XLINKS' MOROCCO-UK POWER PROJECT

Environmental Statement

Volume 2, Appendix 3.1: Flood Risk Assessment

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Prepared by:

RPS

Prepared for:

Xlinks 1 Limited

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Glossary

Term	Meaning
Alverdiscott Substation Site	The National Grid Electricity Transmission site within which the Alverdiscott Substation sits.
Alverdiscott Substation Connection Development	The development required at the existing Alverdiscott Substation Site, which is envisaged to include development of a new 400 kV substation, and other extension modification works to be carried out by National Grid Electricity Transmission. This does not form part of the Proposed Development, however, it is considered cumulatively within the Environmental Impact Assessment as it is necessary to facilitate connection to the national grid.
Applicant	Xlinks 1 Limited.
Converter Site	The Converter Site is proposed to be located to the immediate west of the existing Alverdiscott Substation Site in north Devon. The Converter Site would contain two converter stations (known as Bipole 1 and Bipole 2) and associated infrastructure, buildings and landscaping.
Converter station	Part of an electrical transmission and distribution system. Converter stations convert electricity from Direct Current to Alternating Current, or vice versa.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Permitting Regulations	Provide a consolidated system of environmental permitting in England and Wales. Permits are required by facilities which carry out activities that could pollute the air, water or land and increase flood risk by adversely affecting land drainage.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Flood Risk Assessment	A flood risk assessment is an assessment of the risk of flooding from all flood mechanisms, including the identification of flood mitigation measures, in order to satisfy the requirements of the National Planning Policy Framework and Planning Practice Guidance.
Horizontal Directional Drilling	Horizontal Directional Drilling (HDD) is a method of installing underground pipelines, cables and service conduit (or ducts) through trenchless methods to avoid obstacles and sensitive features (e.g. roads, watercourses, woodlands, etc.). The term HDD is used here interchangeably with other similar trenchless techniques but excluding micro tunnelling or direct pipe methods.
HVAC Cables	The High Voltage Alternating Current cables which would bring electricity from the converter stations to the new Alverdiscott Substation Connection Development.
HVAC Cable Corridors	The proposed corridors (for each Bipole) within which the onshore High Voltage Alternating Current cables would be routed between the Converter Site and the Alverdiscott Substation Site.
HVDC Cables	The High Voltage Direct Current cables which would bring electricity to the UK converter stations from the Moroccan converter stations.
Hydrology	The study of the movement, distribution, and quality of water.
Intertidal area	The area between Mean High Water Springs and Mean Low Water Springs.
Landfall	The proposed area in which the offshore cables make landfall in the United Kingdom (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Cornborough Range, Devon, between Mean Low Water Springs and the transition joint bays inclusive of all construction works, including the offshore and onshore cable routes, and landfall compound(s).

Term	Meaning
Lead Local Flood Authority	Lead Local Flood Authorities have responsibility for developing a Local Flood Risk Management Strategy for their area covering local sources of flooding. The local strategy produced must be consistent with the national strategy. It will set out the local organisations with responsibility for flood risk in the area, partnership arrangements to ensure co-ordination between these organisations, an assessment of the flood risk, and plans and actions for managing the risk.
Local Authority	A body empowered by law to exercise various statutory functions for a particular area of the United Kingdom. This includes County Councils, District Councils and County Borough Councils. The relevant Local Authorities for the Proposed Development are Devon County Council and Torridge District Council.
Local Planning Authority	The local government body (e.g., Borough Council, District Council, etc.) responsible for determining planning applications within a specific area.
Mean High Water Springs	The height of mean high water during spring tides in a year.
National Grid Electricity Transmission	National Grid Electricity Transmission owns and maintains the electricity transmission network in England and Wales.
Onshore HVDC Cable Corridor	The proposed corridor within which the onshore High Voltage Direct Current cables would be located.
Onshore Infrastructure Area	The proposed infrastructure area within the Order Limits landward of Mean High Water Springs. The Onshore Infrastructure Area comprises the transition joint bays, onshore HVDC Cables, converter stations, HVAC Cables, highways improvements, utility diversions and associated temporary and permanent infrastructure including temporary compound areas and permanent accesses.
Order Limits	The area within which all offshore and onshore components of the Proposed Development are proposed to be located, including areas required on a temporary basis during construction (such as construction compounds).
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project, and which helps to inform consultation responses.
Proposed Development	The element of Xlinks' Morocco-UK Power Project within the UK. The Proposed Development covers all works required to construct and operate the offshore cables (from the UK Exclusive Economic Zone to Landfall), Landfall, onshore Direct Current and Alternating Current cables, converter stations, and highways improvements.
Study area	This is an area which is defined for each environmental topic which includes the Order Limits as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each topic is intended to cover the area within which an impact can be reasonably expected.
Transition joint bay	A transition joint bay is an underground structure at the landfall area where the offshore cables are jointed to the onshore cables.
Xlinks' Morocco UK Power Project	The overall scheme from Morocco to the national grid, including all onshore and offshore elements of the transmission network and the generation site in Morocco (referred to as the 'Project').

Acronyms

Acronym	Meaning
AC	Alternating Current

Acronym	Meaning
AEP	Annual Exceedance Probability
BGS	British Geological Survey
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
CTMP	Construction Traffic Management Plan
DC	Direct Current
DCO	Development Consent Order
DEFRA	Department for Environment Food & Rural Affairs
DESNZ	Department for Energy Security and Net Zero
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environmental Statement
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IH	Institute of Hydrology
LLFA	Lead Local Flood Authority
MLWS	Mean Low Water Springs
NGET	National Grid Electricity Transmission
NPPF	National Planning Policy Framework
NPS	National Policy Statement
On-CEMP	Onshore Construction Environmental Management Plan
OS	Ordnance Survey
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
PPP	Pollution Prevention Plan
QBAR	Mean Annual Maximum Flow Rate
SFRA	Strategic Flood Risk Assessment
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
UK	United Kingdom
UKCP19	United Kingdom Climate Projections 2019
WFD	Water Framework Directive

Units

Units	Meaning
%	Percentage

Units	Meaning
ha	Hectare
km	Kilometre
km^2	Square kilometre
l/s	Litres per second
m	Metre
m^2	Square metre
m^3	Cubic metre
mAOD	Metres above ordnance datum
mm	Millimetre
mm/yr	Millimetres per year

1 FLOOD RISK ASSESSMENT

1.1 Introduction

1.1.1 This document forms Volume 2, Appendix 3.1: Flood Risk Assessment (FRA) of the Environmental Statement (ES) prepared for the United Kingdom (UK) elements of Xlinks' Morocco-UK Power Project (the 'Project'). For ease of reference, the UK elements of the Project are referred to as the 'Proposed Development, which is the focus of the Environmental Statement (ES). The ES presents the findings of the Environmental Impact Assessment (EIA) process for the Proposed Development.

1.1.2 This document provides the FRA for the Proposed Development to support Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.

1.1.3 The key objectives of the FRA are as follows:

- Assess the flood risk to the Proposed Development and to demonstrate the feasibility of appropriate design such that any residual flood risk to the Proposed Development and users would be acceptable.
- To assess the potential impact of the Proposed Development on flood risk elsewhere and to demonstrate the feasibility of appropriate design, such that the Proposed Development would not increase flood risk elsewhere.
- Satisfy the requirements set out in legislation and planning guidance. This is detailed in **section 1.3** of this FRA**,** and identifies the requirement for FRAs to be submitted in support of applications for development consent.

1.1.4 The Development Consent Order (DCO) seeks permission to install two converter stations and associated infrastructure. The key components within the Onshore Infrastructure Area relevant to this FRA include the following:

- Landfall:
  - This is the site at Cornborough Range where the offshore cables are jointed to the onshore cables. This term applies to the entire landfall area between Mean Low Water Springs (MLWS) and the transition joint bays. This includes all construction works, including the offshore and onshore cable routes, and landfall compound.
- Onshore elements:
  - Converter stations: two independent converter stations, known as Bipole 1 and Bipole 2, to convert electricity from Direct Current (DC) to Alternating Current (AC) before transmission to the national grid.
  - High Voltage Alternating Current (HVAC) Cables: these cables would connect the proposed converter stations to the national grid via the new Alverdiscott Substation Connection Development (this does not form part of the Proposed Development, as it would be taken forward by National Grid Electricity Transmission (NGET)).
  - Onshore High Voltage Direct Current (HVDC) Cables: these cables would link the converter stations to the Landfall.

- Highway improvements: improvements to the existing road network to facilitate access during construction and operation and maintenance, including road widening, and new or improved junctions.
- Temporary and permanent utility connections: temporary and permanent utility connections to the construction compounds and the Converter Site.
- Permanent utility diversions: permanent diversion of existing utility services within and adjacent to the Onshore Infrastructure Area.

1.1.5 As set out in Volume 1, Chapter 3: Project Description of the ES, the above work would be located within the Order Limits.

1.1.6 The FRA concentrates on the impact of permanent development within the Landfall and Onshore Infrastructure Area. Within this area all permanent onshore infrastructure, together with temporary construction facilities (such as access roads, construction compounds and highway improvements), would be located.

1.1.7 The only above ground permanent infrastructure proposed are the highways developments and converter stations. As such, the FRA focuses on temporary and permanent impacts of these aspects of development.

1.1.8 Several Horizontal Directional Drilling (HDD) crossings associated with the Onshore HVDC Cable Corridor within the Onshore Infrastructure Area would pass through areas designated as Flood Zones 2 and 3 (defined in **Table 1.9**). Impacts associated with the Onshore HVDC Cable Corridor would be temporary, arising as a result of cable installation. Following installation, land would be reinstated to its former use so the only permanent elements along the cable routes would be maintenance covers associated with the link boxes. Therefore, there is no potential for significant operational runoff associated with the cable route and the FRA focuses on temporary impacts associated with construction activities for the Onshore HVDC Cable Corridor.

1.2 Methodology

Sources of Information

1.2.1 The FRA has been produced in accordance with the Overarching National Policy Statement (NPS) for Energy EN-1, EN-3, and EN-5 the National Planning Policy Framework (NPPF), and associated Planning Practice Guidance (PPG). Reference has also been made to local flood risk documents. The FRA provides an outline of the relevant local planning policies in addition to potential flood risk and hydrological constraints to the Proposed Development. The policies cover the requirements for development consent under the Planning Act 2008.

1.2.2 To achieve the key objectives set out in **paragraph 1.1.3**, a staged approach was adopted in preparing the FRA in accordance with NPS EN-1, EN-3, and EN-5 the NPPF, and PPG.

1.2.3 Initially, screening studies were undertaken utilising publicly available information within the study area (described further in **paragraphs 1.2.4** and **1.1.1**) which may warrant further consideration. Where potential flooding issues were identified these were then assessed further for the Converter Site and for all the other elements within the Onshore Infrastructure Area. Each assessment involved:

- a review of all available information;
- a qualitative analysis of the flood risk to the Proposed Development; and

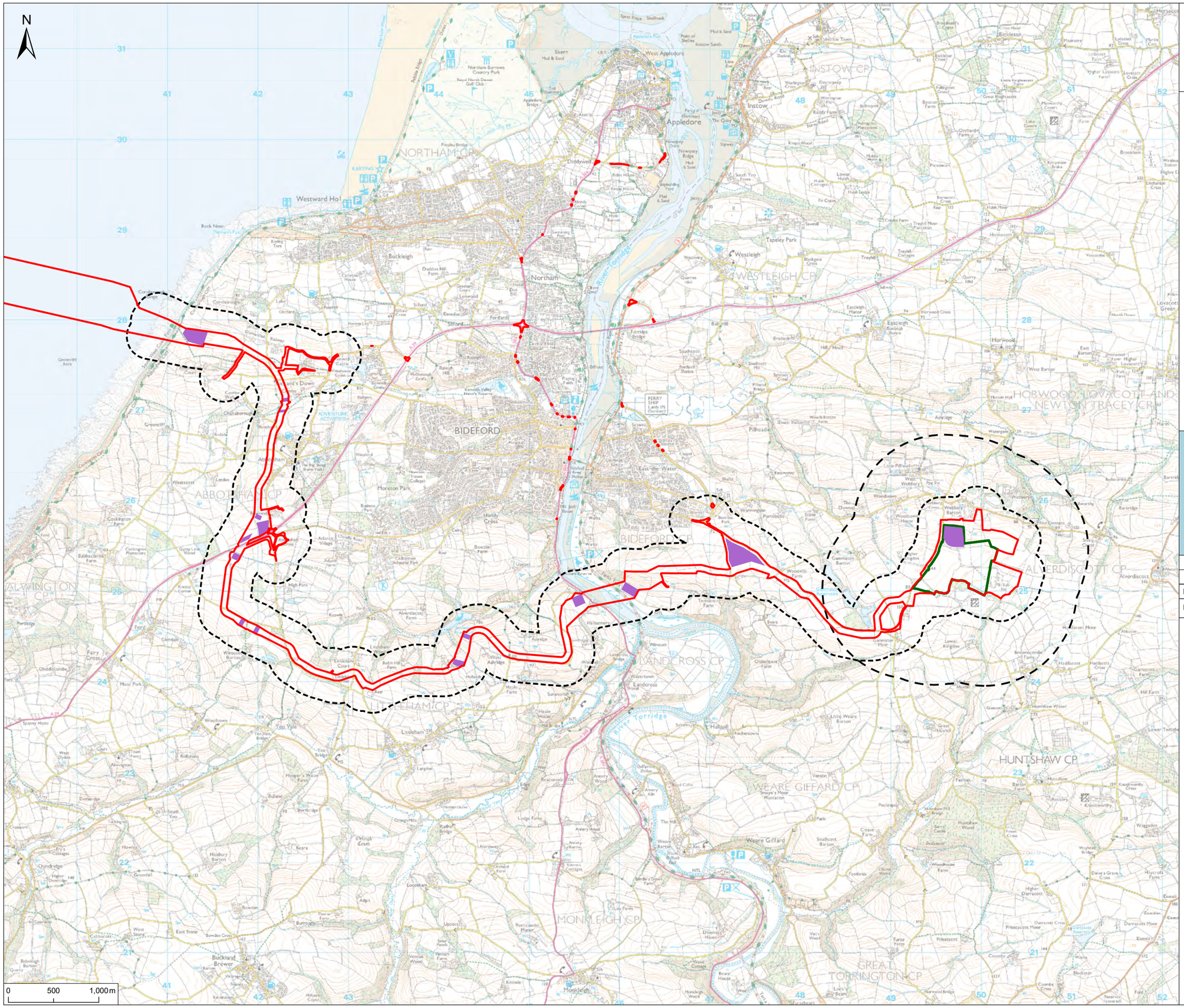
- the identification of any impact of the Proposed Development on flood risk elsewhere.

Study Area

1.2.4 The study area for this FRA focuses on areas of land to be temporarily or permanently occupied during the construction, operation and maintenance, and decommissioning of the onshore elements of the Proposed Development. The study area is shown within **Figure 1.1** and includes the following:

- Flood risk receptors located within 1 km of the Converter Site and 250 m of the Onshore Infrastructure Area including the following:
  - Landfall;
  - Onshore HVDC Cable Corridor;
  - HVAC Cable Corridors;
  - Converter Site;
  - highways improvements; and
  - temporary construction facilities (such as haul roads and construction compounds) associated with the Landfall, HVAC Cable Corridors, Onshore HVDC Cable Corridor and Converter Site.

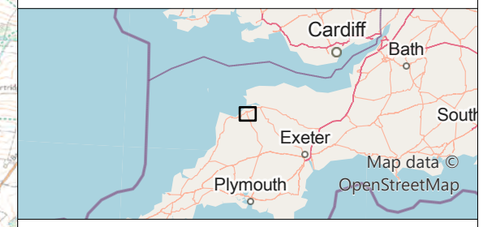
1.1.1 The buffers are considered appropriate for data collection taking into account the likely zone of influence of surface water and ground water receptors. The buffers have also been chosen to identify any existing receptors, assets or infrastructure that have the potential to be affected by temporary flood risk as a result of the Proposed Development.



Notes
1. This plan is scaled at paper size A3. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Flood Risk Assessment Study Area

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.1**

Rev: **P01**

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Information Sources

1.2.5 The information used in the preparation of this report is set out in **Table 1.1**

Table 1.1: Information sources consulted during the preparation of the FRA

Title	Source	Year	Author
1:25,000 mapping	https://www.bing.com/maps	2023	Ordnance Survey (OS)
Catchment Data Explorer	https://environment.data.gov.uk/catchment-planning/	2023	Environment Agency (EA)
Climate Change Allowances for Rainfall	https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall	2023	Department for Environment Food & Rural Affairs (DEFRA)
Climate Change Allowances for Peak River Flow	https://environment.data.gov.uk/hydrology/climate-change-allowances/river-flow	2023	DEFRA
Sea Level Allowances	https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances	2023	DEFRA
Enviro and Geo Insight digital reports	GSIP-2022-12875-10942_1a GSIP-2022-12875-10942_1b GSIP-2022-12875-10942_1c	2022	Groundsure
Flood Estimation Handbook (FEH) Webservice	https://fehweb.ceh.ac.uk/GB/map	2023	FEH
Flood Map for Planning	https://flood-map-for-planning.service.gov.uk/	2023	EA
Geoindex Onshore Viewer	https://mapapps2.bgs.ac.uk/geoindex/home.html	2023	British Geological Survey (BGS)
Internal Drainage Boards Map	https://www.ada.org.uk/idb-map/	2023	Association of Drainage Authorities
Long Term Flood Risk Mapping	https://check-long-term-flood-risk.service.gov.uk/map	2023	EA
Multi-Agency Geographic Information for the Countryside (MAGIC) mapping	https://magic.defra.gov.uk	2002	DEFRA
NPPF	https://www.gov.uk/government/publications/national-planning-policy-framework--2	2023	Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government

Title	Source	Year	Author
NPS for Energy EN-1	https://www.gov.uk/government/collections/national-policy-statements-for-energy-infrastructure	2023	Department for Energy Security and Net Zero (DESNZ)
PPG	https://www.gov.uk/guidance/flood-risk-and-coastal-change	2023	Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government
Shoreline Management Plans	https://environment.data.gov.uk/shoreline-planning	2024	EA
Soilscapes Viewer	http://www.landis.org.uk/soilscapes/	2023	The National Soils Research Institute

1.2.6 **Table 1.2** below lists the reports consulted during the preparation of the FRA.

Table 1.2: Reports consulted during preparation of the FRA

Title	Source	Year	Author
North Devon and Somerset Shoreline Management Plan	https://southwest.coastalmonitoring.org/projects/shoreline-management-plans/ndascag-smp2/	2010	North Devon and Somerset Coastal Advisory Group
North Devon and Torridge Local Plan 2011 - 2031	https://consult.torridge.gov.uk/kse/event/33615/section/	2011	North Devon Council) and Torridge District Council
Shoreline Management Plan Policy Designations	https://southwest.coastalmonitoring.org/projects/shoreline-management-plans/ndascag-smp2/	2023	North Devon and Somerset Coastal Advisory Group
Strategic Flood Risk Assessment (SFRA) – Level 1 and 2	https://www.torridge.gov.uk/article/11269/Strategic-Flood-Risk-Assessment-SFRA-Level-1-and-2	2009	Torridge Distric Council
Surface Water Management Plan	https://consult.torridge.gov.uk/file/3369625	2012	Devon County Council

1.3 Legislation and Guidance

1.3.1 The Proposed Development will be located in the UK Exclusive Economic Zone, with the onshore infrastructure located wholly within England. As set out in Volume 1, Chapter 1: Introduction of the ES, the Secretary of State for Energy Security and Net Zero (formerly Business, Energy and Industrial Strategy) has directed that the Proposed Development is nationally significant infrastructure and is to be treated as development for which development consent is required under the Planning Act 2008, as amended.

National Policy Statements

1.3.2 There are currently six energy National Policy Statements (NPSs), three of which contain policy relevant to the Proposed Development, specifically:

- Overarching NPS for Energy (NPS EN-1) which sets out the UK Government's policy for the delivery of major energy infrastructure (DESNZ, 2023a);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNZ, 2023b); and
- NPS for Electricity Networks Infrastructure (NPS EN-5) (DESNZ, 2023c).

1.3.3 **Table 1.3** sets out a summary of the policies within the current NPSs, relevant to hydrology and flood risk.

