WHITE CROSS

White Cross Offshore Wind Farm ES Addendum

Appendix D: 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
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
NSIP	Nationally Significant Infrastructure Projects
OCEMP	Outline Construction Environmental Management Plan
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance

Acronym	Definition
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
WCOWL	White Cross Offshore Windfarm Limited
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.
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 impacts. Additional mitigation is therefore subsequently adopted by WCOWL 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.
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.

Defined Term	Description
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).
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).
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.
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 Offshore Windfarm Limited	White Cross Offshore Windfarm Ltd (WCOWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd.
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 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. Furthermore, the FRA has been reviewed and clarification provided in light of comments received by key stakeholders and regulators.

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 all elements of the Onshore Project (i.e. Landfall, Onshore Cable Route and Onshore Substation) to increase flood risk elsewhere i.e. off-site receptors, both during construction and once operational
- 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

Policy or Guidance Document	Author / Produced on behalf of	Year Published
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
Braunton Parish Neighbourhood Plan 2018 - 2031	Braunton Parish Council	2023
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 Braunton Parish Neighbourhood Plan 2018 – 2031

26. Braunton Parish Council has prepared a neighbourhood plan for their parish. On 4th October 2023 North Devon Council formally adopted the Braunton Parish Neighbourhood Plan and it now forms part of the wider development plan documentation for the North Devon planning authority area.

27. A review of the Braunton Parish Neighbourhood Plan notes that the policies of particular relevance to this FRA are NE8 – Watercourses and Drainage and NE9 – Provision of Natural Flood Management.

28. It is noted that the Braunton Parish Neighbourhood Plan is of relevance to the Onshore Project located to the north of the Taw / Torridge Estuary. As such the elements of the Onshore Project likely to require consideration against each of the above policies, is limited to the construction phase, as once it has been built the Landfall and Onshore Export Cable will be located below ground.

29. Policy NE8 focuses on the protection and improvement of water quality and the use of Sustainable Drainage Systems to both minimise flood risk as well as improve water quality. As part of this FRA, the issues associated with passing through the Braunton Marsh Internal Drainage District have been considered. Furthermore, given the Onshore Project will include the use of trenchless techniques in sensitive areas it is concluded that it will not result in a detrimental impact on water quality. This potential impact is also subject to further discussion in **Chapter 14: Water Resources and Flood Risk**.

30. Policy NE9 focuses on the use of natural flood management within the Parish and the use of land management techniques. Potential issues associated with land drainage and management of water levels within the Braunton Marsh Internal Drainage District have been addressed by using trenchless techniques in sensitive areas. Furthermore, as noted above, once the Onshore Project has been constructed it will be located below ground and therefore there is no requirement for the provision of flood management measures.

31. Given the Onshore Project will only have an impact on this area during construction, it is considered that the FRA is in accordance with the above policies.

1.2.4 National Policy Statement

32. 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.

33. 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.

34. 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.

35. 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.

36. 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.

37. 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."

38. 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.

39. 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.

1.2.5 Preliminary Flood Risk Assessment

40. 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.

41. 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).

1.2.6 Devon Local Flood Risk Management Strategy

42. 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.

43. 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*."

44. 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.

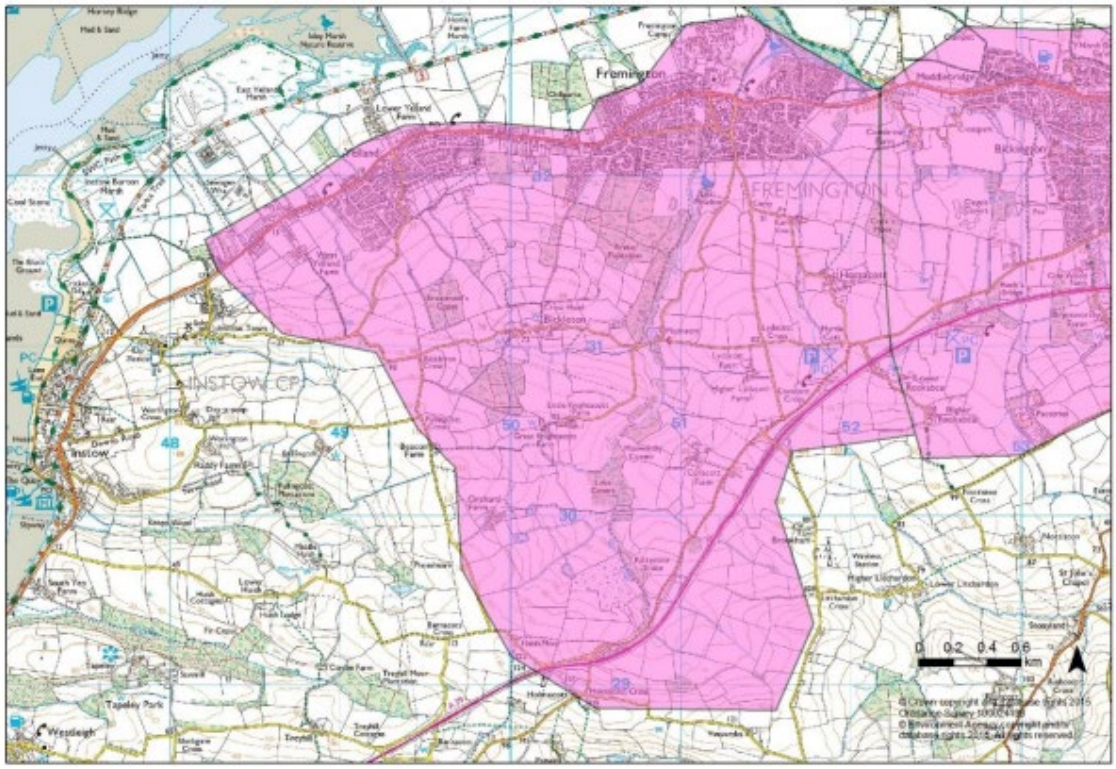
45. There is an area to the south of the Onshore Substation, around Yelland and along the B3233, that is located within the Fremington Yelland CDA, as shown on **Figure 1.1**. However, this does not interact with either the Onshore Substation or the Onshore Export Cable Corridor.

46. 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**.

1.2.7 Strategic Flood Risk Assessment

47. 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



48. 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.

49. 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.

50. 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."

51. 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."

52. Given the allocation relates to mixed use development and provides a summary of the constraints related to the residential element it is not considered to be directly relevant to this FRA. However, wider flood risk issues in the area, of relevance to the Onshore Project, have been considered throughout this FRA.

1.2.8 Catchment Flood Management Plan

53. 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.

54. 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.

55. 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*'.

56. 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.

1.2.9 Shoreline Management Plan

57. 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.

58. 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.

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

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

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

62. 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.

63. 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

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

65. 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).

66. 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).

67. 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.

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

69. 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.

70. 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.

71. 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.

72. 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

73. 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.

74. 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.

75. 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.

76. 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).

77. 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.

78. 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.

79. 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.

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

81. 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.

82. 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.

83. 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.

84. 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.

85. 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.

86. 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.

87. 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.

88. The FRA was submitted on 18th August 2023 alongside the ES and other planning documentation to NDC to support the planning application for the Onshore Project (Planning Application Reference: 77576).

89. Initial feedback was provided by NDC on 25th August 2023 with regards to the information provided for the Onshore Project. As a result, a Flood Risk Clarification Note was prepared to provide NDC with signposting and a summary response to their comments, in relation to flood risk.

