XLINKS MOROCCO-UK POWER PROJECT

Preliminary Environmental Information Report

Volume 2, Appendix 3.1: Flood Risk Assessment

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Glossary

Term	Meaning
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 confirmed by National Grid Electricity Transmission.
Alverdiscott Substation site	The National Grid Electricity Transmission substation site within which the Alverdiscott Substation sits.
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 (DC) to Alternating Current (AC), or vice versa.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a Proposed Development. This requires consideration of the likely changes to the environment, where these arise as a consequence of a Proposed Development, through comparison with the existing and Proposed 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.
HVAC Cables	The High Voltage Alternating Current (HVAC) cables which would bring electricity from the converter stations to the new Alverdiscott Substation Connection Development.
HVDC Cables	The High Voltage Direct Current (HVDC) 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 Bay inclusive of all construction works, including the offshore and onshore cable routes, and landfall compound(s).
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 Authority for the Proposed Development are Devon County Council and Torridge District Council.

Term	Meaning
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 (NGET) 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 will be located.
Onshore Infrastructure Area	The proposed infrastructure area within the Proposed Development Draft Order Limits landward of the transition joint bays, which contains the onshore HVDC Cables, Converter Site, the Alverdiscott Substation Connection Development, highway works, utility diversions and onshore HVAC Cables.
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 Proposed Development and which helps to inform consultation responses.
Proposed Development	The element of the Xlinks Morocco-UK Power Project within the UK, which includes the offshore cables (from the UK Exclusive Economic Zone to landfall), landfall site, onshore Direct Current and Alternating Current cables, converter stations, road upgrade works and, based on current assumptions, the Alverdiscott Substation Connection Development.
Proposed Development Draft 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).
Study area	This is an area which is defined for each environmental topic which includes the Proposed Development Draft 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.
Xlinks Morocco UK Power Project (the '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
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
DESNZ	Department for Energy Security and Net Zero
EA	Environment Agency
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment

Acronym	Meaning
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
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
TJB	Transition Joint Bay
UKCP18	United Kingdom Climate Projections 2018

Units

Units	Meaning
%	Percentage
ha	Hectares
km	kilometres
l/s	Litres per second
m	Meters
m^2	Meters Squared
m^3	Meters cubed
mAOD	Metres above ordnance datum
mm	Millimetres
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 Preliminary Environmental Information Report (PEIR) prepared for the United Kingdom (UK) elements of the Xlinks Morocco-UK Power Project (the 'Project'). For ease of reference, the UK elements of the Project are referred to throughout as the Proposed Development. The PEIR presents the preliminary findings of the assessments and surveys completed to date for the Proposed Development.

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

1.1.3 The key objectives of the FRA are as follows:

- To 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.
- To satisfy the requirements set out in legislation and planning guidance, as set out in **section 1.3** of this FRA**,** which require FRAs to be submitted in support of applications for development consent.

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

- Landfall:
  - This is where the offshore cables are jointed to the onshore cables. This term applies to the entire landfall area between Mean Low Water Springs and the Transition Joint Bay. This includes all construction works, including the offshore and onshore cable corridors and landfall construction works compound.
- Onshore elements:
  - Converter Site: the site includes 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.
  - Alverdiscott Substation Connection Development – the anticipated National Grid Electricity Transmission (NGET) 400 kV substation would be located to the immediate east of the existing 400/132 kV facility and would be a replacement for the existing 400 kV infrastructure.
  - High Voltage Alternating Current (HVAC) Cables: these cables connect the Converter Site to the national grid, via the envisaged Alverdiscott Substation Connection Development. The HVAC cables would be situated within the boundaries of the Converter Site and Alverdiscott Substation site.

- Onshore High Voltage Direct Current (HVDC) Cables: underground cable connection of approximately 14.5 km between the proposed converter stations and the Transition Joint Bay (TJB) at the landfall. The onshore HVDC Cables would be located within the Onshore HVDC Cable Corridor.
- Other works to facilitate the development, including permanent road improvement works, temporary and permanent utility connections, permanent utility diversions and temporary construction compounds, drainage and access. The Proposed Development also includes opportunities for environmental mitigation, compensation and enhancement.

1.1.5 As set out in Volume 1, Chapter 3: Project Description of the PEIR, the above work will be located within the Proposed Development Draft Order Limits.

1.1.6 The FRA concentrates on permanent development within the Onshore Infrastructure Area, within which the landfall and all permanent onshore infrastructure, together with temporary construction facilities (such as access roads and construction compounds), will be located.

1.1.7 The only above ground permanent infrastructure proposed are the converter stations and Alverdiscott Substation Connection Development. As such, the FRA focuses on temporary and permanent impacts for the converter stations, Alverdiscott Substation Connection Development and associated infrastructure.

1.1.8 Several Horizontal Directional Drilling (HDD) crossings associated with the Onshore HVDC cable corridor within the Onshore Infrastructure Area will pass through areas designated as Flood Zones 2 and 3. Impacts associated with the Onshore HVDC Cable Corridor will be temporary, arising as a result of cable installation. Following installation, land will be reinstated to its former use so the only permanent elements along the cable routes will be maintenance covers. 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 and 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 In order 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 **1.2.5**) which may warrant further consideration. Identified potential flooding issues were then assessed further for each substation 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
- 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 Infrastructure Area. 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 Alverdiscott Substation Connection Development and 250 m of the Onshore Infrastructure Area including the following:
  - Landfall;
  - HVAC Cables (which would also situated within the Converter Site and Alverdiscott Substation Connection Development);
  - Onshore HVDC Cable Corridor; and
  - Temporary onshore infrastructure including haul roads and temporary construction compounds.

1.2.5 The buffers were chosen primarily to identify any existing receptors, assets or infrastructure that have the potential to be affected by flood risk as a result of the Onshore Infrastructure Area.

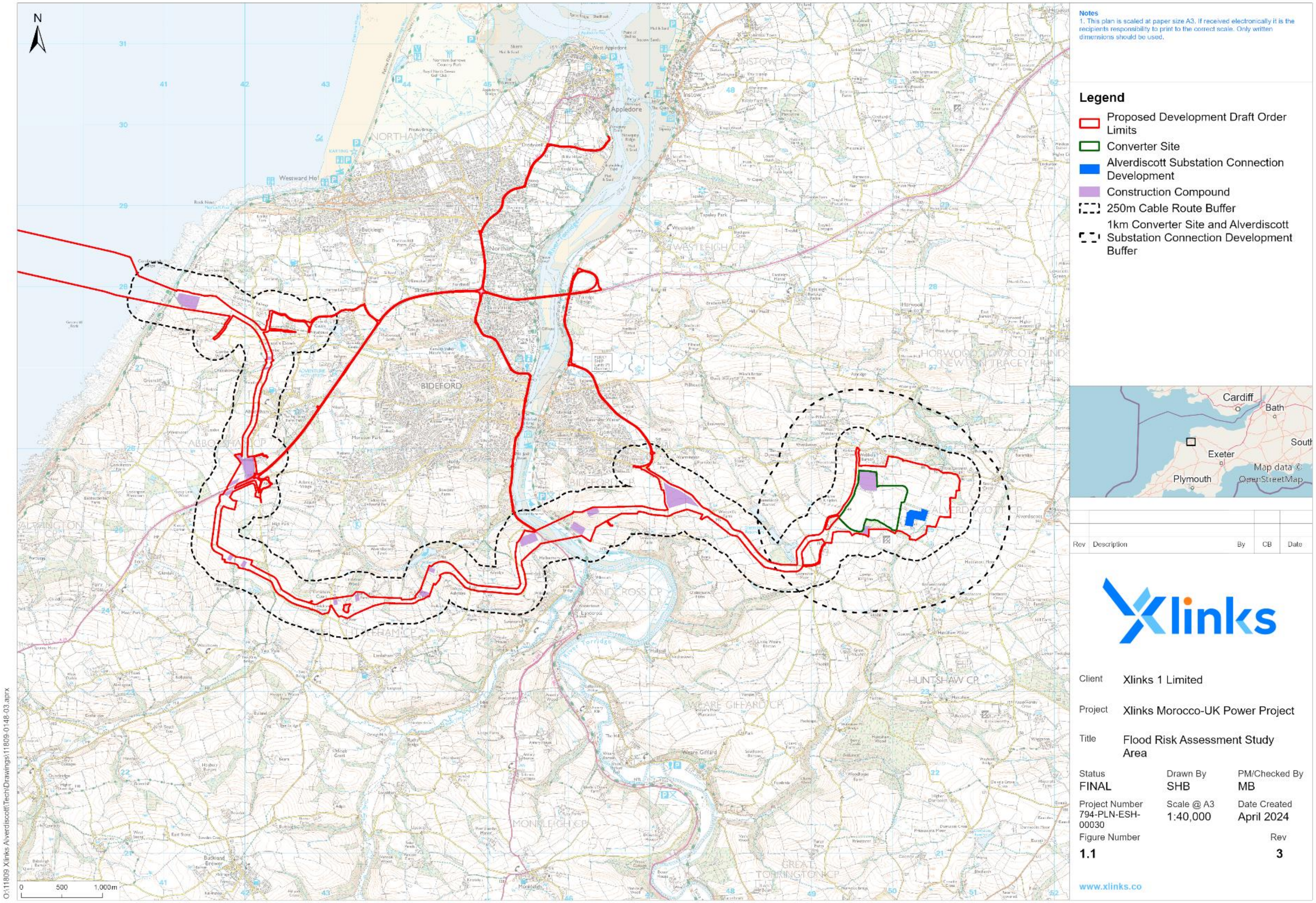

Figure 1.1: Flood Risk Assessment Area

Information Sources

1.2.6 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	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	2023	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
Soilscapes Viewer	http://www.landis.org.uk/soilscapes/	2023	The National Soils Research Institute

1.2.7 **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 (EEZ), with the onshore infrastructure located wholly within England. As set out in Volume 1, Chapter 1: Introduction of the PEIR, 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 requirements	How and where considered in the PEIR
Climate change adaption	
'The Secretary of State should be satisfied that applicants for new energy infrastructure have taken into account the potential impacts of climate change using the latest UK Climate Projections[1] and associated research and expert guidance (such as the EAs Climate Change Allowances for Flood Risk Assessments) available at the time the ES was prepared to ensure they have identified appropriate mitigation or adaptation measures. This should cover the estimated lifetime of the new infrastructure, including any decommissioning period. *Should a new set of UK Climate Projections or associated research become available after the preparation of the ES, the Secretary of State (or the Examining Authority during the examination stage) should consider whether they need to request further information from the applicant.* *The Secretary of State should be satisfied that there are not features of the design of new energy infrastructure critical to its operation which may be seriously affected by more radical changes to the climate beyond that projected in the latest set of UK climate projections, taking account of the latest credible scientific evidence on, for example, sea level rise (for example by referring to additional maximum credible scenarios – i.e., from the Intergovernmental Panel on Climate Change or EA) and that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime.' (paragraphs 4.10.13 – 4.10.15 NPS EN-1)*	Climate change is considered in this Flood Risk Assessment (FRA) Appendix and the climate change chapter Volume 4, Chapter 1: Climate Change of the PEIR). Climate change has been taken into account in the characterisation of the baseline and future baseline environment of the hydrology and flood risk PEIR chapter (see Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR).
'Applicants should demonstrate that any necessary land-side infrastructure (such as cabling and onshore substations) will be appropriately resilient to climate-change induced weather phenomena. Similarly, applicants should particularly set out how the proposal would be resilient to storms.' (paragraph 2.4.8, NPS EN-3)	The resilience to flood risk of the onshore elements of the Proposed Development is set out within this Appendix.

Summary of NPS requirements	How and where considered in the PEIR
'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, NPS EN-5)*	Climate change is considered in this FRA and the climate change chapter Volume 4, Chapter 1: Climate Change of the PEIR). Climate change has been taken into account in the characterisation of the baseline and future baseline environment of the hydrology and flood risk PEIR chapter (see Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR).
Flood risk	
'The minimum requirements for FRAs 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 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;*	This FRA has been prepared which considers the flood risk associated the Onshore Infrastructure Area and demonstrates how flood risk will be managed, taking climate change into consideration. Conceptual drainage strategies for the converter stations are provided within this Flood Risk Assessment. The conceptual drainage strategies have been developed in accordance with the 2023 NPS, NPPF, PPG ID7 the Sustainable Drainage Systems (SuDS) Manual and local council policy. With regards to the proposed converter stations and Alverdiscott Substation Connection Development, surface water from the 1 in 100-year storm event plus an allowance for climate change is to be stored within basins, with flows to be discharged following the SuDS hierarchy. Further SuDS are to be determined at detailed design stage.

Summary of NPS requirements	How and where considered in the PEIR
• *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:* – *Demonstrate how the hierarchy of drainage options has been followed.* – *Explain and justify why the types of SuDS and method of discharge have been selected and why they are considered appropriate. Where cost is a reason for not including SuDS, provide information to enable comparison with the lifetime costs of a conventional public sewer connection* – *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* – *Describe the multifunctional benefits the sustainable drainage system will provide* – *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* – *Explain how run-off from the completed development will be prevented from causing an impact elsewhere* – *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;* • *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.' (paragraph 5.8.15, NPS-EN1)*	
'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 EA, and, where relevant, other bodies such as Lead Local Flood Authorities, Internal Drainage Boards, sewerage undertakers, navigation authorities, highways authorities and reservoir owners and operators.' (paragraph 5.8.18, NPS-EN1)	A FRA has been prepared and details stakeholder consultation undertaken relating to flood risk and drainage as part of the Proposed Development.
'To satisfactorily manage flood risk, arrangements are required to manage surface water and the impact of the natural water cycle on people and property	A FRA has been prepared which considers the flood risk associated the Onshore Infrastructure Area and demonstrates how

Summary of NPS requirements	How and where considered in the PEIR
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 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.* *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 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.*	flood risk will be managed, taking climate change into consideration. Conceptual drainage strategies for the Converter Stations and Alverdiscott Substation Connection Development are provided and/or referenced within this FRA. The conceptual drainage strategies have been developed in accordance with the 2023 NPS, NPPF, PPG ID7 the SuDS Manual and local council policy. With regards to the proposed Converter Stations, surface water from the 1 in 100-year storm event plus an allowance for climate change is to be stored within a basin, with flows to be discharged following the SuDS hierarchy. Further SuDS are to be determined at detailed design stage.