Table 1.3: Summary of the NPS EN-1, NPS EN-3, NPS EN-5 requirements relevant to this chapter

Summary of NPS requirement	How and where considered in the ES
NPS EN-1	
Climate change is already having an impact and is expected to have an increasing impact on the UK throughout this century. The UK Climate Projections 2018 show an increased chance of milder, wetter winters and hotter, drier summers in the UK, with more intensive rainfall causing flooding. Sea levels will continue to rise beyond the end of the century, increasing risks to vulnerable coastal communities. Within the lifetime of energy projects, these factors will lead to increased flood risks in areas susceptible to flooding, and to an increased risk of the occurrence of floods in some areas which are not currently thought of as being at risk. A robust approach to flood risk management is a vital element of climate change adaptation; the applicant and the Secretary of State should take account of the policy on climate change adaptation in Section 4.10. [Paragraph 5.8.5 NPS EN-1].	Climate change is considered in this Flood Risk Assessment (see **paragraphs 1.3.18** to **1.3.38**). An assessment of an increase of peak river flow, peak rainfall intensities and sea level rise driven by climate change has been made within the FRA to the end of the construction phase for the Landfall, Onshore HVDC Cable Corridor and HVAC Cable Corridors and the operation and maintenance phase for the Converter Site. Climate change, including peak river flow and sea level rise, have been taken into account in the characterisation of the baseline and future baseline environment of Volume 2, Chapter 3: Hydrology and Flood Risk of the ES. Peak rainfall intensity is taken into account within the assessment of flood risk in addition to the Converter Site drainage strategy which incorporates a 50% climate change uplift based on the Upper End allowance for the 2070's epoch. The Outline Operational Drainage Strategy has been submitted with the DCO application (document reference 7.22).
If, following application of the Sequential Test, it is not possible, (taking into account wider sustainable development objectives), for the project to be located in areas of lower flood risk the Exception Test can be applied. The test provides a method of allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. The Exception Test is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site. It would only be appropriate to move onto the Exception Test when the Sequential Test has identified reasonably available, lower risk sites appropriate for the proposed development where, accounting for wider sustainable development objectives, application of relevant policies would provide a clear reason for refusing development in any alternative locations identified. Examples could	The Proposed Development is classified as 'essential infrastructure'. This definition, alongside the definitions for the sequential test and exception test are provided within this FRA. The site selection process is detailed within Volume 1, Chapter 4: Needs and Alternatives of the ES**.** Development has been steered towards areas of lowest flood risk, including Flood Zone 1, with the Converter Site assessed to have a low risk of flooding. The Proposed Development is partially located within Flood Zone 3 and have been subjected to and deemed to have passed the sequential test as presented within **paragraphs 1.6.105** to **1.6.109** of this FRA. The exception test for the Onshore Infrastructure Area of the Proposed Development is presented within **paragraphs 1.6.110** to **1.6.121** of this FRA. The exception test demonstrates the Proposed

Summary of NPS requirement	How and where considered in the ES
include alternative site(s) that are subject to national designations such as landscape, heritage and nature conservation designations, for example Areas of Outstanding Natural Beauty (AONBs), Site of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS) which would not usually be considered appropriate. Both elements of the Exception Test will have to be satisfied for development to be consented. To pass the Exception Test it should be demonstrated that: • the project would provide wider sustainability benefits to the community that outweigh flood risk; and • the project 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. Development should be designed to ensure there is no increase in flood risk elsewhere, accounting for the predicted impacts of climate change throughout the lifetime of the development. There should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site. Mitigation measures should make as much use as possible of natural flood management techniques. [paragraphs 5.8.9 – 5.8.11 of NPS EN-1].	Development will provide wider sustainability benefits that outweigh flood risk, and the Proposed Development will be safe for its lifetime, taking into consideration the vulnerability of its users.
Development should be designed to ensure there is no increase in flood risk elsewhere, accounting for the predicted impacts of climate change throughout the lifetime of the development. There should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site. Mitigation measures should make as much use as possible of natural flood management techniques. [paragraph 5.8.12 of NPS EN-1].	An assessment of an increase of peak river flow, peak rainfall intensities and sea level rise driven by climate change has been made within the FRA to the end of the construction phase for the Landfall, Onshore HVDC Cable Corridor and HVAC Cables and the operation and maintenance phase for the Converter Site. Peak river flow and sea level rise are accounted for within fluvial flood risk sections. Peak rainfall intensity is taken into account within surface water flooding sections as well as the Outline Operational Drainage Strategy provided as part of the DCO application (document reference 7.22). Aside from highways improvements, all temporary and permanent elements of the Proposed Development are located within Flood Zone 1 aside from cables which pass underneath extents of Flood Zones 3 via HDD. HDD compounds which include the entry and exit pits are all located within Flood Zone 1. In regard to highways improvements located within Flood Zone 3, these elements of development relate to junction upgrades and road widening and are expected to tie into existing ground levels. As such, no floodplain displacement will occur, and no floodplain compensation will be required. Commitments have been proposed to reduce flood risk and vulnerability to flooding during the construction, operation and maintenance and decommissioning periods. Commitments are

Summary of NPS requirement	How and where considered in the ES
	presented within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
A site-specific flood risk assessment should be provided for all energy projects in Flood Zones 2 and 3 in England. In Flood Zone 1, an assessment should accompany all proposals involving: • sites of 1 hectare or more • land which has been identified by the Environment Agency as having critical drainage problems • land identified (for example in a local authority strategic flood risk assessment) as being at increased flood risk in future • land that may be subject to other sources of flooding (for example surface water) • where the EA, LLFA, Internal Drainage Board or other body have indicated that there may be drainage problems. This assessment should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account. The minimum requirements for Flood Risk Assessments (FRA) are that they should: • be proportionate to the risk and appropriate to the scale, nature and location of the project; • consider the risk of flooding arising from the project in addition to the risk of flooding to the project; • take the impacts of climate change into account, across a range of climate scenarios, clearly stating the development lifetime over which the assessment has been made; • be undertaken by competent people, as early as possible in the process of preparing the proposal; • consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure and exceedance; • consider the vulnerability of those using the site, including arrangements for safe access and escape; • consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and include information on flood likelihood, speed-of-onset, depth, velocity, hazard and duration; • identify and secure opportunities to reduce the causes and impacts of flooding overall, making as	Due to the scale of the Proposed Development, an FRA has been undertaken to assess flood risk from fluvial, tidal, surface water (pluvial), groundwater, sewers, reservoirs and artificial sources to the Landfall, Onshore HVDC Cable Corridor, HVAC Cables and Converter Site. The FRA is presented within this appendix. Due to negligible above ground development associated with the operation and maintenance phase of the Landfall, Onshore HVDC Cable Corridor and HVAC Cables, the FRA focuses on construction phase impacts. The FRA for the Converter Site also assesses flood risk to the development throughout its operation and maintenance phase. An assessment of an increase of peak river flow, peak rainfall intensities and sea level rise driven by climate change has been made within the FRA to the end of the construction phase for the Landfall, Onshore HVDC Cable Corridor and HVAC Cables and the operation and maintenance phase for the Converter Site. Peak river flow and sea level rise are accounted for within fluvial flood risk sections. Peak rainfall intensity is taken into account within surface water flooding sections as well as the Outline Operational Drainage Strategy provided as part of the DCO application (document reference 7.22). In regard to an assessment of residual flood risk, whilst flood defences are present within the study area and provide a degree of protection against flooding, the undefended scenario has been used to assess residual fluvial and tidal flood risk throughout the development lifetime, taking into account the effects of climate change. Historical flood events recorded by the Environment Agency and Strategic Flood Risk Assessment reports are also noted. Commitments have been proposed to reduce flood risk and vulnerability to flooding during the construction, operation and maintenance and decommissioning periods. Commitments are presented within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES. For aspects of the Proposed Development which are located Flood Zone 2 and 3 during construction, the measures included in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES will be implemented to reduce vulnerability of site users. Minimal above ground development (in the form of inspection covers) will occur as a result of the installation of the Landfall, Onshore HVDC Cable Corridor and HVAC Cables. As a result, no floodplain compensation is required in relation to these elements of the Proposed Development. The Outline Operational Drainage Strategy has been submitted with the DCO application (document

Summary of NPS requirement	How and where considered in the ES
much use as possible of natural flood management techniques as part of an integrated approach to flood risk management; • consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes; • include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that these risks can be safely managed, ensuring people will not be exposed to hazardous flooding; • consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems. Information should include: i. Describe the existing surface water drainage arrangements for the site ii. Set out (approximately) the existing rates and volumes of surface water run-off generated by the site. Detail the proposals for restricting discharge rates iii. Set out proposals for managing and discharging surface water from the site using sustainable drainage systems and accounting for the predicted impacts of climate change. If sustainable drainage systems have been rejected, present clear evidence of why their inclusion would be inappropriate iv. Demonstrate how the hierarchy of drainage options has been followed. v. Explain and justify why the types of SuDS and method of discharge have been selected and why they are considered appropriate. vi. Explain how sustainable drainage systems have been integrated with other aspects of the development such as open space or green infrastructure, so as to ensure an efficient use of the site vii. Describe the multifunctional benefits the sustainable drainage system will provide viii. Set out which opportunities to reduce the causes and impacts of flooding have been identified and included as part of the proposed sustainable drainage system ix. Explain how run-off from the completed development will be prevented from causing an impact elsewhere x. Explain how the sustainable drainage system been designed to facilitate maintenance and, where relevant, adoption. Set out plans for ensuring an acceptable standard of operation and maintenance throughout the lifetime of the development	reference 7.22). The existing site is currently predominantly greenfield, aside from the permitted solar farm under construction. Surface water runoff arising from proposed impermeable areas are to drain to attenuation basin SuDS features prior to discharging to a watercourse within the site boundary at the QBAR greenfield runoff rate. Additional SuDS features that could be implemented as part of the drainage strategy for the Converter Site are to be assessed at the detailed design stage. Due to underlying ground conditions, infiltration techniques are not expected to be feasible, subject to confirmation via further Ground Investigation at the detailed design stage. Surface water attenuation requirements include a 50% climate change allowance uplift. Pollution mitigation is to be provided via oil interceptors and attenuation basin Sustainable Drainage Systems (SuDS) features. Any exceedance flows are to be stored on site to prevent an increase in flood risk downstream. Appropriate management and maintenance to the drainage network is to be undertaken throughout the operational phase of the development by a specialist management company, with details to be confirmed during the detailed design stage. With the implementation of the above, it is demonstrated flood risk will not be increased elsewhere, accounts for the predicted impacts of climate change and ensures no reduction in floodplain capacity.

Summary of NPS requirement	How and where considered in the ES
• detail those measures that will be included to ensure the development will be safe and remain operational during a flooding event throughout the development's lifetime without increasing flood risk elsewhere; • identify and secure opportunities to reduce the causes and impacts of flooding overall during the period of construction; and • be supported by appropriate data and information, including historical information on previous events. Further guidance can be found in the Planning Practice Guidance Flood Risk and Coastal Change section which accompanies the National Planning Policy Framework (NPPF) or successor documents. [Paragraphs 5.8.13 – 5.8.16 of NPS EN-1].	
Development (including construction works) will need to account for any existing watercourses and flood and coastal erosion risk management structures or features, or any land likely to be needed for future structures or features so as to ensure: • Access, clearances and sufficient land are retained to enable their maintenance, repair, operation, and replacement, as necessary • Their standard of protection is not reduced • Their condition or structural integrity is not reduced [paragraph 5.8.17 of NPS EN-1].	HDD (or other trenchless techniques) entry and exit points will be located at least 16 m away from the River Torridge and associated landward toe of flood defences and at least 8 m from ordinary watercourses, as presented within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES. This commitment ensures watercourse easements are not reduced and the condition of flood defences will not be adversely impacted by construction activities.
Applicants for projects which may be affected by, or may add to, flood risk should arrange pre-application discussions before the official pre-application stage of the NSIP process with the Environment Agency and, where relevant, other bodies such as Lead Local Flood Authorities, Internal Drainage Boards, sewerage undertakers, navigation authorities, highways authorities and reservoir owner and operators. Such discussions should identify the likelihood and possible extent and nature of the flood risk, help scope the FRA, and identify the information that will be required by the Secretary of State to reach a decision on the application when it is submitted. The Secretary of State should advise applicants to undertake these steps where they appear necessary but have not yet been addressed. If the Environment Agency or another flood risk management authority has reasonable concerns about the proposal on flood risk grounds, the applicant should discuss these concerns with the Environment Agency and take all reasonable steps to agree ways in which the proposal might be amended, or additional information provided, which would satisfy the authority's concerns.	A meeting was held with the Lead Local Flood Authority (LLFA) and EA in April 2024 to discuss the scope of the project, the nature of flood risk within the study area and impacts relating to hydrology and flood risk scoped into the EIA. Two technical notes were prepared for the EA in regards to the method for assessing flood risk based on available data, as well as climate change allowances to be used within the FRA and Converter Site drainage strategy. An Outline Operational Drainage Strategy has been submitted with the DCO application (document reference 7.22). Feedback from the consultation meeting and technical note was taken forward within the Flood Risk Assessment presented within this FRA and the impact assessment presented within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.

Summary of NPS requirement	How and where considered in the ES
[paragraphs 5.8.18 – 5.8.20 of NPS EN-1].	
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 with medium risk areas and then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas. The technology specific NPSs set out some exceptions to the application of the Sequential Test. However, when seeking development consent on a site allocated in a development plan through the application of the Sequential Test, informed by a strategic flood risk assessment, applicants need not apply the Sequential Test, provided the proposed development is consistent with the use for which the site was allocated and there is no new flood risk information that would have affected the outcome of the test. [paragraphs 5.8.21 – 5.8.22 of NPS EN-1].	The Proposed Development is classified as 'essential infrastructure'. This definition, alongside the definitions for the sequential test and exception test are provided within this FRA. The site selection process is detailed within Volume 1, Chapter 4: Needs and Alternatives of the ES. Development has been steered towards areas of lowest flood risk, including Flood Zone 1, with the Converter Site assessed to have a low risk of flooding. The Proposed Development is partially located within Flood Zone 3 and have been subjected to and deemed to have passed the sequential test as presented within **paragraphs 1.6.105** to **1.6.109** of this FRA.
To satisfactorily manage flood risk, arrangements are required to manage surface water and the impact of the natural water cycle on people and property. In this NPS, the term SuDS refers to the whole range of sustainable approaches to surface water drainage management including, where appropriate: • source control measures including rainwater recycling and drainage • infiltration devices to allow water to soak into the ground, that can include individual soakaways and communal facilities • filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns • filter drains and porous pavements to allow rainwater and run-off to infiltrate into permeable material below ground and provide storage if needed • basins, ponds and tanks to hold excess water after rain and allow controlled discharge that avoids flooding • flood routes to carry and direct excess water through developments to minimise the impact of severe rainfall flooding Site layout and surface water drainage systems should cope with events that exceed the design capacity of the system, so that excess water can be safely stored on or conveyed from the site without adverse impacts.	The Outline Operational Drainage Strategy has been submitted with the DCO application (document reference 7.22). The existing site is currently predominantly greenfield, aside from the permitted solar farm under construction. Surface water runoff arising from proposed impermeable areas are to drain to attenuation basin SuDS features prior to discharging to a watercourse within the site boundary at the QBAR greenfield runoff rate. Additional SuDS features that could be implemented as part of the drainage strategy for the Converter Site are to be assessed at the detailed design stage. Due to underlying ground conditions, infiltration techniques are not expected to be feasible, subject to confirmation via further Ground Investigation at the detailed design stage. Surface water attenuation requirements include a 50% climate change allowance uplift. Pollution mitigation is to be provided via oil interceptors and attenuation basin SuDS features. Any exceedance flows are to be stored on site to prevent an increase in flood risk downstream. Appropriate management and maintenance to the drainage network is to be undertaken throughout the operational phase of the development by a specialist management company, with details to be confirmed during the detailed design stage. With the implementation of the above, it is demonstrated flood risk will not be increased elsewhere, accounts for the predicted impacts of climate change and ensures no reduction in floodplain capacity.

Summary of NPS requirement	How and where considered in the ES
The surface water drainage arrangements for any project should, accounting for the predicted impacts of climate change throughout the development's lifetime, be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, unless specific off-site arrangements are made and result in the same net effect. It may be necessary to provide surface water storage and infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the site. There may be circumstances where it is appropriate for infiltration facilities or attenuation storage to be provided outside the project site, if necessary, through the use of a planning obligation. [paragraphs 5.8.24 – 5.8.28 of NPS EN-1].	
The sequential approach should be applied to the layout and design of the project. Vulnerable aspects of the development should be located on parts of the site at lower risk and residual risk of flooding. Applicants should seek opportunities to use open space for multiple purposes such as amenity, wildlife Overarching National Policy Statement for Energy (EN-1) habitat and flood storage uses. Opportunities should be taken to lower flood risk by reducing the built footprint of previously developed sites and using SuDS. Where a development may result in an increase in flood risk elsewhere through the loss of flood storage, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked. Where development may cause the deflection or constriction of flood flow routes, these will need to be safely managed within the site. Where development may contribute to a cumulative increase in flood risk elsewhere, the provision of multifunctional sustainable drainage systems, natural flood management and green infrastructure can also make a valuable contribution to mitigating this risk whilst providing wider benefits. The receipt of and response to warnings of floods is an essential element in the management of the residual risk of flooding. Flood Warning and evacuation plans should be in place for those areas at an identified risk of flooding. [paragraphs 5.8.29 – 5.8.33 of NPS EN-1].	The Proposed Development is classified as 'essential infrastructure'. This definition, alongside the definitions for the sequential test and exception test are provided within this FRA. The site selection process is detailed within Volume 1, Chapter 4: Needs and Alternatives of the ES. Development has been steered towards areas of lowest flood risk, including Flood Zone 1, with the Converter Site assessed to have a low risk of flooding. The Proposed Development is partially located within Flood Zone 3 and have been subjected to and deemed to have passed the sequential test as presented within **paragraphs 1.6.105** to **1.6.109** of this FRA. Aside from highways improvements, all temporary and permanent elements of the proposed development are located within Flood Zone 1 aside from cables which pass underneath extents of Flood Zones 3 via HDD. HDD compounds which include the entry and exit pits are all located within Flood Zone 1. In regards to highways improvements located within Flood Zone 3, these elements of development relate to junction upgrades and road widening and are expected to tie into existing ground levels. As such, no floodplain displacement will occur and no floodplain compensation will be required. Commitments have been proposed to reduce flood risk and vulnerability to flooding during the construction, operation and maintenance and decommissioning periods. Commitments are presented within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
The applicant should take advice from the local authority emergency planning team, emergency services and, where appropriate, from the local resilience forum when producing an evacuation plan for a manned energy project as part of the FRA. Any	An Outline Flood Management Plan will form part of the final Onshore Construction Environmental Management Plans(s) (On-CEMP(s)) and will be prepared for works taking place within a Flood Warning/Flood Alert area. During the construction

Summary of NPS requirement	How and where considered in the ES
emergency planning documents, flood warning and evacuation procedures that are required should be identified in the FRA [paragraph 5.8.34 if NPS EN-1].	phase the Principal Contractor will sign up to the Flood Warning Service and will be alerted by a phone call or text when a Flood Warning becomes active to enable site personnel to be evacuated from the site in a timely manner prior to a flood event occurring. Commitments are presented within Volume 2, Chapter 3: Hydrology and Flood Risk and Volume 1, Appendix 3.1: Commitments Register of the ES.
Flood resistant and resilient materials and design should be adopted to minimise damage and speed recovery in the event of a flood [paragraph 5.8.35 if NPS EN-1].	In regards to highways improvements located within Flood Zone 3, these elements of development relate to junction upgrades and road widening and are expected to tie into existing ground levels. Roads comprise flood resistant and resilient materials within its construction and will require minimal maintenance after a flood event.
In determining an application for development consent, the Secretary of State should be satisfied that where relevant: • the application is supported by an appropriate FRA • the Sequential Test has been applied and satisfied as part of site selection • a sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk • the proposal is in line with any relevant national and local flood risk management strategy • SuDS (as required in the next paragraph on National Standards) have been used unless there is clear evidence that their use would be inappropriate • in flood risk areas the project is designed and constructed to remain safe and operational during its lifetime, without increasing flood risk elsewhere (subject to the exceptions set out in paragraph 5.8.42) • the project includes safe access and escape routes where required, as part of an agreed emergency plan, and that any residual risk can be safely managed over the lifetime of the development • land that is likely to be needed for present or future flood risk management infrastructure has been appropriately safeguarded from development to the extent that development would not prevent or hinder its construction, operation or maintenance. [paragraph 5.8.36 if NPS EN-1].	Due to the scale of the Proposed Development, an FRA has been undertaken to assess flood risk from fluvial, tidal, surface water (pluvial), groundwater, sewers, reservoirs and artificial sources to the Landfall, Onshore HVDC Cable Corridor, HVAC Cables and Converter Stations. The FRA is presented within this appendix. Due to negligible above ground development associated with the operation and maintenance phase of the Landfall, Onshore HVDC Cable Corridor and HVAC Cables, the FRA focuses on construction phase impacts. The FRA for the Converter Site also assesses flood risk to the development throughout its operation and maintenance phase. An assessment of an increase of peak river flow, peak rainfall intensities and sea level rise driven by climate change has been made within the FRA to the end of the construction phase for the Landfall, Onshore HVDC Cable Corridor and HVAC Cables and the operation and maintenance phase for the Converter Site. Peak river flow and sea level rise are accounted for within fluvial flood risk sections. Peak rainfall intensity is taken into account within surface water flooding sections as well as the operational drainage strategies for the Converter Site. In regard to an assessment of residual flood risk, whilst flood defences are present within the study area and provide a degree of protection against flooding, the undefended scenario has been used to assess residual fluvial and tidal flood risk throughout the development lifetime, taking into account the effects of climate change. The site selection process is detailed within Volume 1, Chapter 4: Needs and Alternatives of the ES. Development has been steered towards areas of lowest flood risk, including Flood Zone 1, with the Converter Site assessed to have a low risk of flooding. The Proposed Development is partially located within Flood Zone 3 and have been subjected to and deemed to have passed the

Summary of NPS requirement	How and where considered in the ES
	sequential test as presented within **paragraphs 1.6.105** to **1.6.109** of this FRA.
For energy projects which have drainage implications, approval for the project's drainage system, including during the construction period, will form part of the development consent issued by the Secretary of State. The Secretary of State will therefore need to be satisfied that the proposed drainage system complies with any National Standards published by Ministers under paragraph 5(1) of Schedule 3 to the Flood and Water Management Act 2010. In addition, the Development Consent Order (DCO), or any associated planning obligations, will need to make provision for appropriate operation and maintenance of any SuDS throughout the project's lifetime. Where this is secured through the adoption of any SuDS features, any necessary access rights to property will need to be granted. Where relevant, the Secretary of State should be satisfied that the most appropriate body is being given the responsibility for maintaining any SuDS, taking into account the nature and security of the infrastructure on the proposed site. Responsible bodies could include, for example the landowner, the relevant lead local flood authority (LLFA) or water and sewerage company (through the Ofwat approved Sewerage Sector Guidance), or another body, such as an Internal Drainage Board. [Paragraphs 5.8.37 – 5.8.39 of NPS EN-1].	An Outline Pollution Prevention Plan has been included as part of the Outline On-CEMP (document reference 7.7, Appendix A), which has been submitted as part of the application for development consent. Furthermore, pollution prevention measures have been incorporated into the Outline Operational Drainage Strategy (document reference 7.22). Mitigation measures to be adopted as part of the Proposed Development, in relation to hydrology and flood risk, are presented within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES. The Outline Operational Drainage Strategy has been submitted with the DCO application (document reference 7.22). Appropriate management and maintenance to the drainage network is to be undertaken throughout the operational phase of the development by a specialist management company, with details to be confirmed during the detailed design stage.
If the Environment Agency or another flood risk management authority continues to have concerns and objects to the grant of development consent on the grounds of flood risk, the Secretary of State can grant consent, but would need to be satisfied before deciding whether or not to do so that all reasonable steps have been taken by the applicant and the authority to try to resolve the concerns. [paragraph 5.8.40 if NPS EN-1].	A meeting was held with the LLFA and EA in April 2024 to discuss the scope of the project, the nature of flood risk within the study area and impacts relating to hydrology and flood risk scoped into the EIA. Two technical notes were prepared for the EA in regards to the method for assessing flood risk based on available data, as well as climate change allowances to be used within the Flood Risk Assessment and Converter Site drainage strategy. An Outline Operational Drainage Strategy has been submitted with the DCO application (document reference 7.22). Feedback from the consultation meeting and technical note was taken forward within the Flood Risk Assessment presented within this FRA (see **section 1.4**) and the impact assessment presented within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
Energy projects should not normally be consented within Flood Zone 3b, or on land expected to fall within these zones within its predicted lifetime. This may also apply where land is subject to other sources of flooding (for example surface water). However, where essential energy infrastructure has to be located in such areas, for operational reasons, they should only be consented if the development	As assessed within this FRA, extents of Flood Zone 3 at the Landfall are considered to be tidal in nature. Extents of Flood Zone 3 across the remainder of the study area are associated with fluvial flows from small ordinary watercourses. Due to data availability, the extent of Flood Zone 3b is informed by the extent of Flood Zone 3.