90. Furthermore, the Environment Agency also provided comments on the planning application (dated 3rd November 2023). The Applicant's responses to these comments were outlined in a response dated 5th December 2023 which also included at Appendix A, the Flood Risk Clarification Note previously prepared for NDC.

91. Further to the above, an ETG meeting was held on 7th December 2023 with NDC, Environment Agency and Devon County Council, as the LLFA, to discuss the responses provided by various parties to date and to discuss any remaining flood risk concerns.

92. Following the ETG meeting in December 2023 and consideration of the Environment Agency and NDC written comments a number of clarifications have been incorporated into this updated FRA.

1.3.3 Potential Permitting / Consenting Requirements

93. 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.

94. 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.

95. 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.

96. 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. Locations of the entry and exit pits for the crossing below the Taw Estuary can be found in **Chapter 5: Project Description Appendix 5.D: Onshore Export Cable Corridor Alignment Sheets Figure 5.D 5: Onshore Cable Route - Alignment Sheets (Sheet 5 of 5) (Drawing No.: FLO-WHI-DWG-0008)**.

97. 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.

98. 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.

99. Should the design of the Onshore Project be subject to change the above indicative permitting requirements will be reviewed. Furthermore, we will consult on these design changes with the Environment Agency, Braunton Marshes IDB and Devon County Council, as appropriate, to confirm whether they have any impact on the permitting requirements.

1.3.4 Probability of Flooding – Flood Zones

100. **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).

101. 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.

102. 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.

103. 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)

104. 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.

105. 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.

106. 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.

107. 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.

108. 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. Flooding associated with smaller watercourses, not considered in the Flood Zone dataset, is usually picked up by the surface water flood mapping. Main Rivers, IDB maintained watercourses and other Ordinary Watercourses have been considered throughout this FRA.

109. 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

110. 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

111. 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.

112. 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)

113. 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.

114. 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.

115. 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.

116. 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.

117. 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.

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

119. 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.

120. 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.

121. Routine maintenance is generally carried out from late Spring through to early Autumn when the ground is drier and firmer underfoot.

122. 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

123. 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)

124. 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.

125. 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. In addition, there is a culvert that conveys water from the drains alongside the Tarka Trail, underneath the trail and directly into this small lake. It is proposed that this culvert and the watercourse flowing into it will be utilised for the discharge of the drainage from the Onshore Substation, as set out in the updated **Outline Drainage Strategy** (**Appendix E of the ES Addendum**).

1.4.1.4 Coastal catchment (Braunton Burrows)

126. 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).

127. 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.

128. 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.

129. 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

130. 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

131. The British Geological Survey (BGS) 1:50K scale bedrock and superficial geology geological mapping has been reviewed for the onshore project area.

132. 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.

133. 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.

134. 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.

135. 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.

136. 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.

137. 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

138. The Cranfield Soil and Agrifood Institute Soilscape web service provides an overview of UK soil coverage and types.

139. 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

140. 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.
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	Freely draining	Section below Saunton in the vicinity of the temporary access road off the B3231 highway and continuing southwards along Burrows Close Lane.

Soilscape Soil Type	BGS Superficial Deposit Geology	Aquifer Superficial Deposit Designation (Secondary Aquifers)	Natural Drainage Type	Approximate location(s) within the Onshore Project area
		characteristics of rock types.		
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

141. 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.

142. 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)

143. 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.

144. The FRA focuses on the onshore elements of the Project only and therefore the Landfall location considered in this FRA is limited to the area above Mean High Water Springs.

1.5.1 Historic Flooding Records

145. To understand the likely risk of flooding to the Onshore Project, a desktop review of historical flood event records has been undertaken.

146. 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.

147. 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.

148. 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.

149. 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.

150. 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

151. 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.

152. The onshore element of the Project assessed in this FRA, where it passes under the dunes and the coastal frontage is to be constructed using trenchless techniques. Therefore, it would have no impact on potential flood risk and / or the ongoing natural defences(s) along this frontage.

153. Between MHWS and MLWS it is acknowledged this area would be subject to tidal inundation, but in this location any flood risk would be to the Project only and this would be mitigated through the use of appropriate construction techniques. As this FRA is in support of the Onshore Development Area, not the offshore element it does not specifically focus on this area.

154. In the vicinity of the Sandy Lane Car Park, where the Onshore Export Cable Corridor passes under Sandy Lane/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.

155. 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.

156. 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

157. 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.

158. 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.

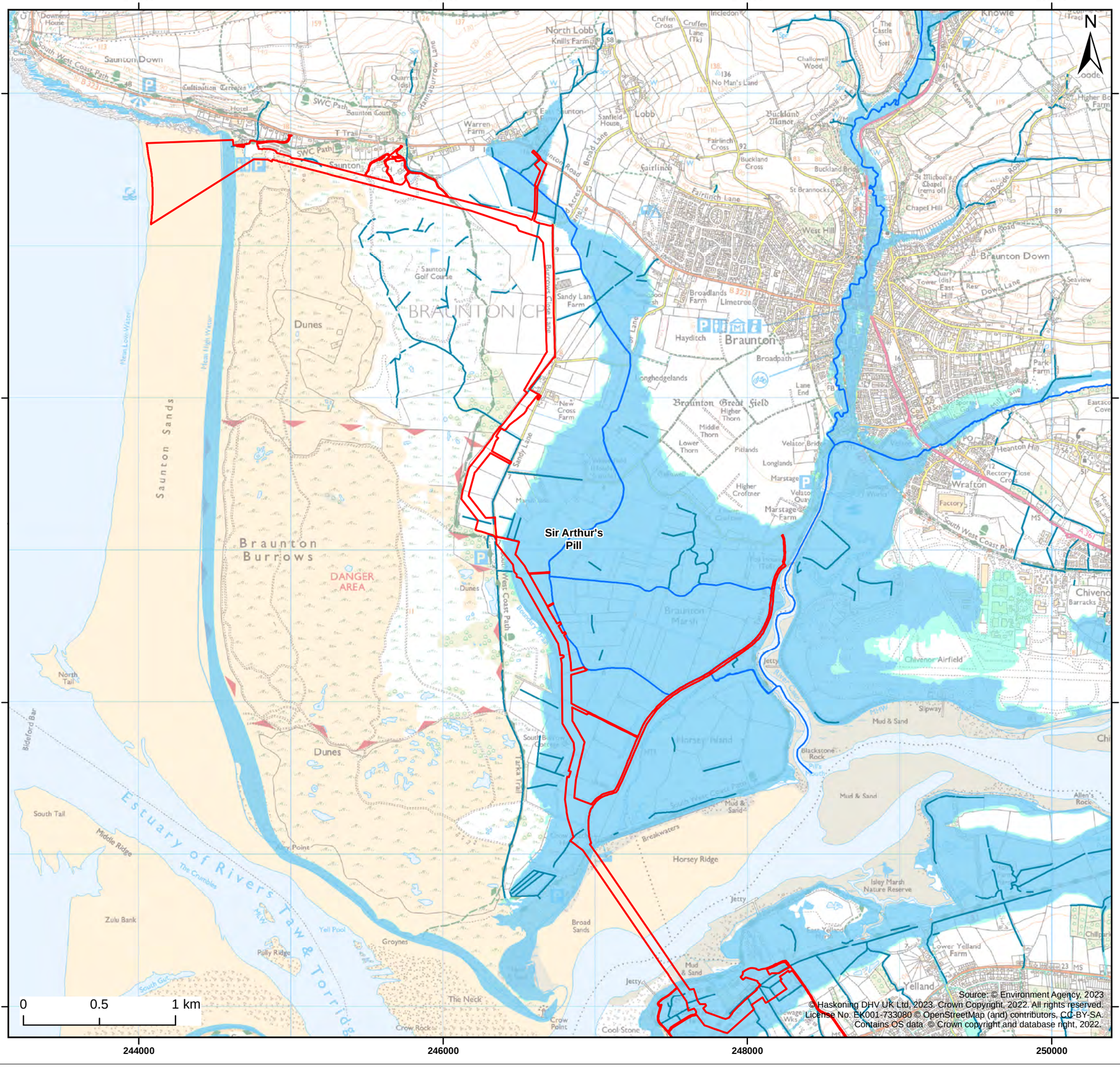
159. In addition, it is noted that following consultation with the Braunton Marsh IDB the watercourses in this area are actively managed, with eventual discharge into the Taw Estuary via the Great Sluice.

