within the onshore project area vary. However, these can be summarised as follows:

- Superficial Deposits:
  - At the location of Landfall comprises of Blown Sand, a sedimentary rock formed between 2.588 million years Before Present (BP)
  - The majority of the footprint of the Onshore Export Cable Corridor passes through the Braunton Marshes in a southerly direction down to the shoreline of the Taw Estuary and comprises of Tidal Flat deposits of clay, sand and silt. These are sedimentary superficial deposits formed between 11.8 thousand years BP and the present during the Quaternary Period (last 250,000 years)
  - South of the Taw Estuary Alluvial deposits of clay, silt, sand and gravel dominate. Again, formed since 11.8 thousand years BP through to the present day of the Quaternary Period.
- Bedrock Geology:
  - On the north side of the Taw Estuary the entire footprint of the onshore cable corridor route lies over a bedrock geology of Mudstone, known as the Pilton Mudstone Formation. Mudstone is a sedimentary bedrock formed between 372.2 and 346.7 million years BP
  - On the south side of the Taw Estuary the onshore substation lies over a bedrock geology of Mudstone and Siltstone, known as the Ashton Mudstone Member and Crackington Formation. This is defined as a Sedimentary bedrock formed between 329 and 318 million years BP.

121. Tidal Flat Deposits are classified as being ‘unproductive’. These are geological strata with low permeability that have negligible significance for regional water supply or river base flows.

122. The bedrock geology of the Onshore Development Area is defined as being a ‘Secondary’ aquifer in terms of productiveness for providing water. This is defined as bedrock that can provide modest amounts of water, but the nature of the rock or aquifer’s structure limits their use, mostly in this case to a local scale.

123. The Department for Food & Rural Affairs (DEFRA) MAGIC Map webservice indicates that the Onshore Development Area has been classified as having '**Medium**' and '**Medium – High**' groundwater vulnerability risk.

124. A **Medium - High** Groundwater vulnerability designation indicates that the soils are easily able to transmit pollution to groundwater. They are characterised by high leaching soils and the absence of low permeability superficial deposits.

125. The Onshore Development Area is underlain by one Water Framework Directive (WFD) groundwater body comprising the River Taw and North Devon Streams groundwater body (Defra, 2022).

1.4.4 Soils

126. The Cranfield Soil and Agrifood Institute Soilscape web service provides an overview of UK soil coverage and types.

127. The Soilscape web service identifies a total of five soil types across the Onshore Development Areas including the Landfall, Braunton Marshes and the south side of the estuary in the area of the Onshore Substation. These are:

i. Soil Type 4
ii. Soil type 6
iii. Soil Type 23
iv. Soil type 21
v. Soil Type 17

128. A summary table presenting the geological properties by soil type and location within the Onshore Development Area from north to south is presented in **Table 1.4**.

Table 1.4 Geological properties and soil type within the Onshore Development Area

Soilscape Soil Type	BGS Superficial Deposit Geology	Aquifer Superficial Deposit Designation (Secondary Aquifers)	Natural Drainage Type	Approximate location(s) within the Onshore Project area
Type 4	Blown sand: Sedimentary superficial deposit.	Secondary A - permeable layers capable of supporting local water resources.	Freely draining	Landfall section from shoreline eastwards across the northern area of the golf course and the burrows dune system.

Soilscape Soil Type	BGS Superficial Deposit Geology	Aquifer Superficial Deposit Designation (Secondary Aquifers)	Natural Drainage Type	Approximate location(s) within the Onshore Project area
Type 6	Tidal Flats Deposits: Clay, silt and sand sedimentary superficial deposits	Secondary (undifferentiated) – rock strata designated as both minor and non-aquifer in different locations due to variable characteristics of rock types.	Freely draining	Section below Saunton in the vicinity of the temporary access road off the B3231 highway and continuing southwards along Burrows Close Lane.
Type 23	Tidal Flats Deposits: Clay, silt and sand sedimentary superficial deposits	Secondary (undifferentiated)	Naturally wet	To the south of Type 6, mainly along the length of the Onshore Export Cable Corridor along America Road and around the Taw Estuary.
Type 21	Tidal Flats Deposits: Clay, silt and sand sedimentary superficial deposits	Secondary (undifferentiated)	Naturally wet	Small areas of the Onshore Export Cable Corridor may intersect this area across Braunton Marsh, to the east of Type 23.
Type 17	Alluvium: Clay, silt, sand and gravel. Sedimentary superficial deposits.	Secondary A – permeable layers capable of supporting local water resources.	Impeded Drainage	South side of the Taw Estuary and location of the Onshore Substation.

1.4.5 Existing Surface Water Drainage

129. The Onshore Project will be located on predominantly rural coastal agricultural land, with the exception of the Onshore Substation, as such there is likely to be limited existing surface water drainage infrastructure present apart from land drains and ditch connections.

130. However, as noted in earlier sections, there are a large and extensive number of agricultural land drains and Ordinary Watercourses that will require crossing along the route of the Onshore Export Cable Corridor. As such, a considered approach to the management of surface water drainage during the construction phase will need to be adopted.

1.5 Landfall and Onshore Export Cable Corridor (Section 1)

131. This section covers the Landfall location and the northern part of the Onshore Export Cable Corridor to the point where it passes under the Taw Estuary.

1.5.1 Historic Flooding Records

132. To understand the likely risk of flooding to the Onshore Project, a desktop review of historical flood event records has been undertaken.

133. The review aims to provide an understanding as to the context of flooding throughout the Onshore Development Area and where possible identifying specific areas prone to flooding issues. However, it should be noted that the absence of historical flooding records for specific localities does not necessarily confirm that flooding has not occurred.

134. A review of the Environment Agency Historic Flood Map, which includes records of flooding from rivers, groundwater and the sea, indicates that at the Landfall and throughout the entire length of the proposed Onshore Export Cable Corridor there are no records of historical flooding within the dataset.

135. It should be noted that the Environment Agency Historic Flood Map excludes flooding from surface water sources, except in areas where it is impossible to determine whether the source is fluvial or surface water but the dominant source is fluvial.

136. The North Devon & Torridge District Council Level 1 SFRA provides location points for historic flood events from fluvial, tidal, sewer, groundwater, highway drainage and surface water sources. In addition, Devon County Council has published a number of Section 19 Flood Investigation Reports.

137. A review of these documents indicates there was tidal / coastal flooding of the Braunton Marshes and further up the estuary in 2018, whereby Storm Eleanor breached the sea defence wall in proximity to Crow Beach House (known locally as the White House).

1.5.2 Flood Zones

138. Based on the Environment Agency Flood Zone mapping the Landfall location is identified as being located in Flood Zone 1, as shown on **Figure 1.2**. In addition, the northern part of the Onshore Export Cable Corridor is also located in Flood Zone 1.

139. In the vicinity of the Braunton Burrows Car Park, where the Onshore Export Cable Corridor passes under American Road to run along the eastern side of Boundary Drain it passes through an area of Flood Zone 3 up to the crossing point of the Taw Estuary.

140. At the northern end of the Onshore Export Cable Corridor there is a proposed access road from the B3231. It crosses over Sir Arthur's Pill which is Main River in this location and in this location would pass through Flood Zone 3.

141. Furthermore, although the Onshore Export Cable Corridor passes through the Saunton Golf Club golf course, it will be unaffected as a trenchless technique will be used in this location.

1.5.3 Flooding from Rivers and the Sea

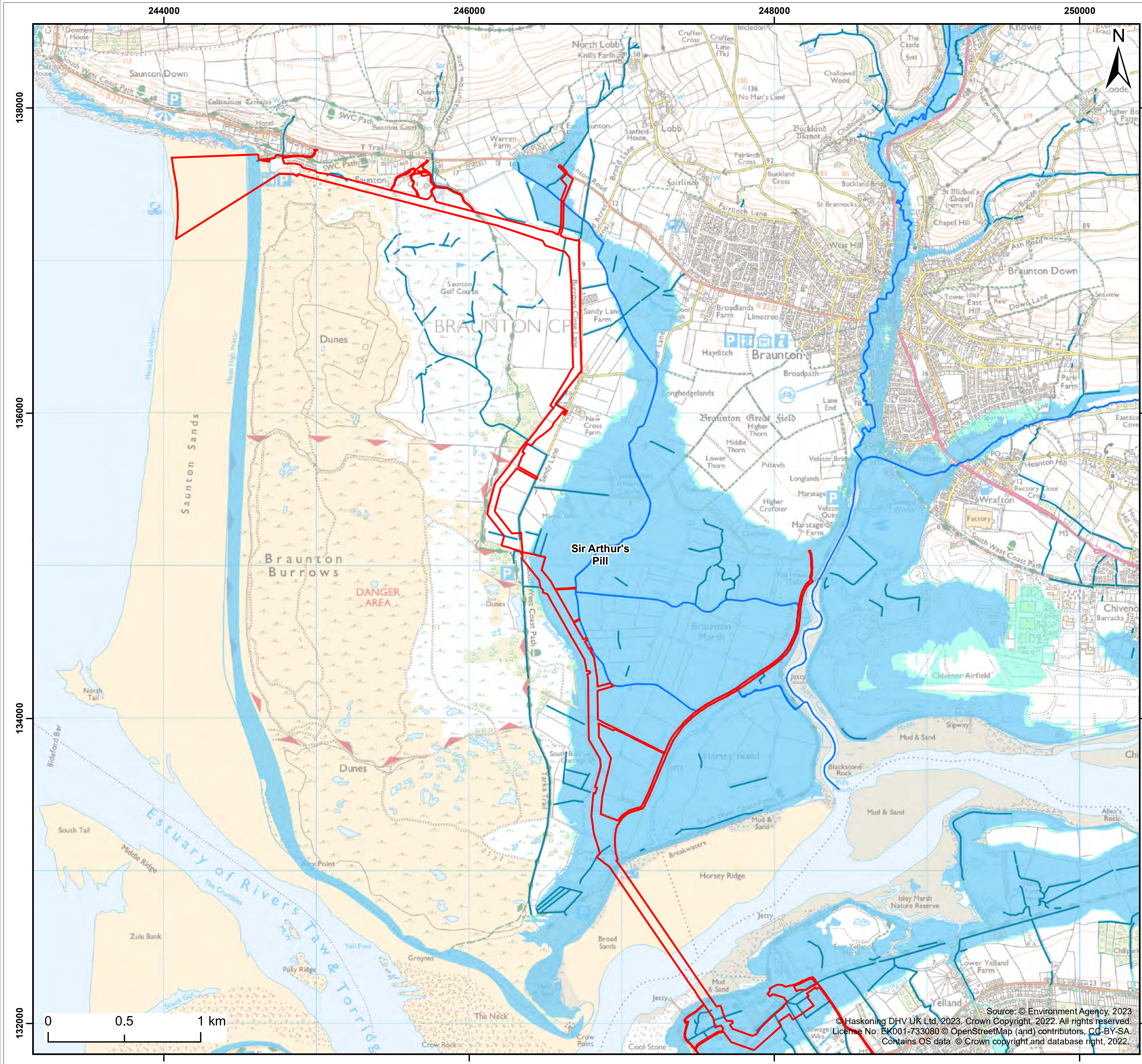
142. Information obtained from the Environment Agency Product 4 and 5 data packages indicates that the flood risk in this location is likely to be based on a tidal event, as opposed to a fluvial event. This was also discussed and confirmed with the Environment Agency at the ETG meeting on 6th June 2023.