Summary of NPS requirement	How and where considered in the ES
will not result in a net loss of floodplain storage and will not impede water flows. *Exceptionally, where an increase in flood risk elsewhere cannot be avoided or wholly mitigated, the Secretary of State may grant consent if they are satisfied that the increase in present and future flood risk can be mitigated to an acceptable and safe level and taking account of the benefits of, including the need for, nationally significant energy infrastructure as set out in Part 3 above. In any such case the Secretary of State should make clear how, in reaching their decision, they have weighed up the increased flood risk against the benefits of the project, taking account of the nature and degree of the risk, the future impacts on climate change, and advice provided by the Environment Agency and other relevant bodies.* *[paragraph 5.8.41 – 5.8.42 of NPS EN-1].*	Permanent development includes the converter stations and their associated access and egress Proposed permanent development is located within Flood Zone 1. Due to its vulnerability classification and location within Flood Zone 1, 2, 3a and 3b, the Landfall and Onshore HVDC Cable Corridor has been subject to and have deemed to have passed the sequential test and exception test (see **paragraphs 1.6.105** to **1.6.109** of this FRA). Aside from highways improvements, all temporary and permanent elements of the proposed development are located within Flood Zone 1 aside from cables which pass underneath extents of Flood Zones 3 via HDD. HDD compounds which include the entry and exit pits are all located within Flood Zone 1. In regards to highways improvements located within Flood Zone 3, these elements of development relate to junction upgrades and road widening and are expected to tie into existing ground levels. As such, no floodplain displacement will occur and no floodplain compensation will be required.
Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment, as part of the Environmental Statement or equivalent. [Paragraph 5.16.3 of NPS EN-1].	The Water Framework Directive (WFD) Assessment (Volume 2, Appendix 3.2: Onshore Water Framework Directive Assessment of the ES) includes a description of the baseline environment and an assessment of the impacts on water quality, resources and physical characteristics. Climate change is considered in this FRA (see **paragraphs 1.3.18** to **1.3.38**) and the Outline Operational Drainage Strategy submitted with the DCO application (document reference 7.22). The documents take into account how rainfall patterns will change as a result of climate change, and the Conceptual Drainage Strategy presents calculations to demonstrate the drainage strategy for the converter site is able to accommodate increasing volumes of surface water runoff associated with the effects of climate change.
Where possible, applicants are encouraged to manage surface water during construction by treating surface water runoff from exposed topsoil prior to discharging and to limit the discharge of suspended solids e.g. from car parks or other areas of hard standing, during operation. Applicants are encouraged to consider protective measures to control the risk of pollution to groundwater beyond those outlined in River Basin Management Plans and Groundwater Protection Zones – this could include, for example, the use of protective barriers. [paragraph 5.16.5 – 5.16.6 of NPS EN-1].	A Outline Pollution Prevention Plan forms Appendix A to the Outline On-CEMP (document reference 7.7) which has been submitted as part of the DCO Application. A Construction Drainage Strategy would be developed post-consent and in accordance with the Outline On-CEMP (document reference 7.7), which outlines the measures and details to be incorporated into the strategy. An Outline Operational Drainage Strategy (document reference 7.22) has been provided as part of the DCO application. The drainage scheme will provide pollution mitigation measures to the water environment during the operation and maintenance stage of the Proposed Development.

Summary of NPS requirement	How and where considered in the ES
The Secretary of State should consider whether mitigation measures are needed over and above any which may form part of the project application. A construction management plan may help codify mitigation at that stage. The risk of impacts on the water environment can be reduced through careful design to facilitate adherence to good pollution control practice. For example, designated areas for storage and unloading, with appropriate drainage facilities, should be clearly marked. The impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling. If a development needs new water infrastructure, significant supplies or impacts other water supplies, the applicant should consult with the local water company and the EA. [paragraphs 5.16.8 to 5.16.10, NPS EN-1].	Flood risk mitigation measures are presented within this FRA (see **paragraphs 1.5.55** to **1.5.75,** and **paragraphs 1.6.122** to **1.6.142**). An assessment of effects to hydrology and flood risk has been undertaken in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES**.** Appropriate mitigation measures to reduce the impacts on the water environment are set out in the Outline On-CEMP (document reference 7.7) which has been prepared as part of the application**.** This includes measures relating to control of impacts to the water environment during construction**.**
Activities that discharge to the water environment are subject to pollution control. The considerations set out in Section 4.12 on the interface between planning and pollution control therefore apply. These considerations will also apply in an analogous way to the abstraction licensing regime regulating activities that take water from the water environment, and to the control regimes relating to works to, and structures in, on, or under controlled waters. [paragraph 5.16.11 of NPS EN-1].	A Outline Pollution Prevention Plan forms Appendix A to the Outline On-CEMP (document reference 7.7) which has been submitted as part of the DCO Application. A Construction Drainage Strategy would be developed post-consent and in accordance with the Outline On-CEMP (document reference 7.7), which outlines the measures and details to be incorporated into the strategy. The Outline Operational Drainage Strategy (document reference 7.22) considers the use SuDS features, pollution mitigation measures and allowances for climate change. The drainage scheme will provide pollution mitigation measures to the water environment during the operation stage of the Proposed Development. Potential impacts from pollution and contamination are assessed within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
The Secretary of State should consider proposals to mitigate adverse effects on the water environment and any enhancement measures put forward by the applicant and whether appropriate requirements should be attached to any development consent and/or planning obligations are necessary [Paragraph 5.16.16 NPS EN-1].	An assessment and the mitigation measures proposed as part of the WFD assessment (Volume 2, Appendix 3.2: Onshore Water Framework Directive Assessment of the ES) has taken into account the requirements of the River Basin Management Plan, and in particular the environmental objectives of the water bodies affected, to ensure all potential impacts on the water environment are mitigated to within acceptable levels. Therefore, the achievement of the environmental objectives of the water bodies within the WFD study area will not be compromised as a result of the project activities associated with the Proposed Development
NPS EN-3	
Whilst offshore wind farms will not be affected by flooding, applicants should demonstrate that any necessary land-side infrastructure (such as cabling and onshore substations) will be appropriately	Resilience to storms is discussed in Volume 3, Chapter 8: Physical Processes of the ES, in relation to the intertidal area. The resilience to flood risk of the onshore elements of the Proposed Development

Summary of NPS requirement	How and where considered in the ES
resilient to climate-change induced weather phenomena. Similarly, applicants should particularly set out how the proposal would be resilient to storms. [Paragraph 2.3.8 of NPS EN-3].	is set out within this FRA, Volume 2, Chapter 3: Hydrology and Flood Risk of the ES and the climate change chapter (Volume 4, Chapter 1: Climate Change of the ES).
NPS EN-5	
As climate change is likely to increase risks to the resilience of some of this infrastructure, from flooding for example, or in situations where it is located near the coast or an estuary or is underground, applicants should in particular set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to: • flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change; • the effects of wind and storms on overhead lines; • higher average temperatures leading to increased transmission losses; • earth movement or subsidence caused by flooding or drought (for underground cables); and • coastal erosion – for the landfall of offshore transmission cables and their associated substations in the inshore and coastal locations respectively. [Paragraph 2.3.2 of NPS EN-5].	Climate change is considered in this FRA and Volume 4, Chapter 1: Climate Change of the ES. Climate change has been taken into account in the characterisation of the baseline and future baseline environment of the Volume 2, Chapter 3: Hydrology and Flood Risk of the ES. An assessment of an increase of peak river flow, peak rainfall intensities and sea level rise driven by climate change has been made within this FRA to the end of the construction phase for the Landfall, Onshore HVDC Cable Corridor and HVAC Cables and the operational and maintenance phase for the Converter Site. In regard to coastal erosion, Volume 3, Chapter 8: Physical processes of the ES provides details relating to the intertidal area and coastal erosion. The resilience to flood risk of intertidal and onshore elements of the Proposed Development is set out within this FRA and Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.

National Planning Policy Framework

1.3.4 The NPPF was released in March 2012 and was updated in December 2023. The document advises of the requirements for a site-specific FRA for any of the following cases (Planning and Flood Risk paragraph 173 (footnote 59)):

- All proposals (including minor development and change of use) located within the EA designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability).
- All proposals of 1 ha or greater in an area located in Flood Zone 1 (low probability).
- All proposals within an area which has critical drainage problems (as notified to the Local Planning Authority by the EA).
- Land identified in a strategic flood risk assessment as being at increased flood risk in future.
- Where proposed development may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

1.3.5 Paragraph 175 of the NPPF identifies that major developments (developments of ten homes or more and for major commercial development) should incorporate

SuDS unless there is clear evidence that this would be inappropriate. The systems used should:

- '*take account of advice from the Lead Local Flood Authority;*
- *have appropriate proposed minimum operational standards;*
- *have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
- *where possible, provide multifunctional benefits'*.

1.3.6 The NPPF has been updated and the draft version was published for consultation on 30 July 2024 with the consultation period ending on 24 September 2024 (Ministry of Housing, Communities and Local Government, 2024). The draft NPPF includes similar provisions as the current designated NPPF. The draft NPPF has been reviewed and there are no material updates for Hydrology and Flood Risk.

1.3.7 Defra published their 'Non-statutory technical standards for sustainable drainage systems' in March 2015. These are supported by the revised NPPF.

1.3.8 The NPPF is supported by the PPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2022).

Local Planning Policy

The North Devon and Torridge Local Plan

1.3.9 The North Devon and Torridge Local Plan was formally adopted on 29 October 2018 by North Devon Council and Torridge District Council (2018) and covers the years 2011 to 2031 for the local area. The plan contains the following policies relating to flood risk and drainage:

Policy ST03: Adapting to Climate Change and Strengthening Resilience

1.3.10 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:

- locating and designing development to minimise flood risk through:
  - avoiding the development of land for vulnerable uses which is or will be at risk from flooding; and
  - 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;
- reducing existing rates of surface water runoff within Critical Drainage Areas;
- upgrading flood defences and protecting key transport routes from risks of flooding;
- re-establishing functional flood plains in accordance with the Shoreline Management Plan, Flood Risk Management Plan and Catchment Action Plan;
- locating development to avoid risk from current and future coastal erosion;

- adopting effective water management including Sustainable Drainage Systems, water quality improvements, water efficiency measures and the use of rainwater;
- 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;
- ensuring risks from potential climate change hazards, including pollutants (of air and land) are minimised to protect and promote healthy and safe environments;
- 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;
- protecting and integrating green infrastructure into urban areas, improving access to natural and managed green space; and
- promoting the potential contribution from ecosystem services that support adaptation to climate change.

1.3.11 Flood risk and drainage is further discussed within Chapter 3 of the Local Plan:

- 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.
- Provision of Sustainable Drainage Systems should be integrated with the delivery of green infrastructure and a net gain in biodiversity. These systems should be designed to maximise their multi-functionality and located away from catchments of sensitive designated features.
- Within Critical Drainage Areas all new development will utilise Sustainable Drainage Systems to reduce current runoff rates by creating additional water storage areas contributing to a reduction in flood risk downstream.
- The sustainable drainage scheme should incorporate water storage areas across the site, which can be integrated with the provision of new green infrastructure creating linkages with existing biodiversity networks in the area.

Policy ST09: Coast and Estuary Strategy

1.3.12 The integrity of the coast and estuary as an important wildlife corridor will be protected and enhanced. The importance of the undeveloped coastal, estuarine and marine environments, including the North Devon Coast Areas of Outstanding Natural Beauty, will be recognised through supporting designations, plans and policies. The undeveloped character of the Heritage Coasts will be protected.

1.3.13 Water quality will be improved where it has been affected by human activity.

1.3.14 Development within the Undeveloped Coast and estuary will be supported where it does not detract from the unspoilt character, appearance and tranquillity of the area, nor the undeveloped character of the Heritage Coasts, and it is required

because it cannot reasonably be located outside the Undeveloped Coast and estuary.

Torridge District Council Level 1 Strategic Flood Risk Assessment

1.3.15 The Torridge District Council in partnership with North Devon Council prepared the Level 1 Strategic Flood Risk Assessment (SFRA). The SFRA (North Devon Council and Torridge District Council, 2009) identifies and maps flood risk from all sources at a borough-wide scale as well as providing guidance on producing Site specific FRAs. Relevant information from the SFRA has been referenced throughout this FRA report.

1.3.16 Torridge District Council has also commissioned a SFRA Level 2 (Torridge District Council, 2010); a partnership approach has not been applied to this part of SFRA process. Relevant information has been referenced through this FRA report.

1.3.17 The Devon County Council, Surface Water Management Plan (Devon County Council, 2012) assesses the risk of surface water flooding within the local area and identifies options to manage risk to an acceptable level. Relevant information from the Surface Water Management Plan has been reproduced throughout this FRA report.

Climate Change Allowances

1.3.18 The NPPF sets out how the planning system should help to minimise the vulnerability and provide resilience to the impacts of climate change. The NPPF and supporting PPG on Flood Risk and Coastal Change explain when and how FRAs should be used. This includes demonstrating how flood risk will be managed now and over the Proposed Development's lifetime, taking climate change into account.

1.3.19 To ensure future development can provide a safe and secure living and/or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk to be accompanied by an assessment of flood risk to and from the development, taking into account the impacts of climate change.

Peak River Flow

1.3.20 In May 2022, the EA released its latest climate change allowances, which update the 2020 and 2011 versions of Adapting to Climate Change: Advice to Flood and Coastal Risk Management (EA, 2022). The EA has used the UKCP19 Projections to update the peak river flow allowances and have based them on management catchments instead of river basin districts.

1.3.21 **Table 1.4** below presents the anticipated increase in peak river flows for the North Devon Management Catchment over the coming decades. Three allowance categories are presented based on percentiles. A percentile describes the proportion of possible scenarios that fall below an allowance level.

1.3.22 The three types of allowances are:

- Central allowance: Based on the 50th percentile

- Higher central allowance: Based on the 70th percentile
- Upper end allowance: Based on the 95th percentile

Table 1.4: Peak River Flow Allowances by River Basin District

Management Catchment	Allowance Category	Total Potential change anticipated for '2020s' (2015 – 2039)	Total Potential change anticipated for '2050s' (2040 – 2069)	Total potential change anticipated for the '2080s' (2070-2115)
North Devon Management Catchment	Central	13%	19%	38%
	Higher Central	18%	27%	45%
	Upper End	28%	45%	80%

1.3.23 The Proposed Development is classified as 'Essential Infrastructure.' The Proposed Development is expected to be fully commissioned by 2033. The minimum operational lifetime of the Proposed Development is currently anticipated to be 50-years.

1.3.24 Parts of the Landfall, Onshore HVDC Cable Corridor and highway improvements are located within Flood Zone 2 and 3. An 18% uplift of fluvial flows to the Onshore HVDC Cable Corridor and highway improvements is calculated by the 2020's upper end epoch up until commissioning in 2033.

1.3.25 The permanent above ground infrastructure associated with the Onshore HVDC Cable Corridor is wholly located within Flood Zone 1. Due to the distance between this aspect of Proposed Development and the location of fluvial sources (Flood Zone 2 and 3) it is not assessed to become at risk from flooding due to the impacts of climate change on peak river flow during the development lifetime.

1.3.26 In terms of highways alterations, a 45% uplift of fluvial flows to the Onshore HVDC Cable Corridor and highway improvements is calculated by the 2020's upper end epoch up until commissioning in 2083.

Peak Rainfall Intensity

1.3.27 Increased rainfall affects surface water flood risk and how drainage systems need to be designed. In May 2022, the EA released revised peak rainfall climate change allowances, to also reflect the management catchment geography. The anticipated increases are provided in **Table 1.5** and demonstrate how peak rainfall allowances are projected to rise over the coming decades.

Table 1.5: Change to Extreme Rainfall Intensity compared/annual exceedance events

North Devon Management Catchment	Total Potential change anticipated for '2050s' (up to 2060)	Total potential change anticipated for the '2070s' (2062-2125)
Central Estimate	25%	30%
Upper Estimate	45%	50%

1.3.28 Runoff and attenuation calculations should take into account the above allowance for climate change, which is determined by the lifetime of the development as follows.

- Developments with a lifetime beyond 2100 must assess the upper end allowance for the 2070s epoch. The development should be designed to that there is no increased flood risk elsewhere and the development is safe from surface water flooding for the upper end allowance in the 1% Annual Exceedance Probability (AEP) rainfall event.
- Developments with a lifetime between 2061 and 2100 should consider the central allowance for the 2070s epoch.
- Developments with a lifetime up to 2060 should consider for the central allowance for the 2050s epoch.

1.3.29 Watercourses with catchments smaller than 3 km^2 are expected to respond to rainfall events. Therefore, the impacts of climate change to small watercourses with catchments under 3 km^2 have been assessed using increases in peak rainfall intensity rather than peak river flow.

1.3.30 The converter stations have an anticipated minimum operational lifetime of 50 years. It is likely that this operational lifetime could be extended through refurbishment and the replacement of equipment, rather than decommissioning. Therefore, the 2070s central estimate (for developments with a lifetime of between 2061 and 2125) of 30% is considered to be acceptable.

1.3.31 It is noted the Outline Operational Drainage Strategy (document reference 7.22) incorporates a 50% climate change uplift based on the Upper End allowance for the 2070's epoch. The percentage uplift to be used within Converter Site drainage strategy calculations is greater than the standard uplift detailed within the above paragraph and as a result, the drainage network has been designed to accommodate a greater volume of surface water than required as standard.

Sea Level Rise

1.3.32 The EA expects sea level rise to increase flood risk in coastal locations. **Table 1.6** presents the anticipated sea level rise for given timeframes associated with climate change for the South West River Basin District. There are a range of allowances for each river basin district and epoch for sea level rise.

Table 1.6: Sea level allowances for each epoch in mm for each year

River Basin District	Allowance category	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (m)
South West	Higher Central	5.8 (203)	8.8 (264)	11.7 (351)	13.1 (393)	1.21
	Upper End	7 (245)	11.4 (342)	16 (480)	18.4 (552)	1.62

Sea level allowances for each epoch (mm) for each year are based on a 1981 to 2000 baseline – the total sea level rise for each epoch is in brackets.

1.3.33 The Landfall at Cornborough Range would be constructed using trenchless techniques (i.e. HDD) under the seabed and shoreline, pulling the offshore cables (from the sea towards the land) through underground ducts and connecting to the

onshore cables at the transition joint bays. The Landfall HDD crosses underneath the extents of Flood Zone 2 and 3 associated with coastal flooding and the transition joint bays are to be located at the top of the Cornborough Range, at approximately 12 meters Above Ordnance Datum (m AOD) and within Flood Zone 1. It is understood the duration of works will be 18 months in the initial phase, with a further six months following a gap in Landfall works.

1.3.34 Using the 'Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018)' the T200 and T1,000 sea levels for chainage 216 closest to the landfall are 5.62 m AOD and 5.74 m AOD respectively. Based on the upper end allowance projected sea level rise between 2018 and 2033 of 68.4 mm, it has been assessed the area of construction and the temporary construction compound will not be affected by sea level rise during the 200 and 1,000-year tidal events.

Credible maximum climate change scenario

1.3.35 In line with NPS EN-1 guidance, the Applicants should demonstrate proposals can be adapted over the predicted lifetimes to remain resilient to a credible maximum climate change scenario.

1.3.36 H++ is the credible maximum scenario for sea level rise to 2100 and informed by including a 1.9 m allowance onto the design flood level.

1.3.37 The Upper Estimate peak river flow allowance is used as the credible maximum design scenario for fluvial flood risk.

1.3.38 Further discussion regarding the H++ assessment is presented within **Paragraphs 1.5.35, 1.6.80** and **1.6.82**.

1.4 Consultation

1.4.1 Throughout the EIA process, consultation and engagement (in addition to scoping and section 42 consultation) with interested parties specific to hydrology and flood risk has been undertaken.

1.4.2 A summary of the key items raised specific to hydrology and flood risk is presented in **Table 1.7,** together with how these issues have been considered in the production of this FRA.