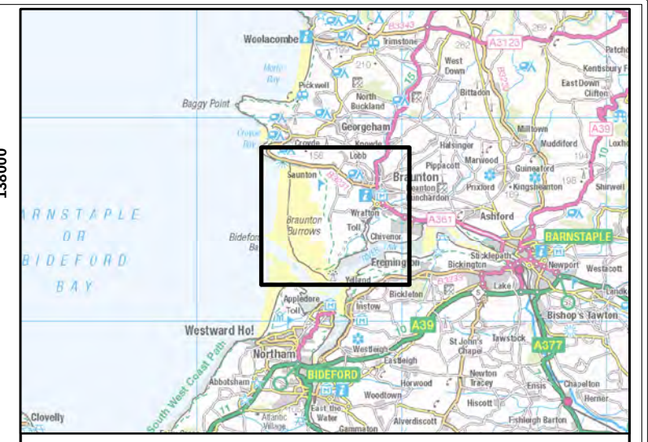
160. On the basis the flood risk associated with the watercourses within the Braunton Marsh IDB is as a result of active management of water levels and not from tidal

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.

161. In addition, the exit pit for the HDD crossing, in the vicinity of the White House immediately to the north of the Taw Estuary, would be located approximately 70m to the north / rear of the car park. This is shown on the drawing entitled River Taw Outline HDD Plan and Profile found within **Chapter 5 Project Description, Appendix 5.A Braunton Burrows and Taw Estuary Crossing Method Statement** and therefore does not affect either the flood risk or frontage in this location.

162. Any works in this location are limited to the construction phase, on the basis that once constructed the Landfall and Onshore Export Cable will be located below ground. As such, potential flood risk to these elements of the Onshore Project will only be applicable during construction and there will be no flood risk once they are operational.





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:
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Co-ordinate system: British National Grid

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1.5.4 Flooding from Surface Water

163. 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.

164. 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**.

165. 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.

166. 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.

167. 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.

168. 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.

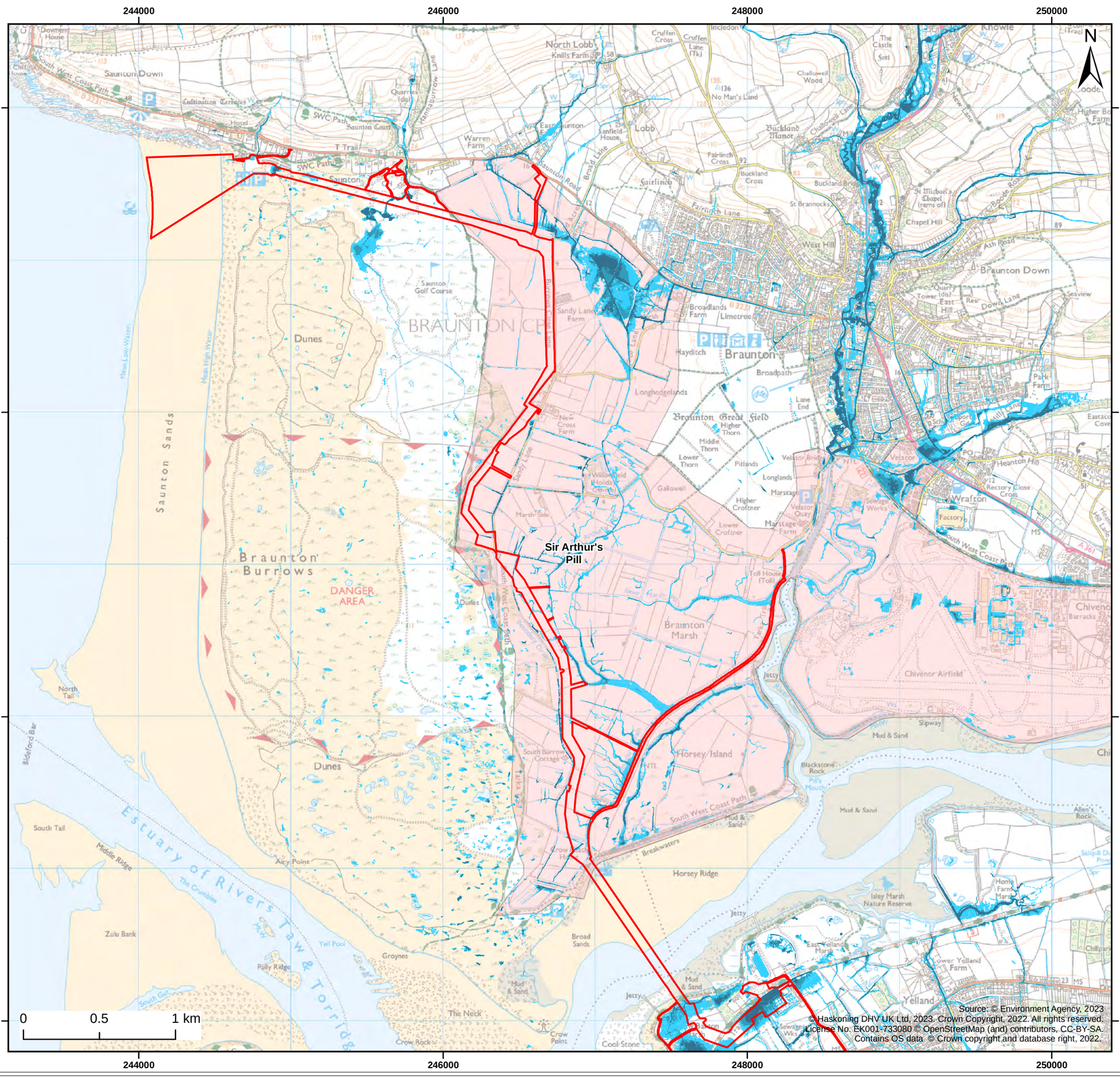
169. At this stage in the Onshore Project's design, trenchless techniques cannot be committed to at all locations, where the engineering feasibility of using such techniques needs further assessment before it can be confirmed. The list of techniques being considered at each crossing is described in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement**.

170. 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.

171. 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.

172. 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.

173. 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.



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: Offshore Wind Ltd.	Project: 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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1.5.5 Flooding from Groundwater

174. 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.

175. The geology maps available from the BGS indicate that the Onshore Development Area is located over 'unproductive' rock strata in terms of groundwater resources.

176. 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.

177. 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.

178. 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.

179. 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.

180. Saline intrusion may be occurring within Braunton Marsh and this will need confirming post-consent as part of any site survey works.