143. Therefore, it is considered that the principal source of flooding to the Onshore Export Cable Corridor in this location is likely to be from a tidal event.

144. In addition, it is noted that following consultation with the Braunton Marsh IDB the watercourses in this area are actively managed, with eventual discharge into the Taw Estuary via the Great Sluice.

145. On the basis the flood risk associated with the watercourses within the Braunton Marsh IDB is as a result of active management of water levels and not from tidal inundation, the potential flood risk impact to and from the Onshore Project in this location is considered separately from the tidal flood risk in the following section.

Figure 1.2 Watercourses and Environment Agency Flood Zones (Landfall and northern section of the Onshore Export Cable Corridor)



Legend:

- Onshore Development Area
- Statutory Main River
- Ordinary Watercourse
- Flood Zone 2
- Flood Zone 3

Note: All areas not shown as being located in either Flood Zone 2 or 3 are classified as Flood Zone 1 (when considering fluvial and tidal flood risk)

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title:

Watercourses and Environment Agency Flood Zones (Landfall and Northern Section of Onshore Export Cable Corridor)

Figure:	1.2	Drawing No:	PC2978-RHD-ZZ-XX-DR-Z-0692

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	02/08/2023	MCP	HW	A3	1:25,000

Co-ordinate system: British National Grid

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1.5.4 Flooding from Surface Water

146. A review of the Environment Agency surface water flood mapping for the Landfall and Onshore Export Cable Corridor indicates that there are predominantly small, localised areas of low to medium risk of surface water flooding throughout the Onshore Development Area, which are associated with topographical low points.

147. There are some areas at high risk of surface water flooding along the Onshore Export Cable Corridor, but these are associated with the watercourses within the area covered by the Braunton Marsh IDB, as shown on **Figure 1.3**.

148. As previously noted, this area is actively managed by the Braunton Marsh IDB and as part of the water level management in this area, water levels in the ditches are deliberately retained at higher levels for key periods throughout the year and there is sometimes deliberate "inundation" of some areas.

149. It is understood that in the Winter the sluice and gate control structures are opened to allow water to flow southwards and discharge into the Taw Estuary. Conversely, in the Summer water is penned back / held within the system to increase levels in the ditch network and hold the groundwater levels up in the fields.

150. The minor areas of increased flood risk on the Environment Agency surface water mapping have been identified from national scale modelling and do not appear to coincide with any existing property or infrastructure receptors within the Onshore Development Area.

151. The areas where the Onshore Export Cable Corridor crosses Ordinary Watercourses are identified as having a higher risk of surface water flooding. However, this is primarily limited to the width of the watercourse channel and relates to the lower lying area comprising the channel itself and the land draining into it.

152. At this stage in the Onshore Project's design, trenchless techniques cannot be committed to at all locations, where the engineering feasibility of using such techniques needs further assessment before it can be confirmed. The list of techniques being considered at each crossing is described in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement**.

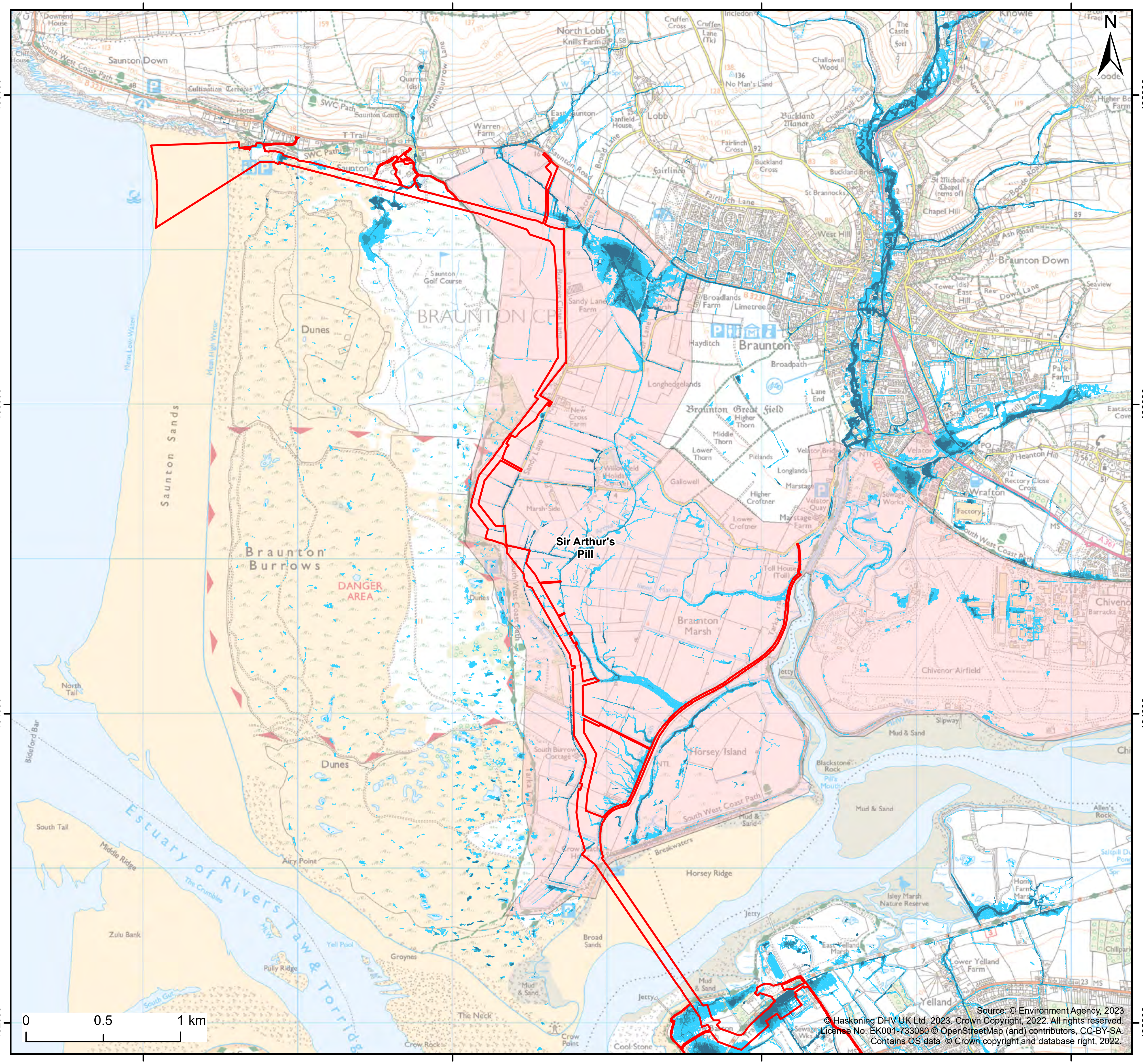
153. As the Landfall and Onshore Export Cable will be located below ground within sealed ducts there will be no interaction with the surface water flood risk once operational.

154. Along the Onshore Export Cable Corridor, link boxes will be provided for earthing cables and these will be installed inside a protective concrete chamber. The link boxes will provide access (for inspections) from the surface during operations.

155. On this basis, any surface water flood risk to the Landfall and Onshore Export Cable Corridor will be temporary in nature and removed once construction is complete as all Onshore Infrastructure associated with the Onshore Export Cables will be located below ground other than the link boxes which will be built to limit surface water ingress.

156. As such it is concluded that the Landfall and Onshore Export Cable Corridor will only be at risk of surface water flooding during the construction phase of the Onshore Project.

Figure 1.3 Environment Agency Surface Water Flood Risk (Landfall and northern section of Onshore Export Cable Corridor)



Legend:

- Onshore Development Area
- Braunton Marsh IDB
- High Risk - In any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - In any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low Risk - In any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title:

Environment Agency Surface Water Flood Risk
(Landfall and Northern Section of Onshore Export Cable)

Figure: 1.3	Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0693				
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Co-ordinate system: British National Grid

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1.5.5 Flooding from Groundwater

157. Groundwater flooding occurs when water levels below the surface of the ground rise above or break through the ground surface and either pool in one locality and or flow overland. Low-lying areas underlain by unconfined aquifers are most susceptible to this source of flooding, in particular following heavy rainfall events.

158. The geology maps available from the BGS indicate that the Onshore Development Area is located over 'unproductive' rock strata in terms of groundwater resources.

159. The North Devon and Torridge District Council Level 1 SFRA indicates that some groundwater flooding occurs in the Yeo Vale / Portmarsh Field areas of Barnstaple - these are the only known locations in the North Devon and Torridge areas subject to groundwater flooding.

160. A review of the Environment Agency's Areas Susceptible to Groundwater Flooding (AStGWF) maps, contained within the Devon County Council PFRA, has been undertaken. This is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It should be noted that it does not show the likelihood of groundwater flooding occurring.

161. Given the relatively coarse nature of this mapping it indicates that flooding from groundwater along this section of the Onshore Export Cable Corridor passes through 1km square grids where greater than 75% of the area is classified as being at risk of groundwater emergence. In addition, it also passes through 1km square grids where between 50% to 75% of the area is classified as being at risk of groundwater emergence.

162. It is considered likely that local groundwater is flowing through the superficial strata layer and being held within the wider drainage system by the network of control structures.

163. Saline intrusion may be occurring within Braunton Marsh and this will need confirming post-consent as part of any site survey works.

164. The above indicates that the underlying groundwater table is localised and reflected by water levels within the drainage ditch network throughout the Braunton Marshes and the wider area of pastureland in the north of the Onshore Development Area.

165. As the construction works require earthworks in order to place the Onshore Export Cables, it is important to note that groundwater may be present below sections of

the Onshore Export Cable Corridor and could be encountered during the below-ground engineering works.

166. As such it can be assumed that the risk of flooding to the Onshore Export Cable Corridor from groundwater is likely to be high especially during the winter months. This should be taken into consideration in the mitigation measures to be implemented, including the addition of less permeable material as breaks along the cable route at regular intervals, to ensure there is no creation of preferential flow paths along the Onshore Export Cable.

167. The inclusion of mitigation measures such as this during construction will ensure there is no detrimental impact either to or from the Onshore Project on groundwater flood risk within the area.

1.5.6 Flooding from Sewers

168. As the Onshore Export Cable Corridor is located within existing agricultural land it is likely that there is a limited foul sewer network within the proximity of this location.

169. During the development of the Onshore Project a utilities search has been undertaken, including identification of the water and sewerage network. This confirmed that there is a South West Water sewer towards the northern end of the Onshore Project, associated with existing housing along the B3231 Saunton Road; however, through Braunton Marsh there is no foul sewer network.

170. The presence and location of utilities will be confirmed during the design phase along with refinement of the route of the Onshore Export Cable. However, given the limited foul sewer network, the risk of flooding from sewers is considered to be **Low** for the Landfall and this section of the Onshore Export Cable Corridor.

1.5.7 Flooding from Reservoirs

171. Reservoirs with an impounded volume greater than 25,000 cubic metres (m^3) are governed by the Reservoirs Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low.

172. Recent changes to legislation under the Flood and Water Management Act 2010 require the Environment Agency to designate the risk of flooding from these reservoirs. Flooding from reservoirs is defined based on the implications of a large uncontrolled release of water from registered reservoirs i.e. greater than 25,000m^3.