Summary of NPS requirements	How and where considered in the PEIR
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.* *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 emergency planning documents, flood warning and evacuation procedures that are required should be identified in the FRA.* *Flood resistant and resilient materials and design should be adopted to minimise damage and speed recovery in the event of a flood.' (paragraphs 5.8.24 – 5.8.35 NPS EN-1)*	
'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 will not result in a net loss of floodplain storage, and will not impede water flows (paragraph 5.8.41, NPS EN-1) *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 the nature and degree of the risk, the future impacts on climate change, and advice provided by the EA and other relevant bodies.' (paragraphs 5.8.41 - 5.8.42, NPS EN-1)*	The approach to flood risk and the assessment is described in the FRA. The permanent development associated with the Converter Stations is located within Flood Zone 1. Due to its vulnerability classification and location within Flood Zone 1, 2, 3 and 3b, the landfall and Onshore HVDC Cable Corridor has been subject to and has passed the sequential test and exception test.
Water Quality Resources	
'Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment, as part of the ES or equivalent.' (paragraph 5.16.3, EN-1).	The assessment and the proposed mitigation measures have taken into account the requirements of the river basin management plan and WFD to ensure all potential impacts on the water environment are mitigated to within acceptable levels (see Volume 2, Appendix 3.2: Preliminary Water Framework Directive Assessment of the PEIR).
'The ES should in particular describe: • *the existing quality of waters affected by the proposed project and the impacts of the proposed project on water*	The assessment and the proposed mitigation measures have taken into account the requirements of the river basin management plan and WFD to ensure all

Summary of NPS requirements	How and where considered in the PEIR
quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges • *existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Abstraction Licensing Strategies) and also demonstrate how proposals minimise the use of water resources and water consumption in the first instance* • *existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics* • *any impacts of the proposed project on water bodies or protected areas (including shellfish protected areas) under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and source protection zones (SPZs) around potable groundwater abstractions* • *how climate change could impact any of the above in the future* • *any cumulative effects.' (paragraph 5.16.7, NPS EN-1)*	potential impacts on the water environment are mitigated to within acceptable levels (see Volume 2, Appendix 3.2: Preliminary Water Framework Directive Assessment of the PEIR).

National Planning Policy Framework

1.3.4 The NPPF was released in March 2012 and was updated in September 2023. The document advises of the requirements for a site-specific FRA for any of the following cases (Planning and Flood Risk paragraph 167 (footnote 55)).

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

1.3.7 The NPPF is supported by Planning Practice Guidance (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

1.3.8 The North Devon and Torridge Local Plan was formally adopted on 29 October 2018 by North Devon Council and Torridge District Council 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

1.3.9 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.

1.3.10 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

1.3.11 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.

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

1.3.13 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

1.3.14 The Torridge District Council worked in partnership with North Devon Council to prepare the SFRA Level 1. 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.

1.3.15 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.

1.3.16 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 acceptable level. Relevant information from the Surface Water Management Plan has been reproduced throughout this FRA report.

Climate Change Allowances

1.3.17 The NPPF sets out how the planning system should help to minimise the vulnerability and provide resilience to the impacts of climate change. NPPF and supporting planning practice guidance 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.

1.3.18 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

1.3.19 In May 2022, the EA released its latest climate change allowances, which update the 2020 and 2011 version 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.

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

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%

1.3.21 The Proposed Development is expected to be fully commissioned by 2033 and the minimum operational lifetime of the development is currently anticipated to be 50 years. As such, for 'essential infrastructure' development within Flood Zone 2 and 3 and additional 28% uplift of river flows is calculated by the 2020’s upper end epoch up until commissioning in 2033. An 80% uplift of river flows is calculated by the 2080's’upper end epoch for permanent infrastructure, however all permanent above ground infrastructure is limited to Flood Zone 1.

1.3.22 Less vulnerable development includes temporary construction compounds to be present up to 2033. For ‘less vulnerable’ development within Flood Zone 2 and 3 an additional 13% uplift of river flows is calculated by the 2020’s central epoch will be applied.

Peak Rainfall Intensity

1.3.23 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 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%

1.3.24 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.

1.3.25 The only development anticipated to be affected by an increase in peak rainfall intensity due to climate change is permanent development associated with the Converter Site and Alverdiscott Substation Connection Development.

1.3.26 The Proposed Development is expected to be fully commissioned by 2033 and the minimum operational lifetime of the development is currently anticipated to be 50 years. it is anticipated that potential refurbishment and operational life extension of the Proposed Development may occur. Therefore, the 2070s upper estimate (for developments with a lifetime of between 2061 and 2125) of 50% is considered to be acceptable.

Sea Level Rise

1.3.27 The EA expect sea level rise to increase the rate of coastal erosion. **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 (metres)
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.

1.3.28 The landfall at Cornborough Range would be constructed using 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 Transition Joint Bays. The landfall HDD crosses underneath 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 mAOD (meters Above Ordnance Datum) 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.

1.3.29 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. 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.

1.3.30 Further discussions are to be undertaken with the EA after the submission of the PEIR to discuss climate change allowances (including allowances for wave action) applicable to the Proposed Development in more detail.

1.4 Consultation

Environment Agency

1.4.1 To inform flood risk to the Onshore Infrastructure Area, we have 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 (2007).

1.4.2 A meeting with the EA NSIP team was undertaken on 8 of April 2024 to establish how flood risk within the study area can be adequately assessed. Further communication will be undertaken post PEIR submission to discuss flood risk and climate change allowances in greater detail.

South West Water

1.4.3 A consultation response was received from South West Water on 5 January 2024 confirming that no sewers are present within the Converter Site or its immediate vicinity.

Lead Local Flood Authority

1.4.4 A consultation response was received from Devon County Council, the Lead Local Flood Authority (LLFA) on 5 January 2024. The response contained flood risk information regarding Converter Site.

1.4.5 A meeting with the LLFA was undertaken on the 8 of April 2024 to discuss flood risk and drainage of the Proposed Development. The LLFA agreed they would be satisfied with a 50% climate change uplift on the Converter Site and Alverdiscott Substation Development to account for a possible development lifetime extension.

Internal Drainage Board

1.4.6 The Onshore Infrastructure Area is not located within an Internal Drainage Board district.

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 north west 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 includes associated mitigation and land required for construction is approximately 37 ha. The proposed converter stations would be connected to the national grid via the Alverdiscott Substation Connection Development, by the HVAC cables.

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

Topography

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

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 south east boundary. A public highway is located beyond the Converter Site's western boundary.

Proposed Use

1.5.6 The proposed Converter Site would include two separated converter stations, a main car park, a spare parts building, and control access building, as well as a temporary construction laydown area during construction. 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 with the national grid. Each converter station would comprise the following:

- control building;
- harmonic filter;
- AC switch yard;
- transformers (including a spare transformer);
- valve hall and reactor building; and
- DC switch yard.

1.5.7 It is anticipated that the converter stations would be connected to the national grid via underground AC cables at an envisaged Alverdiscott Substation Connection Development, which forms part of the Proposed Development.

1.5.8 The Converter Site would be accessed via the existing Alverdiscott Substation site entrance from the minor road running north south between Gammaton Crossroads and Webbery Barton.

Site Visit

1.5.9 A site walkover of the Converter Site was undertaken on 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 1 km buffer zone is presented within **Figure 1.2.**

Main Rivers

1.5.13 There are no EA designated Main Rivers within the Converter Site or within the associated 1 km buffer zone.

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

Ordinary Watercourses

1.5.15 OS Mapping indicates that there are two ordinary watercourses that commence immediately adjacent to the western boundary of the Converter Site. The watercourses are unnamed and flow in a southerly direction, towards Huntshaw Water, an ordinary watercourse which in turn outfalls to the River Torridge.

Other Hydrological Features

1.5.16 No significant other hydrological features (e.g., reservoirs and canals) have been identified within 1 km of the Converter Site.

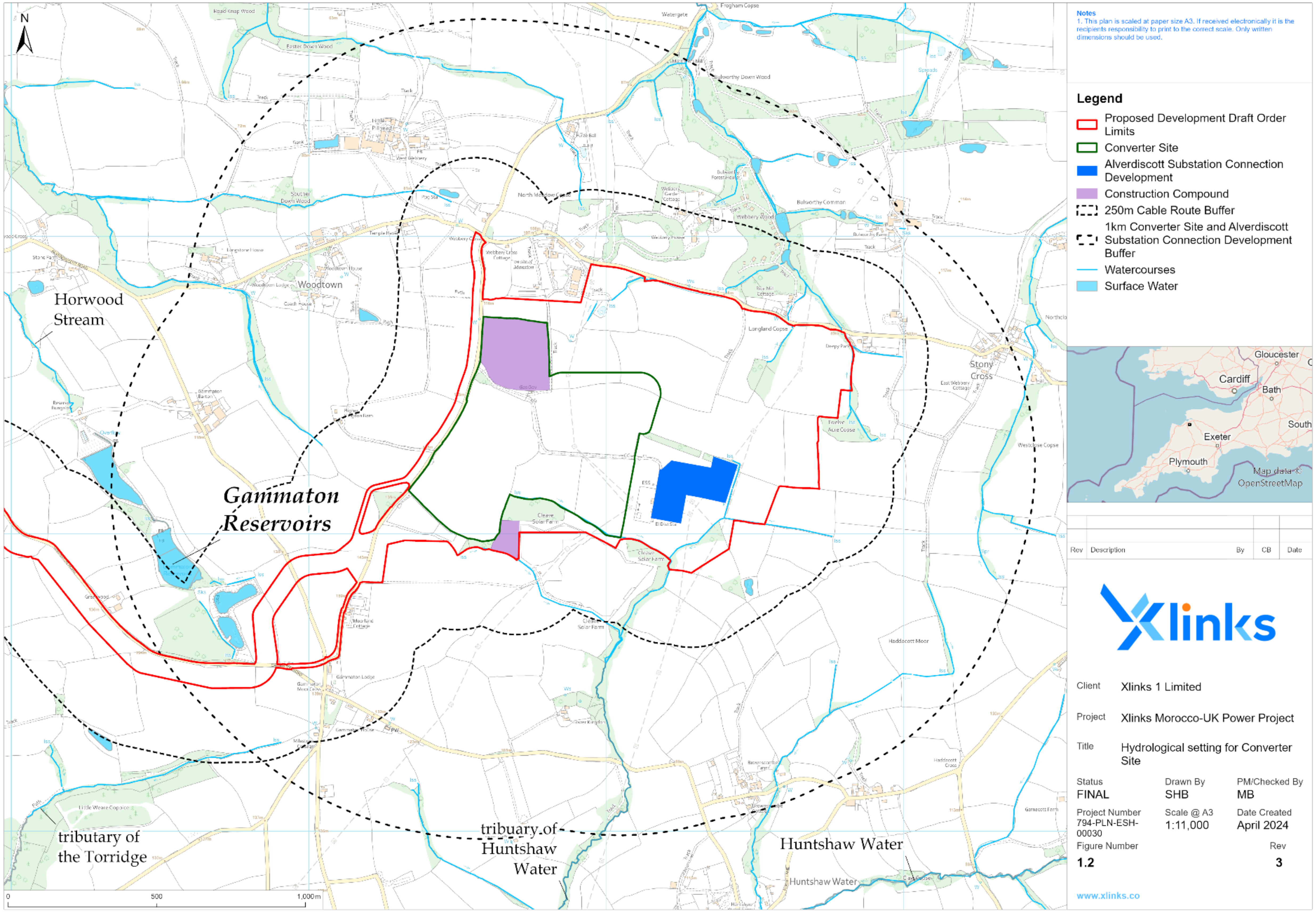

Figure 1.2: Hydrological setting for Converter Site and Alverdiscott Substation Connection Development

Designated Sites

1.5.17 There are no designated sites within the Converter Site. **Table 1.7** presents designated sites within the associated 1 km buffer zone. Designated sites are shown within **Figure 1.3**.

Table 1.7: Designated sites within the Alverdiscott Substation Connection Development and associated 1 km buffer zone

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

1.5.18 The EA Spatial Flood Defences (including standardised attributes) dataset shows no formal flood defences are present within the Converter Site or associated 1 km buffer zone.

Hydrogeological Overview

Geological Setting

1.5.19 BGS Geoindex Onshore mapping (1:50,000 scale) indicates that the Converter Site and associated 1 km buffer zone is not underlain by superficial deposits.

1.5.20 Bedrock geology for the Converter Site and associated 1 km buffer zone is Bude Formation (mudstone) with bands of Bideford Formation (sandstone) and Bude Formation (Sandstone).

1.5.21 Geology of the Converter Site and associated 1 km buffer zone is presented within the is presented within **Figure 1.4.**