Table 1.7: Summary of consultation relevant to this chapter

Date	Consultee and type of response	Issues raised	How and where considered in the ES
5 January 2024	South West Water email consultation	No public sewers are located within proximity to the Converter Site and Alverdiscott Substation Connection Development.	Information has been incorporated within this FRA. The Alverdiscott Substation Connection Development does not form part of the Proposed Development but has been considered cumulatively in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
5 January – 13 March 2024	EA freedom of information request	To inform flood risk to the Onshore Infrastructure Area, we requested Product 4, 5, 6 and 8 data from the EA Partnership and Strategic Overview Team (East) (FOI/EIR Ref: 346828 and 340734) under an Open Government Licence. This included the following datasets: • Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018); • Weare Gifford model (2019); • Devon Tidal Flood Zone Improvements model (2012); and • JFLOW data (2007).	Data was taken forward and presented within the first EWG meeting on the 8 April explaining data limitations and proposing ways forward. Data was then incorporated within this FRA.
5 January 2024	LLFA email consultation	Flood risk information request within proximity to the proposed permanent development associated with the converter site and Alverdiscott Substation Connection Development.	Information has been incorporated within this FRA. The Alverdiscott Substation Connection Development does not form part of the Proposed Development but has been considered cumulatively in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
8 April 2024	EWG consultation meeting	Approach to Volume 2, Chapter 3: Hydrology and Flood Risk of the ES, including; • Identified receptors • impacts scoped in and out • mitigation measures currently proposed Flood risk data limitations and discussions of ways forward.	Initial comments have been incorporated within this FRA. A technical note was prepared outlining the approach to flood risk discussed within the meeting. Outcomes from the technical note

Date	Consultee and type of response	Issues raised	How and where considered in the ES
			have been incorporated at the ES stage of the Proposed Development.
24 June 2024	EA Section 42 Response	Vol. 1, Appendix 3.2: Outline Onshore CEMP Issue - Measures to manage pollution risks have not been established. Impact - Risk of detrimental impact on the environment. Failure to consider measures at an early stage increases the risk that the project encounters issues with treatment during the construction phase. Solution - Provide an Outline Pollution Prevention Plan and Outline Construction Drainage Strategy which incorporates mitigation to limit the impacts from contaminated runoff. The Outline Construction Drainage Strategy should assess the efficacy of proposed surface water treatment systems and should ensure that sufficient space for treatment is provided within the proposed red line boundary.	Noted. The Outline On-CEMP (document reference 7.7) has been updated to include the management of pollution risk. An Outline Pollution Prevention Plan also considers the management of pollution risk, which forms part of the DCO application (document reference 7.7, Appendix A).
24 June 2024	EA Section 42 Response	Vol. 1, Appendix 3.2: Outline Onshore CEMP Issue - The risks of construction on existing flood defences have not been adequately addressed. Impact - The risk of flooding to the surrounding area and to the construction works may be increased and opportunities for flood risk mitigation may be overlooked. Solution - The CEMP should include consideration of flood risk: - Plans for the storage of construction materials outside of the flood zone - Flood defence vibration monitoring - Surveys for any works close to a flood defence to better understand defence's geometry, condition, composition and structure. (If appropriate) details of any construction phasing to ensure there is no loss in flood storage at any point during construction.	Plans for the storage of construction materials outside of the flood zone have been incorporated within the Outline On-CEMP (document reference 7.7) submitted as part of the DCO application.
24 June 2024	EA Section 42 Response	Vol 2, Chapter 3: Hydrology and Flood Risk Issue - The drainage strategy for operational drainage from the Converter Site and Substation has not been provided. Impact - Risk of detrimental impact on the environment from contaminated drainage (including spills and firewater). Solution - The Outline Operational Drainage Strategy should detail the mitigation measures that will minimize the risks to water quality. These	Noted. Additional details regarding water quality and pollution treatment are provided within the Outline Pollution Prevention Plan (document reference 7.7, Appendix A) and the Outline On-CEMP (document

Date	Consultee and type of response	Issues raised	How and where considered in the ES
		must be sufficient to reduce the risk of pollution from spills, or from firewater in the event of a fire.	reference 7.7) submitted as part of the DCO application.
24 June 2024	EA Section 42 Response	Vol 2, Chapter 3: Hydrology and Flood Risk Issue - The impact from surface water run-off from across the site has not been adequately assessed. Impact - Contaminated Surface water run-off can pose a significant risk to water quality and the environment. If it is not considered, then potential impacts could be underestimated, or the mitigation may be insufficient. Solution - The impact of surface water run-off across the site should be incorporated into the assessment. Additional Information the Outline Onshore CEMP, should include the following: • Details on how corrective action will be decided upon and actioned if non-compliance with the CEMP is identified. • Details on how contracts will be managed to ensure the principal contractor will adhere to the CEMP. • Monitoring and reviewing procedures that will allow the Applicant to maintain oversight of the principal contractor's compliance with the CEMP and other environmental mitigation.	Noted. An Outline Pollution Prevention Plan has been submitted as part of the DCO application (document reference 7.7, Appendix A). Furthermore, the Outline On-CEMP includes details on the outline construction drainage strategy, which forms part of the DCO application (document reference 7.7).
24 June 2024	EA Section 42 Response	Vol 2, Chapter 3: Hydrology and Flood Risk Issue - Flood risk has not been adequately assessed. There is no assessment to demonstrate that development will avoid the 1 in 100 year, (plus an allowance for climate change), flood extent. Impact - The future flood risk posed to/by the development may be underestimated resulting in insufficient flood risk mitigation measures. Solution - It must be demonstrated that no permanent above-ground development will be located within the 1 in 100yr fluvial flood extent, including an allowance for climate change. A lack of existing EA flood models should not be interpreted as a lack of fluvial flood risk. Where flood risk data, including climate change, does not exist, it is the responsibility of the developer to undertake this assessment and ensure there is sufficient data to inform their FRA.	RPS submitted a Technical Note to the EA in May 2024 detailing flood risk to the development and anticipated impacts from an increase in peak river flow and sea level rise as a result of climate change. The EA broadly agreed to the approach which has been further refined during the ES stage and submitted as part of the DCO application.

Date	Consultee and type of response	Issues raised	How and where considered in the ES
24 June 2024	EA Section 42 Response	Vol.2 Chapter 3: Hydrology and flood risk Issue - The requirement for consents/permits relating to dewatering activities has been identified as Tertiary mitigation. However, no other water demands anticipated during the construction have been identified. Consumptive uses of water during construction can include on-site concrete production, dust suppression, wheel washing, or potable/domestic supply to workforce on-site. Impact - Failure to identify all potential water supply demands and the associated licence requirements, can result in lengthy project delays due to the licence determination process. Solution - Provide assessment of the impacts of abstraction from surface/ groundwater (or the use of public water supply). Understanding potential restrictions affecting design will help to expedite the permitting process ahead of the construction phase.	Noted. Abstractions have been considered as a receptor within 'the impact of contaminated runoff on the quality of surface water and ground receptors'. No water abstractions are to be required as part of the Proposed Development.
24 June 2024	EA Section 42 Response	Additional Information Paragraph 4.15.1 states that intrusive ground investigations will be undertaken, and the findings will be used to verify the levels of risk and inform the requirement for any site remediation required. It goes on to say, in paragraph 4.15.2 that work will be carried out to, "identify the location and extent of Private Water Supplies as part of the work for the ES with further assessment as necessary". We welcome both recommendations. We are likely to request that a requirement regarding how unsuspected contamination is managed should be included in the Development Consent Order.	Noted.
24 June 2024	EA Section 42 Response	Vol.2 Chapter 3: Hydrology and flood risk Typographical error: PEIR Main Report, Volume 2, Chapter 3: Hydrology and Flood Risk – Table 3.7 says 'into' instead of 'out of' with regards to what has been scoped out of the assessment. Incorrect information: Volume 2, Appendix 3.1: FRA Paragraph 1.5.26 currently reads: 'The EA Flood Zones refer to the probability of flooding from rivers and sea in a given year, assuming no defences are in place and accounting for climate change'. This is incorrect as the Flood Zones do not account for climate change. This mistake is also repeated in Paragraph 1.6.22.	Noted. This has been amended.

1.5 Converter Site Flood Risk Assessment

Site Setting

Location

1.5.1 The proposed Converter Site is located across agricultural fields, to the west and northwest of the Alverdiscott Substation Site and approximately 2.5 km to the east of East-the-Water.

1.5.2 The total area for the proposed Converter Site including associated mitigation and land required for construction is approximately 39.5 ha. The proposed converter stations would be connected to the national grid through the construction and installation of the HVAC Cable Corridors.

1.5.3 A 1 km study area has been applied to the Converter Site for this assessment. The study area predominantly comprises agricultural land to the north, west and south. The Alverdiscott Substation Site is located within the eastern extent of the study area and Cleave Solar Farm is located to the southeast.

Topography

1.5.4 1:25,000 mapping indicates the Converter Site falls to the east from a high point of 144 m AOD upon the site's central western boundary to a low point along the central eastern boundary of 115 m AOD.

Existing Use

1.5.5 Land within the Converter Site consists of agricultural land and improved grassland, which is bordered by hedgerows across all boundaries, with two patches of woodland on the southeast boundary. A public highway is located beyond the Converter Site's western boundary.

1.5.6 A section of land within the Converter Site also includes permitted solar farm development, which is under construction at the time of writing.

Proposed Use

1.5.1 The proposed Converter Site would include two separated converter stations (Bipole 1 and Bipole 2), a main car park, a spare parts building, and a control access building, as well as a temporary construction laydown area during construction (see Volume 1, Figure 3.3: Converter Site Location Plan, of the ES). The proposed purpose-built converter stations will contain the electrical equipment required to convert the transmitted electricity from DC to AC, prior to the connection to the national grid. Each converter station would typically comprise the following:

- control building;
- harmonic filter;
- AC switch yard;
- transformers;

- valve hall and reactor building; and
- DC switch yard.

1.5.2 The design of the proposed Converter Site would require cut and fill earthworks to provide a suitable topography for development and landscape (e.g., visual screening) purposes. It would create a level construction platform, in which the converter stations would sit, as well as the creation of bunds to reduce the visual impact of the converter stations. Further information is provided within Volume 1, Chapter 3: Project Description of the ES.

1.5.3 The converter stations would be connected to the national grid via underground HVAC Cables at an anticipated Alverdiscott Substation Connection Development. Following engagement with NGET, the anticipated works for the Alverdiscott Substation Connection Development at the Alverdiscott Substation Site will not form part of the Proposed Development and will be taken forward by NGET.

1.5.4 The construction of the converter stations and associated landscaping would also require the alteration of the existing Alverdiscott Substation Site access road, which provides access to the site.

Decommissioning

1.5.5 For the electricity infrastructure only, the end of the operational lifetime is anticipated to be 50 years from date of full commissioning. In the event that the operational lifetime of the Proposed Development is not extended, decommissioning would take place. The decommissioning sequence would generally be the reverse of the construction sequence and involve similar types and numbers of vehicles, vessels and equipment. Therefore, it is likely that the effects of decommissioning on the environment would be no worse than those effects identified during the construction phase.

1.5.6 The Outline Decommissioning Strategy (document reference 7.17) sets out that onshore decommissioning plan(s) would be developed if decommissioning is required. An onshore decommissioning plan would be developed in a timely manner in consultation with the relevant consultees and prior to commencement of decommissioning. It would consider the latest best practice and new technologies, in preparation of decommissioning occurring.

1.5.7 The onshore decommissioning plan(s) would include an assessment of the need to remove above ground infrastructure and the decommissioning of below ground infrastructure. The plan would focus on details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The approach and methodologies to be implemented would be in accordance with the latest available guidance, legislation and any new technologies at the time of the Proposed Development's decommissioning.

1.5.8 If the operation of the Proposed Development does not continue beyond 50 years, the converter stations would be decommissioned. If complete decommissioning is required, then all the electrical infrastructure and buildings would be removed and any waste arising would be recycled or disposed of in accordance with the waste hierarchy and relevant regulations at the time of decommissioning. The Converter Site may be re-purposed for an alternate use (separately agreed and consented) or would be reinstated as far as possible to a suitable use, in accordance with the onshore decommissioning plan(s).

Site Visit

1.5.9 A site walkover of the Converter Site was undertaken on the 22 March 2023. The weather during the site visit was mixed with sunny intervals and showers, with generally good visibility.

1.5.10 During the site visit, it was noted that the ground was unseasonably wet with water standing in wheel ruts and marsh grass present indicating a high water table or impeded drainage. This is shown below in **Plate 1.1**.

Plate 1.1: Agricultural field adjacent to the existing Alverdiscott Substation

1.5.11 Aerial photographs also appear to show a comprehensive land drainage scheme which may have been installed to try and improve the quality of the land for agriculture. The discharge from the land drainage scheme appeared to be via a piped outfall with covers next to the adjacent cattle grid under which water could be heard running. This outfall will need to be traced but may link to the substation drainage network. The covers and cattle grid are shown in **Plate 1.2** below.

Plate 1.2: Covers and cattle grids at the proposed Converter Site

Hydrological Overview

1.5.12 Hydrological features within the Converter Site and associated study area is presented within **Figure 1.2.**

Main Rivers

1.5.13 There are no EA designated Main Rivers within the Converter Site or the associated study area.

1.5.14 The River Torridge is the nearest designated EA main river to the Converter Site located approximately 2.1 km to the southwest.

Ordinary Watercourses

1.5.15 OS mapping indicates there is an ordinary watercourse running to the east within the southern extent Converter Site, along a field margin. The on-site watercourse and a second watercourse 20 m to the Converter Site's southern boundary are unnamed and flow in an easterly then southerly direction, before joining another unnamed watercourse flowing south within the study area.

1.5.16 There are several additional watercourses within the 1 km study area; to the north there are three unnamed watercourses flowing north out of the study area and to the west there are two unnamed watercourses flowing westward out of the study area.

Other Hydrological Features

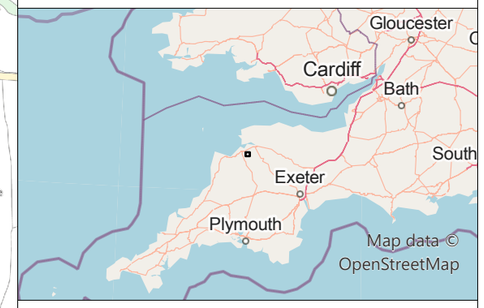
1.5.17 Gammaton reservoirs (north and south) are located approximately 800 m southwest of the converter site within the study area.

1.5.18 No significant other hydrological features (e.g., reservoirs and canals) have been identified within the study area.

Notes
1. This plan is scaled at paper size A3. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer
- Watercourses
- Surface Water



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Xlinks

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Hydrological setting for Converter Site

Status: FINAL

Scale @ A3: 1:11,000

Date Created: Nov 2024

Figure Number: **1.2**

Rev: **P01**

www.xlinks.co

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Designated Sites

1.5.19 There are no designated sites within the Converter Site. **Table 1.8** presents designated sites within the associated study area. Designated sites are shown in **Figure 1.3**.

Table 1.8: Designated sites within the Converter Site and associated 1 km study area

Designation type	Designated Site
Drinking Water Protected Area (Surface Water)	Gammaton Lower Reservoir (ID GB30844781)
	Gammaton Upper Reservoir (ID GB30844798)
Nitrate Vulnerable Zone	Jennetts reservoir Eutrophic lake (EL118)
	Gammaton Lower Reservoir Eutrophic lake (EL122)

Flood defences

1.5.20 The EA Spatial Flood Defences (including standardised attributes) dataset shows no formal flood defences are present within the Converter Site or associated study area.

Flood Warning/Alert

1.5.21 The EA monitors rainfall totals, river levels, and sea conditions to forecast the probability of flooding and provide a tiered warning system for specific areas when a flood event is forecast and/or occurring. Flood warnings are available to emergency responders, media outlets and the general public and provide information regarding flood vulnerability reduction measures to people located within Flood Warning Areas and Flood Alert Areas including evacuation methods.

1.5.22 The EA defines Flood Warning Areas and Flood Alert Areas as where flooding is expected to occur, generally from rivers and sea, and where a Flood Warning Service is provided. The Converter Site and associated 1 km study area is not located within a Flood Warning Area or Flood Alert Area (see **Figure 1.4**).

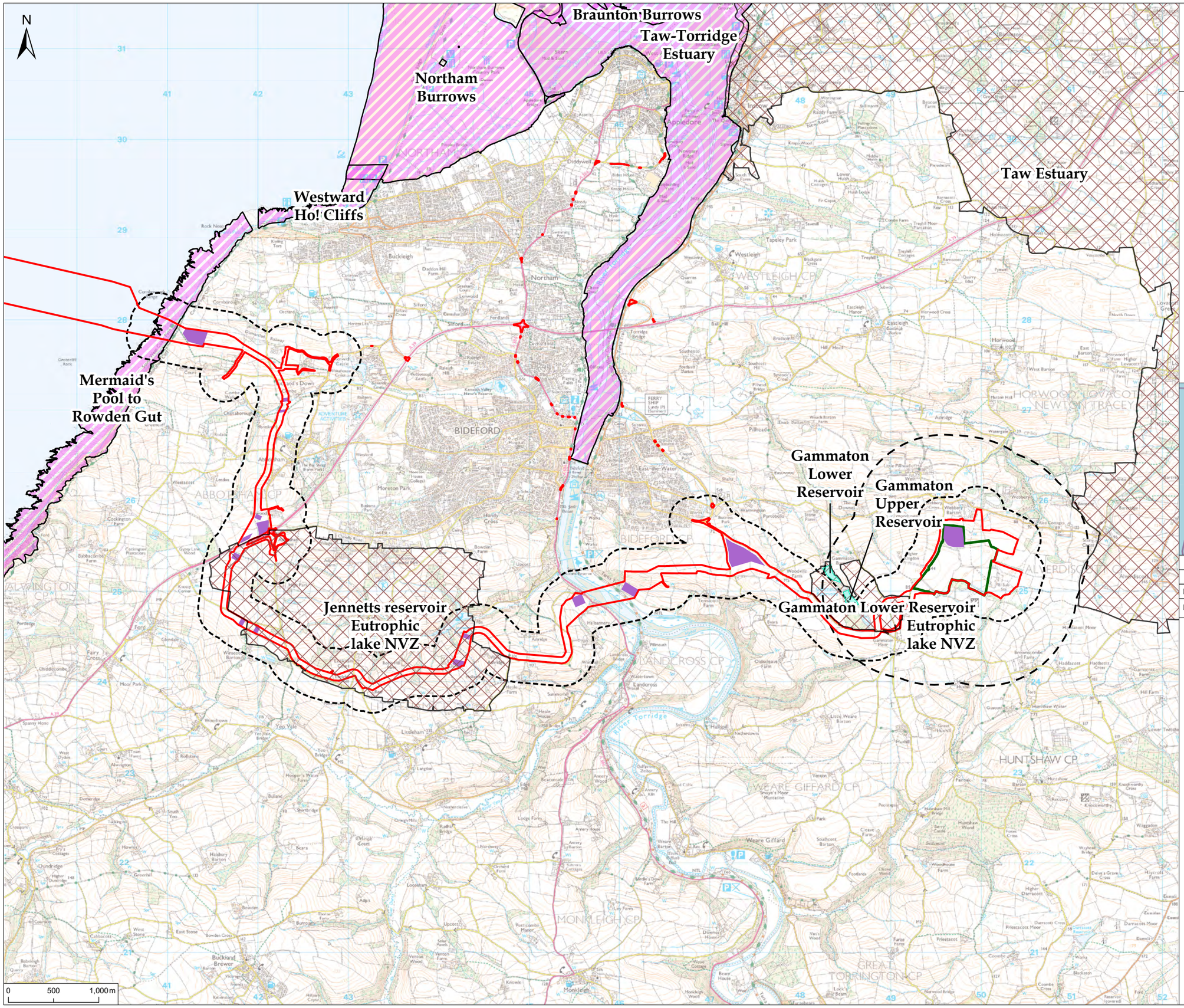
Hydrogeological Overview

Geological Setting

1.5.23 BGS Geoindex Onshore mapping (1:50,000 scale) indicates that the Converter Site is not underlain by superficial deposits. Within the study area, superficial deposits of Alluvium are present in areas adjacent to ordinary watercourses.

1.5.24 Bedrock geology for the Converter Site and associated study area is Bude Formation (mudstone) with bands of Bideford Formation (sandstone) and Bude Formation (Sandstone).

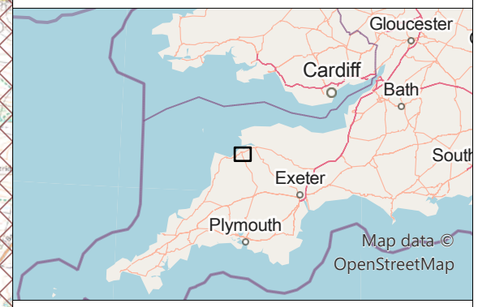
1.5.25 The geology of the Converter Site and associated 1 km study area is presented within **Figure 1.5** and **Figure 1.6.**



Notes
1. This plan is scaled at paper size A3. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer
- Site of Special Scientific Interest
- Nitrate Vulnerable Zone
- Drinking Water Protected Area



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Designated Sites

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.3**

Rev: **P01**

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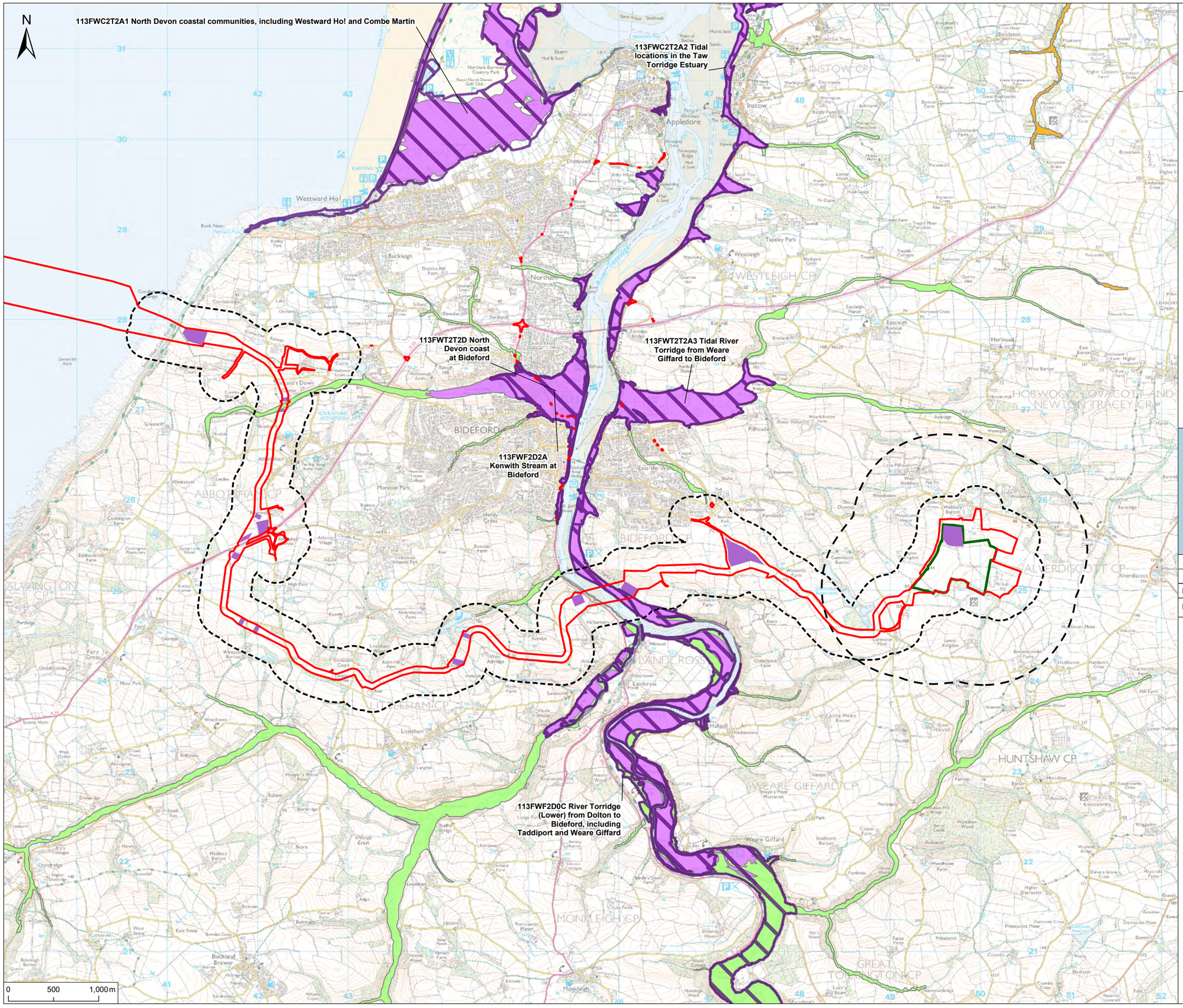