181. 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.

182. 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.

183. 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.

184. In addition, it has been identified that dewatering will be required, and sufficient allowance has been included within the boundary of the Onshore Project to allow for dewatering during construction. Further details will be developed post-consent as part of the detailed design.

185. 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

186. 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.

187. 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.

188. 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

189. 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.

190. 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.

191. 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

192. The Landfall and this section of the Onshore Export Cable Corridor are not located near to any canals.

193. 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.

194. 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

195. 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.

196. 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

197. 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

198. To understand the likely risk of flooding to the Onshore Project, a desktop review of historical flood event records has been undertaken.

199. 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.

200. 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.

201. 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.

202. 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.

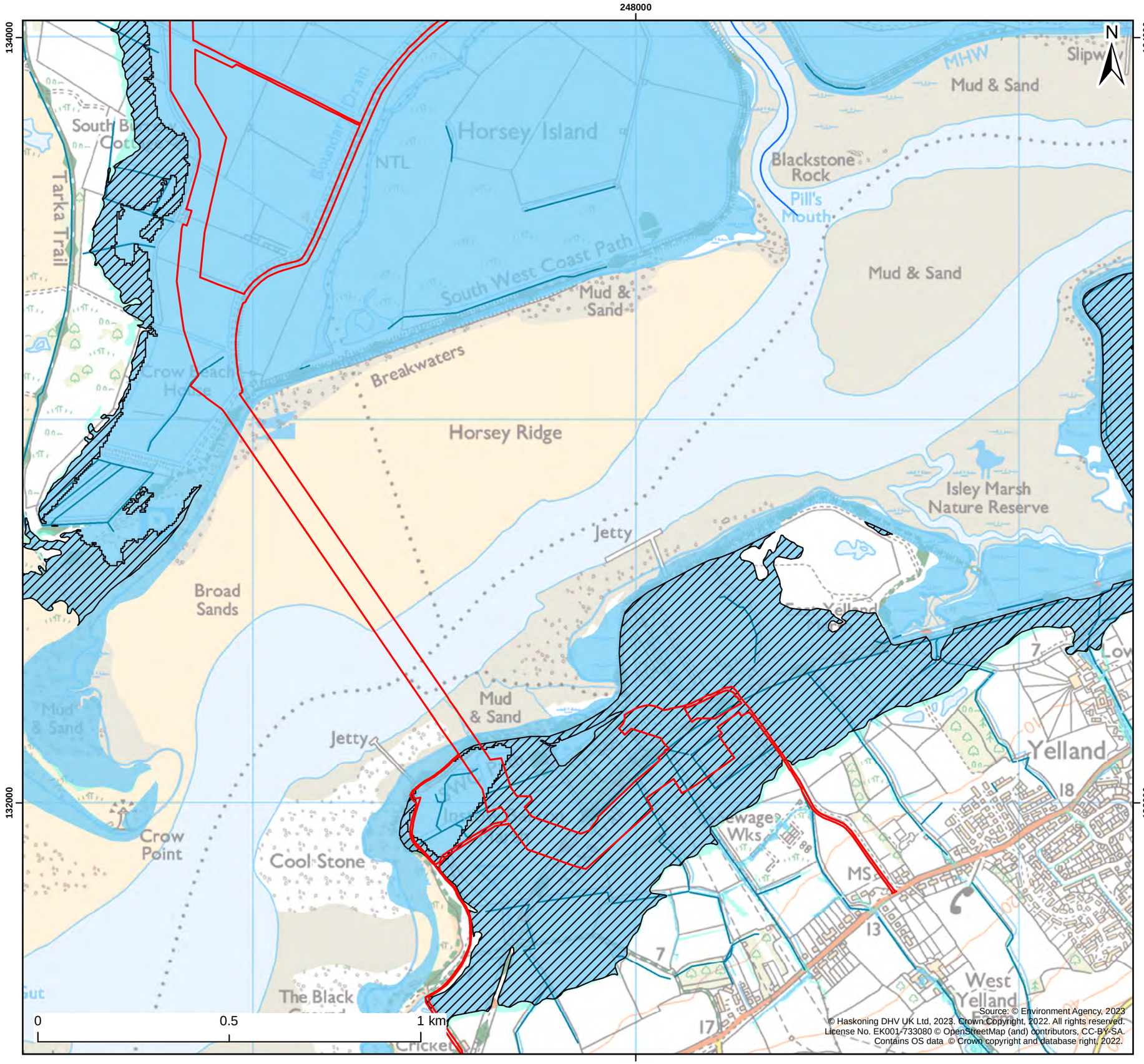
1.6.2 Flood Zones

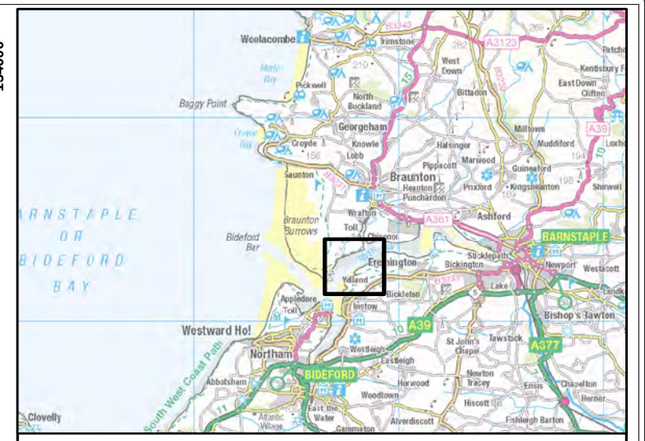
203. Based on the Environment Agency Flood Zone mapping, shown in **Figure 1.4**, the Onshore Export Cable Corridor and the Onshore Substation are located in Flood Zone 3.

204. 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**.

205. 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.

206. 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.





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: Offshore Wind Ltd.	Project: 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