173. The Environment Agency Flood Risk from Reservoirs map shows that the Landfall and this section of the Onshore Export Cable Corridor are not located within an area at risk of flooding from reservoir sources under any situation. Therefore, there is no risk of flooding from this source.

1.5.8 Flooding from Canals and other Artificial Sources

174. The Landfall and this section of the Onshore Export Cable Corridor are not located near to any canals.

175. As previously noted, the Onshore Export Cable Corridor passes through an area that is actively managed by the Braunton Marsh IDB and therefore the drainage network in this area could be classed as an artificial source.

176. However as these comprise a series of Ordinary Watercourses the risk, associated with the drainage network in this location, has been considered within the preceding section on flooding from surface water.

1.5.9 Summary of Flooding

177. Overall, the Landfall and this section of the Onshore Export Cable Corridor is not at risk from fluvial sources, sewers, canals or other artificial sources.

178. However, there is a risk of flooding from tidal, groundwater and surface water associated with Ordinary Watercourses within the Braunton Marsh IDB.

1.6 Onshore Export Cable Corridor (Section 2) and Onshore Substation

179. This section covers the Onshore Export Cable Corridor located to the south of the Taw Estuary as well as the area around the proposed Onshore Substation.

1.6.1 Historic Flooding Records

180. To understand the likely risk of flooding to the Onshore Project, a desktop review of historical flood event records has been undertaken.

181. The review aims to provide an understanding as to the context of flooding throughout the Onshore Development Area and where possible identifying specific areas prone to flooding issues. However, it should be noted that the absence of historical flooding records for specific localities does not necessarily confirm that flooding has not occurred.

182. A review of the Environment Agency Historic Flood Map, which includes records of flooding from rivers, groundwater and the sea, indicates that throughout the entire

length of the proposed Onshore Export Cable Corridor, as well as at the Onshore Substation, there are no records of historical flooding within the dataset.

183. It should be noted that the Environment Agency Historic Flood Map excludes flooding from surface water sources, except in areas where it is impossible to determine whether the source is fluvial or surface water but the dominant source is fluvial.

184. A review of the North Devon and Torridge District Council Level 1 SFRA indicates that in 1983 Yelland Power Station reported the basement flooded from tidal flooding.

1.6.2 Flood Zones

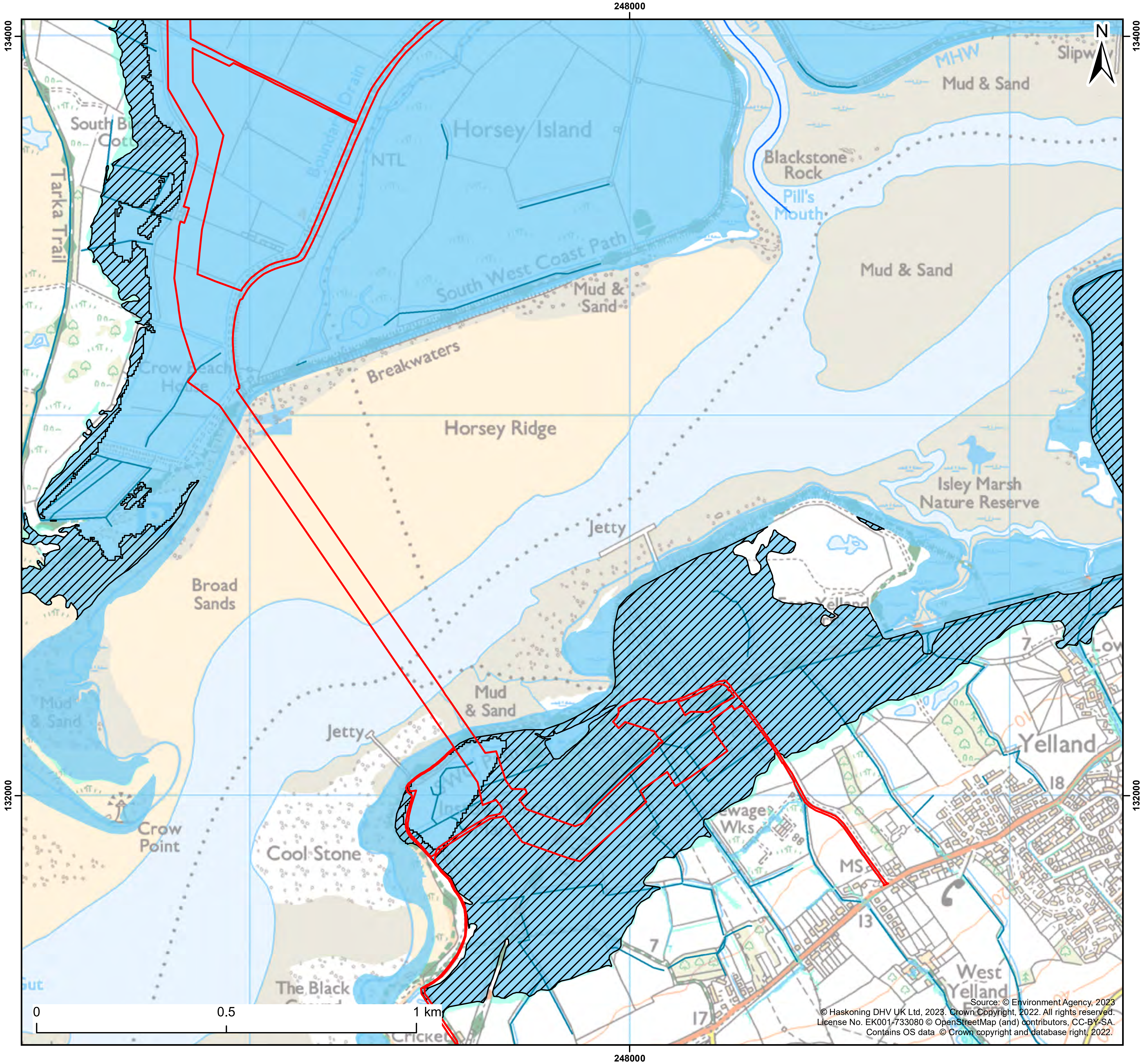
185. Based on the Environment Agency Flood Zone mapping, shown in **Figure 1.4**, the Onshore Export Cable Corridor and the Onshore Substation are located in Flood Zone 3.

186. The Environment Agency confirmed within the Product 4 and 5 data packages that land to the south of the Taw Estuary is protected from tidal flooding by a series of defences, as seen in **Figure 1.5**. Information related to the defences in this location are reproduced in **Table 1.5**.

187. The Product 4 and 5 dataset confirmed that the Environment Agency database lists five defence embankments surrounding the wider area of the Onshore Export Cable Corridor and Onshore Substation and each of these embankments has a different crest level.

188. In addition, in the ETG meeting with the Environment Agency on 6th June 2023, it was noted by the Environment Agency that the Tarka Trail also provides some protection from flooding to land located behind it.

Figure 1.4 Watercourses and Environment Agency Flood Zones (Southern section of Onshore Export Cable Corridor and Onshore Substation)



Legend:

- Onshore Development Area
- Statutory Main River
- Ordinary Watercourse
- Areas Benefiting from Flood Defences
- Flood Zone 2
- Flood Zone 3

Note: All areas not shown as being located in either Flood Zone 2 or 3 are classified as Flood Zone 1 (when considering fluvial and tidal flood risk)

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title: Watercourses and Environment Agency Flood Zones (Southern Section of Onshore Export Cable Corridor and Onshore Substation)

Figure: 1.4 Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0704

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Figure 1.5 Location of Environment Agency Defences

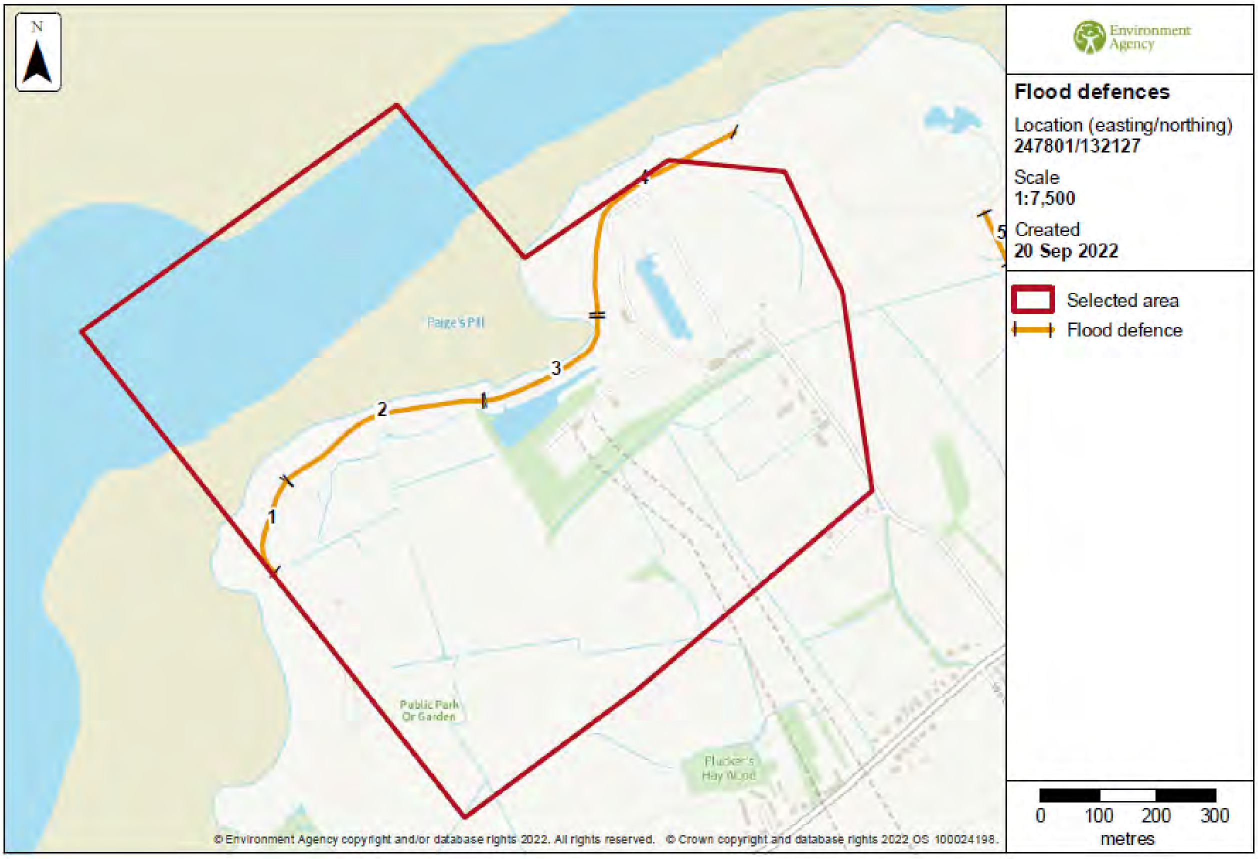


Table 1.5 Details of Flood Defences to the south of the Taw Estuary

Label	Asset ID	Asset Type	Current condition	Effective Crest Level (mAOD)
1	56301	Embankment	Fair	6.76
2	6384	Embankment	Poor	6.31
3	170473	Embankment	Fair	6.15
4	170366	Embankment	Fair	6.19
5	56302	Embankment	Fair	6.12

189. It is also noted that as part of the works being undertaken for the adjacent Yelland Quay development, located to the north east of the Onshore Project, a new tidal defence is being constructed to provide protection to both the development and the land surrounding it.