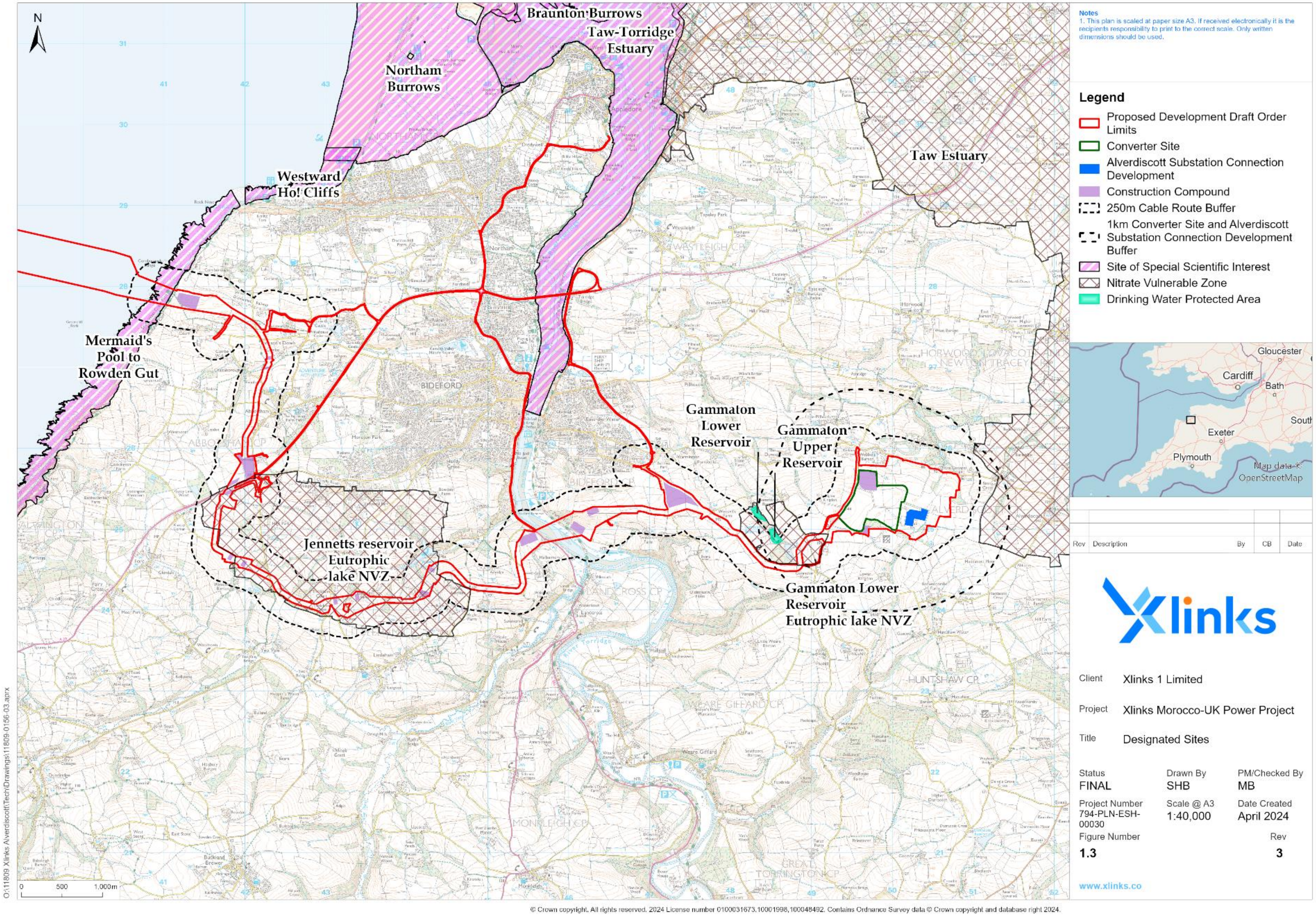

Figure 1.3: Designated Sites

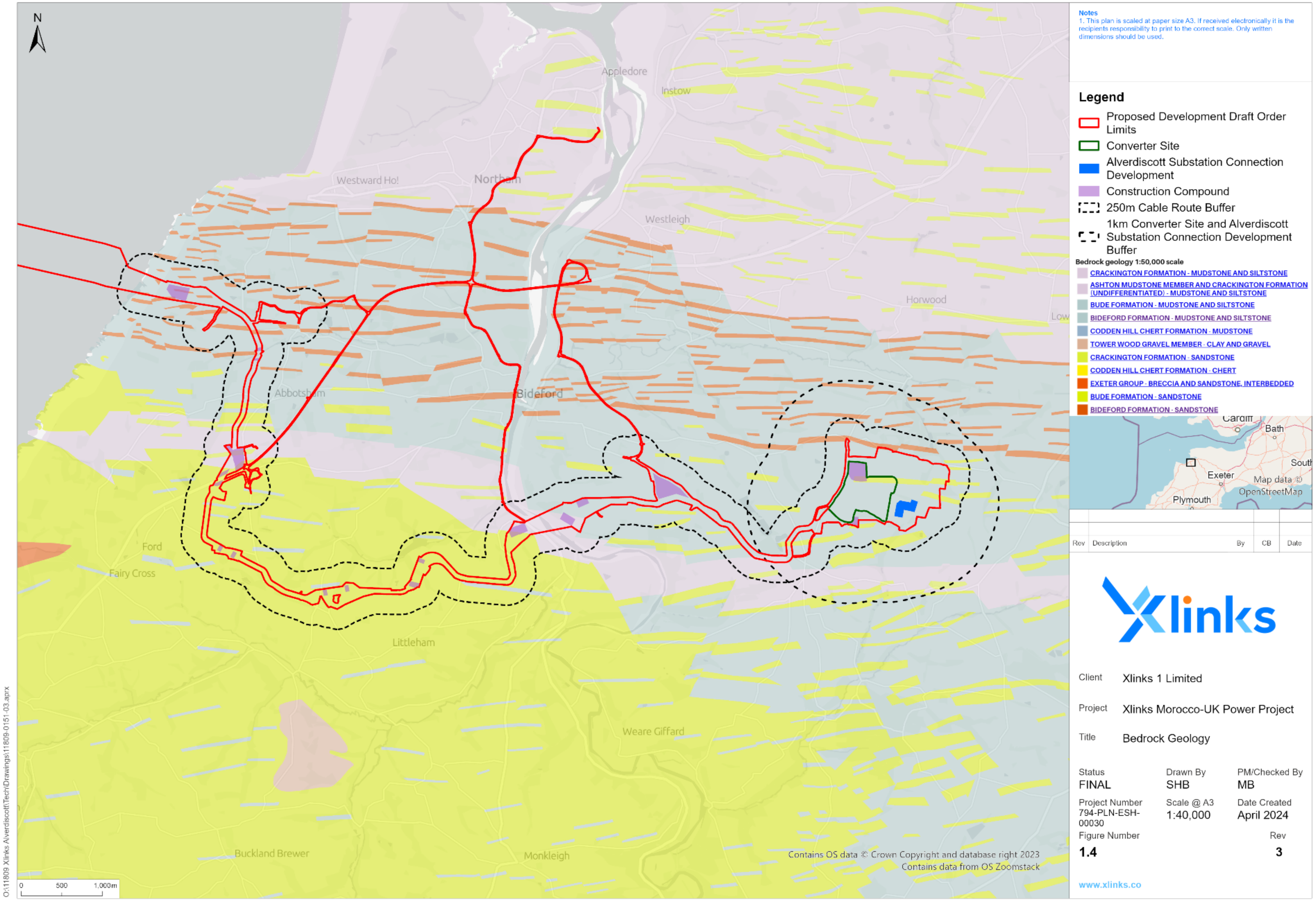

Figure 1.4: Bedrock Geology

Groundwater

1.5.22 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight report shows the Converter Site and associated 1 km buffer zone has a ‘negligible’ and ‘low’ risk of groundwater flooding.

Aquifer Designation

1.5.23 According to the EAs Aquifer Designation Mapping, the bedrock geology underlying the Converter Site and associated 1 km buffer zone 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

1.5.24 EA online groundwater Source Protection Zone (SPZ) mapping indicates that the Converter Site and associated 1 km buffer zone is not located within a groundwater SPZ.

Soils Classification

1.5.25 The soils underlying the Converter Site and associated 1 km buffer zone consists of two soils types, the soils are described as the following by the National Soils Research Institute:

- freely draining slightly acid loamy soils within the north west; and
- slowly permeable seasonally wet acid loamy and clayey soils within the south east.

Flood Risk

Fluvial/Tidal Flood Risk Classification

Flood Map for Planning

1.5.26 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. Flood zone definitions are presented below within **Table 1.8**.

Table 1.8: 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.

1.5.27 The Flood Map for Planning is presented within **Figure 1.5,** indicating the entirety of the Converter Site is located Within Flood Zone 1, with a low risk of flooding from fluvial and tidal sources.

1.5.28 Areas of Flood Zone 2 and 3 associated with areas of fluvial flood risk are present within the 1 km study area. From a review of topography, flooding from these watercourses would flow away and out of the buffer zone. There is also a hydraulically isolated area of flooding within the northern extent of the buffer zone.

Environment Agency Flood Model Data

1.5.29 EA modelled Product 4 data was requested for the Converter Site and associated 1 km buffer zone. The EA provided model data outputs of the 2007 JFLOW Model, the 2012 Devon Hydrology Strategy and 2019 Weare Gifford Model.

1.5.30 The Converter Site and associated 1 km buffer zone is not included within the undefended or defended flood scenario as indicated by the modelled fluvial tidal and depth maps provided the EA.

Strategic Flood Risk Assessment Data

1.5.31 The North Devon and Torridge District Council Level 1 SFRA was published in February 2009 (North Devon Council and Torridge District Council, 2009). It provides an overview of flood risk from various sources within the borough. Information relevant to this assessment 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.

Flood Warning/Alert

1.5.32 The EA defines a Flood Warning Area as '*geographical areas where we expect flooding to occur and where we provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater*.'

1.5.33 The Converter Site and associated 1 km buffer zone is not located within a Flood Warning Area or Flood Alert Area (see **Figure 1.6**).

Groundwater Flood Risk

1.5.34 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight report shows the Converter Site and associated 1 km buffer zone 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.

1.5.35 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.

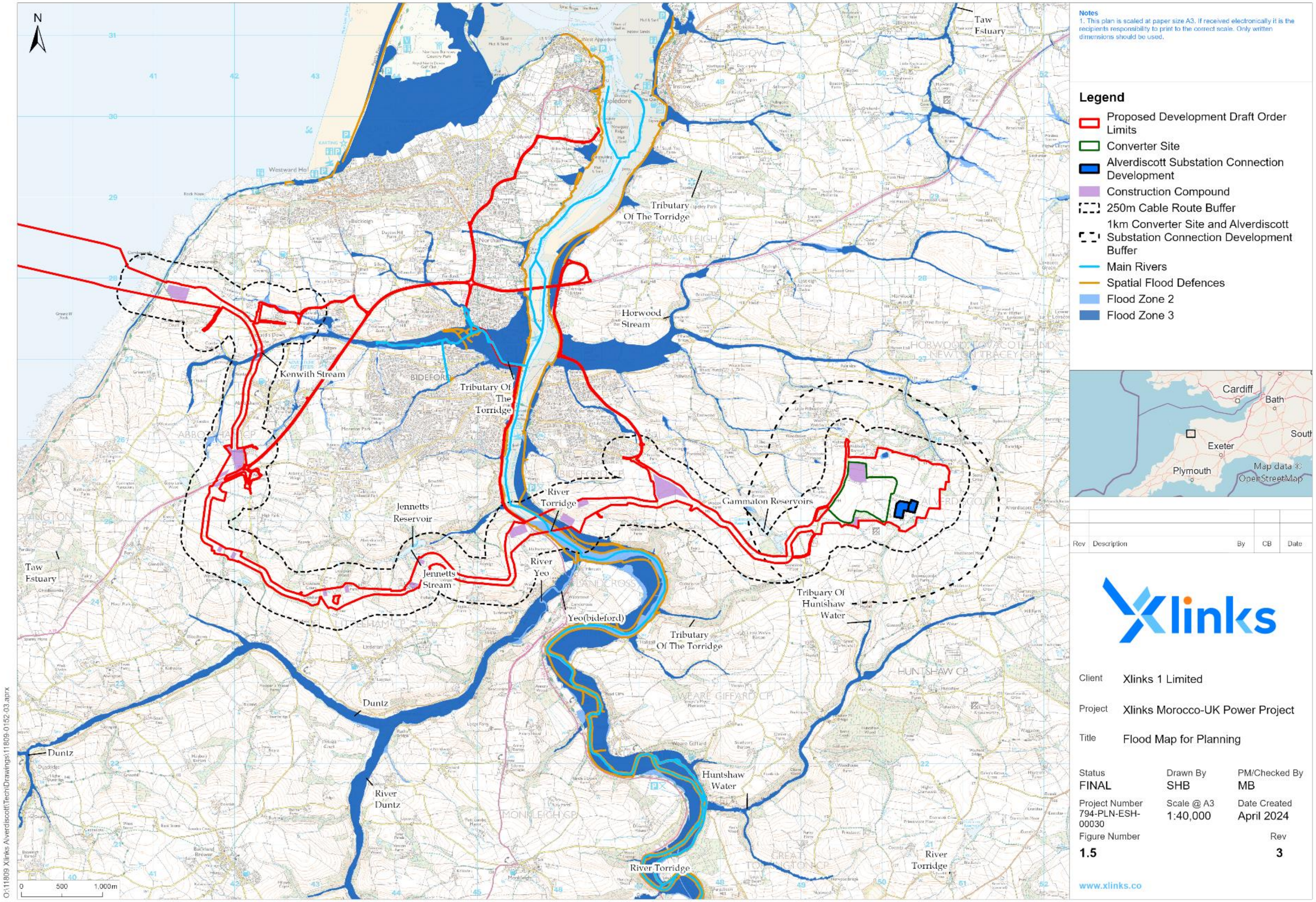

Figure 1.5: Flood Map for Planning

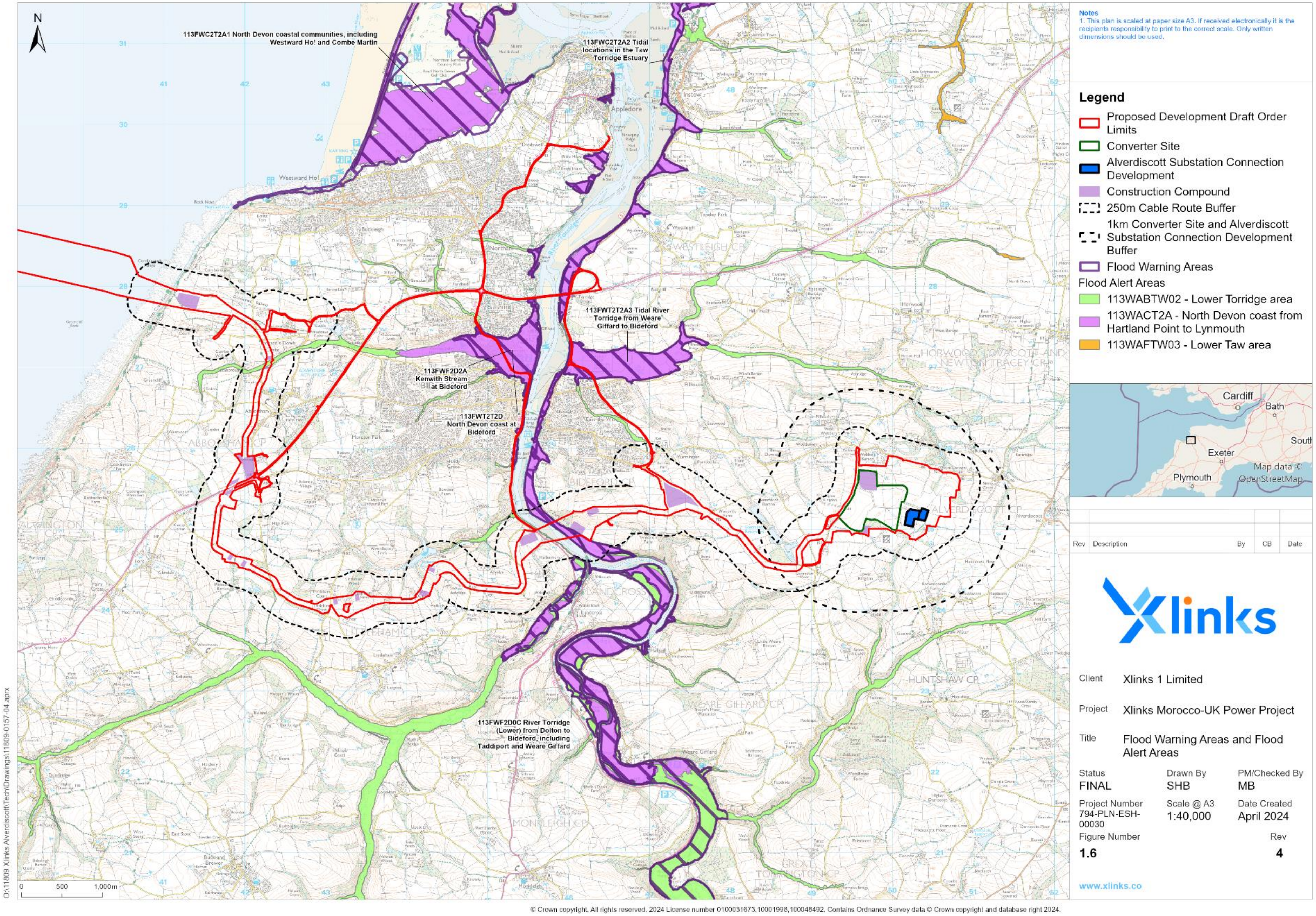

Figure 1.6: Flood warning areas and flood alert areas

Surface Water Flood Risk

1.5.36 The EAs Risk of Flooding from Surface Water mapping is available online and identifies areas at risk of surface water flooding. Mapping is presented within **Figure 1.7** and the classification of the risk is presented within **Table 1.9.**

Table 1.9: 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

1.5.37 The EA surface water map indicates that the Converter Site has a predominantly ‘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.