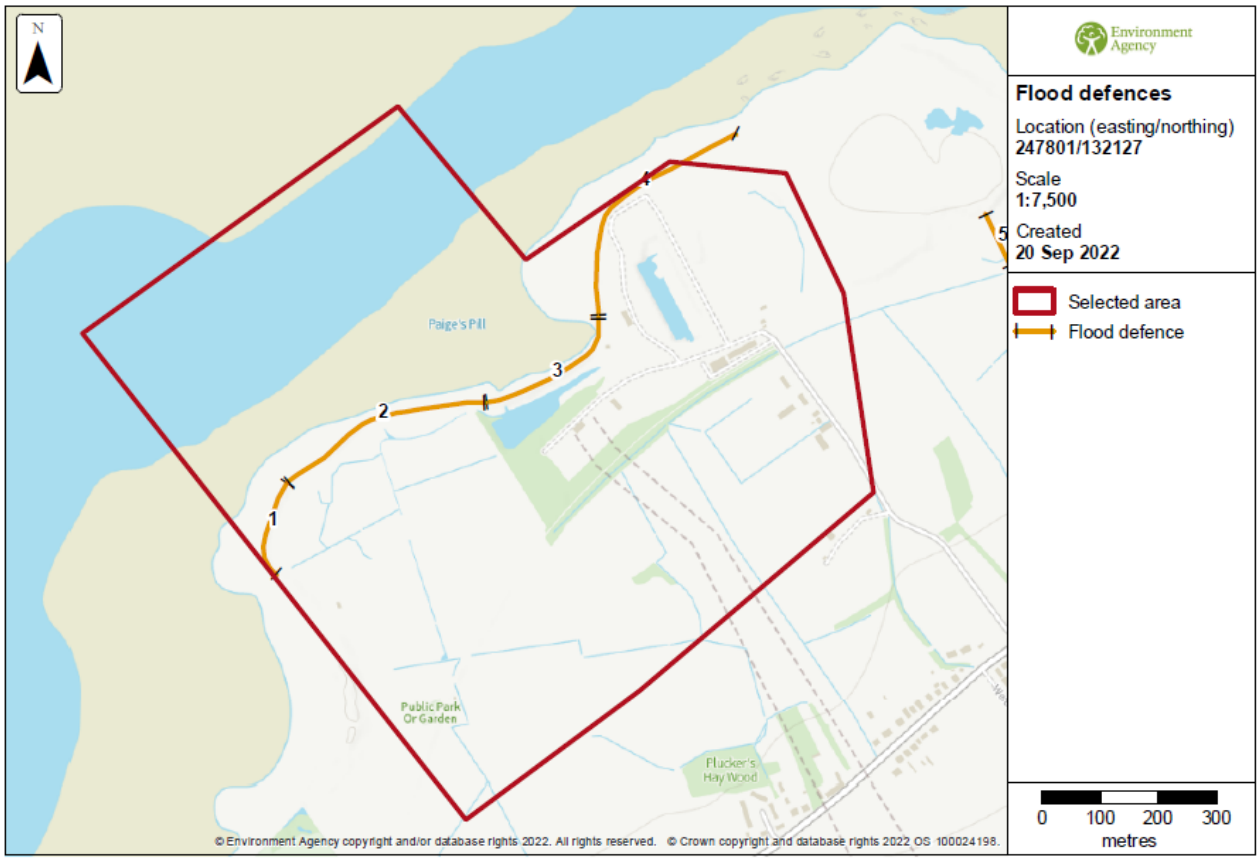


Table 1.5 Details of Flood Defences to the south of the Taw Estuary

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

207. 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.

208. 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.

209. 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.

210. 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

211. 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.

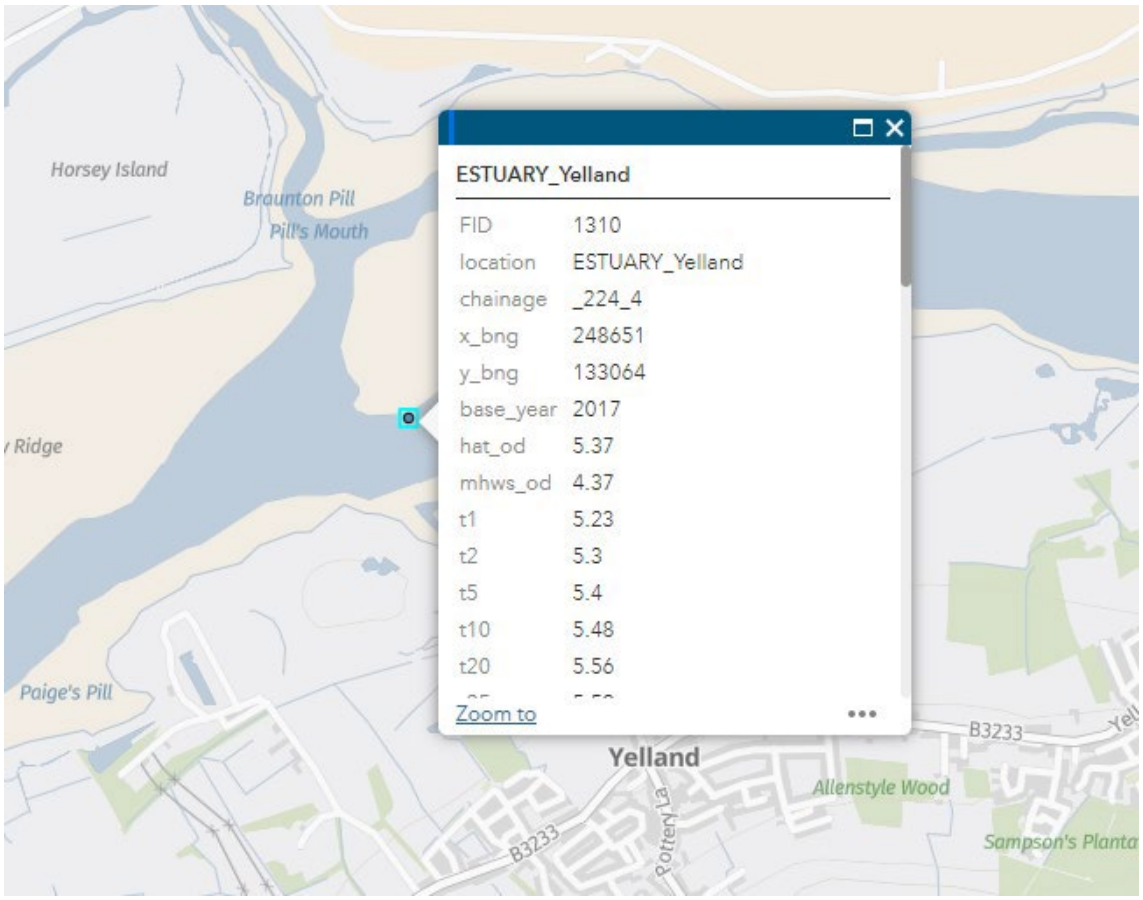
212. On this basis, it is also necessary to understand the indicative Standard of Protection (SoP) the existing defences offer the Onshore Export Cable Corridor and Onshore Substation.

213. 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.

214. 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.

215. 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



216. 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.

217. Where

- HAT: Highest Astronomical Tide Level
- MHWS: Mean High Water Spring Tide Level.

218. 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.

219. 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.

220. 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).

221. 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.

222. 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.

223. 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.

224. 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.

225. The Environment Agency has also advised that updated tidal / wave modelling along the Taw Estuary is currently underway. The Applicant has requested this

modelling from the Environment Agency for use within this FRA, however it was confirmed at the ETG meeting in December 2023 that it is not yet available for use.

226. It is recommended that this modelling 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

227. 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**.

228. 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.

229. 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.

230. 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.

231. 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 updated **Outline Drainage Strategy** (**Appendix E of the ES Addendum**) which has been submitted as part of the planning application.

232. 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.

248000

132000

N

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%)

0 0.325 0.65 km

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

Title: Environment Agency Surface Water Flood Risk (Southern Section of Onshore Export Cable)

Figure:	Drawing No:
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233. 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.

234. 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.

235. 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.

236. 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

237. 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.

238. 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.

239. 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.

240. 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.

241. 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.

242. 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

243. 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.

244. 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

245. 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.

246. 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.

247. 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

248. This section of the Onshore Export Cable Corridor and Onshore Substation are not located near to any canals.

249. Furthermore, there are no other Artificial Sources in proximity to either this section of the Onshore Export Cable Corridor and Onshore Substation.

250. As such, there is no flood risk from these sources to these elements of the Onshore Development Area.

1.6.9 Summary of Flooding

251. 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.

252. 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

1.7.1 Background to Policy

253. 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.

254. 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."

255. 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.

256. 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."

257. 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.

258. 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.

259. The PPG for Flood Risk and Coastal Change 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; and
- 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.