190. For the west facing shoreline i.e. the element of the Yelland Quay development closest to the Onshore Project it is understood that the defence crest level will be set at 8.60mAOD. For the north and east facing shorelines it is understood that the defence crest level will be set at 8.00mAOD.

191. From a review of the defences in the local area, it appears that the Environment Agency defence embankment #3 (i.e. crest level at 6.15mAOD) and defence embankment #4 (i.e. crest level at 6.19mAOD) provide protection to the Onshore Export Cable Corridor and Onshore Substation. These are also the lowest crest levels along this section of the coastal / tidal frontage compared with other existing or proposed defences.

192. Whilst defence embankment #5 is marginally lower, this is in isolation and separate from the main coastal / tidal frontage and therefore of less relevance to this assessment.

1.6.3 Flooding from Rivers and the Sea

193. Based on the information provided by the Environment Agency in the Product 4 and 5 data packages, it has been confirmed that the principal source of flood risk in this location is tidal / coastal flood risk from the Taw Estuary.

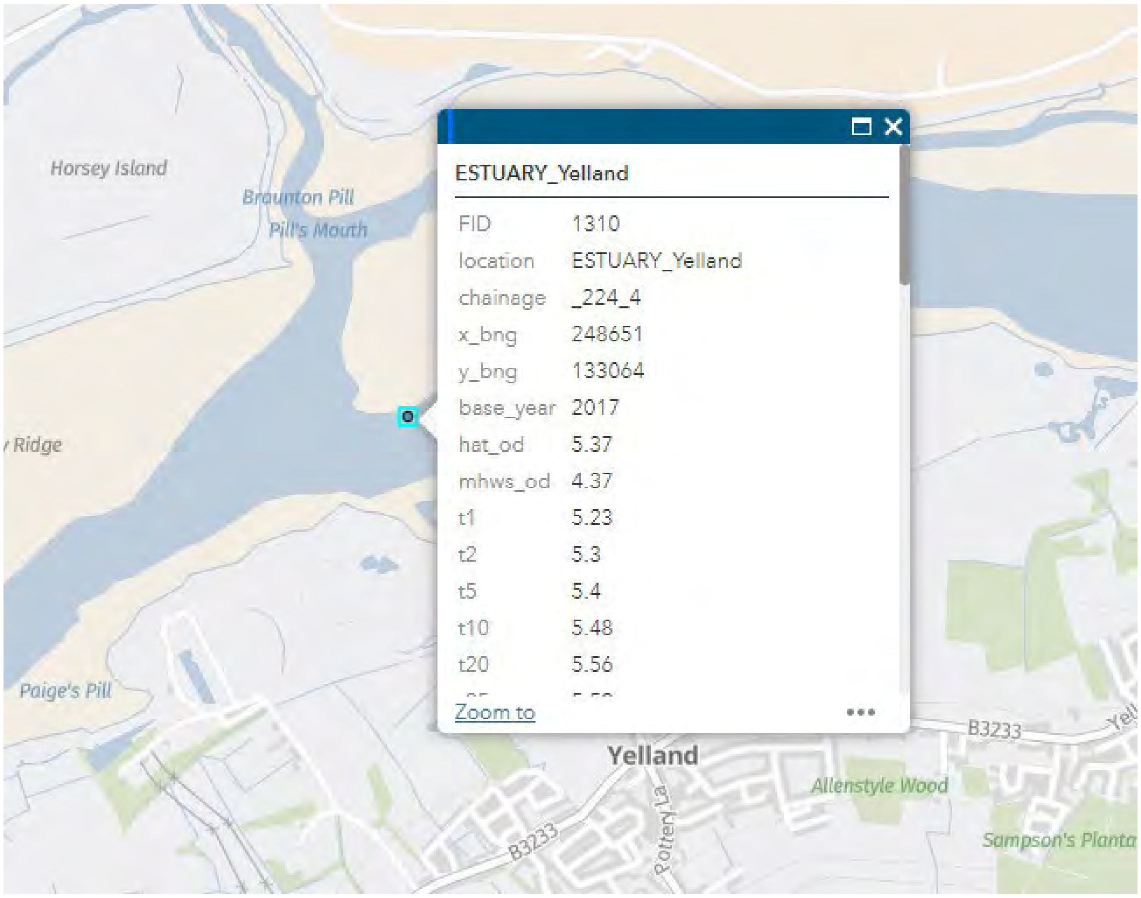
194. On this basis, it is also necessary to understand the indicative Standard of Protection (SoP) the existing defences offer the Onshore Export Cable Corridor and Onshore Substation.

195. From a review of the locations of the defences identified in the preceding section, it appears that defence embankment #3 (i.e. crest level at 6.15mAOD) and defence embankment #4 (i.e. crest level at 6.19mAOD) provide protection to the Onshore Export Cable Corridor and Onshore Substation. These are also the lowest crest levels along this section of the coastal / tidal frontage.

196. As noted above, both the Onshore Export Cable Corridor and Onshore Substation are located in Flood Zone 3. It is therefore key to understand whether this is Flood Zone 3a or Flood Zone 3b. This is determined by reviewing the existing defences and the SoP that they provide.

197. Information has been taken from the Environment Agency Coastal Flood Boundary dataset which was updated in 2018. For the Onshore Export Cable Corridor and Onshore Substation, the Estuary node point 1310 is considered to be the most representative, as can be seen in **Figure 1.6**.

Figure 1.6 Environment Agency Estuary Node Point 1310 from the Coastal Flood Boundary Dataset



198. A review of the Baseline tidal data is summarised as follows:

- Tidal data baseline year 2017 hat_od = 5.37mAOD
- Tidal data baseline year 2017 mhws_od = 4.37mAOD.

199. Where

- HAT: Highest Astronomical Tide Level
- MHWS: Mean High Water Spring Tide Level.

200. In addition, a review of the Extreme Water Levels, for the base year 2017, at this location have been summarised as follows:

- 1 in 1 year (100% AP) = 5.23mAOD
- 1 in 2 year (50% AP) = 5.3mAOD
- 1 in 5 year (20% AP) = 5.4mAOD
- 1 in 10 year (10% AP) = 5.48mAOD
- 1 in 20 year (5% AP) = 5.56mAOD

- 1 in 25 year (4% AP) = 5.59mAOD
- 1 in 50 year (2% AP) = 5.67mAOD
- 1 in 200 year (0.5%) = 5.82mAOD
- 1 in 1,000 year (0.1% AP) = 6.2mAOD.

201. On this basis, it can be seen that this indicates the existing defences provide protection up to the 1 in 200 year (0.5% AP) event in the baseline 2017 scenario. However, they are likely to be overtopped in the 1 in 1,000 year (0.1% AP) event.

202. The 2017 baseline sea levels require update to bring them in line with the present day 2023 baseline. Each of the baseline 2017 values have been uplifted based on the Environment Agency Sea Level Rise Allowances (taken from the Environment Agency guidance on flood risk assessments: climate change allowances).

203. The Upper End baseline values for 2023 have been derived, based on 7mm per year (over 6 years). This comprises a cumulative increase in 42mm (0.042m) for the Upper End allowance, resulting in 2023 Baseline Extreme water Levels as follows:

- 1 in 1 year (100% AP) = 5.27mAOD
- 1 in 2 year (50% AP) = 5.34mAOD
- 1 in 5 year (20% AP) = 5.44mAOD
- 1 in 10 year (10% AP) = 5.52mAOD
- 1 in 20 year (5% AP) = 5.60mAOD
- 1 in 25 year (4% AP) = 5.63mAOD
- 1 in 50 year (2% AP) = 5.71mAOD
- 1 in 200 year (0.5%) = 5.86mAOD
- 1 in 1,000 year (0.1% AP) = 6.24mAOD.

204. On this basis, it is concluded that the existing defences provide protection against Still Water Levels up to the 1 in 200 year (0.5% AP) event in the baseline 2023 scenario. However, they are likely to be overtopped in the present day (2023) 1 in 1,000 year (0.1% AP) event.

205. On this basis, it is concluded that the Onshore Export Cable Corridor and Onshore Substation are located in Flood Zone 3a rather than the Functional Floodplain (Flood Zone 3b). However, it is also noted that the Product 4 dataset has been generated from strategic scale flood models (JFLOW) and is not intended for use at individual property scale.

206. Following discussion with the Environment Agency it has been confirmed that there is some uncertainty surrounding the condition and SoP provided by the existing

defences, should there be a significant tidal event allowing for wave action along the Taw Estuary.

207. The Environment Agency has also advised that updated tidal / wave modelling along the Taw Estuary is currently underway. It is recommended that this is incorporated into the detailed design, specifically for the Onshore Substation post planning consent, once it is available and that this will also inform the development of the mitigation measures outlined later within this FRA.

1.6.4 Flooding from Surface Water

208. A review of the Environment Agency surface water flood mapping for the Onshore Export Cable Corridor and Onshore Substation indicates there are areas of varying low to high risk of surface water flooding throughout the Onshore Development Area. These are associated with topographical low points close to the tidal frontage, and land drains crossing the rural land to the rear of the tidal frontage as well as around the Onshore Substation, as shown on **Figure 1.7**.

209. The areas of increased flood risk on the Environment Agency surface water mapping have been identified from national scale modelling and do not appear to coincide with any existing property or infrastructure receptors within the Onshore Development Area.