1.5.38 The ordinary watercourse presents a ‘low’ to ‘high’ risk of flooding within an ordinary watercourse downstream within the Converter Site 1 km buffer zone. There is also isolated area of surface water ponding within the 1 km buffer zone. Mapping does not show these areas of flooding to be hydraulically connected to the Converter Site.

Reservoir Flood Risk

1.5.39 EA mapping indicates that the Converter Site and associated 1 km buffer zone is not located within an area potentially at risk from reservoir flooding (see **Figure 1.8**).

1.5.40 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

1.5.41 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).

1.5.42 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 PEIR, are expected to include a utilities 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 very low.

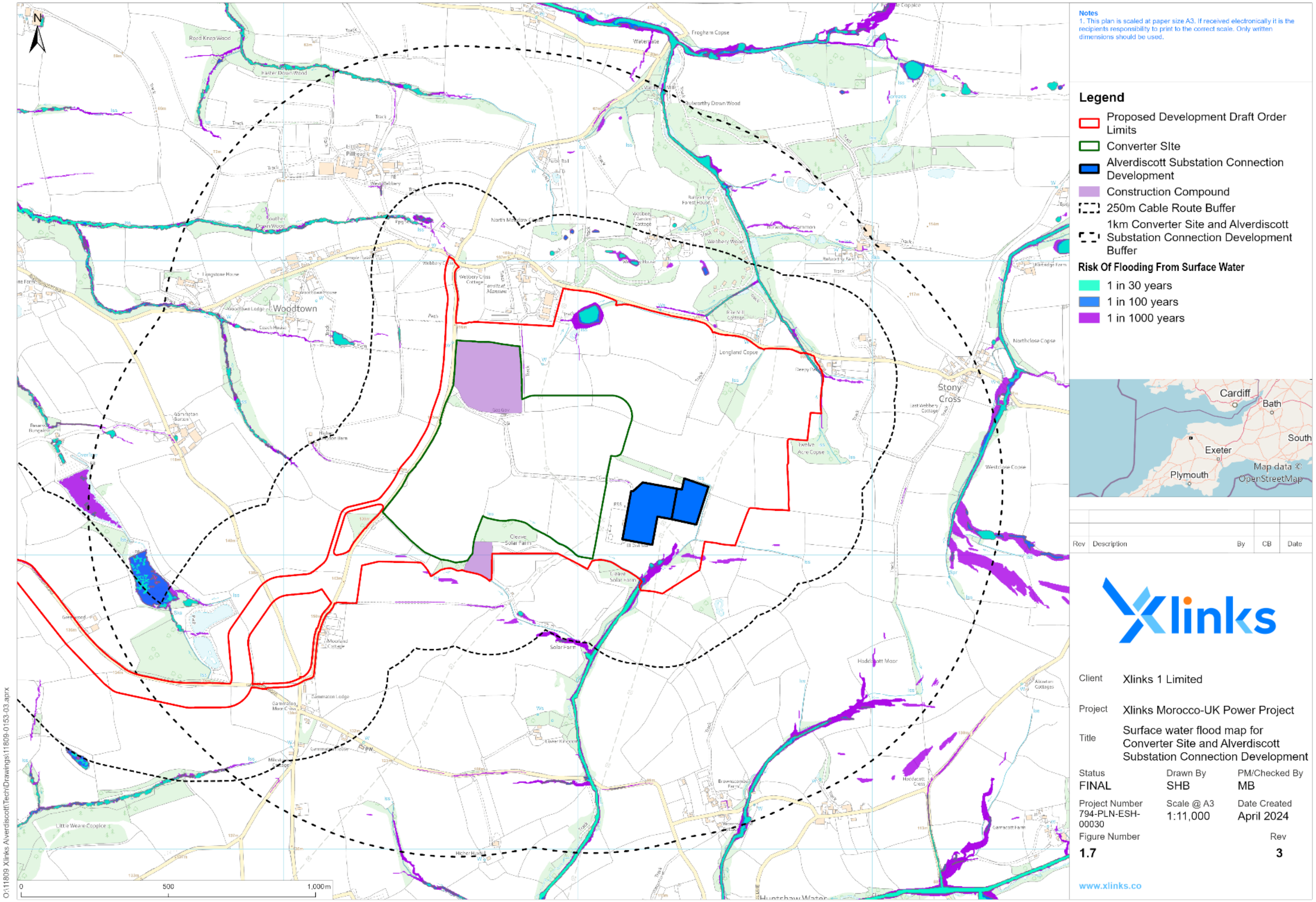

Figure 1.7: Surface water flood map for Converter Site and Alverdiscott Substation Connection Development

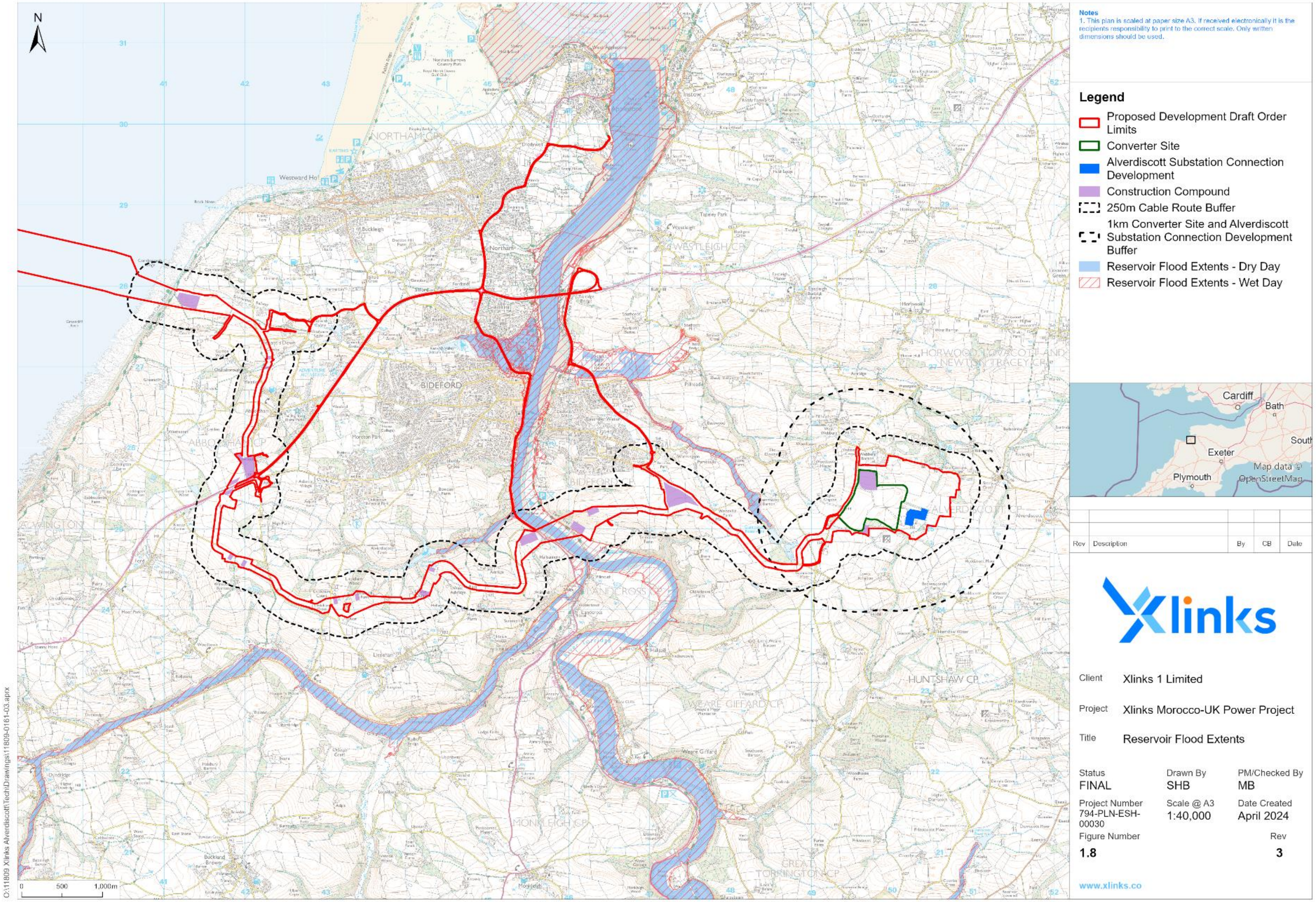

Figure 1.8: Reservoir flood extents

Historic Flooding

1.5.43 The EA has indicated via historic flood maps that the Converter Site and associated 1 km buffer zone does not lie within an area that has a history of flooding.

Summary of Flood Risk

1.5.44 Overall, the Converter Site and associated 1 km buffer zone is assessed to have a low risk from all sources, including fluvial and tidal flooding.

Flood Risk Management

Sequential Test

1.5.45 The NPPF requires the local authority to apply the sequential test in consideration of new development. The aim of the test is to steer new development to areas at the lowest probability of flooding.

1.5.46 According to Appendix 3: Flood risk vulnerability classification of the NPPF, the proposed permanent development of the Converter Site is classified as 'Essential Infrastructure' and, as such, is acceptable within Flood Zones 1 and 2. The exception test is required if development is proposed within Flood Zone 3. Temporary development associated with the converter site is classified as 'less vulnerable', which is considered to be acceptable within Flood Zones 1, 2 and 3a.

1.5.47 The permanent development is fully located within Flood Zone 1 and has a low risk from all assessed forms of flooding. The Converter Site is located within Flood Zones 1 and has a low risk from all assessed forms of flooding. The sequential test is therefore passed.

Exception Test

1.5.48 'Essential Infrastructure' developments are considered appropriate within Flood Zones 1 and 2 without the requirement to apply the exception test. 'Less Vulnerable' developments are considered appropriate within Flood Zones 1, 2 and 3a. Therefore, the application of the exception test is not required for the Converter Site.

Proposed Mitigation

1.5.49 It is anticipated 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.

1.5.50 The final proposed levels of the converter stations will be engineered to ensure any existing flow pathways are maintained to convey surface water towards the watercourses and offsite.

Construction Environmental Management Plan

1.5.51 Construction of the Proposed Development would be managed through the 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.

1.5.52 An Outline Onshore CEMP (On-CEMP) has been developed and will be submitted with the DCO application (See Volume 1, Appendix 3.2: Outline Onshore Construction Environmental Management Plan of the PEIR). The Outline On-CEMP would be developed into an 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.

1.5.53 The 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 On-CEMP(s) are met.

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

Construction Drainage

1.5.55 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.

1.5.56 Such measures would be implemented through the On-CEMP(s) and associated Construction Method Statements, including but not 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

1.5.57 The construction of the TJBs, Onshore HVDC Cables, HVAC Cables and associated joint bays or link boxes will 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, etc.

1.5.58 Consents/permits relating to dewatering activities that may affect surface water and/or groundwater are to be obtained as and when required during the construction phase of the Proposed Development. 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.

Construction methods

1.5.59 In order to manage impacts to field drainage, the Outline On-CEMP will stipulate 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.

1.5.60 The provisions of the Flood Risk Activity Permits and Land Drainage Consents will be disapplied and incorporated as protected provisions of the consent order. The design of the watercourse crossings will be agreed with the Environment Agency and/or Devon County Council

1.5.61 An Outline Pollution Prevention Plan (PPP) will be prepared and submitted with the application for development consent. A PPP will be developed in accordance with the Outline PPP and will include details of emergency spill procedures. Good practice guidance detailed in the EA’s Pollution Prevention Guidance notes (including Pollution Prevention Guidance notes 01, 05, 08 and 21) will be followed where appropriate, or the latest relevant available guidance.

1.5.62 During construction of piled foundations, mitigation measures as defined in the following guidance will be used: Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (EA, 2001), or latest relevant available guidance.

1.5.63 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

1.5.64 The surface water strategy for this development splits the site into two separate drainage networks, one for each of the proposed Converter Stations. For the purposes of this note, these networks will be referred to the “eastern network” and the "western network". Both networks seek to discharge development flows via gravity to an existing ordinary watercourse to the south east of each station. The eastern network will discharge firstly via an attenuation pond, then into the existing watercourse. An application to make the relevant outfall connections into the watercourse will need to be made directly to the LLFA, should it be necessary. Proposed discharge rates for the site as a whole will be restricted to the QBAR (mean annual flood) rate 15.5 l/s for all storms up to and including the 1 in 100 year + 50% climate change storm event, with both the eastern and western networks being restricted to 7.75 l/s respectively.

1.5.65 The above strategy is indicated on the following documents which have been prepared in support of this proposed development:

- AAC5946_RPS_XX_XX_DR_C_600-01_Preliminary Concept Plan_P07.
- AAC5946_RPS_XX_XX_DR_C_602-01_Impermeable Areas Plan_P03.
- AAC5946 - XLINKS Drainage Strategy - Rev C - 02.04.2024

Summary and Conclusions

Summary

1.5.66 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

1.5.67 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 at 'low' risk of flooding and has a flow risk of flooding from all other assessed sources.
- The proposed Converter Site is defined as 'essential infrastructure' and is acceptable within Flood Zone 1.
- Temporary construction compounds and remaining other proposed development within the Converter Site is classified as 'less vulnerable' and is acceptable within Flood Zone 1, 2 and 3a.