Notes

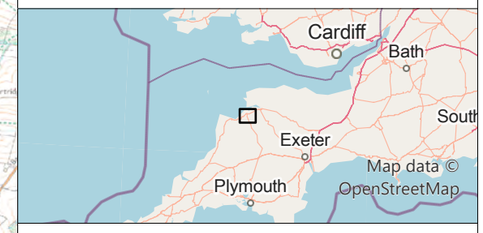
1. This plan is scaled at paper size A3. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer
- Flood Warning Areas

Flood Alert Areas

- 113WABTW02 - Lower Torridge area
- 113WACT2A - North Devon coast from Hartland Point to Lynmouth
- 113WAFTW03 - Lower Taw area



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Flood Warning Areas and Flood Alert Areas

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.4**

Rev: **P01**

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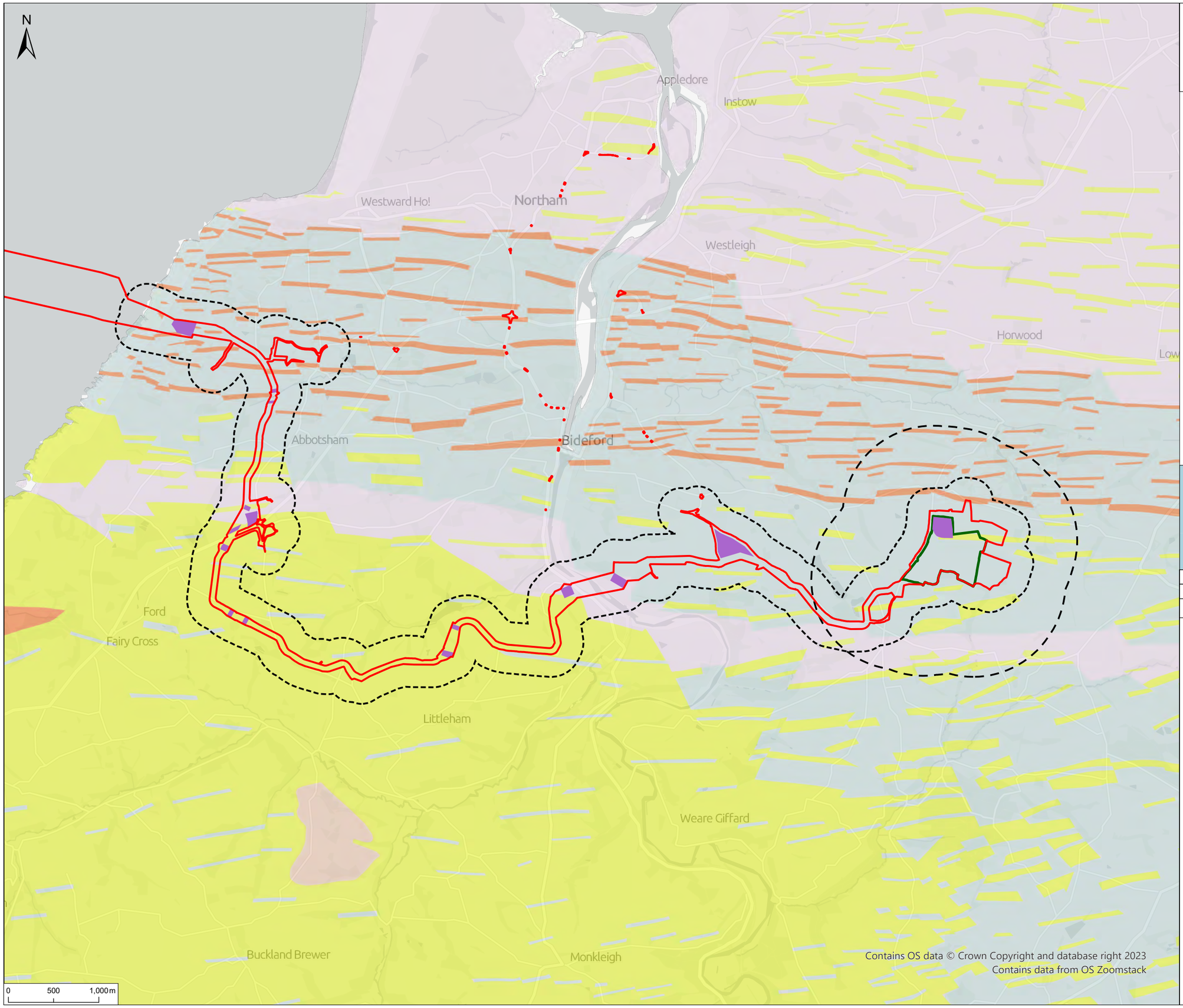


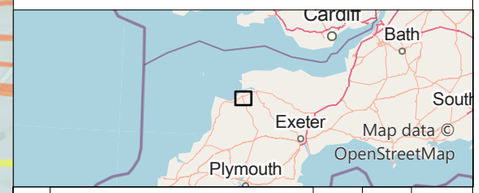
Notes
1. This plan is scaled at paper size A3. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer

Bedrock geology 1:50,000 scale

- CRACKINGTON FORMATION - MUDSTONE AND SILTSTONE
- ASHTON MUDSTONE MEMBER AND CRACKINGTON FORMATION (UNDIFFERENTIATED) - MUDSTONE AND SILTSTONE
- BUDE FORMATION - MUDSTONE AND SILTSTONE
- BIDEFORD FORMATION - MUDSTONE AND SILTSTONE
- CODDEN HILL CHERT FORMATION - MUDSTONE
- TOWER WOOD GRAVEL MEMBER - CLAY AND GRAVEL
- CRACKINGTON FORMATION - SANDSTONE
- CODDEN HILL CHERT FORMATION - CHERT
- EXETER GROUP - BRECCIA AND SANDSTONE, INTERBEDDED
- BUDE FORMATION - SANDSTONE
- BIDEFORD FORMATION - SANDSTONE



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Bedrock Geology

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.5**

Rev: **P01**

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N

0 0.5 1 km

Notes
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Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer

Superficial

- MARINE BEACH DEPOSITS - SAND AND GRAVEL
- STORM BEACH DEPOSITS - GRAVEL
- BLOWN SAND - SAND
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND
- RAISED BEACH DEPOSITS - SAND AND GRAVEL
- TORRIDGE RIVER TERRACE DEPOSITS, 1 MEMBER - GRAVEL, SAND AND SILT
- TILL, MID PLEISTOCENE - DIAMICTON

P01	FINAL	SHB	JT	14.10.24
Rev	Description	By	CB	Date

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Superficial Geology

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.6**

Rev: **P01**

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Groundwater

1.5.26 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight reports (2022) shows the Converter Site and associated study area has a 'negligible' and 'low' risk of groundwater flooding.

Aquifer Designation

1.5.27 According to the EAs Aquifer Designation Mapping, the alluvium superficial deposits within the study area are classed as a Secondary A Aquifer, these formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers.

1.5.28 The bedrock geology underlying the Converter Site and associated study area are also classified as a Secondary A Aquifer.

Source Protection Zone

1.5.29 EA online groundwater Source Protection Zone (SPZ) mapping indicates that the Converter Site and study area are not located within a groundwater SPZ.

Soils Classification

1.5.30 The soils underlying the Converter Site and associated 1 km study area consist of three soil types, the soils are described as the following by the National Soils Research Institute:

- freely draining slightly acid loamy soils within the northwest;
- slowly permeable seasonally wet acid loamy and clayey soils within the southeast; and
- Freely draining acid loamy soils over rock in the south.

Flood Risk Assessment

Fluvial/Tidal Flood Risk Classification

Flood Map for Planning

1.5.31 The EA Flood Zones refer to the probability of flooding from rivers and sea in a given year, assuming no defences are in place. Mapping does not account for climate change. Flood zone definitions are presented below within **Table 1.9**.

Table 1.9: Flood Map for Planning Flood Zones.

Flood zone	Flood zone definitions
Flood Zone 1	Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
Flood Zone 2	Land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
Flood Zone 3	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

1.5.32 The Flood Map for Planning is presented within **Figure 1.7,** indicates the majority of the Converter Site is located within Flood Zone 1, with a low risk of flooding from fluvial and tidal sources.

1.5.33 Areas of Flood Zone 2 and 3 associated with areas of fluvial flood risk are present within the study area. From a review of topography, extents of Flood Zone 2 and 3 from watercourses are located at least 200 m beyond the Converter Station would flow away and out of the study area. There is also a hydraulically isolated area of Flood Zone 2 and 3, 210 m to the north of the converter site study area, associated with a topographical low point.

Environment Agency Flood Model Data

1.5.34 EA modelled Product 5 and 6 data was requested for the Converter Site and associated 1 km study area. The EA provided model data outputs of the 2007 JFLOW Model, the 2012 Devon Hydrology Strategy and 2019 Weare Gifford Model.

1.5.35 The Converter Site and associated study area are not included within the undefended or defended flood scenario as indicated by the modelled fluvial tidal and depth maps, provided by the EA associated with the aforementioned models, including the climate change extents. As such, the Proposed Development is not considered to be at risk from increases in peak river flow, resulting from climate change, or the credible maximum climate change scenario.

Strategic Flood Risk Assessment Data

1.5.36 Information relevant from the North Devon and Torridge District Council Level 1 SFRA is summarised below:

- the Converter Site is located within Flood Zone 1; and
- the Converter Site was not present within any of the SFRAs historical flood outlines, due to the rural nature of the Converter Site location.

Summary

1.5.37 The Converter Site is located within Flood Zone 1 and due to the distance from fluvial and tidal sources, will remain within Flood Zone 1 for its development lifetime. As such, flood risk from fluvial and tidal sources is considered to be low.

Groundwater Flood Risk

1.5.38 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight report shows the Converter Site and associated study area has a 'negligible' and 'low' risk of groundwater flooding. The SFRA did not identify or outline any groundwater flooding event for the Converter Site location.

1.5.39 Although the site visit has indicated that the ground was unseasonably wet with water standing likely indicating a high water table or impeded drainage, given that the Proposed Development does not propose any subterrain development, the risk associated with groundwater flooding to the Proposed Development is classified as low.

N

Taw Estuary

Tributary Of The Torridge

Horwood Stream

Kenwith Stream

Tributary Of The Torridge

Jennetts Reservoir

River Torridge

Gammaton Reservoirs

Jennetts Stream

River Yeo

Yeo(bideford)

Tributary Of The Torridge

Tribuary Of Huntshaw Water

Taw Estuary

Duntz

Duntz

River Duntz

Huntshaw Water

River Torridge

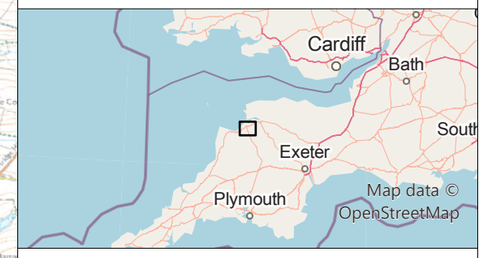
River Torridge

0 500 1,000m

Notes
1. This plan is scaled at paper size A3. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer
- Main Rivers
- Spatial Flood Defences
- Flood Zone 2
- Flood Zone 3



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Xlinks

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Flood Map for Planning

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.7**

Rev: **P01**

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Surface Water Flood Risk

1.5.40 The EA Risk of Flooding from Surface Water mapping is available online and identifies areas at risk of surface water flooding. Mapping is presented within **Figure 1.8** and the classification of the risk is presented within **Table 1.10.**

Table 1.10: Surface water flooding classification

Flood risk	Surface Water Flood Risk Definition
High risk:	The area has a chance of flooding of greater than 1 in 30 (3.3%) each year.
Medium risk	The area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%) each year.
Low risk	The area has a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%) each year.
Very low risk	The area has a chance of flooding of less than 1 in 1,000 (0.1%) each year

1.5.41 The EA surface water map indicates that the Converter Site has a 'very low' risk of surface water flooding. Upon the southern boundary of the Converter Site, there are two isolated areas of 'low risk' surface water. In all surface water flood risk scenarios, the depth is not expected to exceed 300 mm depth for the whole Converter Site. Flood risk from this source is assessed to be low.

1.5.42 The ordinary watercourse presents a 'low' to 'high' risk of flooding within an ordinary watercourse downstream within the study area. There is also an isolated area of surface water ponding within the study area. Mapping does not show these areas of flooding to be hydraulically connected to the Converter Site.

1.5.43 To assess an increase in peak rainfall intensities as a result of climate change, the 100-year + 30% climate change event should be assessed. This data is not readily available and therefore the 1,000-year surface water flood risk extent has been used as a conservative proxy to assess the risk up to the end of the development lifetime. The 1000-year extent presents several areas of isolated ponding within the Converter Site with modelled flood depths below 300 mm.

1.5.44 It is expected that flood risk from this source will be mitigated via proposed levels of the Converter Site, which will fall away from the permanent structures and direct surface water towards onsite drainage systems to provide a level of protection against water ingress. Flood risk from this source is therefore assessed to be low.

Reservoir Flood Risk

1.5.45 EA mapping indicates that the Converter Site and associated study area is not located within an area potentially at risk from reservoir flooding (see **Figure 1.9**).

1.5.46 Due to the regular inspection and maintenance regime in place on large reservoirs, the likelihood of catastrophic failure and therefore risk of flooding to the site from this source is unlikely to occur. Flood risk from this source is therefore assessed to be very low.

Sewer Flood Risk

1.5.47 Flooding from sewerage failure occurs when a rainfall event exceeds the maximum capacity of the surrounding network. The most common causes of

flooding from sewers are inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats/greases, and sewer collapse. Should any of these events occur, there is a risk of flooding within the vicinity of the sewer by surcharge where the flood is in excess of the sewer capacity (usually 1 in 30-year event or greater).

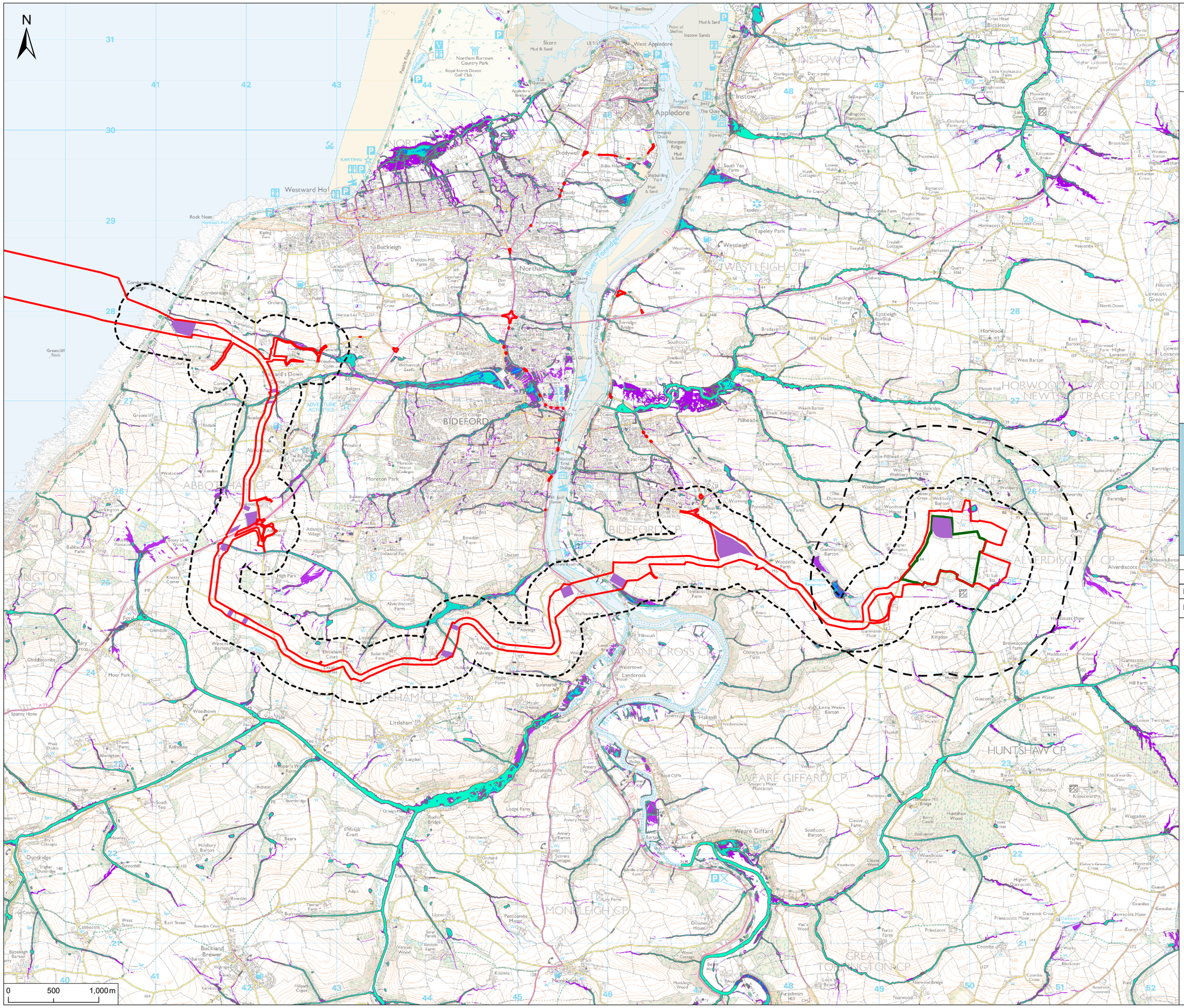
1.5.48 The current site is agricultural and therefore, unlikely to have drainage assets within the site. Mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES, are expected to include a utility survey to identify the location of both water pipelines and sewer assets which are to be taken forward within detailed design. This is expected to limit the potential impact on the surrounding sewer networks from any residual risk from this source. Flood risk from this source is therefore assessed to be low.

Historic Flooding

1.5.49 The EA has indicated via historic flood maps that the Converter Site and associated study area do not lie within an area that has a history of flooding. The historic flood map is presented in **Figure 1.10.**

Summary of Flood Risk

1.5.50 Overall, the Converter Site and associated study area is assessed to have a very low to low risk from all sources, including fluvial and tidal flooding.



Notes
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Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer

Risk Of Flooding From Surface Water

- 1 in 30 years
- 1 in 100 years
- 1 in 1000 years

Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Xlinks

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Surface water flood map for Order Limits

Status	Scale @ A3	Date Created
FINAL	1:40,000	Nov 2024

Figure Number: **1.8**

Rev: **P01**

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N

0 500 1,000 m

Notes
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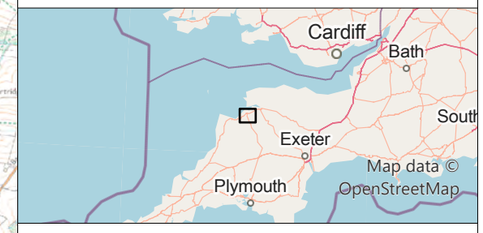
Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer
- Reservoir Flood Extents - Dry Day
- Reservoir Flood Extents - Wet Day



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Reservoir Flood Extents

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.9**

Rev: **P01**

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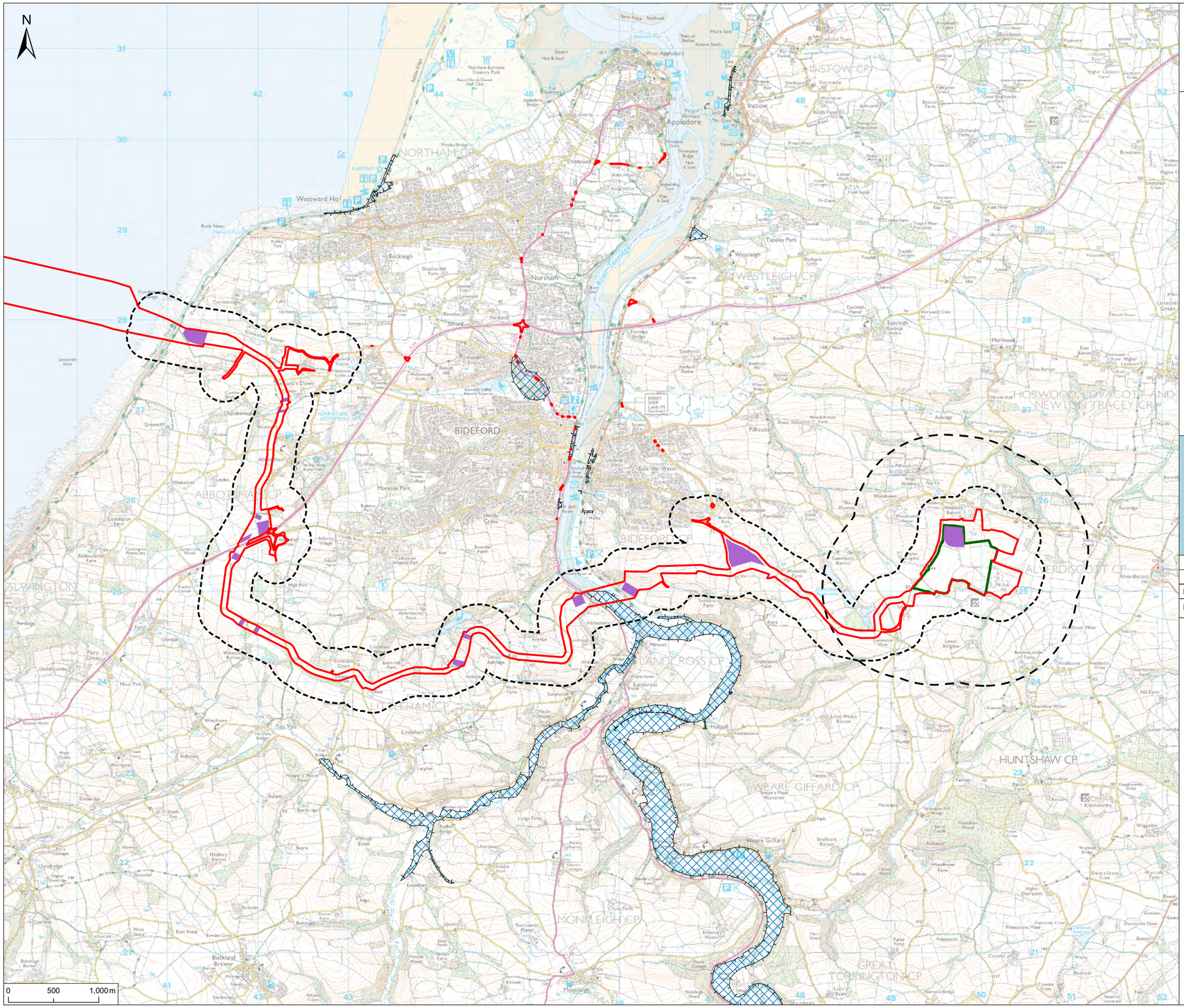

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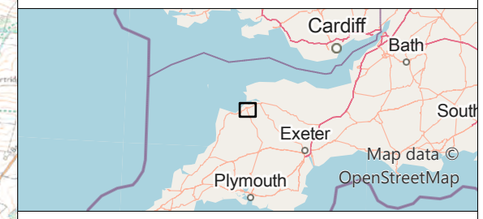
Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer
- Historic Flood Map



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Historic Flood Map

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.10**

Rev: **P01**

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Sequential Test and Exception Test

Site vulnerability

1.5.51 The NPPF requires the local authority to apply the sequential test in consideration of new development. The test aims to steer new development to areas with the lowest probability of flooding.