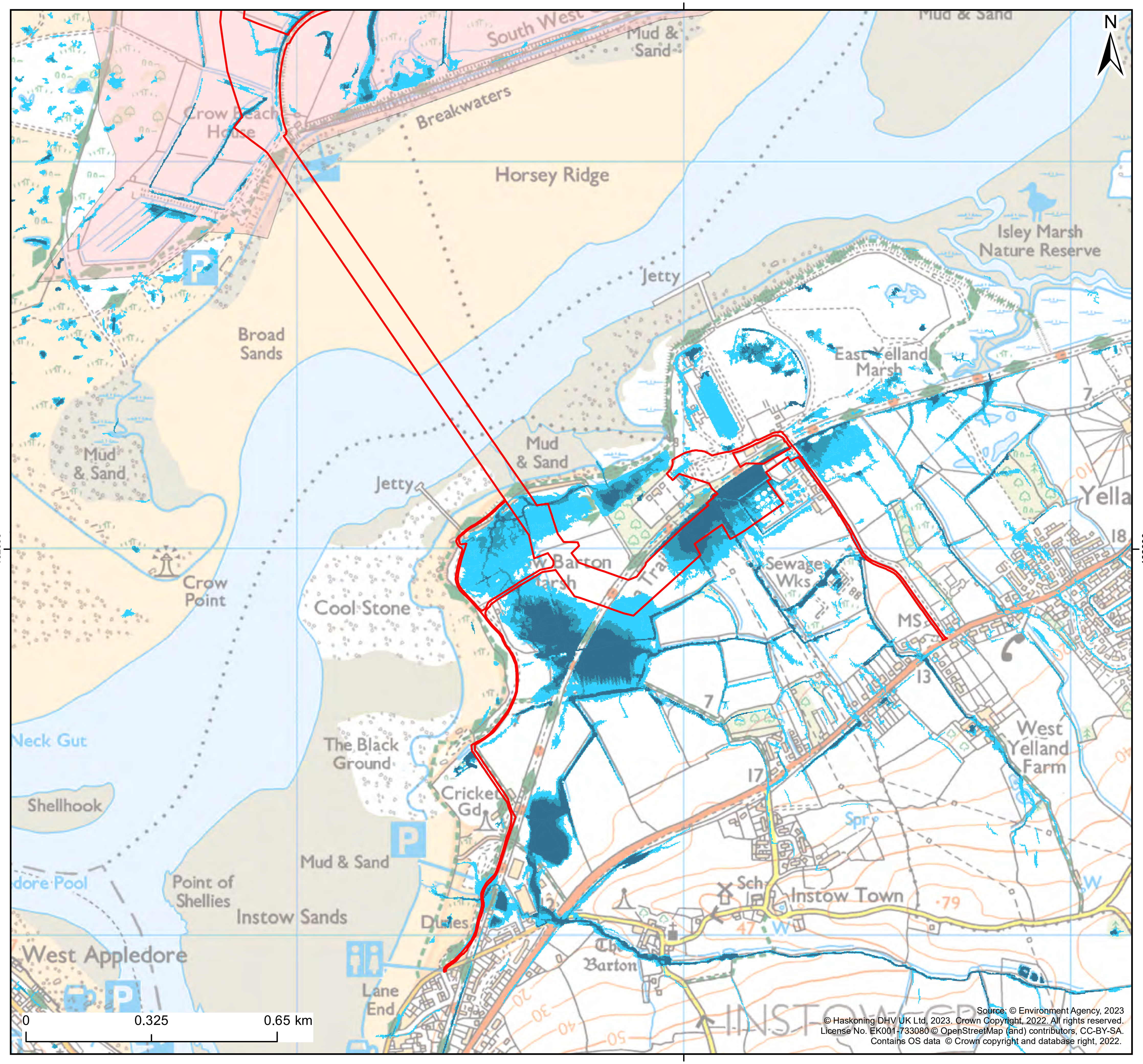
210. It is noted that the Onshore Export Cable Corridor will only be at risk of surface water flooding during the construction phase of the Onshore Project.

211. Any surface water flood risk to the Onshore Export Cable Corridor will be temporary in nature and removed once construction is complete as all Onshore Infrastructure associated with the Onshore Export Cables will be located below ground.

212. Given there is a risk of flooding from surface water at the location of the Onshore Substation, this will be considered as part of the development of the outline drainage design within the Outline Drainage Strategy (**Appendix 5.C**) which will be submitted as part of the planning application.

213. In addition, as noted in **Section 1.2.5**, there is an area to the south of the Onshore Substation, around Yelland and along the B3233, that is located within the Fremington Yelland CDA. However, this does not interact with either the Onshore Substation or the Onshore Export Cable Corridor.

Figure 1.7 Environment Agency Surface Water Flood Risk (Southern section of Onshore Export Cable Corridor and Onshore Substation)



Legend:

- Onshore Development Area
- Braunton Marsh IDB
- High Risk - In any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - In any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low Risk - In any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

Client:	Project:
Offshore Wind Ltd.	White Cross Offshore Windfarm

Title:

Environment Agency Surface Water Flood Risk (Southern Section of Onshore Export Cable)

Figure: 1.7 Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0705

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	02/08/2023	MCP	HW	A3	1:10,000

Co-ordinate system: British National Grid

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214. The Onshore Project overlaps a small area of the Fremington Yelland CDA at the point where the existing access road, which will be used to gain access into the Onshore Substation, connects with the B3233. However, as part of the Onshore Project no works are proposed to the existing access road, as it is already adequate for the proposed access into the Onshore Substation.

215. A review of the North Devon District Council planning validation checklist has been undertaken with specific reference to the guidance on the requirements related to the need for a Critical Drainage Area Surface Water Management Report. It is noted that the criteria for the above document indicates that:

- When is this required?
- all development within a Critical Drainage Area (CDA) that will result in an increase or change to how surface water is dealt with on the site.

216. The access road had been included within the red line boundary to facilitate access along the existing track to the Onshore Substation. However, as noted above no works are proposed to the access road as part of the Onshore Project.

217. Therefore, it is concluded that there will be no increase or change in how surface water is dealt with in this location and on this basis there is no requirement for the production of a Critical Drainage Area Surface Water Management Report.

1.6.5 Flooding from Groundwater

218. Groundwater flooding occurs when water levels below the surface of the ground rise above or break through the ground surface and either pool in one locality and or flow overland. Low-lying areas underlain by unconfined aquifers are most susceptible to this source of flooding, in particular following heavy rainfall events.

219. The North Devon and Torridge District Council Level 1 SFRA indicates that some groundwater flooding occurs in the Yeo Vale / Portmarsh Field areas of Barnstaple - these are the only known locations in the North Devon and Torridge areas subject to groundwater flooding.

220. A review of the Environment Agency's Areas Susceptible to Groundwater Flooding (AStGWF) maps, contained within the Devon County PFRA has been undertaken. This is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It should be noted that it does not show the likelihood of groundwater flooding occurring.

221. Given the relatively coarse nature of this mapping it indicates that flooding from groundwater along this section of the Onshore Export Cable Corridor and the Onshore Substation are either located in 1km square grids where greater than 75% of the area is classified as being at risk of groundwater emergence or within 1km square grids where between 50% to 75% of the area is classified as being at risk of groundwater emergence.

222. As the construction works require earthworks in order to place the Onshore Export Cables, it is important to note that groundwater may be present below sections of the Onshore Export Cable Corridor and could be encountered during the below-ground engineering works.

223. As such it can be assumed that the risk of flooding to the Onshore Export Cable Corridor from groundwater is likely to be high especially during the winter months. This should be taken into consideration in the mitigation measures to be implemented during construction to ensure there is no detrimental impact either to or from the Onshore Project on groundwater levels within the area.

1.6.6 Flooding from Sewers

224. The Onshore Export Cable Corridor is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within the proximity of this location. In addition, the Onshore Substation is located in a relatively rural location with limited adjacent development.

225. As such, the risk of flooding from sewers is considered to be **Low** for this section of the Onshore Export Cable Corridor and the Onshore Substation.

1.6.7 Flooding from Reservoirs

226. Reservoirs with an impounded volume greater than 25,000 cubic metres (m^3) are governed by the Reservoirs Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low.

227. Recent changes to legislation under the Flood and Water Management Act 2010 require the Environment Agency to designate the risk of flooding from these reservoirs. Flooding from reservoirs is defined based on the implications of a large uncontrolled release of water from registered reservoirs i.e. greater than 25,000m^3.

228. The Environment Agency Flood Risk from Reservoirs map shows that this section of the Onshore Export Cable Corridor and Onshore Substation are not located within

an area at risk of flooding from reservoir sources under any situation. Therefore, there is no risk of flooding from this source.

1.6.8 Flooding from Canals and other Artificial Sources

229. This section of the Onshore Export Cable Corridor and Onshore Substation are not located near to any canals.

230. Furthermore, there are no other Artificial Sources in proximity to either this section of the Onshore Export Cable Corridor and Onshore Substation.

231. As such, there is no flood risk from these sources to these elements of the Onshore Development Area.

1.6.9 Summary of Flooding

232. Overall, this section of the Onshore Export Cable Corridor and the Onshore Substation is not at risk from fluvial sources, sewers, canals or other artificial sources.

233. However, there is a risk of flooding from tidal, groundwater and surface water associated with Ordinary Watercourses.

1.7 Consideration of the Sequential Test and Exception Test

234. As noted in **Section 1.2.1**, NPPF requires the application of the Sequential Test and, where necessary, the Exception Test. Guidance on the application of the Sequential Test is provided in the PPG for Flood Risk and Coastal Change, published on 25th August 2022, which provides criteria in relation to the appropriate allocation of development types and flood risk. It is important to note that the elements of the Onshore Project comprising subterranean development (i.e. located wholly below ground) will only be at potential risk of flooding during the construction phase.

235. As stated in Paragraph 23 of the PPG:

"The aim of the sequential approach is to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding. Avoiding flood risk through the sequential test is the most effective way of addressing flood risk because it places the least reliance on measures like flood defences, flood warnings and property level resilience features."

236. The aim of the Sequential Test is to ensure that a sequential risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites:

- Within medium risk areas
- Then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas.

237. As noted in Paragraph 31 of the PPG:

"The Exception Test is not a tool to justify development in flood risk areas when the Sequential Test has already shown that there are reasonably available, lower risk sites, appropriate for the proposed development. It would only be appropriate to move onto the Exception Test in these cases where, accounting for wider sustainable development objectives, application of relevant local and national policies would provide a clear reason for refusing development in any alternative locations identified."

238. The Exception Test should only be applied if the Sequential Test has shown that there are no reasonably available, lower-risk sites, suitable for the proposed development, to which the development could be steered.

239. The need for the Exception Test depends on the potential vulnerability of the development proposed, based on the Flood Risk Vulnerability Classification, and the Flood Zone within which it would be located, as summarised in Table 2 of the PPG for Flood Risk and Coastal Change.

240. NPPF provides guidance on the criteria required to pass the Exception Test, where it is necessary to demonstrate that:

- Development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk
- The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

241. Furthermore, NPPF clarifies that both elements of the Exception Test should be satisfied for development to be allocated or permitted in situations where suitable sites at lower risk of flooding are not available following application of the Sequential Test.

242. As noted above, the NPPF and supporting PPG provides guidance on suitable development types within each Flood Zone, as identified in Table 2, which has been considered for the Onshore Project and reproduced as **Table 1.6**.

Table 1.6 Flood Risk Vulnerability and Flood Zone 'Incompatibility' Table

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
2	Appropriate	Exception Test required	Appropriate	Appropriate	Appropriate
3a	Exception Test required †	Not Appropriate	Exception Test required	Appropriate	Appropriate
3b (Functional Floodplain	Exception Test required *	Not Appropriate	Not Appropriate	Not Appropriate	Appropriate

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood

** In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:*

- remain operational and safe for users in times of flood;

- result in no net loss of floodplain storage;

- not impede water flows and not increase flood risk elsewhere

243. In terms of the Onshore Project, and based on the guidance in both NPPF and the supporting PPG, the Onshore Project is classed as '**Essential Infrastructure**' which is defined as:

- Essential transport infrastructure (including mass evacuation routes), which has to cross the area at risk
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood
- Wind turbines
- Solar farms.

244. Development classed as '**Essential Infrastructure**' is considered acceptable in Flood Zones 1 and 2, whilst development located within Flood Zone 3 is required to pass the Exception Test.

245. The Landfall and northern part of the Onshore Export Cable Corridor are to be located in Flood Zone 1. However, sections of the Onshore Export Cable Corridor and the Onshore Substation are located in Flood Zone 3a.

246. Due to the large-scale nature of the works, it is acknowledged that there are locations where infrastructure is required to pass through or be located in Flood Zone 3. This relates to the Onshore Export Cable Corridor to the north and south of the Taw Estuary and the Onshore Substation.