Surface Water Drainage

1.5.68 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 15.5 l/s for all storms up to and including the 1 in 100 year + 50% climate change storm event.

Conclusion

1.5.69 The FRA and supporting documentation demonstrate that the Converter Site meets the requirements of the NPS EN-1, the NPPF and the associated PPG.

1.6 Alverdiscott Substation Connection Development Flood Risk Assessment

Site Setting

Location

1.6.1 The proposed Alverdiscott Substation Connection Development is located at the existing Alverdiscott Substation Site, approximately 3 km to the east of East-the-Water.

1.6.2 A 1 km buffer zone has been applied to the Alverdiscott Substation Connection Development for the purposes of this assessment. The buffer zone predominantly comprises agricultural land to the north, west and south. The Converter Site is located within the north and western extent of the buffer zone and Cleave Solar Farm is located to the south west.

Topography

1.6.3 1:25,000 mapping indicates the Alverdiscott Substation Site falls to the east from a high point of 122 mAOD upon the site's north-western boundary to a low point along the central southern boundary of 105 mAOD.

Existing Use

1.6.4 Land within the Alverdiscott Substation Site consists of the existing Alverdiscott Substation which is surrounded by improved grassland and bordered by hedgerows across all boundaries. Areas of woodland bounds the southern boundary and an access road to the existing substation is located within the northern extent of the site.

Proposed Use

1.6.5 NGET would undertake works at the Alverdiscott Substation Site to accommodate the connection and onward transmission of the Applicant's power. Details of the development parameters required by NGET are currently assumed to form part of the DCO application, subject to further discussion with NGET.

1.6.6 In the absence of a confirmed design for the grid connection infrastructure from national grid, the area to be set aside for the Alverdiscott Substation Connection Development amounts to up to 3.8 ha. Within that area it is assumed that the substation itself will occupy a footprint of approximately 2.8 ha, with a maximum height of 15 m, excluding connecting tower structures.

Site Visit

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

1.6.8 The existing Alverdiscott Substation Site comprises a large impermeable area within an agricultural setting. The drainage from this appears to run to an outfall on the nearby unnamed ordinary watercourse running along the site's southern boundary as shown below within **Plate 1.3**.

Plate 1.3: Unnamed stream to the south of Alverdiscott Substation

Hydrological Overview

1.6.9 Hydrological features within the Alverdiscott Substation Connection Development and associated 1 km buffer zone is presented within the is presented within **Figure 1.2.**

Main Rivers

1.6.10 There are no EA designated Main Rivers within the Alverdiscott Substation Connection Development or within the associated 1 km buffer zone.

1.6.11 The River Torridge is the nearest designated EA Main River to the Alverdiscott Substation Connection Development located approximately 2.7 km to the south west.

Ordinary Watercourses

1.6.12 OS Mapping indicates that there are two ordinary watercourses within the Alverdiscott Substation Site which converge upon the southern boundary of the site. The unnamed watercourse flows in a southerly direction, towards Huntshaw Water, an ordinary watercourse which in turn outfalls to the River Torridge.

Other Hydrological Features

1.6.13 No significant other hydrological features (e.g., reservoirs and canals) have been identified within 1 km of the Alverdiscott Substation Connection Development.

Designated Sites

1.6.14 There are no designated sites within the Alverdiscott Substation Connection Development. **Figure 1.3** presents designated sites within the associated 1 km buffer zone.

Flood defences

1.6.15 The EA Spatial Flood Defences (including standardised attributes) mapping shows the presence of the following flood defences within the study area. No formal flood defences are present within the Alverdiscott Substation Connection Development or associated 1 km buffer zone.

Hydrogeological Overview

Geological Setting

1.6.16 BGS Geoindex Onshore mapping (1:50,000 scale) indicates that the majority of the Alverdiscott Substation Connection Development and associated 1 km buffer zone is not superficial deposits. A marginal area of alluvium (clay, silt, sand and gravel) is located within the south-east of the Alverdiscott Substation Connection Development. Superficial deposits are presented within **Figure 1.9.**

1.6.17 Bedrock geology for the Alverdiscott Substation Connection Development and associated 1 km buffer zone is Bude Formation (mudstone).Geology of the Alverdiscott Substation Connection Development and associated 1 km buffer zone is presented within the is presented within **Figure 1.4.**

Groundwater

1.6.18 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight report shows the Alverdiscott Substation Connection Development and associated 1 km buffer zone has a ‘negligible’ and ‘low’ risk of groundwater flooding.

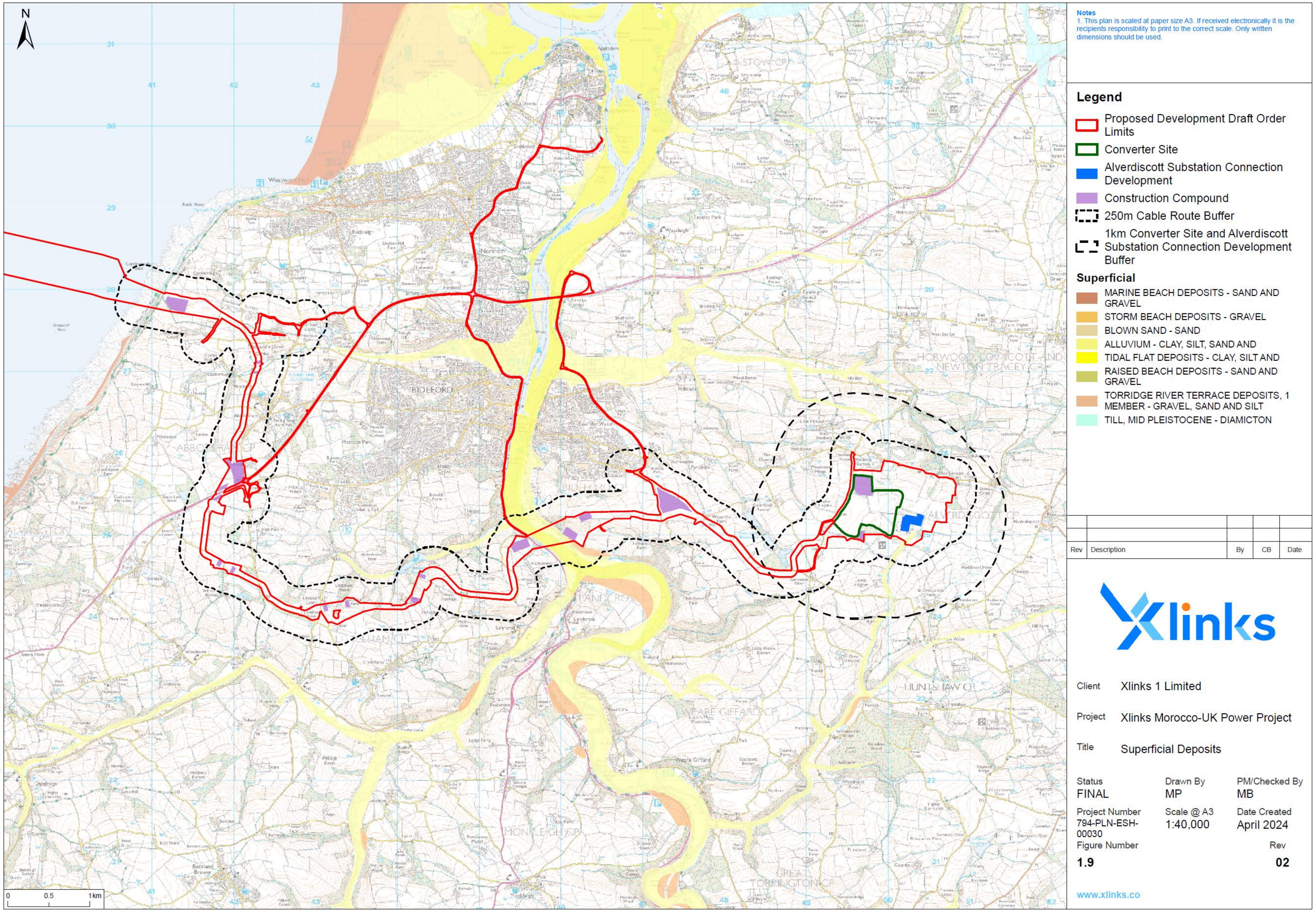

Figure 1.9 Superficial deposits

Aquifer Designation

1.6.19 According to the EAs Aquifer Designation Mapping, the bedrock geology underlying the Alverdiscott Substation Connection Development and associated 1 km buffer zone 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

1.6.20 EA online groundwater Source Protection Zone (SPZ) mapping indicates that the Alverdiscott Substation Connection Development and associated 1 km buffer zone is not located within a groundwater SPZ.

Soils Classification

1.6.21 The soils underlying the Alverdiscott Substation Connection Development are classified by the National Soils Research Institute as slowly permeable seasonally wet acid loamy and clayey soils within the south east. Freely draining slightly acid loamy soils are also located within the 1 km buffer zone.

Flood Risk

Fluvial/Tidal Flood Risk Classification

Flood Map for Planning

1.6.22 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. Flood zone definitions are presented below within **Table 1.10**.

Table 1.10: 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.

1.6.23 The Flood Map for Planning is presented within **Figure 1.5** indicating the entirety of the Alverdiscott Substation Connection Development is located Within Flood Zone 1, with a low risk of flooding from fluvial and tidal sources.

1.6.24 Areas of Flood Zone 2 and 3 associated with areas of fluvial flood risk are present within the 1km study area. From a review of topography, flooding from these watercourses would flow away and out of the buffer zone. There is also a hydraulically isolated area of flooding within the northern extent of the buffer zone.

Environment Agency Flood Model Data

1.6.25 EA modelled Product 4 data was requested for the Alverdiscott Substation Connection Development and associated 1 km buffer zone. The EA provided model data outputs of the 2007 JFLOW Model, the 2012 Devon Hydrology Strategy and 2018 Weare Gifford Model.

1.6.26 The Alverdiscott Substation Connection Development and associated 1 km buffer zone is not included within the undefended or defended flood scenario as indicated by the modelled fluvial tidal and depth maps provided the EA.

Strategic Flood Risk Assessment Data

1.6.27 The North Devon and Torridge District Council Level 1 SFRA was published in February 2009 (North Devon Council and Torridge District Council, 2009). It provides an overview of flood risk from various sources within the borough. Information relevant to this assessment is summarised below:

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

Flood Warning/Alert

1.6.28 The EA defines a Flood Warning Area as '*geographical areas where we expect flooding to occur and where we provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater*.'

1.6.29 The Alverdiscott Substation Connection Development and associated 1 km buffer zone is not located within a Flood Warning Area or Flood Alert Area.

Groundwater Flood Risk

1.6.30 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight report shows the Alverdiscott Substation Connection Development and associated 1 km buffer zone has a 'negligible' and 'low' risk of groundwater flooding. The SFRA did not identify or outline any groundwater flooding event for the Alverdiscott Substation Connection Development location.

1.6.31 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 development does not propose any subterrain development, the risk associated with groundwater flooding to the proposed development is classified as low.

Surface Water Flood Risk

1.6.32 The EAs Risk of Flooding from Surface Water mapping is available online and identifies areas at risk of surface water flooding. Mapping is presented within **Figure 1.7** and the classification of the risk is presented within **Table 1.11**.

Table 1.11: 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

1.6.33 The EA surface water map indicates that the majority of Alverdiscott Substation Connection Development has a 'very low' risk of surface water flooding. A surface water flow pathway is present upon the southern boundary of the Alverdiscott Substation Connection Development which predominantly presents a 'low' risk with isolated areas of 'medium' and 'high' risk. In all surface water flood risk scenarios, the depth is predominantly below 150 mm with isolated areas up to 600 mm in depth. Flood risk from this source is assessed to be low.

1.6.34 The ordinary watercourse presents a 'low' to 'high' risk of flooding downstream within the Alverdiscott Substation Connection Development 1 km buffer zone. There are also isolated area of surface water ponding within the 1 km buffer zone. Mapping does not show these areas of flooding to be hydraulically connected to the Alverdiscott Substation Connection Development.

Reservoir Flood Risk

1.6.35 EA mapping indicates that the Alverdiscott Substation Connection Development and associated 1 km buffer zone is not located within an area potentially at risk from reservoir flooding.

1.6.36 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 (**Figure 1.8**).

Sewer Flood Risk

1.6.37 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).

1.6.38 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 PEIR, are expected to include a utilities 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 very low.

Historic Flooding

1.6.39 The EA has indicated via historic flood maps that the Alverdiscott Substation Connection Development and associated 1 km buffer zone does not lie within an area that has a history of flooding.

Summary of Flood Risk

1.6.40 Overall, the Alverdiscott Substation Connection Development and associated 1 km buffer zone is assessed to have a low risk from all sources, including fluvial and tidal flooding.

Flood Risk Management

Sequential Test

1.6.41 The NPPF requires the local authority to apply the sequential test in consideration of new development. The aim of the test is to steer new development to areas at the lowest probability of flooding.

1.6.42 According to Appendix 3: Flood risk vulnerability classification of the NPPF, the proposed permanent development of Alverdiscott Substation Connection Development is classified as 'essential infrastructure' and, as such, is acceptable within Flood Zones 1 and 2. The exception test is required if development is proposed within Flood Zone 3. Temporary development associated with the Alverdiscott Substation Connection Development is classified as 'less vulnerable', which is considered to be acceptable within Flood Zones 1, 2 and 3a.

1.6.43 The permanent development is fully located within Flood Zone 1 and has a low risk from all assessed forms of flooding. The Alverdiscott Substation Connection Development is located within Flood Zones 1 and has a low risk from all assessed forms of flooding. The sequential test is therefore passed.

Exception Test

1.6.44 'Essential Infrastructure' developments are considered appropriate within Flood Zones 1 and 2 without the requirement to apply the exception test. 'Less Vulnerable' developments are considered appropriate within Flood Zones 1, 2 and 3a. Therefore, the application of the exception test is not required for the Alverdiscott Substation Connection Development.

Proposed Mitigation

1.6.45 It is anticipated proposed levels will fall away from the permanent structures proposed as part of the Alverdiscott Substation Connection Development and direct surface water towards onsite drainage systems to provide a level of protection against water ingress.