1.5.52 According to Appendix 3: Flood risk vulnerability classification of the NPPF, the Converter Site is classified as 'essential infrastructure' and, as such, is acceptable within Flood Zones 1 and 2 and within areas with a low risk of flooding from other sources. The exception test is required if development is proposed within Flood Zone 3.

Sequential test

1.5.53 The site selection process for the Converter Site is detailed within Volume 1, Chapter 4: Needs and Alternatives of the ES. A sequential approach has been applied to the Converter Site, whereby the converter station development platforms, temporary construction compound and associated access/egresses are located within Flood Zone 1 and have a low risk of flooding from all assessed sources. In relation to the Converter Site, the sequential test is considered to be passed.

Exception Test

1.5.54 'Essential infrastructure' developments are considered appropriate within Flood Zones 1 and 2 without the requirement to apply the exception test. Therefore, the application of the exception test is not required for the Converter Site.

Flood Risk Management

Proposed Mitigation

1.5.55 It is anticipated that proposed levels will fall away from the permanent structures proposed as part of the Converter Site and direct surface water towards onsite drainage systems, to provide a level of protection against water ingress.

Construction Environmental Management Plan

1.5.56 Construction of the Proposed Development would be managed through the On-CEMP(s) that set out the principles of good environmental management to be followed in order to avoid or minimise environmental impacts. This includes principles for the management of construction noise, dust, traffic, materials storage and waste management, drainage and ecological protection.

1.5.57 An Outline On-CEMP has been developed and has been submitted with the DCO application (document reference 7.7). The Outline On-CEMP would be developed into a final On-CEMP(s), which would be agreed with Torridge District Council prior to the commencement of construction. The final On-CEMP(s) shall include the measures set out in the Outline On-CEMP, together with any further detail available at that time.

1.5.58 The final On-CEMP(s) would be supported by detailed Construction Method Statements to be produced by the lead construction contractor(s), which would provide method statements for construction activities detailing how the requirements for the final On-CEMP(s) are met.

1.5.59 In a similar manner, a Construction Traffic Management Plan(s) (CTMP(s)) would be produced by onshore main works Contractors prior to the commencement of construction, based on the Outline CTMP (document reference 7.12) which will be developed and provided as part of the application for development consent.

Construction Drainage

1.5.60 The construction phase would incorporate pollution prevention and flood response measures to ensure that the potential for any temporary effects on water quality or flood risk are reduced as far as practicable.

1.5.61 Such measures would be implemented through the Pollution Prevention Plan that would be appended to the On-CEMP(s). An Outline Pollution Prevention Plan forms Appendix A to the Outline On-CEMP submitted as part of the application for development consent (document reference 7.7).

1.5.62 A Construction Drainage Strategy would be developed post-consent and in accordance with the Outline On-CEMP (document reference 7.7), which outlines the measures and details to be incorporated into the strategy. The Construction Drainage Strategy would incorporate pollution prevention and flood response measures to ensure that the potential for any temporary effects on water quality or flood risk are reduced as far as practicable during the construction stage.

1.5.63 Measures would include but not be limited to the following:

- installation of suitable facilities to remove material (e.g., mud and dust) from wheels;
- use of sediment fences along existing watercourses/waterbodies when working nearby to reduce sediment load;
- covers for lorries transporting materials to/from site to prevent releases of dust/sediment to watercourses/drains;
- bulk storage areas to be secured and provided with secondary containment (in accordance with the Oil Storage Regulations and best practice);
- storage of oils and chemicals away from existing watercourses, including drainage ditches or ponds;
- concrete to be stored and handled appropriately to prevent release into drains;
- treatment of any runoff water that gathers in the trenches would be pumped via settling tanks or ponds to remove any sediment;
- obtain consent/permit for any works (e.g., discharge of surface water, dewatering, etc.) that may affect surface water and/or groundwater. The conditions of the consent will be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial risk;
- use of a documented spill procedure and use of spill kits kept in the vicinity of chemical/oil storage;

- storage of stockpiled materials on an impermeable surface to prevent leaching of contaminants and use of covers when not in use to prevent materials being dispersed and to protect from rain; and
- stockpiles to be kept to minimum possible size with gaps to allow surface water runoff to pass through.

Dewatering

1.5.64 The groundwater removed by dewatering would be pumped to an appropriate location to allow any sediments present to be settled, prior to discharge to local surface watercourses or across ground away from the excavations.

1.5.65 In the event that trenches need dewatering, water from such activities would be discharged in agreement with Devon County Council and/or the Environment Agency to a local drainage ditch or watercourse and/or spread over ground. This would be undertaken in accordance with measures agreed through the On-CEMP and Pollution Prevention Plan.

Construction methods

1.5.66 In order to manage impacts to field drainage, the Outline On-CEMP (document reference 7.7) stipulates that the contractor will develop field drainage plans in consultation with the relevant landowners. If required, additional field drainage will be installed to ensure the existing drainage of the land is maintained during and after construction.

1.5.67 Land Drainage consents will be sought where required from the Devon County Council (as LLFA) in consultation with the EA.

1.5.68 An Outline Pollution Prevention Plan forms Appendix A to the Outline On-CEMP, which has been prepared as part of the application for development consent (document reference 7.7, Appendix A). Onshore PPP(s) would be developed in accordance with the Outline Pollution Prevention Plan and would include details of emergency spill response procedures. Good practice guidance detailed in the Environment Agency's Pollution Prevention Guidance notes and Construction Industry Research and Information Association (CIRIA) guidance would be followed where appropriate, or the latest relevant available guidance.

1.5.69 If ground surveys confirm presence of contamination, the construction of piled foundations would use mitigation measures as defined in the following guidance: Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (EA, 2001), or latest relevant available guidance.

1.5.70 Finally, it is anticipated that storage of fuels and chemicals will be within areas at low risk of flooding (Flood Zone 1). Refuelling of plant and equipment will only be permitted in designated refuelling areas within areas at low risk of flooding and will be undertaken using pumps to reduce spillage.

Converter Site Drainage Strategy

1.5.71 The Outline Operational Drainage Strategy has been submitted as part of the application for development consent (document reference 7.22).

1.5.72 The existing site is currently predominantly greenfield, aside from the permitted solar farm under construction. Surface water runoff arising from proposed

impermeable areas are to drain to attenuation basin SuDS features prior to discharging to a watercourse within the site boundary at the QBAR greenfield runoff rate. Additional SuDS features that could be implemented as part of the drainage strategy for the Converter Site are to be assessed at the detailed design stage. Due to underlying ground conditions, infiltration techniques are not expected to be feasible, subject to confirmation via further GI at the detailed design stage.

1.5.73 Surface water attenuation requirements include a 50% climate change allowance uplift.

1.5.74 Pollution mitigation is to be provided via oil interceptors and attenuation basin SuDS features. Any exceedance flows are to be stored on site to prevent an increase in flood risk downstream. Appropriate management and maintenance to the drainage network is to be undertaken throughout the operational phase of the development by a specialist management company, with details to be confirmed during the detailed design stage.

1.5.75 With the implementation of the above, it is demonstrated flood risk will not be increased elsewhere, accounts for the predicted impacts of climate change and ensures no reduction in floodplain capacity.

Converter Site Summary and Conclusions

Summary

1.5.76 A site-specific FRA in accordance with Section 5.7 of the NPS EN-1, the NPPF, and associated PPG has been undertaken for the Converter Site located to the west of Alverdiscott.

Flood Risk

1.5.77 In accordance with the guidance on development and flood risk, this FRA demonstrates that:

- The EA Flood Map for Planning shows that the Converter Site is located in Flood Zone 1 and has been assessed to have a low to very low risk of flooding from all assessed sources.
- The proposed Converter Site is defined as 'essential infrastructure' and is acceptable within Flood Zone 1 and 2 and is considered to pass the Sequential Test. The Exception Test is not considered to be required.

Surface Water Drainage

1.5.78 A surface water drainage strategy for the Converter Site has been prepared. Proposed discharge rates for the Converter Site as a whole will be restricted to the QBAR greenfield runoff rate for all storms up to and including the 1 in 100 year + 50% climate change storm event.

Conclusion

The FRA and supporting documentation demonstrate that the Converter Site meets the requirements of the NPS, the NPPF and the associated PPG.

1.6 Onshore Infrastructure Area Flood Risk Assessment

Site Setting

Location

1.6.1 The Onshore Infrastructure Area is located on the southwest coast of England. The study area coincides with the Torridge District Council Local Planning Authority area.

1.6.2 The Onshore Infrastructure Area is presented within **Figure 1.1**. A 250 m study area has been applied to the Onshore Infrastructure Area for this assessment. The study area runs from the coast at Cornborough Range and trends counterclockwise around Bideford before routing eastwards, crossing the River Torridge and terminating at the existing Alverdiscott Substation Site to the west of Alverdiscott.

1.6.3 Whilst the Converter Site is included within the Onshore Infrastructure Area, it is considered within the previous section, and, as such, the Converter Site is not considered further in this section.

Existing Use

Landfall

1.6.4 The Landfall is located to the southwest of Cornborough, at Cornborough Range. This location comprises a natural and wide, substantially dry valley with a natural shingle bar as shown below in **Plate 1.3**.

1.6.5 The extent of the Landfall crosses the Mermaid's Pool to Rowden Gut geological Special Site of Scientific Interest (SSSI). The designated coastal section exposes the only complete sequence available through the Bideford Formation which is a localised development of fluvio-lacustrine 'Coal Measure' type deposits.

1.6.6 The beach profile provides an informal flood defence inland against tidal flooding. There are no formal flood defences along this part of the coast, with much of the coast here being cliffs. The North Devon and Somerset Shoreline Management Plan classifies this section of coastline to have no active intervention; a decision not to invest in providing or maintaining defences due to the lack of requirement to protect property and infrastructure.

1.6.7 An ephemeral ordinary watercourse is noted within the Order Limits, intermittently discharging flows directly to Bideford Bay during and following rainfall events. The watercourse is shown within the left extent of **Plate 1.3**.

Plate 1.3: Landfall at Cornborough Range

1.6.8 It should be noted that this valley is the lowest part of the coast around and also hosts the discharge pipe for treated sewage from the South West Water Cornborough Waste Water Treatment Plant located nearby. This is further noted with the marker post for the pipeline being visible on the coast path as shown within **Plate 1.4**.

Plate 1.4: South West Water Cornborough Waste Water Treatment Plant Pipeline

Lower Dunn Farm

1.6.9 The Onshore HVDC Cable Corridor passes immediately to the south of Lower Dunn Farm and to the north of the spring that feeds the farm.

1.6.10 It is understood that there is a gravity connection from the well directly to the farmhouse and that this also feeds by gravity several drinking troughs across the farm. These other connections cross the pipeline route several times and whilst they are not marked, the property owner is aware of the locations.

1.6.11 The principal concern is damage to the connections that cross the Onshore HVDC Cable Corridor as this would both drain and cut off the water supply to both the farmhouse and the livestock.

1.6.12 The owner requested that these connections be surveyed, marked, and replaced in ducting as part of the Proposed Development and to ensure that they remain in a serviceable condition.

Ashridge Farm

1.6.13 The Onshore HVDC Cable Corridor passes immediately to the south and east of Ashridge Farm with the springs feeding the farm being to the north of the Onshore HVDC Cable Corridor close to the farmhouse.

1.6.14 To the northeast of the farm there is an unused water supply borehole which is understood to be licenced to supply water to the farm. This is clearly marked and visible in the field and at the time of writing potentially conflicts with the cable route. Further review of this conflict is required.

River Torridge

1.6.15 Land owned by Ashridge Farm runs steeply down to and adjacent to the A386 Bideford Road. Whilst there is land drainage in this field the land is very wet and there is reported sheet runoff to towards the A386. At lower flows this is captured in a culvert that runs under the A386 as shown within **Plate 1.5**. It is understood this watercourse and the A386 will be crossed by HDD techniques.

Plate 1.5: Culvert which runs under the A386

Proposed Use

1.6.16 For the purpose of this FRA, the maximum design scenario for the Proposed Development is identified within Volume 1, Chapter 3: Project Description of the ES, and summarised below within **Table 1.11**.

Table 1.11 Maximum design scenario within the Onshore Infrastructure Area considered for the FRA

Construction phase	
Landfall	• Construction works at the Landfall comprise an initial 18 months of works, with a space between the second phase

Construction phase	
	of works. The second phase of works at the Landfall would continue for a further six months.
	• Offshore and onshore HVDC cables are to come ashore via HDD and jointed together at transition joint bays. The Landfall Horizontal Directional Drilling (HDD) has a maximum length of 2,110 m from the exit pit to the transition joint bays. There is a maximum of 2 transition joint bays, each 750 m^2 with a cover depth of 2.5 m. The HDD has with 4 entry pits and 4 exit pits, each with an area of 25 m^2 and a depth of 3 m. The volume of excavated material per exit pit will be 75 m^3.
	• A 10,000 m^2 Landfall compound is expected to be present for a duration of 36 months.
Onshore Cable Corridors	• The temporary and permanent Onshore HVDC Cable Corridor width is 65 m with a length of up to 14.5 km. The temporary and permanent width of the HVAC cable corridor would be 65 m, with a length of up to 1.2 km.
	• The expected construction duration for the Onshore HVDC Cable Corridor is up to 36 months. The expected construction period for the Onshore HVAC Cables is a total of 12 months.
	• The maximum number of cable trenches for Onshore HVDC Cable Corridor will be 2 with an approximate trench width at ground level of 4.3 m and depth of 1.4 m. The maximum number of cable trenches for the Onshore HVAC Cable Corridor will be 4 with an approximate trench width at ground level of 4.9 m and a depth of 1.4 m.
	• In regard to HDD, the maximum number of HDD locations will be 6 (including Landfall) along the Onshore HVDC Cable Corridor with two compounds per HDD, each with an area of 10,000 m^2. Duration of installation of up to 36 months.
	• Within the Onshore HVDC Cable Corridor, there will be up to 34 joint bays, each with an area of 100 m^2 and a depth of 1.4 m. The distance between jointing bays would be between 800 and 1,100 m.
	• Within the Onshore HVDC Cable Corridor, there will be up to 34 link boxes each with an area of 2.25 m^2 and a depth of 1.4 m. The distance between link boxes would be between 800 and 1,100 m.
	• The main construction compound at Gammaton Road is to have an area up to 63,000 m^2 and is expected to be present for a duration of 72 months.
	• A secondary construction compound (A39 compound) is to have an area up to 48,000 m^2 and is expected to be present for a duration of 36 months.
	• Dimensions of temporary culvert/bridge crossings for the haul road will be a maximum 3 m in diameter and 10 m in length
Highways Improvements	• Temporary widening of Gammaton Road between Manteo Way and the Gammaton Road compound access. • Permanent widening along Gammaton Road in selective locations (south side only).

Construction phase	
	• Reserved rights to install a temporary junction west of Gammaton Moor Crossroads and a section of private temporary track connecting Gammaton Road with the unnamed road to the Converter Site. • Permanent widening of the unnamed road north of Gammaton Crossroads towards the Converter Site access. • Creation of accesses to Onshore HVDC Cable Corridor construction sites including: – Sewage Treatment Works access road: expanded junction and widened private track. – A39 West: A compound access will be created off the unnamed road to Abbotsham approximately 120m west of the A39 Abbotsham Cross roundabout. – A39 East: A site access will be created on the unnamed road towards Littleham approximately 165m south of Clovelly Road. – A386: this includes the improvement of an existing junction along the A386 with an unnamed road towards Littleham. – Gammaton Road Compound: a new access will be created approximately 70 m east of Tennacott Lane.
Operation and maintenance	
Landfall	• Two transition joint bays: A total area of 300 m^2 (150 m^2 each)
Onshore cable corridor	• 34 joint bays: An area of 100 m^2 per joint bay.
	• 34 link boxes: An area of 2.25 m^2 per link box.
Decommissioning	
Landfall	• The cables within the Landfall HDD will be pulled out at the landward end and recycled.
Onshore HVDC and HVAC cables	• HVDC and HVAC Cables may be recovered and removed by pulling the cables through the ducts (e.g., for recycling). Otherwise, they will be left in place in the ground with the cable ends cut, sealed and securely buried as a precautionary measure.
	• Cable ducts, joint bays and link boxes would be left *in-situ*, to minimise environmental disturbance.
Highways Improvements	• Highways improvements would not have a forecast end life and would not be decommissioned.

Decommissioning

1.6.17 For the electricity infrastructure only, the end of the operational lifetime is anticipated to be 50 years from date of full commissioning. In the event that the operational lifetime of the Proposed Development is not extended, decommissioning would take place. The decommissioning sequence would generally be the reverse of the construction sequence and involve similar types and numbers of vehicles, vessels and equipment. Therefore, it is likely that the effects of decommissioning on the environment would be no worse than those effects identified during the construction phase.

1.6.18 The Outline Decommissioning Strategy (document reference 7.17) sets out that onshore decommissioning plan(s) would be developed if decommissioning is required. An onshore decommissioning plan would be developed in a timely manner in consultation with the relevant consultees and prior to commencement of decommissioning. It would consider the latest best practice and new technologies, in preparation of decommissioning occurring.

1.6.19 The onshore decommissioning plan would include an assessment of the need to remove above ground infrastructure and the decommissioning of below ground infrastructure. The plan would focus on details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The approach and methodologies to be implemented would be in accordance with the latest available guidance, legislation and any new technologies at the time of the Proposed Development's decommissioning.

1.6.20 If the Proposed Development is required to be decommissioned, the underground electricity (HVDC and HVAC) cables would be decommissioned. HVDC and HVAC Cables may be recovered and removed by pulling the cables through the ducts (e.g., for recycling). Otherwise, they would be left in place in the ground with the cable ends cut, sealed and securely buried as a precautionary measure. Cable ducts, joint bays and link boxes would be left *in-situ*, to minimise environmental disturbance. The highways improvements would not have a forecast end of life and would not be decommissioned.

Hydrological Overview

Main Rivers and Sea

1.6.21 A review of published OS maps and EA data within the study area shows the River Torridge, a designated Main River, bisects the central extent of the study area and is presented in **Figure 1.11**. The river discharges to the Taw and Torridge Estuary prior to discharging to Barnstaple Bay, where the landfall is located.

1.6.22 The River Torridge is considered tidally influenced, with the normal tidal limit located at Weare Gifford, upstream of the study area.

1.6.23 The River Torridge is to be crossed via trenchless techniques.

Shoreline Management Plan

1.6.24 Shoreline Management Plans set out the strategic approach to managing the coastline over a short, medium, and long temporal scale.

1.6.25 The study area is located within the Shoreline Management Plan 2 North Devon and Somerset. The landfall is located within subcell 7C05 'Clovelly to Westward Ho! (Seafield House)' and the Onshore HVDC Cable Corridor crosses sub cell 7C12 'Taw/Torridge Estuary'. Management approaches within the cell are included below in **Table 1.12.**

Table 1.12: SMP Management Approaches

		Policy and approach		
Policy unit	**Policy name**	**2005 – 2025**	**2025 – 2055**	**2055 – 2105**
7C05	Clovelly to Westward Ho!	No Active Intervention – Local Activity Only	No Active Intervention – Local Activity Only	No Active Intervention – Local Activity Only
7C12	Taw/Torridge Estuary	No Active Intervention – Local Activity Only	No Active Intervention – Local Activity Only	No Active Intervention – Local Activity Only

Ordinary Watercourses

1.6.26 Ordinary watercourses are also present within the study area presented within **Figure 1.11** and include the following:

- River Yeo.
- Kenwith Stream (to be crossed via trenchless techniques at easting 242290.3943, northing 127048.7285). From FEH catchment mapping, this watercourse has an approximate catchment of 1.95km^2 where the watercourse is crossed.
- Several tributaries of Jennetts Reservoir and its associated outflow:
  - The headwaters to a tributary directly the south of the A39 (to be crossed via trenchless techniques at easting 243799.0529, northing 124116.4925 and assessed to comprise a dry ditch at the crossing location within the Phase 1 habitat survey (Volume 2, Appendix 1.1: Phase 1 Habitat Survey of the ES).
  - A tributary located within Littleham Wood (to be crossed via trenched techniques at easting 243799.0529, northing 124116.4925). From FEH catchment mapping, this watercourse has an approximate catchment of 0.23 km^2.
  - A tributary to the south of Jennnetts Reservoir (to be crossed via trenchless techniques at easting 244272.5098, northing 124343.7668) From FEH catchment mapping, this watercourse has an approximate catchment of 0.49 km$^{2.}$

1.6.27 The majority of ordinary watercourses within the study area form tributaries of the River Torridge. Ordinary watercourses present in closest proximity to the coast outfall directly to Barnstaple Bay.

1.6.28 It is noted the River Yeo within the study area is shown to be tidally influenced within the study area, with the normal tide limit located upstream of the study area. The downstream most section of the outfall to Jennetts Reservoir is also noted to be tidally influenced.

1.6.29 The Phase 1 habitat survey (Volume 2, Appendix 1.1: Phase 1 Habitat Survey of the ES) recorded a dry ditch directly to the south of the A39.

Other Hydrological Features

1.6.30 Jennetts Reservoir and the Gammaton Reservoirs are additionally present within the study area in addition to Bideford and District Angling Club Lake and several unnamed ponds. These features are presented within **Figure 1.11.**

1.6.31 Jennetts Reservoirs discharges to the River Torridge. Gammaton Reservoirs discharge to Horwood Stream which in turn outfalls to the River Torridge.