247. Most of the area behind the tidal frontage, to the south of the Taw Estuary, is shown by the Environment Agency Flood Map for Planning, to benefit from the presence of flood defences.

248. However, parts of the Onshore Export Cable Corridor and the Onshore Substation are elements of the Onshore Project which need to be subject to the consideration of the Exception Test.

249. As noted previously, subterranean development will only be at potential risk of flooding during the construction phase. Once operational, the flood risk to the Onshore Export Cable Corridor will have been removed as the transition joint bays and cables will be wholly located underground. These will be sealed using a watertight manhole cover and therefore there will be no interaction with above ground flood risk. The only visible above ground structures will be the link boxes which, as previously noted, will be constructed using a protective concrete chamber.

250. It is proposed that the Landfall will be constructed through either open-trenching, a trenchless technique or a combination of the two, with the preference being for the use of trenchless techniques. Should the open-trenching technique be adopted then timescales for construction will be relatively short. Once operational, regardless of the construction approach selected, the Landfall will be wholly located below ground. As such, during construction and once operational, it is concluded that there will be limited interaction with the above ground flood risk.

251. The location of the Onshore Substation is such that it will be located in Flood Zone 3a both during construction and once operational. However, it cannot be located elsewhere due to the proximity of the Onshore Project to other environmental receptors, the need to be close to the National Grid connection point (i.e. the

existing Yelland Substation) and limited locations in the area that are not also located in Flood Zone 3a.

252. Taking into account the two parts of the Exception Test, it is concluded that the first part comprising the provision of wider sustainability benefits to the community has been passed on the basis that the Onshore Project is providing energy certainty utilising a sustainable source of energy at a national scale.

253. With regard to the second part of the Exception Test, it is necessary to consider the Onshore Project in the context of its relatively large scale and linear nature.

254. It should also be noted that the only element of the Onshore Project that would be located above ground, once operational, is the Onshore Substation which is situated within Flood Zone 3. However, it benefits from the presence of flood defences, according to the Environment Agency Product 4 and 5 data packages.

255. In addition, the majority of the Onshore Export Cable Corridor is not located within an area considered to be at risk of surface water flooding.

256. Those elements that are likely to pass through areas at increased risk of flooding, i.e. Flood Zone 3 or high surface water flood risk, comprise the subterranean development which, following construction, will not be vulnerable to flood risk during its operational lifetime and will not increase flood risk elsewhere.

257. For the subterranean development, only during the construction phase is there the potential for a temporary increase in flood risk. This flood risk will be minimised through the use of appropriate management measures, which are set out within the **Appendix 5.B: Outline Construction Environmental Management Plan** (OCEMP). This will then be further refined within the subsequent CEMP during detailed design.

258. With regard to the Onshore Substation, whilst there are areas at increased surface water risk, the location / layout of the onshore substation has not yet been defined as part of the Onshore Project.

259. Flood risk concerns will be considered through further assessment and following further investigations, studies and consultation which will inform the detailed design. If areas at increased risk of surface water flooding and Flood Zone 3 cannot be avoided, it is concluded that mitigation measures can be incorporated such that there is no risk, either to or from the Onshore Project.

260. On this basis, it is considered that both elements of the Exception Test can be addressed through the detailed design process.

261. Those elements of the Onshore Project that require the application of the Exception Test have demonstrated that the Onshore Project provides wider sustainability benefits to the community associated with the provision of renewable energy, and that it can be designed such that it would be safe for its lifetime without increasing flood risk elsewhere.

1.8 Climate Change

262. In the future, the risk of flooding from all potential sources of flood risk is predicted to worsen as a result of the projected changes in regional and local weather systems associated with global climate change.

263. In the UK, predicted changes in the future climate and weather patterns are overseen by the UK Meteorological Office. In 2018, the UK Met Office published an update to the UK Climate Projections 2009 study (UKCP09) called the UK Climate Projections 2018 (UKCP18). UKCP18 supersedes the previous UKCP09 and is the latest and most up to date information at the time of writing this report.

264. Given the nature of the various elements of the Onshore Project and the sources of flooding identified in this FRA, there are two main aspects of climate change that are likely to affect the Onshore Project, comprising:

- Sea level rise and tidal flooding
- Peak Rainfall intensity.

1.8.1 Sea Level Rise Allowances

265. Extreme sea levels include the effects of storm surge and astronomical tides but do not specifically account for any localised increase in sea level that may be induced by onshore wave action, orientation, or topography.

266. The Environment Agency Sea Level Rise Allowances (taken from the Environment Agency guidance on flood risk assessments: climate change allowances) have been considered and it is noted that the Coastal Flood Boundary (CFB) dataset includes an allowance for storm surge.

267. Impacts due to wave action are not include in the CFB dataset and would need to be considered in addition to extreme sea level risk where waves produce flood or erosion risk.

268. The Onshore Project is not classed as a Nationally Significant Infrastructure Project (NSIP) and as such the guidance on climate change for NSIPs is not applicable to the Onshore Project.

269. In addition, the guidance notes that:

"*For flood risk assessments and strategic flood risk assessments, assess both the higher central and upper end allowances*."

270. The Environment Agency guidance on flood risk assessments: climate change allowances notes that the South West region sea level rise allowances applicable to the proposed Onshore Substation, as summarised in **Table 1.7**.

Table 1.7 Sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline)

Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	Cumulative rise 2000 to 2125 (m)
Higher Central	5.8 (203)	8.8 (264)	11.7 (351)	1.21
Upper End	7 (245)	11.4 (342)	16 (480)	1.62

* *The total sea level rise for each epoch is in brackets (taken from Table 1 of the Environment Agency guidance on flood risk assessments: climate change allowances)*

271. A review of the Extreme Sea Levels has been undertaken, based on the assumption that the Onshore Project has a development lifetime of 50 years i.e. up to 2075.

272. In addition, a more conservative scenario assuming a 100 year development lifetime has also been considered for the Onshore Project. This is based on guidance related to development lifetime and uncertainties with regard to future Decommissioning Plans.

273. Following consultation with the Environment Agency, during the ETG meeting on 6th June 2023, it was confirmed that when considering climate change allowances for the Onshore Project, and specifically the Onshore Substation, the Upper End allowance should be considered, as this comprises a more conservative approach.

274. On this basis the sea level allowance for each epoch, utilising the Upper End scenario, have been derived as follows:

- 50 year lifetime i.e. up to 2075

2023 – 2035 = 12 years * 7mm per year = 84mm

2036 – 2065 = 342mm

2066 – 2075 = 9 years * 16mm = 144mm

Total = 570mm (0.57m)

- 100 year lifetime i.e. up to 2125

2023 – 2035 = 12 years * 7mm per year = 84mm

2036 – 2065 = 342mm

2066 – 2095 = 480mm

2096 – 2125 = 552mm

Total = 1,458mm (1.458m)

275. Based on the above calculations, the following future Extreme Water Levels have been identified for the Onshore Substation, for 2075 (i.e. 50 years development lifetime) and 2125 (i.e. 100 years development lifetime), as summarised in **Table 1.8**.

276. Given, the nature of the Onshore Project, the proposed timescales associated with its operation and the relevant legal agreements, it is considered that a 50 year timeframe is an appropriate assumption with regards to the development lifetime. As such, the 2075 scenario has been considered with regards to future flood resilience. The mitigation measures included within the design of the Onshore Substation to address this risk are set out in **Section 1.10**.

Table 1.8 Summary of 2075 and 2125 Extreme Water Levels (rounded to 2dp)

Event	2023 Baseline (Upper End) (mAOD)	2075 (Upper End) (mAOD)	2125 (Upper End) (mAOD)
1 in 200 year (0.5% AP)	5.86	6.43	7.32
1 in 1,000 year (0.1% AP)	6.24	6.81	7.70

277. As indicated above, to ensure a conservative approach the Baseline Extreme Water Levels calculated using the Upper End allowance has also been used as the starting point.

1.8.2 Peak Rainfall Intensity Allowances

278. When considering surface water flood risk, the Environment Agency has issued climate change allowance guidance, specifically with regard to the application of peak rainfall allowances (Environment Agency, 2022).

279. The surface water climate change allowances are determined by the predicted increase in peak rainfall intensity. These are determined by regional variations, based on management catchments, which are sub-catchments of river basin districts. The Onshore Project is located entirely within the North Devon Management Catchment and therefore the allowances for this Management Catchment have been considered further within this FRA.

280. The Environment Agency guidance setting out the appropriate climate change allowances to be adopted for different development lifetimes (Environment Agency, 2022) is summarised below:

- Development with a lifetime beyond 2100:
  - This includes development proposed in applications or local plan allocation
  - For FRAs and SFRAs assess the upper end allowances. You must do this for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125)
  - Design your development so that for the upper end allowance in the 1% annual exceedance probability event
  - There is no increase in flood risk elsewhere your development will be safe from surface water flooding.
- Development with a lifetime of between 2061 and 2100:
  - For development with a lifetime between 2061 and 2100 take the same approach (as for a development with a lifetime beyond 2100) but use the central allowance for the 2070s epoch (2061 to 2125).

281. As noted above, the Onshore Substation is situated in the North Devon Management Catchment and **Table 1.9** provides a summary of the appropriate allowance relevant to this Management Catchment.

Table 1.9 Peak Rainfall Intensity Allowance for North Devon Management Catchment

	Central 1 in 30 year (3.3% AP)	Upper End 1 in 30 year (3.3% AP)	Central 1 in 100 year (1% AP)	Upper End 1 in 100 year (1% AP)
2050s	20%	35%	25%	45%
2070s	30%	45%	30%	50%

282. On the basis of the above guidance, assuming 50 years of operation, with commencement of operation in 2025 at the earliest the required allowance is an increase of 30% for the 1 in 100 (1%) year event applying the central allowance. In addition, sensitivity testing should be undertaken for the 1 in 100 year plus 50% allowance for climate change.

283. The outline drainage design, including the incorporation of an allowance for climate change, is set out within the within the Outline Drainage Strategy (**Appendix 5.C**), which will be submitted as part of the planning application.

1.9 Surface Water Drainage

1.9.1 Onshore Infrastructure Pre-Construction Work

284. Prior to commencement of the construction works, detailed drainage surveys will be undertaken to support the development of the detailed drainage design for all elements of the Onshore Infrastructure.

285. The drainage infrastructure will be developed and agreed with the appropriate regulators, where relevant, and implemented to minimise water within the working areas, ensure the ongoing drainage function of surrounding land, especially within the Braunton Marsh IDB, and that there is no increase in surface water flood risk.

286. In addition, a specialised drainage contractor will undertake surveys, locate drains, and create drawings pre- and post-construction, to ensure appropriate reinstatement. Construction drainage will include provisions to minimise flood risk within the working area and ensure ongoing drainage of surrounding land.

287. The above measures are set out within the OCEMP (**Appendix 5.B**) and will be further refined within the subsequent CEMP during detailed design.

1.9.2 Landfall Location and Onshore Export Cable Corridor Surface Water Drainage

288. The Landfall and Onshore Export Cable Corridor will only be at risk of surface water flooding during the construction phase. However, during the construction phase and once operational, there is a risk that drainage ditches and surface water flow routes could be adversely affected should the works not be appropriately managed, and the ground reinstatement not carefully managed.