1.6.46 The final proposed levels of the Alverdiscott Substation Connection Development will be engineered to ensure any existing flow pathways are maintained to convey surface water towards the watercourses and offsite

Construction Environmental Management (CEMP)

1.6.47 Construction of the Proposed Development would be managed through the 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.

1.6.48 An Outline On-CEMP has been developed and will be submitted with the DCO application (See Volume 1, Appendix 3.2: Outline Onshore Construction Environmental Management Plan). 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.

1.6.49 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.

1.6.50 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 which will be developed and provided as part of the application for development consent.

Construction Drainage

1.6.51 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.

1.6.52 Such measures would be implemented through the On-CEMP(s) and associated Construction Method Statements, including but not 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;
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- concrete to be stored and handled appropriately to prevent release to drains;
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- 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;
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- stockpiles to be kept to minimum possible size with gaps to allow surface water runoff to pass through.

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1.6.54 Consents/permits relating to dewatering activities that may affect surface water and/or groundwater are to be obtained as and when required during the construction phase of the Proposed Development. 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.

Construction methods

1.6.55 In order to manage impacts to field drainage, the Outline On-CEMP will stipulate 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.

1.6.56 The provisions of the Flood Risk Activity Permits and Land Drainage Consents will be disapplied and incorporated as protected provisions of the consent order. The design of the watercourse crossings will be agreed with the Environment Agency and/or Devon County Council

1.6.57 An Outline PPP will be prepared and submitted with the application for development consent. A PPP will be developed in accordance with the Outline PPP and will include details of emergency spill procedures. Good practice guidance detailed in the EA’s Pollution Prevention Guidance notes (including Pollution Prevention Guidance notes 01, 05, 08 and 21) will be followed where appropriate, or the latest relevant available guidance.

1.6.58 During construction of piled foundations, mitigation measures as defined in the following guidance will be used: Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (EA, 2001), or latest relevant available guidance.

1.6.59 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.

Alverdiscott Substation Connection Development Drainage Strategy

Drainage strategy

Surface water drainage

1.6.60 The sustainable management of surface water is an essential element of reducing future flood risk to the site and its surroundings.

1.6.61 Undeveloped sites generally rely on natural drainage to convey or absorb rainfall, with water infiltrating into the ground or coalescing across the surface towards watercourses.

1.6.62 The effect of development is generally to reduce the permeability of at least part of the site, which markedly changes its response to rainfall. Without specific measures to manage surface water the volume of water and peak flow rate are likely to increase.

1.6.63 Inadequate surface water drainage arrangements can threaten the development itself and increase the risk of flooding to others.

1.6.64 Surface water arising from a developed site should as far as is practicable be managed in a sustainable manner to mimic the natural hydrology of the site while reducing the risk of flooding and elsewhere, taking climate change into account.

Sustainable drainage options

1.6.65 NPS EN-1, the NPPF (and supporting PPG), SuDS Manual (CIRIA 2015) and Sustainable Drainage System – Guidance for Devon (2023) promote sustainable water management through the use of SuDS. A hierarchy of techniques is identified as:

- prevention;
- source control;
- site control; and
- regional control.

1.6.66 The implementation of SuDS as opposed to conventional drainage systems provides several benefits by:

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;
- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- reducing potable water demand through rainwater harvesting;
- improving amenity through the provision of open spaces and wildlife habitat; and
- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

1.6.67 An assessment of the current and proposed runoff rates was undertaken to determine the surface water attenuation requirements for the Alverdiscott Substation Connection Development . In line with the SuDS Manual (C753) (CIRIA, 2015) the proposed discharge rate must not exceed the greenfield discharge rate prior to development.

Runoff rate calculations

1.6.68 Runoff rates have been determined using the current 'industry best practice' guidelines as outlined in the SuDS Manual (C753) (CIRIA, 2015) and the non-statutory technical standards for sustainable drainage systems (Defra, 2015). The Defra recommended methodology for sites up to 50 hectares (ha) is the Institute of Hydrology Report 124 (IH124) method (Institute of Hydrology, 1994).

1.6.69 For catchments smaller than 50 ha, the equivalent runoff from a 50 ha site must be calculated using IH124, it is then possible to pro-rata this value to give the runoff for the smaller site. Interim Code of Practice SuDS calculation automatically carries out the pro rata conversion reducing the possibility of human error. The runoff rates were calculated using the MicroDrainage software suite and are present within **Table 1.12.**

Table 1.12: Existing surface water run-off rates

Return period (years)	Runoff rate (l/s)
1 in 1	6.3
1 in 2	7.1
QBAR*	8.1
1 in 30	15.4
1 in 100	19.5

*Mean Annual Flood

Greenfield runoff rate characteristics

1.6.70 The area to be set aside for the Alverdiscott Substation Connection Development amounts to up to 3.8 ha. Within that area it is assumed that the substation itself will occupy a footprint of approximately 2.8 ha which, for the purposes of the PEIR, is assumed to be impermeable. The greenfield runoff rates are based on the current site baseline, assumed to be 100% permeable surfacing.

1.6.71 The following parameters were incorporated into the greenfield site runoff calculations.

- Impermeable area: 2.8 ha.
- Standard-period Average Annual Rainfall: 1034 mm/yr.
- Soil: 0.300 (global soils index).
- Region number: 8 (catchment based on Flood Studies Report Figure I.2.4.).

Attenuation requirements

1.6.72 The attenuation volume required to restrict the surface water runoff from low permeable surfacing to the existing QBAR runoff rate for a 1 in 100-year rainfall event plus climate change (50%) has been determined using the industry standard MicroDrainage software suite incorporating the following parameters.

1.6.73 The system was modelled within MicroDrainage as a tank/pond with restricted discharge rate achieved via an orifice outflow control. The MicroDrainage calculation sheets are included within Annex A.

1.6.74 The attenuation volume required to restrict runoff from a 1 in 100-year storm event, plus a 50% allowance for climate change, to the QBAR greenfield runoff rate of 8.1 l/s, has been determined to be approximately 2,790 m^3 for the Alverdiscott Substation Connection Development.

1.6.75 The drainage design will be developed further based on the set of maximum design parameters.

Summary and Conclusions

Summary

1.6.76 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 Alverdiscott Substation Connection Development located to the west of Alverdiscott.

Flood Risk

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

- The EA Flood Map for Planning shows that the Alverdiscott Substation Connection Development is located in Flood Zone 1 at 'low' risk of flooding and has a flow risk of flooding from all other assessed sources.
- The proposed Alverdiscott Substation Connection Development is defined as 'essential infrastructure' and is acceptable within Flood Zone 1.
- Temporary construction compounds and remaining other proposed development within the Converter Site is classified as 'less vulnerable' and is acceptable within Flood Zone 1, 2 and 3a.

Surface Water Drainage

1.6.78 The proposed land use comprises Alverdiscott Substation Connection Development and it is assumed that the substation itself will occupy a footprint of approximately 2.8 ha which for the purposes of the PEIR is assumed to be impermeable.

1.6.79 The site is currently undeveloped and, as such, the proposed discharge rate will be set at 8.1 l/s – the QBAR greenfield runoff rate. Approximately 2,790 m^3 of attenuation will be required to accommodate these flows for the 1 in 100-year plus 50% climate change event.

Conclusion

1.6.80 The FRA and supporting documentation demonstrates that the Alverdiscott Substation Connection Development meets the requirements of the NPS EN-1, the NPPF and the associated PPG.

1.7 Onshore Infrastructure Area Flood Risk Assessment

Site Setting

Location

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

1.7.2 The Onshore Infrastructure Area is presented within **Figure 1.1**. For the purposes of this assessment, the study area includes an additional 250 m buffer zone. The study area runs from the coast at Cornborough Range and trends counter clockwise around Bideford before routing eastwards, crossing the River Torridge and terminating at the existing Alverdiscott Substation site to the west of Alverdiscott.

1.7.3 Whilst the Converter Site and Alverdiscott Substation Connection Development are included within the Onshore Infrastructure Area, it is considered within the previous section and, as such, the converter station and substation elements are not considered further in this section.

Existing Use

Landfall

1.7.4 The landfall is located to the south west 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 1.4**.

1.7.5 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.

1.7.6 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 to either side being higher 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.

1.7.7 An ephemeral ordinary watercourse is noted within the Draft Order Limits, intermittently discharging flows directly to Bideford Bay during and following rainfall events. The watercourse is shown within the left extent of **Plate 1.4**.

Plate 1.4: Landfall site at Cornborough Range

1.7.8 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 1.5**.

Plate 1.5: South West Water Cornborough Waste Water Treatment Plant Pipeline

Lower Dunn Farm

1.7.9 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.

1.7.10 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.

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

1.7.12 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

1.7.13 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. The owner indicated no private water supply assets were located within the route of the Onshore HVDC Cable Corridor.

1.7.14 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 time of writing potentially conflicts with the cable route. Further review of this conflict is required.

River Torridge

1.7.15 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 which runs under the A386 as shown within **Plate 1.6**. During construction, careful consideration of drainage will be required.

Plate 1.6: Culvert which runs under the A386

Proposed Use

1.7.16 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 PEIR, and summarised below.

- Landfall.
  - Up to 2 landfall transition joint bays each approximately 150 m2 and 2.5 m deep.
  -
- Onshore HVDC Cable Corridor between the transition joint pit, at the Landfall site, and the proposed converter stations.
  - a maximum length of 14.5 km
  - a temporary construction corridor width of 65 m and a permanent width of 32 m for trenched methods and 60 m for HDD locations.
  - Up to ten cables within two cable trenches, each trench up to 4.3 m wide at ground level and a depth of 1.4 m.
- Onshore HVAC Cables between the proposed converter stations and the national grid, via Alverdiscott Substation Connection Development
  - a maximum length of 1.2 km
  - a temporary construction corridor width of 65 m and a permanent width of 30 m.
  - Up to 12 cables within four cable trenches, each trench up to 4.9 m wide at ground level and a depth of 1.4 m.

- Up to 34 joint bays in total, each approximately 20 m long, with a width of approximately 5 m and a floor depth of 1.4 m
- Up to 34 link bays in total, each approximately 2.25 m^2 and 1.4 m deep.
- Up to 8 HDD locations (including landfall) with two compounds per HDD.
- Up to 20 temporary construction compounds:
  - One main construction compound measuring up to 63,000 m^2 in size; and
  - One secondary construction compound measuring up to 48,000 m^2 in size.
  - One landfall construction compound measuring up to 10,000m^2 in size.
  - One converter compound measuring up to 20,000 m^2 in size.
  - 16 HDD compounds each measuring up to 10,000 m^2 in size.
- One temporary 7 m wide haul roads constructed using imported engineered granular fill with Terram layers nominal thickness 300 mm.

Hydrological Overview

Main Rivers and Sea

1.7.17 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 within **Figure 1.10**. The river discharges to the Taw and Torridge Estuary prior to discharging to Barnstaple Bay, where the landfall is located.

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

Shoreline Management Plan

1.7.19 The study area is located within the Shoreline Management Plan 2 North Devon and Somerset.

1.7.20 The landfall is located within sub cell 7c05 'Hartland Point to Westward Ho!' and the Onshore HVDC Cable Corridor crosses sub cell 7c12 'Taw/Torridge Estuary'. Both subcells are classified 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.

Ordinary Watercourses

1.7.21 Ordinary watercourses also present within the study area presented within **Figure 1.10** and include the following:

- River Yeo
- Kenwith Stream
- Several tributaries of Jennetts Reservoir and its associated outflow

1.7.22 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.

1.7.23 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.

Other Hydrological Features

1.7.24 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 1.10**.

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

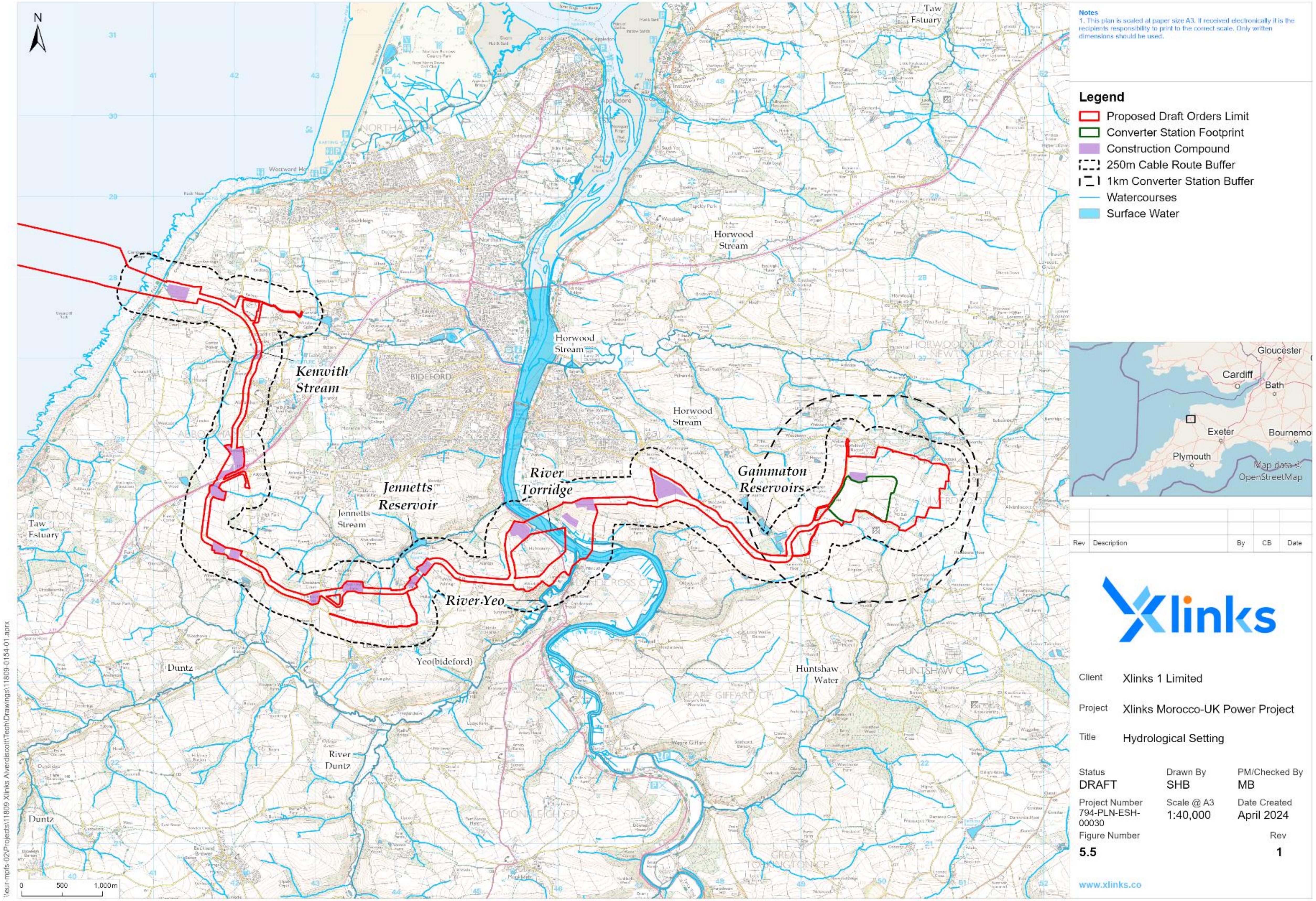

Figure 1.10: Hydrological Setting

Internal Drainage Board

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

Designated Sites

1.7.27 The landfall crosses the Mermaid's Pool to Rowden Gut geological SSSI. The Taw-Torridge Estuary biological SSSI 1,000 m impact zone is also located within the study area. Additional designated sites within the study area are listed within **Table 1.7** and presented within **Figure 1.3**.