N

Taw Estuary

Tributary Of The Torridge

Tributary Of The Torridge

Horwood Stream

Kenwith Stream

Tributary Of The Torridge

Horwood Stream

Horwood Stream

Gammaton Reservoirs

Taw Estuary

Jennetts Reservoir

Jennetts Stream

River Torridge

River Yeo

Tributary Of The Torridge

Tributary Of The Torridge

Tribuary Of Huntshaw Water

Yeo(bideford)

Huntshaw Water

Duntz

Duntz

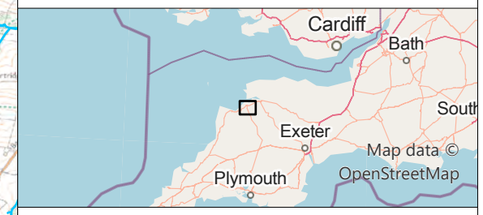
River Duntz

0 500 1,000m

Notes
1. This plan is scaled at paper size A3. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Legend

- Order Limits
- Converter Site
- Construction Compound
- 250m Cable Route Buffer
- 1km Converter Site Buffer
- Watercourses
- Surface Water



Rev	Description	By	CB	Date
P01	FINAL	SHB	JT	14.10.24

Xlinks

Client: Xlinks 1 Limited

Project: Xlinks' Morocco-UK Power Project

Title: Hydrological Setting

Status: FINAL

Scale @ A3: 1:40,000

Date Created: Nov 2024

Figure Number: **1.11**

Rev: **P01**

www.xlinks.co

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Internal Drainage Board

1.6.32 The study area is not located within an Internal Drainage Board and therefore no further assessment is required.

Designated Sites

1.6.33 The Landfall crosses the Mermaid's Pool to Rowden Gut geological SSSI. The Taw-Torridge Estuary biological SSSI is also located within the study area. Additional designated sites within the study area are listed in **Table 1.8** and presented in **Figure 1.3**.

Flood defences

1.6.34 The EA Spatial Flood Defences (including standardised attributes) mapping shows the presence of the following flood defences within the study area. Formal flood defences are present along either bank of the River Torridge. Defences and associated attributes are listed below in **Table 1.13** and presented in **Figure 1.7.**

Table 1.13: Flood Defences

Asset ID	Asset Maintainer	Description	Design Standard of Protection	Condition
5010	Private individual, Company or Charity	Bridge Abutment	5	Unknown
57005	Private individual, Company or Charity	Natural High Ground	3	Unknown
57006	Private individual, Company or Charity	Natural High Ground	5	Unknown
57211	Private individual, Company or Charity	Natural High Ground	5	Unknown
87999	Private individual, Company or Charity	Natural High Ground	100	Unknown
57402	Local Authority	Embankment	200	Unknown
57255	Private individual, Company or Charity	Embankment	5	Unknown
57230	Private individual, Company or Charity	Natural High Ground	100	Unknown
57223	Private individual, Company or Charity	Embankment	5	Unknown
57211	Private individual, Company or Charity	Natural High Ground	5	Unknown
57210	Local Authority	Wall	200	Unknown
57209	Environment Agency	Wall	20	3

Asset ID	Asset Maintainer	Description	Design Standard of Protection	Condition
56844	Environment Agency	Embankment	100	2
56836	Private individual, Company or Charity	Natural High Ground	5	Unknown
56285	Private individual, Company or Charity	Wall	100	Unknown
5541	Private individual, Company or Charity	Wall	Unknown	Unknown
526654	Environment Agency	Engineered High Ground	Unknown	3
526614	Environment Agency	Engineered High Ground	Unknown	3
526584	Environment Agency	Engineered High Ground	Unknown	3
526575	Environment Agency	Engineered High Ground	Unknown	2
5013	Local Authority	Embankment	200	Unknown
4897	Local Authority	Engineered High Ground	100	Unknown
4349	Local Authority	Natural High Ground	100	Unknown
4348	Local Authority	Embankment	100	Unknown
4347	Local Authority	Wall	200	Unknown
4299	Local Authority	Wall	100	Unknown
40713	Local Authority	Bridge Abutment	200	Unknown
40370	Environment Agency	Natural High Ground	100	3
40369	Private individual, Company or Charity	Natural High Ground	100	Unknown
40122	Private individual, Company or Charity	Embankment	5	Unknown
4006	Environment Agency	Natural High Ground	100	3
40005	Local Authority	Wall	200	Unknown
40003	Local Authority	Bridge Abutment	100	Unknown

Asset ID	Asset Maintainer	Description	Design Standard of Protection	Condition
40002	Private individual, Company or Charity	Wall	100	Unknown
40001	Local Authority	Wall	100	Unknown
39885	Environment Agency	Natural High Ground	100	3
39883	Environment Agency	Natural High Ground	100	3
39882	Environment Agency	Embankment	100	3
39881	Private individual, Company or Charity	Wall	100	Unknown
3890	Environment Agency	Wall	100	3
3889	Environment Agency	Natural High Ground	100	3
3888	Environment Agency	Natural High Ground	100	3
3771	Environment Agency	Natural High Ground	100	3
3645	Private individual, Company or Charity	Embankment	5	Unknown
145148	Local Authority	Wall	50	Unknown

Flood Alert and Flood Warnings

1.6.35 The EA defines Flood Warning Areas and Flood Alert Areas as where flooding is expected to occur, generally from rivers and sea and where a Flood Warning Service is provided. Flood warning and flood alert areas located within the study area are presented below in **Table 1.14** and **Table 1.15** and additionally presented within **Figure 1.4**.

Table 1.14: Flood Warnings

Flood Warning Area Code	Description	Flood source
113FWT2T2A3	Tidal River Torridge from Weare Gifford to Bideford	River Torridge
113FWT2T2D	Bristol Channel, River Torridge, North Devon Coast	River Torridge
113FWF2D0C	River Torridge (Lower) from Dolton to Bideford, including Taddiport and Weare Gifford	River Torridge

Table 1.15: Flood Alerts

Flood Alert Area Code	Description	Flood source
113WACT2A	North Devon coast from Hartland Point to Lynmouth	Bristol Channel
113WABTW02	Lower Torridge area	River Torridge, Kenwith Stream

Hydrogeological Overview

Geological Setting

1.6.36 BGS Geoindex Onshore mapping (1:50,000 scale) of bedrock geology, as presented in **Figure 1.5** indicates that the study area is situated on a variety of intermittent bedrock geology, consisting of the following:

- Bude Formation – Sandstone.
- Bude Formation – Mudstone and Siltstone.
- Crackington Formation – Mudstone and siltstone.
- Bideford Formation – Sandstone.

1.6.37 BGS Geoindex Onshore mapping of superficial deposits, as presented in **Figure 1.6** and demonstrates River Torridge Terrace Deposits, 1 member (gravel, sand and silt) superficial deposits are present in proximity of the River Torridge within the study area.

1.6.38 The BGS borehole logs indicated that there were no borehole records along the Onshore Infrastructure Area.

Groundwater

1.6.39 The Groundsure Report indicates the study area is located in an area with negligible risk of groundwater flooding.

Aquifer Designation

1.6.40 The EAs Aquifer Designation Mapping indicates the strata at the surface of the study area are classified as a Secondary A Aquifer. These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers.

Source Protection Zone

1.6.41 EA online groundwater Source Protection Zone (SPZ) mapping indicates that the study area is not located within a groundwater SPZ.

Soils Classification

1.6.42 The soils for the study area are described as the following by the National Soils Research Institute:

- freely draining acid loamy soils over rock;
- freely draining slightly acid loamy soils;
- slowly permeable seasonally wet acid loamy and clayey soils; and
- freely draining slightly acid loamy soils.

Historical Flooding

1.6.43 The EA Historic Flood Map presented in **Figure 1.10** records historical flooding that has occurred within the study area:

- Within proximity to the River Torridge and downstream sections of the River Yeo with an extent of approximately 206,930 m^2 (20.7 ha), and
- Within proximity to an ordinary watercourse which flows adjacent to Kingsley Road Between Kingsley Road and Northam Road with an extent of approximately 106,790 m^2 (10.8 ha).

Strategic Flood Risk Assessment

1.6.44 Torridge District Council Level 2 SFRA was published in July 2010 (Torridge District Council, 2010). This provides a more detailed and studied overview of specific areas and settlements:

- SFRA indicates that the Onshore HVDC Cable Corridor travels through areas identified as being slowly permeable seasonally wet acid loamy and clayey soils this geology type will experience impeded drainage. Other identified areas consisted of freely draining slightly acid loamy soils and freely draining acid loamy soils over rock these are identified as freely draining.
- Pockets of ancient woodland (a non-statutory designation) are located on the southern outskirts of Bideford.
- Coastal - The Taw-Torridge estuary is macro-tidal, with a tidal range of 7.5 m at its mouth; this range decreases inland along the River Torridge to 4.2 m at Landcross (NGR SS 4623 2467).
- The SFRA does not differentiate between Flood Zone 3a and 3b.
- Topography - The valley sides of the River Torridge are generally steep (typical slope of 0.1-0.15). However, upstream of the Torridge Bridge, left and right bank tributaries have eroded the landscape, creating a relatively flat and low-lying topography.
- The River Torridge catchment is essentially rural, with agriculture covering 86 per cent of the area. At its tidal limit, the River Torridge has a catchment area of 721 km^2 (CEH, 2006).
- The mean high water tidal limit of the River Torridge is located at Weare Gifford (NGR SS 46799 21872).
- The potential for groundwater flooding is low in the Torridge Estuary because baseflow provides less than 60% of the flow in the rivers in the area, indicating that groundwater does not play a major part in the surface flow regime. There have been no known occurrences from groundwater flooding.

- Although the risk in the Torridge Estuary is low, it may vary locally due to other factors such as micro-geology and sub-infrastructure. Therefore, it is recommended that levels are monitored.
- South West Water (2009) has reported a number of internal property flooding in the Torridge estuary area due to sewer blockages, collapses and equipment failure (flooding tends to be random in nature). However, due to the rural nature of the Onshore HVDC Cable Corridor the areas are unlikely to have been impacted.
- Reservoirs and Lakes – Kenwith Dam north of the Onshore HVDC Cable Corridor is classified as a category A dam, however, should not impact the Onshore HVDC Cable Corridor.
- There are no canals in the Torridge Estuary area and, hence, breach failure of canal banks does not present a flood risk to the cable route area.
- The greatest area at risk of flooding from rivers, the sea and surface water is the town centre in Bideford.
- SFRA states that there are no Groundwater Source Protection Zone in the Torridge Estuary Area.
- SFRA indicates that the drainage in the Torridge area is generally good.
- Areas such as Bideford are at risk of surface water flooding, however, due to the Onshore HVDC Cable Corridor not being located within this there is limited data available on the area.
- Historic Flood Maps indicate flooding in Bideford town centre, north of the Onshore HVDC Cable Corridor.
- Embankment and Masonry walls are implemented along the boundary of the River Torridge, just north of where the Onshore HVDC Cable Corridor crosses the River Torridge. These are expected to have 20 to 100 years existing standard protection.
- The Devon Country Council Environment Viewer indicated that part of the Onshore Infrastructure Area traverses across the Bideford Critical Drainage Area.
- Overtopping of the defences by waves presents a significant flood hazard along The Quay and Marine Parade. New highways order limits are located along The Quay.
- Highways improvements along Kingsley Road and The Quay pass through historic flood extents, these areas are considered a flooding hotspot.
- Flooding incidents along The Quay tend to be attributed to tidal/coastal flooding, those along Kingsley Road tend to be fluvial with one surface water and one unknown source.
- Tidal flood incidents have also been recorded near the junction of Manteo Way and Barnstaple Street where highways improvements are also proposed.
- Bideford Quay and immediate vicinity have suffered frequent tidal flooding. One of the worst incidents occurred on 23 November 1984, 63 commercial properties were flooded in the area of the Quay. Major investment has since been made to alleviate tidal flooding in this area.
- The flood hazard is rated significant to extreme along areas of The Quay, Kingsley Road and Barnstable Road during the 1 in 200 year tidal plus sea

level rise event. During tidal 1 in 100 year + 20% event the hazard is significant along Kingsley Road. (Highways improvements proposed here)

- Flooding along Kingsley Road has often been caused by Kenwith Stream, one flood in 1979 led to the construction of the Kenwith Valley Flood Retention Dam in 1984, which was overtopped in 1993 following two days of heavy rainfall. It is noted that this flood retention scheme is not covered by the inspected or maintained by the Environment Agency.

Flood Risk Assessment

Fluvial and Tidal Flooding

Environment Agency Flood Map for Planning

1.6.45 The EA Flood Map for Planning, which is available online, indicates that the majority of the study area is located within Flood Zone 1. Definitions of Flood Zones are presented within **Table 1.9**. Areas of Flood Zone 2 and 3 are present in association with the following:

- Kenwith Stream;
- River Torridge;
- the outfall of Jennetts Reservoir;
- River Yeo; and
- the coastline at Cornborough Range.

1.6.46 Flood zones associated with the River Torridge and River Yeo within the study area are understood to be fluvial and tidally influenced. Formal flood defences included within the EA spatial flood defences dataset, some of which are shown within the Flood Map for Planning, are presented in **Table 1.13**.

1.6.47 Flood Zone 3 at the Landfall is considered to be tidal in nature and is also located at the coastline; its extent is restricted by the beach profile which by virtue of elevation acts as an informal flood defence.

1.6.48 The EA Flood Map for planning is provided in **Figure 1.7. Table 1.16** below shows the areas of Flood Zone 2 and Flood Zone 3 located within the study area.

Table 1.16: Flood Zone areas within the study area

Flood Zone	Area (ha)	% of Onshore Infrastructure Area
Flood Zone 2	105.5	4.5%
Flood Zone 3	86.9	3.7%

Environment Agency Flood Model Data

1.6.49 To inform flood risk to the Onshore Infrastructure Area, Product 4, 5, 6 and 8 data was requested from the EA Partnership and Strategic Overview Team (East) (FOI/EIR Ref: 346828 and 340734) under an Open Government Licence. This included the following datasets:

- Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018);
- Weare Gifford model (2019);
- Devon Tidal Flood Zone Improvements model (2012); and
- JFLOW (2007).

1.6.50 Due to data availability, extents of Flood Zone 3a and 3b are unable to be distinguished from Flood Zone 3. As such, the extent of Flood Zone 3b is informed by the extent of Flood Zone 3.

Construction phase

Landfall

1.6.51 The offshore cables will be pulled through from an entry point lying offshore (i.e. seaward of MLWS) and connected to the onshore HVDC Cables at the transition joint bays within the Landfall construction compound at Cornborough Range. In order for the cables to reach the transition joint bays, they cross underneath the extents of Flood Zone 2 and 3 associated with coastal flooding.

1.6.52 The transition joint bays would be located within the Landfall construction compound which at its closest extent is located some 102 m inland of the Mean High Water Springs and is located at a level no lower than 12 mAOD. Cornborough cliffs are classified as an 'informal flood defence' as it provides protection against coastal flooding by virtue of elevation. The Shoreline Management Plan is 'no active intervention' until 2105.

1.6.53 Using the 'Coastal Design Sea Levels – Coastal Flood Boundary Extreme Sea Levels (2018)' the T200 and T1,000 sea levels for chainage 216 closest to the Landfall are 5.62 mAOD and 5.74 mAOD respectively.

1.6.54 Based on the upper end allowance projected sea level rise of 119 mm up to 2033, the end of the construction period it is understood due to the distance in land and level of the transition joint bays, the Landfall will remain within Flood Zone 1 with a low risk of tidal and fluvial flooding throughout the construction phase. The Landfall is also assessed to not be at risk from the credible maximum climate change scenario.

Onshore HVDC and HVAC Cable Corridors

1.6.55 Fluvial and/or tidal flood risk within the Onshore HVDC Cable Corridor and HVAC Cable Corridors occurs at cable crossings underneath watercourses (River Torridge, Kenwith Stream and tributaries of Jennetts Reservoir).

1.6.56 The installation of below ground cables associated with the Onshore HVDC Cable Corridor and HVAC Cable Corridors will be temporary in nature; with construction completed by 2032. The installation of cable corridors will not result in any permanent above ground structures proposed other than link box covers. The majority of the construction works are within agricultural land. However, there will be no changes to existing land use.

1.6.57 The majority of the Onshore HVDC Cable Corridor and the entirety of the HVAC Cable Corridors and associated study area is not included within the undefended or defended flood extents of supplied models, including the climate change extents. Due to the distance of these areas of the Onshore HVDC Cable Corridor

and HVAC Cable Corridors from fluvial and tidal sources, the Proposed Development is not considered to be at risk from increases in peak river flow as a result of climate change.

1.6.58 As such, a detailed analysis of flood risk has been made at these crossing locations, as well as an analysis regarding the extent of climate change during the development lifetime within the Onshore HVDC and HVAC cable corridor.

River Torridge Crossing

1.6.59 The Onshore HVDC Cable Corridor is to cross the tidal River Torridge between the settlements of Upscott and Hallsannery. The Devon Character Areas describe the estuary (DCA 58) as '*broad, sweeping [...], with expansive mudflats and sandbanks inundated by water from the sea at high tide backed by gradually rising land*'. This is reflected with areas of Flood Zone 2 and 3 that span across the mudflats and extents are restricted by valley topography.

1.6.60 The EA 'Spatial flood defences (including standardised attributes) dataset shows flood defences (5010, 57005, 57006, 57211,87999) to be present along both banks of the river beyond the mudflats, consisting of 'natural high ground' with a standard of protection to the 1 in 5-year event (**Table 1.13**). It is noted these defences are not represented within the Flood Map for Planning.

1.6.61 The only data available that covers the river crossing is JFLOW modelling. This dataset appears to inform the extents of Flood Zone 2 and 3 within the Flood Map for Planning for the local area. JFLOW data does not account for tidal flooding or the effects of climate change since it was published in 2007.

1.6.62 Whilst the Weare Gifford and Devon Tidal Flood Zone Improvements model does not cover the proposed crossing location of the River Torridge, the EA agreed within their Technical Note response dated 05 June reference XA/2024/100089/01-L01 that the dataset is considered to be appropriate to assess flood risk in this area based on the nature and scale of Proposed Development.

1.6.63 The closest modelled node points are located some 1 km upstream. Modelled tidal and fluvial flood levels relating to this node is presented below in **Table 1.17** and **Table 1.18**.

Table 1.17: Defended Tidal Flood Levels (mAOD)

Modelled Flood Levels, in mAOD (defended model run) (tidal)						
Node	**0.5% AEP**	**0.5% AEP + CC to 2070**	**0.5% AEP + CC to 2115**	**0.1% AEP**	**0.1% AEP + CC to 2070**	**0.1% AEP + CC to 2115**
137	5.65	5.98	6.37	5.75	6.12	6.49

Table 1.18: Defended Flood Levels (mAOD)

Modelled Flood Levels, in mAOD (defended model run) (fluvial)						
Node	**3.33% AEP**	**1% AEP**	**1% AEP + 30% CC to 2115**	**1% AEP + 40% CC to 2115**	**1% AEP + 85% CC to 2115**	**0.1% AEP**
137	5.13	5.17	5.88	5.88	5.90	5.28

1.6.64 Temporary construction compounds are located on either side of the River Torridge where the river is to be crossed by HDD. The temporary construction compounds are located within Flood Zone 1, between 19 and 36 mAOD (western side) and 9 and 27 mAOD (eastern side) and over 16 m in distance from flood defences listed within the EA Spatial flood defences (including standardised attributes) dataset. Temporary construction compounds are shown in **Figure 1.1**.

1.6.65 Using the Weare Gifford model data, in the absence of more site-specific flood risk data, the compounds remain flood-free up to and during the worst-case flood events for tidal and fluvial flooding; the 2115 0.1% AEP tidal event and 1% AEP fluvial event with an 85% uplift to account for climate change. As such, development has been assessed to have a low risk of fluvial and tidal flooding during the construction period.

Kenwith Stream Crossing

1.6.66 The extent of Flood Zone 2 and 3 associated with Kenwith Stream has been informed by 2007 JFLOW modelling which lacks further information regarding depths and flows for the 1 in 100-year and 1 in 1,000-year flood extents and additionally does not account for the effects of climate change.

1.6.67 Flood risk from this ordinary watercourse is informed by newer and refined data presented within the EA Risk of Flooding from Surface Water map. Due to the watercourse's small catchment, the 2050's epoch central estimate increase peak rainfall intensity (25%) has been used to assess the impacts to flows within the watercourse as a result of climate change to the end of the construction phase. This data is not readily available and therefore the 1,000-year surface water flood risk extent has been used as a conservative proxy to assess the risk up to the end of the development lifetime.

1.6.68 Temporary HDD compounds in which HDD entry and exit pits are to be placed would be located at least 8 m in distance from the top of the bank of the ordinary watercourses and outside the extents of the 1,000-year surface water flood event associated with fluvial flood risk from Kenwith Stream.

1.6.69 As such, it has been assessed that temporary construction compounds have a low risk of fluvial flooding, negligible risk of tidal flooding and will remain flood-free to the end of the construction period.

Jennetts Reservoir tributaries

1.6.70 Flood risk from tributaries of Jennetts Reservoir is informed by newer and refined data presented within the EA Risk of Flooding from Surface Water map. Due to the watercourses small catchment, the 2050's epoch central estimate increase peak rainfall intensity (25%) has been used to assess the impacts to flows within the watercourse as a result of climate change to the end of the construction phase. This data is not readily available and therefore the 1,000-year surface

water flood risk extent has been used as a conservative proxy to assess the risk up to the end of the development lifetime.

1.6.71 Temporary HDD compounds, in which HDD entry and exit pits are to be placed, would be located at least 8 m in distance from the top of the bank of the ordinary watercourses and outside the extents of the 1,000-year surface water flood event, associated with flood risk from the tributaries of Jennetts Reservoir.

1.6.72 As such, it has been assessed that temporary construction compounds have a low risk of fluvial flooding, negligible risk of tidal flooding and will remain flood-free to the end of the construction period.

Highways Improvements

1.6.73 The Proposed Development would also include proposed improvements to the local highway network which would facilitate access during the construction, operation and maintenance phase. Improvements are subject to refinements at detailed design.

Cornborough Sewage Treatment Works access

1.6.74 A new junction and associated highway widening for the Cornborough Sewage Treatment Works access road. These highway improvements are located predominantly within Flood Zone 3 with smaller extents within Flood Zone 1 and 2.

1.6.75 The extent of Flood Zone 2 and 3 arises from an ordinary watercourse running adjacent to the highway and has been informed by 2007 JFLOW modelling which lacks further information regarding depths and flows for the 1 in 100-year and 1 in 1,000-year flood extents and additionally does not account for the effects of climate change.