289. During construction, at the Landfall and along the Onshore Export Cable Corridor the Onshore Project would use trenchless crossing techniques at key watercourse crossing locations, including all Main Rivers, to avoid direct interaction with these

watercourses. In these locations the use of trenchless techniques will be confirmed and agreed with the regulators to confirm there will be no impact on flood risk as all proposed elements will be located below ground.

290. It is, however, likely that trenched crossings may also need to be carried out on Ordinary Watercourses crossed by the Onshore Export Cable Corridor. This method has the potential to directly alter the hydrology of the watercourses. Trenched crossings involve installing temporary dams (composed of 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.

291. There is the potential for the installation techniques to affect the bed and banks of the watercourse, which could result in an impact on flows along the watercourse and indirectly a change in flood risk, which will need to be managed during construction.

292. At these locations, a site-specific investigation will be carried out at detailed design stage to identify the local ground and groundwater conditions, enable a site-specific risk assessment to be undertaken and to understand the potential impact of any works on flows along the watercourse and flood risk in the local area.

293. It may be necessary to install additional field drainage parallel to the haul road along the Onshore Export Cable Corridor to ensure the existing drainage characteristics of the land are maintained and there is no increase in flood risk to on- and off-site receptors during and after construction. All temporary drainage would pass through a silt interceptor before being discharged into surrounding drainage.

294. The detailed methodology to be used for any temporary construction at crossing points over existing ditches and watercourses shall be agreed with the Environment Agency, Braunton Marsh IDB and LLFA, as appropriate. In addition, the Applicant will develop the construction drainage in consultation with landowners and other statutory stakeholders. This is set out within the OCEMP (**Appendix 5.B**) and will be further refined within the subsequent CEMP during detailed design.

1.9.3 Onshore Export Cable Corridor Post-Construction

295. Following construction of the Landfall and Onshore Export Cable Corridor there will be no permanent above ground elements. Furthermore, all temporary construction compounds and temporary access tracks will be fully reinstated and would have no operational use.

296. Existing land drains along the Onshore Export Cable Corridor will be reinstated with at least the same capacity as the pre-construction channel to prevent any potential impacts on flood risk, this will be based on the information obtained during the pre-construction survey.

297. The backfilling of material, within both construction drainage channels and along the Onshore Export Cable Corridor itself, will prevent a conduit from forming and ensure there are no changes to the local flow rates due to permeability changes.

1.9.4 Onshore Substation Surface Water Drainage

298. The discharge of surface water from the Onshore Substation has been considered within the context of the surface water flood risk and the need to ensure that any drainage solutions do not result in an increase in flood risk either to or from the onshore substation. This has been considered within the **Outline Drainage Strategy** (**Appendix 5.C**).

299. Surface water drainage requirements will be designed to meet the requirements of the NPPF, NPS EN-1 and the CIRIA SuDS Manual C753 (CIRIA, 2015), with runoff limited where feasible and in accordance with best practice.

300. It will also be developed in accordance with the guidance set out Devon County Council, in their role as the LLFA, within the document entitled Sustainable Drainage System – Guidance for Devon (Devon County Council, 2020). Furthermore, the outline drainage design will be discussed with Devon County Council prior to commencement of the detailed design.

301. The operational drainage at the Onshore Substation will consider the likely maintenance requirements of new and existing infrastructure. It is important that maintenance is also considered in the design of the drainage system to account for the requirements of undertaking maintenance work such as ease of access for personnel, vehicles or machinery.

302. A management and maintenance plan of any proposed surface water drainage infrastructure will also be agreed with relevant stakeholders then adopted for the lifetime of the development.

1.9.5 Temporary Construction Compounds Surface Water Drainage

303. The implementation of temporary construction compounds, along the Onshore Export Cable Corridor, may increase surface water run off temporarily due to an increase in impermeable area during the construction phase.

304. However, this will be managed through the implementation of trenches to collect rainfall and enable either infiltration to occur or discharge to a nearby ditch or watercourse via a silt trap. The collection and discharge of the water can be dictated by the topography of the land to allow for the surface runoff to flow into trenches to be implemented during the construction of the Onshore Export Cables.

305. The temporary construction compounds will only be at risk of surface water flooding during construction as, following completion, the compounds and any associated temporary access tracks will be fully reinstated and would have no operational use.

1.10 Flood Risk Mitigation Measures

306. Residual risk is the risk that remains after flood management or embedded mitigation measures have been implemented.

307. This FRA has considered the residual flood risk to and from the Onshore Project and whether there is a requirement for further mitigation measures to manage the residual flood risk.

1.10.1 Onshore Export Cable Corridor Design Mitigation

308. At the Landfall, where the works have the potential to affect the tidal / coastal flood risk, it is proposed to carry out the Landfall works using trenchless techniques.

309. All Main Rivers will be crossed using trenchless techniques, which is embedded in the scheme design, to avoid direct interaction with these watercourses. The cable entry and exit pits will be at least 9m from the banks of the watercourse and a maximum depth of 20m below the channel bed. Although ground disturbance will occur at entry and exit points, there will be no direct impact on the watercourses themselves.

310. It is, however, likely that trenched crossings will be carried out on some Ordinary Watercourses crossed by the Onshore Export Cable Corridor.

311. At these locations, a site-specific investigation will be carried out at detailed design stage, to identify the local ground and groundwater conditions, enable a site-specific risk assessment to be undertaken and to understand the potential impact of any works on flows along the watercourse and flood risk in the local area.

312. Prior to construction, surface water drainage would be installed along the edge of the working width to intercept surface water. The drainage would minimise the water within the trench(es) and ensure that the construction works do not increase the risk of flooding to the surrounding land.

313. During construction, the haul road will be bound by parallel drainage channels (one on each side) to intercept drainage within the working width. Depending upon the precise location, water from the channels will be infiltrated or discharged into the local drainage network via temporary interceptor drains and / or silt traps.

314. Following construction of the Landfall and Onshore Export Cables there will be no permanent above ground elements, except for the proposed link boxes which will, where possible, be located adjacent to field boundaries and in accessible locations. Additionally, it is proposed that drainage will be reinstated to match the existing baseline conditions. As such there would be no impact on surface water drainage. Furthermore, all temporary construction compounds and temporary access tracks will be fully reinstated and would have no operational use.

1.10.2 Onshore Substation Design Mitigation

315. As noted in the preceding sections of this FRA, there is a risk of tidal flooding to the Onshore Substation throughout the lifetime of the development.

316. Adopting a 50 year development lifetime, as noted in **Section 1.8.1**, tidal Still Water Levels, assuming the Upper End climate change allowance are likely to be 6.43mAOD during the 1 in 200 year (0.5% AP) event.

317. When setting Finished Floor Levels (FFLs) for the Onshore Substation, the requirements provided in the Environment Agency's guidance on preparing a flood risk assessment: standing advice[1], which was last updated on 8th February 2022, has been considered.

318. As noted in **Figure 1.8** the FFL for the Onshore Substation should be set at a minimum level of 300mm above the water level for the 1 in 200 year (0.5% AP) event. It is assumed that the Onshore Project would have a development lifetime of approximately 50 years and therefore the assessment has been undertaken up to 2075.

319. On this basis utilising the Upper End allowance for the Onshore Substation, in 2075, the FFL would need to be set 300mm above the 6.43mAOD Still Water Level. This would result in a FFL of 6.73mAOD.

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[1] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#standing-advice-for-vulnerable-developments

320. Based on existing ground levels within the area around the Onshore Substation of between 5.0mAOD – 5.4mAOD, this may be approximately 1.33m to 1.73m above the existing ground levels in these locations.

Figure 1.8 Environment Agency Standing Advice for Vulnerable Developments

Standing advice for vulnerable developments

For all relevant vulnerable developments, you should follow the advice for:

- floor levels
- extra flood resistance and resilience measures
- access and escape
- surface water management

Floor levels

You need to provide the:

- average ground level of your site
- ground level of the access road(s) next to your building
- finished floor level of the lowest room in your building

Finished floor levels should be a minimum of whichever is higher of 300mm above the:

- average ground level of the site
- adjacent road level to the building
- estimated river or sea flood level

You should also use construction materials that have low permeability up to at least the same height as finished floor levels.

Standing advice for vulnerable developments

For all relevant vulnerable developments, you should follow the advice for:

- floor levels
- extra flood resistance and resilience measures
- access and escape
- surface water management

Floor levels

You need to provide the:

- average ground level of your site
- ground level of the access road(s) next to your building
- finished floor level of the lowest room in your building

Finished floor levels should be a minimum of whichever is higher of 300mm above the:

- average ground level of the site
- adjacent road level to the building
- estimated river or sea flood level

You should also use construction materials that have low permeability up to at least the same height as finished floor levels.

321. In addition, consultation with the Environment Agency has indicated there are concerns regarding wave action up the Taw Estuary in the future. Whilst the Onshore Substation is not located immediately to the rear of the coastal frontage and is afforded some protection by the Tarka Trail, the potential risk to the Onshore Substation platform has been considered within this FRA. As such, additional design mitigation has been included for the Onshore Substation platform.

322. On the basis of the above uncertainty, the Environment Agency requested, during the ETG meeting 6th June 2023, that a freeboard of 600mm above the water level for the 1 in 200 year (0.5% AP) event is applied.

323. Given that 300mm freeboard is provided by setting the Onshore Substation platform at 6.73mAOD, it is proposed that the additional 300mm freeboard is provided through the adoption of resilience measures as part of the detailed design for the Onshore Substation. This approach was also discussed with the Environment Agency at the ETG meeting on 6th June 2023.

324. To provide the additional 300mm of flood resilience, the exterior of the Onshore Substation building has been designed using flood resistant materials, to limit flood water ingress into the building and to provide protection to the electrical equipment and infrastructure contained within it.

325. In addition, the Environment Agency noted that updated modelling of the tidal flood risk within the Taw Estuary is underway, with draft results likely to be available in late 2023. It is recommended that, once available, the results of the modelling in this location are assessed to aid in the refinement of the detailed design.

326. Guidance set out in Paragraph 49 of the PPG notes:

"The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal."

327. Given the nature of the flood risk in this location, i.e. not only is it a residual risk should there be a breach in the defences but also a tidal flood risk, it is concluded that there is no requirement for the provision of floodplain storage / compensation as part of the Onshore Project. Flood Warning and Evacuation

328. While construction work is taking place on site, site workers and users will be required to monitor local weather forecasts and ensure there is an evacuation route in place in the event that either tidal or surface water flooding occurs.

329. Where Environment Agency Flood Alerts and Flood Warnings are available for a location. The Principal Contractor will be required to sign up to receive the relevant flood warnings and alerts.

330. A flood warning and evacuation plan is a list of steps to be taken in case of a flood, although it can also include steps such as taking out the relevant insurance or using recommended flood mitigation products.

331. Flood warning and evacuation plans should be produced for the construction phase of the Onshore Export Cable Corridor, specifically related to construction works where personnel or materials may be located, albeit temporarily, within Flood Zones 2 and 3.

332. All personnel should be made aware of any access routes which are located within Flood Zones 2 and 3 and any flood warnings issued for those areas, should result in the relevant access routes being cleared of all project personnel and, where possible, all project plant / materials.