Flood defences

1.7.28 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 within **Table 1.13** and presented within **Figure 1.5.**

Table 1.13: Flood Defences

Asset ID	Asset Maintainer	Description	Design Standard of Protection	Condition
40714	Private individual, Company or Charity	Natural High Ground	5	Unknown
5007	Private individual, Company or Charity	Bridge Abutment	5	Unknown
5010	Private individual, Company or Charity	Bridge Abutment	5	Unknown
53417	Private individual, Company or Charity	Natural High Ground	Unknown	Unknown
53418	Private individual, Company or Charity	Natural High Ground	Unknown	Unknown
57005	Private individual, Company or Charity	Natural High Ground	3	Unknown
57006	Private individual, Company or Charity	Natural High Ground	5	Unknown
57007	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

Flood Alert and Flood Warnings

1.7.29 Flood warning and flood alert areas located within the study area are presented below within **Table 1.14** and **Table 1.15** and additionally presented within **Figure 1.6**.

Table 1.14: Flood Warnings

Flood Warning Area Code	Description	Flood source
113FWT2T2A3	Tidal River Torridge from Weare Gifford to Bideford	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

1.7.30 BGS Geoindex Onshore mapping (1:50,000 scale) of bedrock geology, as presented within **Figure 1.4** 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.

1.7.31 BGS Geoindex Onshore mapping of superficial deposits, as presented within **Figure 1.9** 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.

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

Groundwater

1.7.33 The Groundsure Report indicates the study area is located in area negligible of groundwater flooding.

Aquifer Designation

1.7.34 The EAs Aquifer Designation Mapping indicates the strata at the surface of the study area is 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

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

Soils Classification

1.7.36 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.

Flood Risk

Fluvial and Tidal Flooding

Environment Agency Flood Map for Planning

1.7.37 The EA Flood Map for Planning, which is available online, indicates that whilst the majority of the study area is located within Flood Zone 1. Areas of Flood Zone 2 and 3 are present in association with the following:

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

1.7.38 Flood zones associated with the River Torridge and River Yeo within the study area is understood 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 within **Table 1.13**.

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

1.7.40 The EA Flood Map for planning is provided in **Figure 1.5. 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)
Flood Zone 2	35.1
Flood Zone 3	58.6

Environment Agency Flood Model Data

1.7.41 To inform flood risk to the Onshore Infrastructure Area, we have 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).
- JFLOW (2007).

Coastal Design Sea Levels

1.7.42 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 for the 200 and 1,000-year tidal events 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.

Weare Gifford model

1.7.43 It is noted the Weare Gifford modelling does not cover the order limits. Closest nodes associated with this model are located within 1 km to the location of the HDD crossing under the River Torridge.

Devon Tidal Flood Zone Improvements model

1.7.44 Extents of the River Torridge to be crossed by the Onshore HVDC Cable Corridor are not included within the modelled extents of the Devon Tidal Flood Zone Improvements model and as such is unable to be used to assess flood risk.

JFLOW modelling

River Torridge

1.7.45 The only data available which covers the extents of the River Torridge to be crossed by the HVDC Cable Corridor via HDD is informed by JFLOW modelling. JFLOW modelling informs the extents of Flood Zone 2 and 3 within the Flood Map for Planning for the local area, including where the Onshore HVDC Cable Corridor is to cross the Kenwith Stream via HDD. The data does not account for the effects of climate change since it was published in 2007.

1.7.46 The Flood Map for Planning and elevation analysis of the River Torridge shows areas of Flood Zone 2 and 3 span across the mudflats with extents constrained by gradually rising topography of the valley. Flood defences are shown 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. It is noted these defences are not represented within the Flood Map for Planning.

1.7.47 Temporary construction and associated HDD compounds for the River Torridge crossing are located within Flood Zone 1, and over 16 m in distance from flood defences noted within the EA ‘Spatial flood defences (including standardised attributes) dataset. It is also noted that the HDD entry and exit pits within the construction compounds are located within areas between 20 – 50 mAOD and 50 – 75 mAOD above the River Torridge. As such, it is not expected the climate change flood extents for the River Torridge will inundate the temporary construction compounds during the construction phase of development.

1.7.48 It is proposed that the Onshore HVDC Cable Corridor is to cross the River Torridge via HDD from an area of Flood Zone 1, crossing underneath extents of Flood Zone 2 and 3. In line with the Standard Rules Flood Risk Activity Permit ‘Service crossing below the bed of a main river not involving an open cut technique (FRA3)’ HDD depths will be at least 1.5 m below hard bed, with ground investigation works to be undertaken within the channel of the river to ascertain the level of the hard bed.

Ordinary watercourses

1.7.49 Ordinary watercourses including Kenwith Stream and the outfall of Jennetts reservoir included within Flood Map for Planning Flood Zones 2 and 3 are also informed by JFLOW modelling. Flood risk from these ordinary watercourses has been informed by the Long Term Flood Risk Mapping for surface water flooding, with the use of the 'low' risk scenario (1 in 1,000-year event) as a proxy for the 100-year plus 28% climate change allowance. No above ground development is proposed within this flood extent.

1.7.50 Temporary construction compounds and HDD compounds associated with the crossings are located within Flood Zone 1 and at least 8 m in distance from the top of bank of the ordinary watercourses.

Summary

Onshore HVDC and HVAC Cable Corridors

1.7.51 The installation of below ground cables associated with the Onshore HVDC and HVAC Cable Corridors will be temporary in nature, with construction completed by 2032. The installation of Onshore 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. The cable corridors will not increase flood risk to the surrounding area and has negligible risk of flooding to and from the development.

1.7.52 The entirety of the Onshore HVAC Cable Corridor is located within Flood Zone 1. The Onshore HVDC Cable Corridor is located within Flood Zones 1, 2 and 3, with extents of Flood Zone 2 and 3 associated with HDD crossings routed underneath watercourses.

1.7.53 Further assessment of flood risk at the HDD crossings is to be made with the EA following the submission of the PEIR.

Landfall

1.7.54 The landfall at Cornborough Range would be constructed using 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 TJBs. The TJBs are to be located at the top of the Cornborough Range, at approximately 12mAOD above the Mean High Water Springs and within Flood Zone 1. As such, the effects of climate change from sea level rise will not impact the Proposed Development at this location.

1.7.55 Further assessment of flood risk at the HDD crossing is to be made with the EA following the submission of the PEIR.

Temporary Onshore Infrastructure

1.7.56 Temporary onshore infrastructure including construction compounds in which HDD entry and exit pits are located are restricted to Flood Zone 1. Haul roads are located within Flood Zones 1, 2 and 3.

1.7.57 Further assessment of flood risk of temporary onshore infrastructure is to be made with the EA following the submission of the PEIR.

Mitigation Measures

1.7.58 Mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR and are discussed within **paragraphs 1.7.92** to **1.7.105**. With the implementation of mitigation measures during construction, flood risk from this source is assessed to be low.

Groundwater Flood Risk

1.7.59 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 ‘moderate’ risk is associated in proximity to the River Torridge.

1.7.60 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 PEIR, limit the potential impact from this form of flooding.

1.7.61 Given that the development does not propose subterrain development, the risk associated with groundwater flooding to the proposed development is classified as low.

Surface Water Flood Risk

1.7.62 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 pond within areas of inadequate drainage.

Environment Agency Long Term Flood Risk Mapping

1.7.63 The EA long term flood risk from surface water mapping is presented within **Figure 1.11** and shows localised areas along the study area as having ‘low’ to ‘high’ risk of flooding from surface water and ordinary watercourses. Flooding is predominantly associated overland flow pathways flowing towards ordinary watercourses and out-of-bank flows from ordinary watercourses which form tributaries to main rivers.

1.7.64 The cable corridors will not be impacted by or cause any adverse effect on surface water flooding following installation.

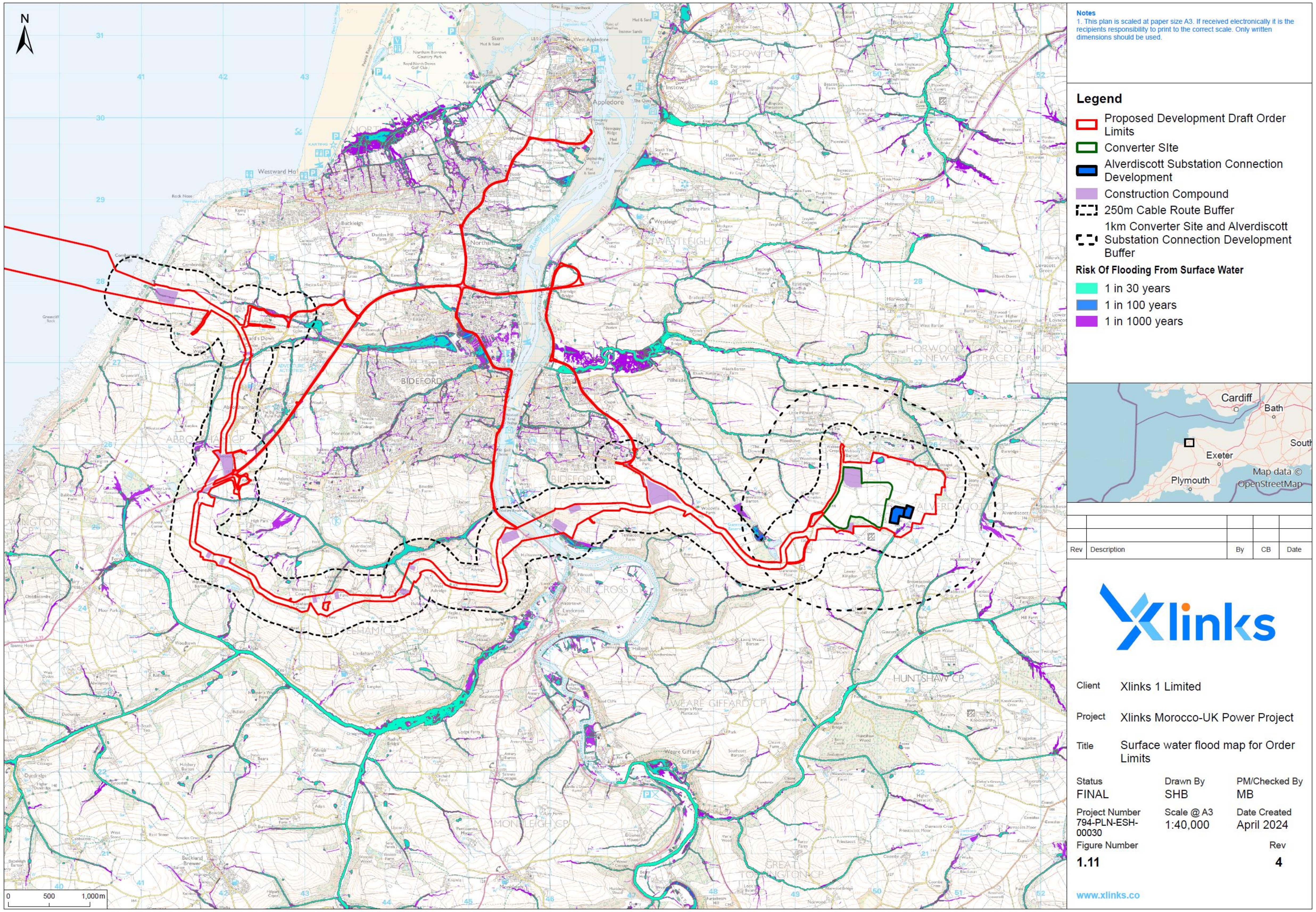

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Figure 1.11 Surface water flood map

Reservoir Flood Risk

1.7.65 EA mapping also indicates that majority 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 a risk of flooding from reservoirs when this occurs simultaneously with flooding from rivers.

1.7.66 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

1.7.67 South West Water operate public sewer assets and water supplies in the study area.

1.7.68 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).

1.7.69 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 PEIR for additional information).

1.7.70 The remainder of the study area is predominantly agricultural and therefore, unlikely to have sewer assets present. Mitigation measures, as identified in Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR, are expected to include a utilities 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 very low.

Artificial sources

1.7.71 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.

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

Historical Flooding

1.7.73 The EA Historic Flood Map is presented within **Figure 1.12** and records historical flooding has occurred within the study area within proximity to the River Torridge and downstream sections of the River Yeo. Extents are approximately 206,930 m^2 (20.7 ha).