260. Furthermore, the PPG 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.

261. As noted above, the NPPF and supporting PPG provides guidance on suitable development types within each Flood Zone, as identified in Table 2 of the PPG for Flood Risk and Coastal Change, 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*

1.7.2 Consultation related to the Sequential and Exception Test

262. As noted in **Section 1.3.2**, initial feedback was provided by NDC on 25 August 2023 with regards to the information provided for the Onshore Project, specifically with regards to the local list requirements and the consideration of the Sequential and Exception Test.

263. In addition, to the comments raised by NDC (as the LPA) the Environment Agency also provided comment, in their response letter dated 03 November 2023, regarding consideration of the Sequential Test and Exception Test, and specifically whether NDC considers the Sequential Test to have been passed.

264. The following sections set out the Sequential Test and Exception Test in the context of the Onshore Project, as well as providing a summary in relation to the local list requirements, taking into account the comments received from both NDC and the Environment Agency.

1.7.3 Review of the Onshore Project elements in the context of the Sequential Test and Exception Test

265. 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.

266. 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.

267. 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.

268. 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.

269. 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.

270. 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.

271. It is proposed that the Landfall will be constructed using open cut trenching thorough the intertidal zone; however a trenchless technique will be used to pass

under the dunes, comprising the coastal defence along this frontage, to the car park at the rear. Once operational, 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.

272. 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.

1.7.4 Sequential Test Statement

273. A review of the comments provided by NDC indicate that there are concerns related to the consideration of alternative sites and the site selection process which was undertaken as part of the development of the Onshore Project.

274. In accordance with the comments raised by NDC, a review of the local list requirements[1] has been provided to understand the context within which this specific concern has been raised.

275. The local list requirements related to the Sequential Test are summarised as follows:

"Sequential Test Applications for new development in flood zones 2 and 3 should additionally include a sequential test statement (other than for minor extensions), which should demonstrate that there are no reasonably available alternative sites, within / around the same settlement, where the proposed development could be sited within an area of lower flood risk; the sequential test should consider sites in flood zone 2 if the proposal is located in flood zone 3. The following evidence should be provided:

- *a written statement explaining the area of search;*
- *a map identifying all other sites considered within lower areas of flood risk; and*
- *a written statement explaining why the alternative sites listed within lower areas of flood risk are not reasonably available."*

[1] North Devon Council (1st November 2022) Validation checklist requirements for planning applications submitted to North Devon and Torridge District Councils. Available at: https://www.northdevon.gov.uk/media/382034/local-list-november-2022.pdf [Accessed: 20/09/23]

276. With regard to various aspects of the Onshore Project and consideration of flood risk, it is noted that alternative sites and the site selection process are principally, although not entirely, related to the proposed Onshore Substation. This is on the basis that, as previously noted, all other permanent elements of the Onshore Project will be located below ground and therefore will not be subject to flood risk concerns once operational.

277. Given the detailed nature of the Onshore Project, much of the information related to the application of the Sequential Test, and specifically the selection of sites is set out in **Chapter 4: Site Selection and Assessment of Alternatives** of the **Onshore Project ES**.

278. The three key elements of the local list requirements are considered in each of the following subsections. In addition, for ease of reference, clarification has been provided within this FRA as to where the information can be found within the wider ES documentation.

1.7.4.1 Area of Search

279. Information related to *"A written statement explaining the area of search"* is set out within **Chapter 4: Site Selection and Assessment of Alternatives** and specifically within supporting document **Appendix 4.A: White Cross Offshore Windfarm Area of Search.**

280. **Paragraph 53** of **Chapter 4: Site Selection and Assessment of Alternatives** confirms that:

"The key drivers for the identification of the substation Area of Search (AoS) were the location of the grid connection offer (as described in Section 4.4) and a 3km buffer around it, and the presence of settlements, flood zones, and internationally and nationally designated nature conservation sites (see Figure 4.2)."

281. It then reiterates in **Paragraph 54** of **Chapter 4: Site Selection and Assessment of Alternatives** that:

"Subsequent to the identification of the AoS, a range of long list substation zones was developed (see Section 5.2 in Appendix 4.B). In accordance with the Horlock Rules outlined, "consideration must be given to environmental issues from the earliest stage" and therefore the areas with relatively fewer sensitive features were included in order to identify the location for the White Cross Onshore Substation. The design assumptions and site selection principles and criteria (see Section 5.1 in Appendix 4.B) used included the avoidance of:

…

- *Flood Zone 2 and 3*

- *Areas at high risk of surface water flooding including flood risk from groundwater, sewers and reservoirs…"*

282. **Appendix 4.A: White Cross Offshore Windfarm Area of Search** provides an overview summary of the Project Area of Search, supported by **Figure 2 Area of Search – Onshore**; however, it is also noted that further explanation related to the specific locations and zones considered for each element of the Onshore Project are subsequently provided in **Appendix 4.B: White Cross Offshore Windfarm Long List Report.**

283. Within **Appendix 4.B: White Cross Offshore Windfarm Long List Report, Section 4 Onshore Cable Corridor – Identification of Long List** provides a more detailed assessment of the Area of Search for the Onshore Cable Corridor and the routes that were subject to consideration.

284. In addition, **Section 5 Onshore substation – Identification of Long List** provides further clarification related to the substation zones considered, which was based on the same design principles and engineering assumptions as those used for the initial Area of Search, which included, but was not limited to, Flood Zones and surface water flood risk mapping.

1.7.4.2 Consideration of other sites within lower areas of flood risk

285. During the assessment of alternative sites within **Chapter 4: Site Selection and Assessment of Alternatives** of the **Onshore Project ES**, flood risk alongside other key parameters was included as part of the assessment process.

286. Supporting information related to *"a map identifying all other sites considered within lower areas of flood risk"* is provided in **Appendix 4.B: White Cross Offshore Windfarm Long List Report**. This report sets out the zones considered and includes a series of figures mapping the various constraints, including flood risk, which are provided as **Figures 4.1 – 4.3** for the Onshore Export Cable Corridor and **Figure 5.1** for the Onshore Substation.

287. This is set out in **Section 4.3.2 National Planning Policy Framework** of **Chapter 4: Site Selection and Assessment of Alternatives** which includes flood risk in the list of receptors and criteria used in the site and route selection process. Furthermore, **Table 4.6 Siting Principles for the Onshore Substation** summarises the flood risk criteria applied for the site selection process.

288. However, it is also noted that flood risk comprises one of a series of environmental constraints and parameters that need to be considered when considering a site for its suitability. An assessment of each element of the Onshore Project is provided in **Appendix 4.C: White Cross Offshore Windfarm Short List Report** which includes a BRAG assessment to enable

comparative analysis of the various constraints / risk associated with each of the options, including consideration of flood risk.

1.7.4.3 Why alternative sites within lower areas of flood risk are not reasonably available

289. With regard to the provision of *"a written statement explaining why the alternative sites listed within lower areas of flood risk are not reasonably available"* for each element of the Onshore Project i.e. Landfall, Onshore Export Cable Corridor and Onshore Substation, there is a conclusion at the end of each section of **Appendix 4.C: White Cross Offshore Windfarm Short List Report** setting out which locations are feasible based on the consideration of various environmental constraints.

290. **Section 6 BRAG Assessment of Onshore Cable Corridors** of **Appendix 4.C: White Cross Offshore Windfarm Short List Report** provides a summary of the BRAG assessment for the long list onshore cable corridors and routes that were identified in the preceding **Appendix 4.B: White Cross Offshore Windfarm Long List Report**. This includes identifying routes classified as having Black criteria and as a result were not progressed further.