333. A site-specific flood warning and evacuation plan should include practical steps during the construction phase for the Onshore Export Cable Corridor and Onshore Substation. It should be easy to communicate and consider delegated responsibility, or whether personnel are likely to require additional support during a flood event.

334. Additionally, it is anticipated that the Onshore Substation will require a comprehensive flood warning and evacuation plan, once operational, including the following aspects:

- A list of important contacts, including Floodline, utilities companies and insurance providers
- A description or map showing locations of service shut off points
- Basic strategies for protecting property, including moving assets to safety where possible, turning off / isolating services and moving to safety
- Safe access and egress routes.

335. As noted above, the Environment Agency provide a free Flood Alert ("flooding is possible") and Flood Warning ("flooding is expected") service for tidal flooding. It is recommended that the flood warning and evacuation plan considers how receipt of these flood alerts or warnings may affect operations.

336. It should be noted that parts of the Onshore Export Cable Corridor are in rural undeveloped areas that may not be covered by flood warnings. Furthermore, it is important to note that Environment Agency flood alerts and warnings are not issued in response to surface water flooding.

337. As such the flood warning and evacuation plan will include independent checks (i.e. Met Office Weather Warnings) alongside any alerts or warnings issued by the Environment Agency. These checks will also account for risks outside of the flood alerts / flood warnings and will enable contractors and site managers to consider how this information will affect planned works, especially areas in close proximity to key watercourses.

338. During construction, contractors and management should liaise with Devon County Council, as the LLFA, and the Environment Agency so they are aware of any forecast related to heavy rainfall events. The potential for flooding can then be assessed to enable work to stop, especially in areas in close proximity to key watercourses, and the site cleared of all personnel in this instance.

1.10.3 Access and Egress

339. The Onshore Substation is located within Flood Zone 3a, and as such any personnel within these areas would be at high risk of flooding from tidal sources, although it is noted that flood defences provide some protection to the proposed location of the Onshore Substation. There is also a potential risk of surface water flooding around the Onshore Substation.

340. Once constructed, the requirement for operational access to the Onshore Substation will be limited and transient in nature, i.e. there will be no requirement to remain on site overnight and the site can be evacuated, upon receipt of either a Flood Warning or a heavy rainfall warning, prior to flooding occurring. This ensures operators of the site would not be placed at risk during such an event.

341. It is recommended that a flood warning and evacuation plan identified the main egress route form the Onshore Substation. It is understood that this would be via the existing access track in a southerly direction, towards the B3233 West Yelland which is located on higher ground and outside the flood extent.

1.11 Conclusions

342. The Onshore Project has been considered within the context of the guidance set out in the NPPF and the supporting PPG. As such, all sources of flood risk to the Onshore Infrastructure within the Onshore Development Area have been considered.

343. In terms of the existing flood risk, at the Landfall, the Onshore Export Cables will be located in Flood Zone 1. In addition, they will be installed utilising trenchless techniques. As such, all infrastructure will be located below ground, at a depth that ensures they will not be at risk from flooding.

344. A review of the flood risk along the Onshore Export Cable Corridor has been undertaken and it has been noted that the northern part of the Onshore Export Cable Corridor is also located in Flood Zone 1.

345. In the vicinity of the Braunton Burrows Car Park, where the Onshore Export Cable Corridor passes under American Road to run along the eastern side of Boundary Drain it passes through an area of Flood Zone 3 up to the crossing point of the Taw Estuary.

346. At the northern end of the Onshore Export Cable Corridor there is a proposed access road from the B3231. It crosses over Sir Arthur's Pill which is Main River in this location and in this location would pass through Flood Zone 3.

347. The use of trenchless techniques has been embedded in the scheme design for Main Rivers, and as such the impact on flood risk in these locations would be relatively **Low**.

348. A review of the Environment Agency surface water flood mapping for the Landfall and northern part of the Onshore Export Cable Corridor indicates that there are predominantly small, localised areas of low to medium risk of surface water flooding

throughout the Onshore Development Area, which are associated with topographical low points.

349. There are some areas at high risk of surface water flooding along the Onshore Export Cable Corridor, but these are associated with the watercourses within the area covered by the Braunton Marsh IDB.

350. This area is actively managed by the Braunton Marsh IDB and as part of the water level management in this area, water levels in the ditches are deliberately retained at higher levels for key periods throughout the year.

351. Based on the Environment Agency Flood Zone mapping the Onshore Export Cable Corridor, to the south of the Taw Estuary, and the Onshore Substation are located in Flood Zone 3.

352. The data package provided by the Environment Agency identified five defence embankments surrounding the wider area of the Onshore Export Cable Corridor and Onshore Substation and each of these embankments has a different crest level.

353. In addition, as part of the works being undertaken for the adjacent Yelland Quay development, located to the north east of the Onshore Project, a new tidal defence is being constructed to provide protection to both the development and the land surrounding it.

354. For the west facing shoreline i.e. the element of the Yelland Quay development closest to the Onshore Project it is understood that the defence crest level will be set at 8.60mAOD. For the north and east facing shorelines it is understood that the defence crest level will be set at 8.00mAOD.

355. From a review of the defences in the local area, it appears that the Environment Agency defence embankment #3 (i.e. crest level at 6.15mAOD) and defence embankment #4 (i.e. crest level at 6.19mAOD) provide protection to the Onshore Export Cable Corridor and Onshore Substation. These are also the lowest crest levels along this section of the coastal / tidal frontage compared with other existing or proposed defences.

356. A review of Still Water Levels for the present day (2023) scenario in comparison with the defence crest levels indicates the existing defences provide protection up to the 1 in 200 year (0.5% AP) event in the baseline 2017 scenario. However, they are likely to be overtopped in the 1 in 1,000 year (0.1% AP) event.

357. On this basis, it is concluded that the Onshore Export Cable Corridor and Onshore Substation are located in Flood Zone 3a rather than the Functional Floodplain (Flood Zone 3b).

358. Following discussion with the Environment Agency it has been confirmed that there is some uncertainty surrounding the condition and SoP provided by the existing defences, should there be a significant tidal event allowing for wave action along the Taw Estuary.

359. The Environment Agency has also advised that updated tidal / wave modelling along the Taw Estuary is currently underway. It is recommended that this is incorporated into the detailed design, specifically for the Onshore Substation post planning consent.

360. A review of the Environment Agency surface water flood mapping for the Onshore Export Cable Corridor, to the south of the Taw Estuary, and Onshore Substation indicates there are areas of varying low to high risk of surface water flooding throughout the Onshore Development Area. These are associated with topographical low points close to the tidal frontage and land drains crossing the rural land to the rear of the tidal frontage as well as around the Onshore Substation.

361. Overall, the Landfall and the Onshore Export Cable Corridor is not at risk from fluvial sources, sewers, canals or other artificial sources.

362. However, there is a risk of flooding from tidal, groundwater and, as previously noted, surface water associated with Ordinary Watercourses within the Braunton Marsh IDB, as well as around the Onshore Substation.

363. Once operational, there will be no flood risk posed to the Onshore Export Cables from fluvial, tidal, surface or sewer flooding, as they will be located below ground. A residual risk of flooding from groundwater shall be mitigated using suitable waterproofing of the cables, link boxes and joint bays.

364. With regard to the potential flood risk at the Onshore Substation, when setting FFLs for the Onshore Substation, the requirements provided in the Environment Agency's guidance on preparing a flood risk assessment: standing advice has been considered.

365. As such, the FFL for the Onshore Substation should be set at a minimum level of 300mm above the water level for the 1 in 200 year (0.5% AP) event. It is assumed that the Onshore Project would have a development lifetime of approximately 50 years and therefore the assessment has been undertaken up to 2075.

366. On this basis utilising the Upper End allowance for the Onshore Substation, in 2075, the FFL would need to be set 300mm above the 6.43mAOD Still Water Level. This would result in a FFL of 6.73mAOD.

367. In addition, consultation with the Environment Agency has indicated there are concerns regarding wave action up the Taw Estuary in the future. Whilst the Onshore Substation is not located immediately to the rear of the coastal frontage and is afforded some protection by the Tarka Trail, the potential risk to the Onshore Substation platform has been considered within this FRA. As such, additional design mitigation has been included for the Onshore Substation platform.

368. On the basis of the above, the Environment Agency has requested that a freeboard of 600mm above the water level for the 1 in 200 year (0.5% AP) event is applied.

369. Given that 300mm freeboard is provided by setting the Onshore Substation platform at 6.73mAOD, it is proposed that the additional 300mm freeboard is provided though the adoption of resilience measures as part of the detailed design for the Onshore Substation.

370. To provide the additional 300mm of flood resilience the exterior of the Onshore Substation building has been designed using flood resistant materials to limit flood water ingress into the building and to provide protection to the electrical equipment and infrastructure contained within it.

371. The Environment Agency also noted that updated modelling of the tidal flood risk within the Taw Estuary is underway, with draft results likely to be available in late 2023. Therefore, it is recommended that, once available, the results of the modelling in this location are assessed to aid in the refinement of the detailed design.

372. This FRA has been undertaken in accordance with the methodology and criteria provided on the application of the Sequential Test and Exception Test contained within NPPF and the supporting PPG.

373. Due to the large-scale nature of the works, it is acknowledged that there are locations where infrastructure is required to pass through or be located in Flood Zone 3 or at increased risk of surface water flooding. This relates to the Onshore Export Cable Corridor either side of the Taw Estuary as well as at the Onshore Substation.

374. In terms of the Onshore Project, and based on the guidance in both NPPF and the supporting PPG, the Onshore Project is classed as '**Essential Infrastructure**'.

375. Given the flood risk vulnerability classification of the Onshore Project, it is necessary to consider the application of the Exception Test.

376. The location of the Onshore Substation is such that it will be located in Flood Zone 3a both during construction and once operational. However, it cannot be located elsewhere due to the proximity of the Onshore Project to other environmental receptors, the need to be close to the National Grid connection point (i.e. the existing Yelland Substation) and limited locations in the area that are not also located in Flood Zone 3a.

377. Taking into account the two parts of the Exception Test, it is concluded that the first part comprising the provision of wider sustainability benefits to the community has been passed on the basis that the Onshore Project is providing energy certainty utilising a sustainable source of energy at a national scale.

378. With regard to the second part of the Exception Test, it is necessary to consider the Onshore Project in the context of its relatively large scale and linear nature.

379. It should also be noted that the only element of the Onshore Project that would be located above ground, once operational, is the Onshore Substation which is situated within Flood Zone 3. However, it benefits from the presence of flood defences, according to the Environment Agency Product 4 and 5 data packages.

380. Where areas at increased risk of surface water flooding and Flood Zone 3 cannot be avoided, it is concluded that the mitigation measures incorporated within the design of the Onshore Substation are such that the risk, both to and from the Onshore Project can be appropriately managed.

381. Therefore, it is concluded that those elements of the Onshore Project requiring application of the Exception Test have demonstrated that the Onshore Project provides wider sustainability benefits to the community associated with the provision of renewable energy, and that it can be designed such that it would be safe for its lifetime without increasing flood risk elsewhere.

382. On the basis of the flood risk identified both to and from the Onshore Project, and consideration of both the Sequential Test and Exception Test, it is concluded that the Onshore Project can be considered appropriate in terms of flood risk and is in accordance with the NPPF and its supporting PPG.

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