1.6.76 Flood risk from the ordinary watercourses is informed by newer and refined data presented within the EA Risk of Flooding from Surface Water map, which presents a smaller extent of flood risk than JFLOW data. Due to the watercourse's small catchment, the 2050's epoch central estimate of increased peak rainfall intensity (25%) has been used to assess the impacts to flows within the watercourse as a result of climate change, to the end of the construction phase. This data is not readily available and therefore the 1,000-year surface water flood risk extent has been used as a conservative proxy to assess the risk up to the end of the development lifetime. Flooding from the ordinary watercourses present flood depths predominantly up to 600 mm adjacent to the highway and up to 300 mm within the existing highway.

1.6.77 Junction upgrades and road widening are to tie into existing ground levels. As such, no floodplain displacement will occur and no floodplain compensation will be required.

A386 and Gammaton Moor highways improvements

1.6.78 Improvements along the extents of the A386 and Gammaton Moor are located within Flood Zone 1 and are not located within any of the aforementioned model extents. Due to this and the distance from watercourses, these highway improvements are assessed to remain within Flood Zone 1 throughout the construction phase and remainder of the development lifetime.

Operation and Maintenance Period

1.6.79 The construction phase is expected to continue until 2032 and the operational lifetime of the Proposed Development is assumed to be 50 years.

1.6.80 During the operation and maintenance phase, there will be no permanent above ground structures associated with Landfall, the Onshore HVDC Cable Corridor and HVAC Cable Corridors other than joint bay and link box covers at ground level. As such, development will not increase flood risk to the surrounding area and has negligible risk of flooding to and from the development. Due to this, these aspects of the development are not considered to be at risk from the credible maximum climate change scenario.

1.6.81 It is not expected that the transition joint bays at the Landfall would need to be accessed during the operation and maintenance phase. However, link boxes would be provided with inspection covers to allow for access. Link boxes will require access in the event of a cable failure requiring replacement or repair, and for testing purposes.

1.6.82 Whilst widening of Cornborough Sewage Treatment Works access is presently located within Flood Zone 2 and 3, development will tie into existing ground levels. All new impermeable areas associated with highways improvements are to be positively drained. As such development will not exacerbate any existing flood risk. Highways upgrades, by nature of construction, are considered to be waterproof and are not sensitive to the depth of floodwater inundation. As such, the credible maximum climate change scenario is not considered necessary to be applied.

Decommissioning

1.6.83 The Outline Decommissioning Strategy (document reference 7.17) sets out that onshore decommissioning plan(s) would be developed if decommissioning is required. An onshore decommissioning plan would be developed in a timely manner in consultation with the relevant consultees and prior to commencement of decommissioning. It would consider the latest best practice and new technologies, in preparation of decommissioning occurring.

1.6.84 The onshore decommissioning plan(s) would include an assessment of the need to remove above ground infrastructure and the decommissioning of below ground infrastructure. The plan would focus on details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The approach and methodologies to be implemented would be in accordance with the latest available guidance, legislation and any new technologies at the time of the Proposed Development's decommissioning. The highways improvements would not have a forecast end of life and would not be decommissioned.

Summary

1.6.85 The Onshore Infrastructure Area (including Landfall, the Onshore HVDC Cable Corridor and Onshore HVAC Cables) and areas within which highway improvements are proposed are assessed to have a low risk of flooding from fluvial and tidal sources and is not considered to be at risk from increases to peak river flow as a result of climate change.

Mitigation Measures

1.6.86 Mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES and are discussed within **paragraphs 1.6.122** to **1.6.142**.

Groundwater Flood Risk

1.6.87 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight report shows the study area has a predominantly 'negligible' risk of flooding, with areas of 'low' risk in proximity to watercourses. A marginal area of section 'moderate' risk is associated with proximity to the River Torridge.

1.6.88 Groundwater flooding issues may occur within proximity to watercourses during construction and during specific construction techniques e.g. piling. However, mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES, limit the potential impact of this source of flooding.

1.6.89 During construction, mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES and discussed within **paragraphs 1.6.122** to **1.6.142** will ensure any ingress of groundwater during excavation and trenching will be managed appropriately using dewatering. With mitigation, the risk associated with groundwater flooding to the proposed development is classified as low.

Surface Water Flood Risk

1.6.90 Surface water flooding occurs when the amount of rainfall exceeds the drainage or infiltration capacity of the surface it falls upon. Surface water runoff can coalesce into surface water flow pathways as it flows towards a drainage system or watercourse. Surface water can also pool within areas of inadequate drainage.

1.6.91 The EA surface water map is presented within **Figure 1.8** and shows localised areas along the study area as having a 'low' to 'high' risk of flooding from surface water and ordinary watercourses. Flooding is predominantly associated with overland flow pathways flowing towards ordinary watercourses and out-of-bank flows from ordinary watercourses which form tributaries to main rivers.

1.6.92 During construction, mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES and discussed within **paragraphs 1.6.122** to **1.6.142,** will ensure flood risk from this source is mitigated. The cable corridors will not be impacted by or cause any adverse effect on surface water flooding, following installation. With mitigation, the risk associated with surface water flooding to the proposed development is classified as low.

Reservoir Flood Risk

1.6.93 EA reservoir flood risk mapping presented within **Figure 1.9** indicates that most of the Onshore Infrastructure Area is not located within an area potentially at risk from reservoir flooding. However, due to the nature of the section of the Onshore Infrastructure Area which crosses the River Torridge, this section is at risk of flooding from reservoirs when this occurs simultaneously with flooding from rivers.

1.6.94 Due to the regular inspection and maintenance regime in place on large reservoirs, the likelihood of catastrophic failure and therefore risk of flooding to the

site from this source is unlikely to occur. As such, flood risk from this source is assessed to be very low.

Sewer Flood Risk

1.6.95 South West Water operate public sewer assets and water supplies in the study area. Flooding from sewerage failure occurs when a rainfall event exceeds the maximum capacity of the surrounding network. The most common causes of flooding from sewers are inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats/greases, and sewer collapse. Should any of these events occur, there is a risk of flooding within the vicinity of the sewer by surcharge where the flood is in excess of the sewer capacity (usually in a 1 in 30-year event or greater).

1.6.96 The discharge pipe for treated sewage from the South West Water Cornborough Waste Water Treatment Plant is located within the study area at Landfall. Southern Water sewage treatment works is also located at Whitehall Landcross within the study area. Three discharge consents for sewage discharges (final/treated effluent flows) are also noted within the study area (see Volume 2, Appendix 3.3: Surface Water Abstraction Licences, Discharge Consents and Pollution Incidents of the ES for additional information).

1.6.97 Prior to the commencement of works, a number of pre-construction surveys and studies will be undertaken. This includes surveys to confirm the presence/lack of presence of sewage and water supply infrastructure, to inform the design teams when developing the final design.

1.6.98 Prior to the commencement of works, any construction activities will need to be undertaken in accordance with the water authorities' design standards prior to gaining approval. This includes providing evidence to confirm the presence / lack of presence of any water authority assets (e.g. sewers and water mains) and if they are present, how final design and construction methods will be implemented to divert their assets (which will need additional approval) or avoid their assets.

1.6.99 Mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES, are expected to include a utility survey to identify the location of both water pipelines and sewer assets which are to be taken forward within the detailed design. This is expected to limit the potential impact on the surrounding sewer networks from any residual risk from this source. Flood risk from this source is therefore assessed to be low.

Artificial sources

1.6.100 Field drainage is expected to be present within agricultural land within the study area and could pose localised sources of flooding if impacted during construction. The landfall and onshore cable corridor will not be impacted by or cause any adverse effect on field drainage following installation. As such, the risk of flooding from this source is assessed to be low.

1.6.101 Mitigation measures as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES, limit the potential impact on the surrounding field drainage networks. Flood risk from this source is therefore assessed to be low.

Summary

1.6.102 The study area is located within Flood Zones 1, 2 and 3 and is at risk from both fluvial and tidal sources. Flood Zone 3 has been unable to be differentiated between Flood Zone 3a and 3b for the ES.

Sequential Test and Exception Test

Site Vulnerability

1.6.103 In accordance with the Development Vulnerability Categories within Appendix 3: Flood risk vulnerability classification of the NPPF, the Proposed Development is classified as 'essential infrastructure'.

1.6.104 The Proposed Development is classified as 'essential infrastructure' and as such are acceptable within Flood Zones 1 and 2. The exception test is required if development is proposed within Flood Zone 3.

Sequential Test

1.6.105 The site selection process for the Converter Site is detailed within Volume 1, Chapter 4: Needs and Alternatives of the ES. Due to the location of existing development and the linear nature of the Proposed Development, the site selection process has been sequentially steered away from areas with existing development to prevent disruption within the wider area.

1.6.106 The Landfall, Converter Site are located within Flood Zone 1 and have a low risk of flooding. These elements of the Proposed Development are required to be connected by the onshore HVDC and HVAC Cables and there are no reasonably available routes available in which cables can traverse without crossing areas of Flood Zone 3. Extents of Flood Zone 3 are to be crossed by trenchless techniques and as such no above ground development would arise from the cable installation.

1.6.107 In regards to highways improvements which are partially located within Flood Zone 3, this development relates to junction upgrades and road widening and are expected to tie into existing ground levels and drainage of new impermeable areas are to be served by the existing highways drainage network. Therefore, there is no potential for significant operational runoff or floodwater displacement associated with the highways improvements.

1.6.108 Furthermore, no permanent above ground development will occur as a result of construction activities associated with Landfall, the onshore HVDC and HVAC Cables and flood risk will only be temporarily increased until 2032 when the construction phase ends.

1.6.109 The sequential test for the Landfall, onshore HVDC and HVAC Cables are therefore considered passed.

Exception Test

1.6.110 The Proposed Development will contribute towards meeting the UK Government's targets for generating energy from a renewable energy source; it will generate employment during its construction and operation.

1.6.111 According to Table 3 of the PPG to the NPPF, 'Essential Infrastructure' developments are considered appropriate within Flood Zone 1 and 2 without the requirement to apply the exception test. Therefore, the application of the exception test is required for elements of the highways improvements and the Onshore HVDC Cable Corridor which are partially located within Flood Zone 3.

1.6.112 The PPG advises that essential infrastructure development can be considered appropriate in Flood Zone 3, following satisfactory application of the exception test. The Exception test aims to ensure that more vulnerable property types are not allocated to areas at high risk of flooding. For the exception test to be passed the following must be met.

a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared.

b) A site-specific flood risk assessment must demonstrate that 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.

1.6.113 With reference to point (a) above, the Proposed Development will contribute towards meeting the UK Government's targets for renewable energy sources; it will generate employment during its construction and operation. Therefore point (a) of the exception test is considered to be satisfied.

1.6.114 With reference to point (b) above, the Proposed Development is to connect to the national grid and therefore is unable to be routed without crossing areas within Flood Zone 3 and areas with a high risk of other sources of flooding. Highways improvements are required to enable the construction of the Proposed Development and involve improvements to the existing highways network, some of which are located within Flood Zone 3 and areas with a high risk of other sources of flooding.

1.6.115 The majority of the construction works for the Onshore HVDC Cable Corridor are within agricultural land, however there will be no changes to existing land use. The installation of below ground cables will be temporary in nature with no permanent above ground structures proposed aside from link box covers which will be flush with ground level. Trenchless techniques will be used to route the cables underneath extents of Flood Zone 3 and areas at risk from surface water flooding associated with out of bank flows from watercourses.

1.6.116 Highways improvements located within Flood Zone 3 relate to junction upgrades and road widening. The Proposed Development is to tie into existing ground levels, and will not cause any displacement of the floodplain.

1.6.117 Once installed, the Onshore HVDC Cable Corridor and highways improvements will not increase flood risk to the surrounding area and has negligible risk of flooding to and from the development.

1.6.118 Any alterations in the existing surface water drainage regime associated with the installation of the below ground cables are expected to be only during the construction stage and thus temporary in nature. Any increase in run-off from the Onshore HVDC Cable Corridor and HVAC Cable Corridors during construction will be managed through control principles set out in the Outline On-CEMP (document reference 7.7), which will be revised and submitted to the LLFAs for approval with consultation with the EA prior to the commencement of works.

1.6.119 New impermeable areas associated with highways improvements will tie into the existing highways and associated drainage network which serves them. Details regarding drainage will ensure surface water runoff is not increased and is to be refined through detailed design.

1.6.120 This FRA demonstrates that the development will be safe, without increasing flood risk elsewhere, and will reduce flood risk overall given the reduction in surface water runoff following redevelopment.

1.6.121 It is considered that the development passes the exception test.

Flood Risk Management

Proposed Mitigation

Construction Environmental Management Plan

1.6.122 Construction of the Proposed Development would be managed through the On-CEMP(s) that set out the principles of good environmental management to be followed in order to avoid or minimise environmental impacts. This includes principles for the management of construction noise, dust, traffic, materials storage and waste management, drainage and ecological protection.

1.6.123 An Outline On-CEMP has been submitted with the DCO application (document reference 7.7). The Outline On-CEMP would be developed into a final On-CEMP(s), which would be agreed with Torridge District Council prior to the commencement of construction. The final On-CEMP(s) shall include the measures set out in the Outline On-CEMP, together with any further detail available at that time.

1.6.124 The final On-CEMP(s) would be supported by detailed Construction Method Statements to be produced by the lead construction contractor(s), which would provide method statements for construction activities detailing how the requirements for the final On-CEMP(s) are met.

1.6.125 In a similar manner, a CTMP(s) would be produced by onshore main works Contractors prior to the commencement of construction, based on the Outline CTMP (document reference 7.12) which will be developed and provided as part of the application for development consent.

Construction Drainage

1.6.126 The construction phase would incorporate pollution prevention and flood response measures to ensure that the potential for any temporary effects on water quality or flood risk are reduced as far as practicable.

1.6.127 Such measures would be implemented through the Pollution Prevention Plan that would be appended to the On-CEMP(s). An Outline Pollution Prevention Plan has been submitted as part of the application for development consent and forms Appendix A to the Outline On-CEMP (document reference 7.7).

1.6.128 A Construction Drainage Strategy would be developed post-consent and in accordance with the Outline On-CEMP (document reference 7.7), which outlines the measures and details to be incorporated into the strategy. The Construction Drainage Strategy would incorporate pollution prevention and flood response

measures to ensure that the potential for any temporary effects on water quality or flood risk are reduced as far as practicable during the construction stage.

1.6.129 Measures would include but not be limited to the following:

- installation of suitable facilities to remove material (e.g., mud and dust) from wheels;
- use of sediment fences along existing watercourses/waterbodies when working nearby to reduce sediment load;
- covers for lorries transporting materials to/from site to prevent releases of dust/sediment to watercourses/drains;
- bulk storage areas to be secured and provided with secondary containment (in accordance with the Oil Storage Regulations and best practice);
- storage of oils and chemicals away from existing watercourses, including drainage ditches or ponds;
- concrete to be stored and handled appropriately to prevent release to drains;
- treatment of any runoff water that gathers in the trenches would be pumped via settling tanks or ponds to remove any sediment;
- obtain consent/permit for any works (e.g., discharge of surface water, dewatering, etc.) that may affect surface water and/or groundwater. The conditions of the consent will be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial risk;
- use of a documented spill procedure and use of spill kits kept in the vicinity of chemical/oil storage;
- storage of stockpiled materials on an impermeable surface to prevent leaching of contaminants and use of covers when not in use to prevent materials being dispersed and to protect from rain; and
- stockpiles to be kept to minimum possible size with gaps to allow surface water runoff to pass through.

Dewatering

1.6.130 The construction of the transition joint bays, onshore HVDC Cables, HVAC Cables and associated joint bays or link boxes would require dry excavations. Therefore, the dewatering of open trenches and excavations may be required where shallow groundwater is encountered. Dewatering refers to the process of removing or draining groundwater or surface water from a trench, watercourse, ditch, etc.

1.6.131 The groundwater removed by dewatering would be pumped to an appropriate location to allow any sediments present to be settled, prior to discharge to local surface watercourses or across ground away from the excavations.

1.6.132 In the event that trenches need dewatering, water from such activities would be discharged in agreement with Devon County Council and/or the Environment Agency to a local drainage ditch or watercourse and/or spread over ground. This would be undertaken in accordance with measures agreed through the final On-CEMP(s) and Pollution Prevention Plan.

Flood Warning/Flood Alerts

1.6.133 Flood warnings and flood alerts are presented within **Table 1.14** and **Table 1.15** and cover land in proximity to Kenwith Stream, River Torridge, River Yeo and the outflow of Jennet's Reservoir. If a Flood Warning were to become active within an area where works were being undertaken, it is expected works would be stopped whilst the Flood Warning/Flood Alert is active.

1.6.134 A Flood Management Plan will form part of the final on-CEMP(s) and will be prepared for works taking place within a Flood Warning/Flood Alert area. During the construction phase, the Principal Contractor(s) will sign up to the Flood Warning Service and will be alerted by a phone call or text when a Flood Warning becomes active to enable site personnel to be evacuated from the site in a timely manner prior to a flood event occurring.

Construction methods

1.6.135 In order to manage impacts to field drainage, the Outline On-CEMP (document reference 7.7) stipulates that the contractor will develop field drainage plans in consultation with the relevant landowners. If required, additional field drainage will be installed to ensure the existing drainage of the land is maintained during and after construction.

1.6.136 Land Drainage consents will be sought where required from the Devon County Council (as LLFA) in consultation with the Environment Agency.

1.6.137 An Outline Pollution Prevention Plan (PPP) forms Appendix A to the Outline On-CEMP, which has been prepared as part of the application for development consent (document reference 7.7). Onshore Pollution Prevention Plan(s) would be developed in accordance with the Outline Pollution Prevention Plan and would include details of emergency spill response procedures. Good practice guidance detailed in the Environment Agency's Pollution Prevention Guidance notes and CIRIA guidance would be followed where appropriate, or the latest relevant available guidance.

1.6.138 If ground surveys confirm presence of contamination, the construction of piled foundations would use mitigation measures as defined in the following guidance: Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (EA, 2001), or latest relevant available guidance.

1.6.139 Finally, it is anticipated that storage of fuels and chemicals will be within areas at low risk of flooding (Flood Zone 1). Refuelling of plant and equipment will only be permitted in designated refuelling areas, within areas at low risk of flooding, and will be undertaken using pumps to reduce spillage.

Watercourse Crossings

1.6.140 The Onshore HVDC Cable Corridor will cross existing infrastructure and obstacles such as roads, rivers and other utilities. All major crossings, such as major roads and river crossings will be undertaken using trenchless technologies.

1.6.141 There would be six trenchless cable crossings within the onshore section of the Proposed Development, including the HDD at Landfall. It is currently proposed that the following hydrology related features will be crossed by HDD (or other trenchless methodologies):

- The Mermaid's Pool to Rowden Gut SSSI, situated along the coastline at the Landfall, Cornborough Range.
- The following watercourses:
  - The River Torridge
  - Kenwith Stream
  - Two tributaries of Jennetts Reservoir and its associated outflow:
    - A tributary directly south of the A39
    - A tributary to the south of Jennnetts Reservoir

1.6.142 Open-cut techniques may be used, where appropriate, for minor ditches or smaller watercourses that are frequently dry, including the ordinary watercourse within Littleham Wood which has an approximate hydraulic catchment of 0.23 km^2. Where required, consent will be sought from LLFAs and/or the EA for any works within 8 m of non-tidal water bodies and associated flood defences and 16 m from tidal waterbodies and associated flood defences.

Onshore Infrastructure Area Summary and Conclusions

Summary

1.6.143 A site-specific FRA in accordance with Section 5.7 of the NPS EN-1, the NPPF and associated PPG has been undertaken for the Proposed Development within the Onshore Infrastructure Area which extends approximately 14.5 km from the Landfall at Cornborough Range to the Converter Site and then the national grid, located to the west of Alverdiscott.

Flood Risk

1.6.144 In accordance with the guidance on development and flood risk, this FRA demonstrates that:

- The EA Flood Map for Planning shows that the majority of the Onshore Infrastructure Area is located in Flood Zone 1. There are limited areas of land associated with Main Rivers and ordinary watercourses and sea that are designated as being within Flood Zone 2 and Flood Zone 3.
- The Onshore HVDC Cable Corridor passes through areas of Flood Zone 2 and 3 via trenchless techniques, resulting in no above-ground development within the Flood Zones. The only above ground development located within Flood Zone 2 and 3 is associated with highways improvements comprising of junction alterations and road widening which are expected to tie into existing ground levels and new impermeable areas associated with development are to be served by a positive drainage system. As such, the Onshore Infrastructure Area and associated study area have a low assessed risk of flooding from fluvial and tidal sources.
- The Onshore Infrastructure Area and associated study area have a low risk of surface water flooding, associated with out-of-bank flows from ordinary watercourses and areas of surface water ponding.

- The Onshore Infrastructure Area and associated study area have been assessed to have a low risk of groundwater flooding.
- The Onshore Infrastructure Area and associated study area have been assessed to have a low risk of sewer flooding.
- The Onshore Infrastructure Area and associated study area have been assessed to have a low risk of reservoir flooding.
- The Onshore Infrastructure Area and associated study area have been assessed to have a low risk of flooding from artificial sources.
- The Proposed Development is defined as 'Essential Infrastructure' in Table 2 of the NPPF. The Onshore HVAC Cable Corridor is located within Flood Zone 1 and has a low assessed risk of flooding from all sources and is considered to pass the Sequential Test and does not trigger the requirement of the Exception Test. The Landfall and the Onshore HVDC Cable Corridor traverse through areas Flood Zone 2 and 3, and as such this section of development is subject to a Sequential Test and Exception Test.
- The Landfall and Onshore HVDC Cable Corridor will connect to the Converter Site, which is then connected to the national grid via HVAC Cables. Therefore. The onshore HVDC Cables are unable to be routed without crossing areas within Flood Zone 3. Highways improvements are proposed to enable access to the Landfall, Onshore HVDC Cable Corridor, Converter Site and HVAC Cable Corridors. These aspects of the Proposed Development do not increase flood risk to the surrounding area and has a negligible risk of flooding on the Proposed Development. On this basis, the Exception Test for these elements of the Proposed Development is determined to be passed.
- Proposed mitigation measures will reduce any adverse impacts caused by the installation of the Proposed Development, meaning there will be a negligible impact to the existing hydrology and flood risk to the area and designated sites.
- Following construction, it is anticipated that it will have no adverse effects/impacts on all sources of flooding and the hydrological characteristics of the area.

Conclusion

1.6.145 The FRA and supporting documentation demonstrate that the Onshore Infrastructure Area meets the requirements of the NPS, the NPPF and the associated PPG.

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