291. A summary of the main conclusions related to the potential engineering and environmental constraints is provided in **Section 6.5 Onshore Export Cable Corridor Conclusions** of **Appendix 4.C: White Cross Offshore Windfarm Short List Report**, including identifying a refined preferred Onshore Export Cable Corridor.

292. For the Onshore Substation, **Section 7 BRAG Assessment of Onshore Substation Zone** provides a summary of the BRAG assessment for the long list onshore substation zones that were identified in the preceding **Appendix 4.B: White Cross Offshore Windfarm Long List Report**.

293. Similar to the process for the Onshore Export Cable Corridor, those zones identified as having Black Criteria were considered and removed from the assessment. A summary of the main conclusions and discounted zones is provided in **Section 7.5 Onshore Substation Conclusions** of **Appendix 4.C: White Cross Offshore Windfarm Short List Report**, as well as identification of the preferred zones to be progressed for further consideration.

294. Based on the clarifications provided above, it is concluded that, whilst the assessment of suitable alternative sites, from a flood risk perspective, has not been included in detail within this FRA, it has been undertaken for the Onshore Project and primarily evidenced in **Chapter 4: Site Selection and Assessment of Alternatives** of the **Onshore Project Onshore Project ES** and its supporting appendices.

295. The assessment of alternative sites has considered flood risk including locations at lower risk from the various flood risk sources than the proposed location of the Onshore Substation. However, this assessment indicated that on balance when considering all environmental factors and constraints the chosen location was the most appropriate.

1.7.5 Onshore Project and the Exception Test

296. Based on the flood risk vulnerability classification of the Onshore Project, i.e. **'Essential Infrastructure'**, and the Flood Zones through which it will pass, 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.

297. As noted in **Section 1.7.1**, the PPG for Flood Risk and Coastal Change provides guidance on the two criteria which it is required to demonstrate compliance with to pass the Exception Test, as follows:

- Development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and
- 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.

298. 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.

299. 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.

300. 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.

301. 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.

302. 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.

303. 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.

304. With regard to the Onshore Substation the location and layout of the Onshore Substation has been defined.

305. As such , the potential flood risk to the Onshore Substation has been identified including where there are areas at increased risk of surface water flooding and where the extents of the Flood Zones are located. On this basis, mitigation measures have been incorporated into the design, as set out in **Section 1.10** of this FRA, to ensure there is no risk, either to or from the Onshore Project.

306. On this basis, it is considered that both elements of the Exception Test have been considered for the elements of the Onshore Project which will be located above ground once operational, i.e. Onshore Substation.

307. Therefore, this FRA has considered the Onshore Project in the context of the Exception Test and demonstrated that it will provide 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.

1.7.6 Summary related to the Sequential Test and Exception Test

308. Following comments from both NDC and the Environment Agency, regarding the application of the Sequential Test and the Exception Test, this FRA has provided further information to confirm that throughout its design the Onshore Project has considered both the Sequential Test and, where necessary, the Exception Test in the siting and design of key elements of the Onshore Project.

309. The FRA concludes that due to the large-scale and linear 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.

310. Subterranean development will only be at potential risk of flooding during the construction phase and once operational, the flood risk to the Landfall and Onshore Export Cable Corridor will have been removed. Therefore, this is considered to be in accordance with the Sequential Test.

311. Furthermore, 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.

312. On this basis, the Exception Test has been considered for the Onshore Substation. It is concluded that the first part of the Exception Test has been demonstrated as the Onshore Project provides wider sustainability benefits to the community, as it provides energy certainty utilising a sustainable source of energy at a national scale.

313. With regard to the second part of the Exception Test, measures have been included in the design of the Onshore Substation, as set out in **Section 1.10** of this FRA, thereby ensuring the safety of the development over its lifetime without increasing flood risk elsewhere.

314. In summary, it is therefore considered that the Onshore Project is in accordance with both the Sequential Test and Exception Test.

1.8 Climate Change

315. 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.

316. 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.

317. 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

318. 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.

319. 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.

320. 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.

321. 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.

322. In addition, the guidance notes that:

"*For flood risk assessments and strategic flood risk assessments, assess both the higher central and upper end allowances*."

323. 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)*

324. 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.

325. This is in accordance with the lifetime of the development set out in **Paragraph 51 of Chapter 5: Project Description**, as follows:

"It is anticipated that the realistic worst-case for construction of the Onshore Project will take 28 months (18 months for cable installation and 16 months for the White Cross Onshore Substation Construction). The operational phase of the Onshore Project will last for 50 years, the decommissioning phase is anticipated to last up to 18 months."

326. On the basis of the above a 50 year lifetime comprises a consistent and realistic approach which has been confirmed and adopted within the planning documentation submitted as part of the application.

327. In addition, a more conservative scenario, as a sensitivity test, 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.

328. 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.

329. 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)

330. 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**.

331. 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

332. 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

333. 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).

334. 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.

335. 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).

336. 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%

337. 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.

338. The outline drainage design, including the incorporation of an allowance for climate change, is set out within the within the updated Outline Drainage Strategy (**Appendix E of the ES Addendum**), which has been submitted as part of the planning application.

1.9 Surface Water Drainage

1.9.1 Onshore Infrastructure Pre-Construction Work

339. 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.

340. 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.

341. 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.

342. 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

343. 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.

344. 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.

345. 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.

346. 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.

347. 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.

348. 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.

349. 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

350. Following construction of the Landfall and Onshore Export Cable Corridor there will be no permanent above ground elements, except for the relatively small link boxes which will, where possible, be located adjacent to field boundaries and in accessible locations. Furthermore, all temporary construction compounds and temporary access tracks will be fully reinstated and would have no operational use.

351. 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.

352. 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

353. 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 updated Outline Drainage Strategy (**Appendix E of the ES Addendum**).

354. However, with specific regards to flood risk matters, it is noted that the Onshore Substation is likely to result in displacement of surface water flooding. A preliminary assessment of the compensatory storage to be provided has been undertaken to take account of the displacement of surface water. This is to be provided through the inclusion of additional wetland area / depressions around the perimeter of the Onshore Substation platform. Further details of the volume and location of these are provided in the updated **Outline Drainage Strategy** (**Appendix E of the ES Addendum**).

355. 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.

356. 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.

357. 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.

358. 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

359. 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.

360. 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.

361. 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

362. Residual risk is the risk that remains after flood management or embedded mitigation measures have been implemented.

363. 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

364. 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, where it passes under the dunes which comprise the coastal defences along this part of the coastal frontage. As such, there will be no increase in flood risk in this location.

365. 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 (where the risk is fluvial) or 16m (where the risk is tidal) 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.

366. It is, however, likely that trenched crossings will be carried out on some Ordinary Watercourses crossed by the Onshore Export Cable Corridor.

367. 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.

368. 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.

369. 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.

370. Following construction of the Landfall and Onshore Export Cables there will be no permanent above ground elements, except for the relatively small 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

371. 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.

372. 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.

373. 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[2], which was last updated on 8th February 2022, has been considered.

[2] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#standing-advice-for-vulnerable-developments

374. 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.

375. 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.

376. 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

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- 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.

377. 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.

378. 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.

379. 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.

380. 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.

381. In addition, the Environment Agency noted that updated modelling of the tidal flood risk within the Taw Estuary is underway. The Applicant has requested this modelling from the Environment Agency for use within this FRA, however it was confirmed at the ETG meeting in December 2023 that it is not yet available for use. 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.

382. 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."

383. 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.

1.10.3 Flood Warning and Evacuation

384. 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.

385. 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.

386. 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.

387. 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.

388. 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.

389. 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.

390. 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.

391. 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.

392. 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.

393. 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.

394. 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.

1.10.4 Access and Egress

395. 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.

396. 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.

397. 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 NDC Comments regarding impacts during construction phase

398. Comments were also received from NDC related to the flood risk impacts, principally during construction along the cable route and to the temporary work. These have been provided as follows:

"More detail is required on the implication of the impacts of flooding for the cable route and associated works including compounds and haul roads, particularly during the construction phase. Interrelation and detailed analyses between existing site levels, flood levels and proposed levels across the site are important in this respect."

399. In addition, a review of the local list requirements in relation to developments in Flood Zone 3 indicated that Flood Risk Assessments should set out:

- "…existing flood risk to the site from all sources (e.g. flood depth, flow routes, flood velocity, defence failure);
- the potential impact of development upon flood risk, including off site/downstream; and
- design measures proposed to mitigate the risk of flooding, and their impact (details should include floor levels, ground levels, evacuation routes, SUDs)."

400. With regards to the Onshore Export Cable Corridor, this FRA noted in **Section 1.10** above that following construction of the Landfall and Onshore Export Cables there will be no permanent above ground elements, except for the proposed link boxes.

401. **Section 1.10** also notes that drainage along the Onshore Export Cable Corridor will be reinstated to match the baseline conditions and that all temporary construction compounds and temporary access tracks will be fully reinstated and would have no operational use. This process is also summarised in **Section 5.6.3.2.6.3 Drainage Reconnections** of **Chapter 5: Project Description**.

402. Furthermore, the drainage design for both permanent and temporary elements of the Onshore Project will also be developed as part of the detailed Drainage Strategy post-consent.

403. It is therefore concluded that following construction given current ground levels will be reinstated as well as existing drainage routes reinstalled, there will be no change in flood risk as a result of the Onshore Project i.e. there will be no change to flood depths, flow routes etc and there will be no impact on off-site or downstream as the existing flood risk will remain unchanged.

404. On this basis, it has been concluded that there would be no flood risk impact either to or from these elements of the Onshore Project, once operational, despite them being located in Flood Zone 3.

405. Therefore, in providing the following clarification it is concluded that the principal concerns related to flood risk impacts are associated with the construction phase, as indicated by NDC in their correspondence.

406. It is acknowledged that the temporary construction compounds and haul road are not subject to detailed assessment. However, this is based on the temporary nature of the risk and the inclusion of mitigation measures as an inherent part of the Onshore Project to reduce this risk, as summarised in **Section 1.10.1** above.

407. Furthermore, despite the low risk of flooding associated with the above temporary elements of the Onshore Project, the remaining risk will also be subject to consideration during detailed design. It will also be considered as part of the permitting process for Flood Risk Activity Permits and / or when obtaining the appropriate consent under the Land Drainage Act 1991.

408. Flood risk as a result of the temporary construction compounds is considered within **Section 1.9.5 Temporary Construction Compounds Surface Water Drainage** which provides a summary of the design measures that will be put in place to ensure there is no adverse off-site impact as a result of surface water flooding during construction:

- Use of trenches to collect rainfall; and
- Use of either infiltration or controlled discharge to a nearby ditch or watercourse via a silt trap.

409. These measures are also included in **Chapter 5: Project Description** and **Section 5.8 Surface Water Management** of **Appendix 5.B: Outline Construction Environmental Management Plan (OCEMP)**. They will also be reviewed and included in the Final CEMP.

410. **Section 1.10.1 Onshore Export Cable Corridor Design Mitigation** also notes the potential flood risk impact as a result of the installation of the haul road during construction and summarises the design mitigation that will be included as part of the Onshore Project to ensure there is no off-site risk to receptors during construction. These include:

- Use of trenchless crossing techniques at Main Rivers;
- Installation of surface water drainage along the edge of the working width to intercept surface water; and
- Installation of parallel drainage channels (one on each side) of the haul road to intercept drainage.

411. The mitigation measures outlined in this **FRA** primarily relate to land drainage and surface water flood risk.

412. As part of the construction phase works, there will be no increase in ground levels associated with either the haul road or the temporary construction compounds which would result in off-site displacement of tidal flood water should there be an extreme event.

413. In addition, given the size and scale of the temporary compounds in comparison with the much larger tidal flood extent there would be minimal change in flood depth should there be any displacement during an extreme event. On this basis, it is concluded that there would be no change in flood depth, flow routes, flood

velocity or impact on off-site / downstream receptors during an event of this type.

414. With regards to design measures to mitigate the risk associated with flooding it is acknowledged there may be a risk to site workers and users during construction.

415. As such **Section 1.10.3 Flood Warning and Evacuation** addresses this and provides a summary of the measures that will be required to minimise the risk to site workers setting out the information required within a flood warning and evacuation plan, including the need for these to be produced during the construction phase.

416. Given that during construction there will be limited impact on flood risk, beyond identification of the existing flood risk, it is concluded that measures to ensure the Onshore Project does not increase risk during the construction phase are limited to ensuring the safety of construction workers and materials on-site, should an extreme event be forecast.

417. As noted above, these are measures are summarised within this FRA and will be developed further during the detailed design phase.

1.12 Conclusions

418. 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.

419. The FRA was submitted on 18th August 2023 alongside the ES and other planning documentation to North Devon Council (NDC) to support the planning application for the Onshore Project (Planning Application Reference: 77576).

420. Initial feedback was provided by the Environment Agency on 3rd November 2023 and NDC on 25th August 2023 with regards to the information provided for the Onshore Project. This feedback covered a variety of topics associated with the Onshore Project, including comments related to flood risk.

421. A Clarification Note was prepared to provide NDC with signposting and a summary response to their comments, in relation to flood risk.

422. In addition, this FRA has been updated to take into account the clarifications provided as a result of the Clarification Note. Two specific themes which have been amended in the FRA are as follows:

    - Clarification on the Sequential Test and Exception Test (updates provided to **Section 1.7**)

- Impacts of flooding along the cable route and associated works during the construction phase (insertion of **Section 1.11).**

423. 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, where it passes under the dunes which comprise the coastal defences along this part of the coastal frontage. As such, there will be no increase in flood risk in this location during construction. Furthermore, once operational all infrastructure will be located below ground and at a depth that ensures they will not be at risk from flooding or result in an increased risk of flooding in this location.

424. 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.

425. In the vicinity of the Sand Lane Car Park, where the Onshore Export Cable Corridor passes under Sandy Lane/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.

426. 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.

427. 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**.

428. 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.

429. 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.

430. 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.

431. 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.

432. 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.

433. 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.

434. 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.

435. 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.

436. 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.

437. 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).

438. 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.

439. 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.

440. 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.

441. Overall, the Landfall and the Onshore Export Cable Corridor is not at risk from fluvial sources, sewers, canals or other artificial sources.

442. 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.

443. 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.

444. 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.

445. 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.

446. 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.

447. 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.

448. 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.

449. 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.

450. 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.

451. The Environment Agency also noted that updated modelling of the tidal flood risk within the Taw Estuary is underway. The Applicant has requested this modelling from the Environment Agency for use within this FRA, however it was confirmed at the ETG meeting in December 2023 that it is not yet available for use. 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.

452. 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.

453. 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.

454. 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**'.

455. Given the flood risk vulnerability classification of the Onshore Project, it is necessary to consider the application of the Exception Test.

456. 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.

457. 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.

458. 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.

459. 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.

460. 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.

461. 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.

462. 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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