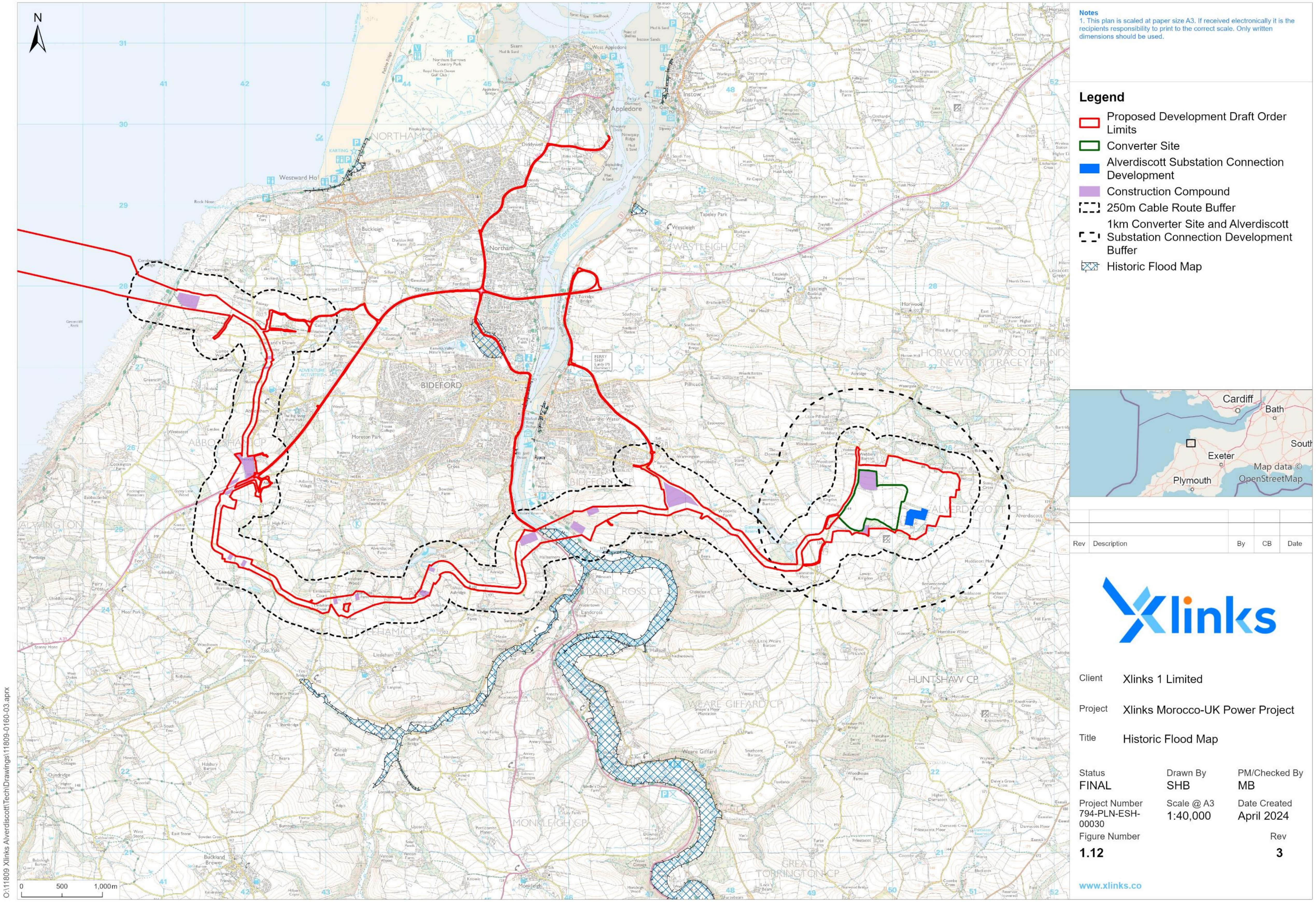

Figure 1.12: Historic flood map

Strategic Flood Risk Assessment

1.7.74 Torridge District Council Level 2 SFRA was published in July 2010 (Torridge District Council, 2010). This provides a more detailed and studied overview on 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 a 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 wall 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.

Summary

1.7.75 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 PEIR.

Flood Risk Management

Site Vulnerability

1.7.76 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.

1.7.77 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'. This is defined as *'Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood.'*

1.7.78 The landfall, Onshore HVDC Cable Corridor and HVAC Cables are classified as 'essential infrastructure' and as such is acceptable within Flood Zones 1 and 2. The exception test is required if development is proposed within Flood Zone 3.

1.7.79 Temporary construction compounds and hail roads are classified as 'less vulnerable' which are considered to be acceptable within Flood Zones 1, 2 and 3a and not acceptable within Flood Zone 3b.

Sequential Test

1.7.80 The NPPF requires the local authority to apply the sequential test in consideration of new development. The aim of the test is to steer new development to areas at the lowest probability of flooding.

1.7.81 According to Annex 3: Flood risk vulnerability classification of the NPPF, the proposed permanent development is classified as 'Essential Infrastructure' and as such is acceptable within Flood Zones 1 and 2. The exception test is required if development is proposed within Flood Zone 3. Temporary development is classified as 'less vulnerable' which is considered to be acceptable within Flood Zones 1, 2 and 3a and not acceptable within Flood Zone 3b.

1.7.82 The permanent development is classified as 'essential infrastructure' and is located within Flood Zone 1, 2 and 3 with have a low risk from all other assessed forms of flooding. As such, development that falls into this classification is subject to the exception test.

1.7.83 Temporary compounds are classified as 'less vulnerable' and are located within Flood Zone 1 2 and 3 with a low risk from all other assessed forms of flooding. The sequential test is therefore passed.

Exception Test

1.7.84 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, application of the exception test is required for the Onshore HVDC Cable Corridor located within Flood Zone 3.

1.7.85 The PPG advises that essential infrastructure development can be considered appropriate in Flood Zone 3a and 3b, 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.

- 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.
- 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.

1.7.86 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.

1.7.87 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. The Converter Site is entirely located within Flood Zone 1.

1.7.88 The installation of below ground cables will be temporary in nature with no permanent above ground structures proposed. The majority of the construction works are within agricultural land however, there will be no changes to existing land use. Once installed, the Onshore HVDC Cable Corridor does not increase flood risk to the surrounding area and has negligible risk of flooding to and from the development.

1.7.89 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 cable corridors during construction will be managed through control principles set out in Volume 1, Appendix 3.2: Outline Onshore Construction Environmental Management Plan of the PEIR, which will be revised and submitted to the LLFAs for approval with consultation with the EA prior to the commencement of works.

1.7.90 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.

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

Proposed Mitigation

Construction Environmental Management (CEMP)

1.7.92 Construction of the Proposed Development would be managed through the 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.

1.7.93 An Outline On-CEMP has been developed and will be submitted with the DCO application (See Volume 1, Appendix 3.2: Outline Onshore Construction Environmental Management Plan). 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.

1.7.94 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.

1.7.95 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 which will be developed and provided as part of the application for development consent.

Construction Drainage

1.7.96 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.

1.7.97 Such measures would be implemented through the CEMP(s) and associated Construction Method Statements, including but not 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

1.7.98 The construction of the transition joint bays, Onshore HVDC Cables, HVAC Cables and associated joint bays or link boxes will 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, etc.

1.7.99 Consents/permits relating to dewatering activities that may affect surface water and / or groundwater are to be obtained as and when required during the construction phase of the Proposed Development. 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.

Flood Warning/Flood Alerts

1.7.100 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. Some haul roads are located within Flood Zone 3. 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.

1.7.101 An Outline Flood Management Plan will be prepared for works taking place within a Flood Warning/Flood Alert area. During the construction 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.

Watercourse crossings

1.7.102 HDD has been assumed for the major crossings due to the 'reasonable maximum design' assumption of construction effects. HDD would generally be undertaken from two construction compounds located either side of each crossing, expected to be located within Flood Zone 1. These compounds would generally be 10,000 m^2 in size and would be suitably located for the drilling works required.

1.7.103 There would be up to eight trenchless cable crossings via HDD within the onshore section of the Proposed Development, including the HDD at landfall. It is currently proposed that the following watercourse features would be crossed by HDD (or other trenchless methodologies):

- The Mermaid's Pool to Rowden Gut Site of Special Scientific Interest (SSSI), situated along the coastline at the landfall, Cornborough Range.
- The following waterbodies:
  - Kenwith Stream;
  - an unnamed watercourse within Littleham Wood;
  - an unnamed watercourse 290 m south of Jennetts Reservoir and to the west of West Ashridge, which feeds into Jennetts Reservoir; and
  - the River Torridge.
- The Proposed Development also includes an option to cross an unnamed watercourse (situated within an area of woodland), to the immediate south of the Converter Site, via HDD.

1.7.104 Where possible, HDD crossings will be undertaken by non-impact methods, excluding preparatory works in order to minimise construction vibration beyond the immediate location of works.

1.7.105 Open-cut techniques may be used, where appropriate, for minor ditches or smaller watercourses that are frequently dry. 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.

1.8 Summary and Conclusions

Summary

1.8.1 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 km from the landfall at Cornborough Range to the Alverdiscott Substation Connection Development via the Converter Site, located to the west of Alverdiscott.

Flood Risk

1.8.2 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 at 'low' risk of flooding. 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, at ‘medium’ to ‘high’ risk of flooding.

- Formal flood defences are located upon either bank of the River Torridge. The shingle bar along the coastline of Cornborough Range acts as an informal flood defence, by virtue of elevation.
- Historical flood extents include land within proximity to the River Torridge and River Yeo.
- The proposed Onshore Infrastructure Area includes the landfall, Onshore Cable HVDC Corridor, HVAC Cables, Converter Site and Alverdiscott Substation Connection Development. These elements are defined as ‘Essential Infrastructure’ in Table 2 of the NPPF. Due to the Onshore HVDC Cable Corridor traversing through areas Flood Zone 2 and 3, this section of development is subject to an exception test.
- The Onshore HVDC Cable Corridor will connect the Converter Site and therefore are unable to be routed without crossing areas within Flood Zone 3. This does not increase flood risk to the surrounding area and has negligible risk of flooding on the Proposed Development. On this basis, the exception test is determined to be passed.
- Temporary construction compounds and other remaining Proposed Development elements within the Onshore Infrastructure Area such as haul roads are classified as ‘less vulnerable’ and is acceptable within Flood Zone 1, 2 and 3a.
- The study area has 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 has been assessed to have a low risk of groundwater flooding.
- The Onshore Infrastructure Area has been assessed to have a low risk of sewer flooding.
- The Onshore Infrastructure Area has been assessed to have a low risk of reservoir flooding.
- The Onshore Infrastructure Area has been assessed to have a low risk of flooding from artificial sources.
- 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

1.8.3 The FRA and supporting documentation shows that the Proposed Development meets the requirements of the NPS EN-1, the NPPF and the associated PPG.

1.9 References

BGS Geology Viewer - The Geological Map viewer of Britain (2023). BGS Geology Viewer (BETA). Available at: https://geologyviewer.bgs.ac.uk/?_ga=2.60345197.172764960.1660052920-1090504202.1660052920 (Accessed: 14 June 2023).

Department for Communities and Local Government (2014). National Planning Policy Guidance [Online]. Available at: https://www.gov.uk/guidance/national-planning-policy-framework

Department for Environment Food & Rural Affairs (2022). Climate change allowances for peak rainfall in England [online]. Available at: https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

Devon County Council (2012). Surface Water Management Plan. Phase 1 – Strategic Assessment [online]. Available at: https://consult.torridge.gov.uk/file/3369625

Environment Agency (2021). Climate Change Allowances for Peak River flow in England [online]. Available at: https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=363522b846b842a4a905829a8d8b3d0c

Explore Catchment Data (2023). Available at: https://environment.data.gov.uk/catchment-planning/

FEH Web Service (2023) [online]. Available at: https://fehweb.ceh.ac.uk/GB/map

GeoIndex (onshore) (2023). British Geological Survey [online]. Available at: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/ (Accessed: 14 June 2023).

GOV. UK. (2022) Flood Risk Assessments: Climate change allowances [online]. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

GOV.UK (2023). Flood Map for Planning [online]. Available at: https://flood-map-for-planning.service.gov.uk/

GOV.UK (2023). Long Term Flood Risk Map [online]. Available at: https://check-long-term-flood-risk.service.gov.uk/map

GOV.UK. Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2022). Planning Practice Guidance: Flood Risk and Coastal Change [online]. https://www.gov.uk/guidance/flood-risk-and-coastal-change

GOV.UK. Department of Energy and Climate Change (2011). Overarching National Policy Statement (NPS) for Energy EN-1 [online]. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

GOV.UK. Ministry of Housing Communities & Local Government (2021). National Planning Policy Framework [online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

Internal Drainage Boards Map (2023) [online]. Available at https://www.ada.org.uk/idb-map/

Ministry of Housing, Communities and Local Government (2021). The National Planning Policy Framework [Online]. Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

National Soil Resources Institute (2023). Soilscapes. Cranfield University – LandIS [online]. Available at: http://www.landis.org.uk/soilscapes/

North Devon Council and Torridge District Council – Level 1 Strategic Flood Risk Assessment (2009) [online]. Available at: https://www.torridge.gov.uk/article/11269/Strategic-Flood-Risk-Assessment-SFRA-Level-1-and-2

North Devon Council and Torridge District Council (2018). The North Devon and Torridge Local Plan 2011-2031 [Online]. Available at: https://www.torridge.gov.uk/localplan

Torridge District Council (2010). Strategic Flood Risk Assessment – Level 2 [online]. https://www.torridge.gov.uk/media/5892/SFRA-Level-2-complete-document/pdf/SFRA_L2_All.pdf?m=634160806451070000

Annex A: Microdrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.300
Area (ha)	2.800	Urban	0.000
SAAR (mm)	1034	Region Number	Region 8

Results	**l/s**
QBAR Rural	8.1
QBAR Urban	8.1
Q2 years	7.1
Q1 year	6.3
Q30 years	15.4
Q100 years	19.5

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.899	0.399	8.1	643.3	O K
30 min Summer	9.018	0.518	8.1	885.6	O K
60 min Summer	9.143	0.643	8.1	1165.7	O K
120 min Summer	9.231	0.731	8.1	1381.1	O K
180 min Summer	9.288	0.788	8.1	1530.2	O K
240 min Summer	9.332	0.832	8.1	1647.8	O K
360 min Summer	9.398	0.898	8.1	1831.7	O K
480 min Summer	9.445	0.945	8.1	1971.0	O K
600 min Summer	9.481	0.981	8.1	2077.8	O K
720 min Summer	9.508	1.008	8.1	2161.6	O K
960 min Summer	9.546	1.046	8.1	2280.3	O K
1440 min Summer	9.583	1.083	8.1	2398.7	O K
2160 min Summer	9.587	1.087	8.1	2413.2	O K
2880 min Summer	9.572	1.072	8.1	2364.1	O K
4320 min Summer	9.539	1.039	8.1	2258.3	O K
5760 min Summer	9.515	1.015	8.1	2184.2	O K
7200 min Summer	9.510	1.010	8.1	2166.7	O K
8640 min Summer	9.513	1.013	8.1	2175.7	O K
10080 min Summer	9.522	1.022	8.1	2206.2	O K
15 min Winter	8.939	0.439	8.1	721.3	O K
30 min Winter	9.068	0.568	8.1	993.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.138	0.0	563.6	27
30 min Summer	85.623	0.0	671.8	41
60 min Summer	56.669	0.0	1131.5	72
120 min Summer	33.981	0.0	1301.0	130
180 min Summer	25.370	0.0	1334.5	190
240 min Summer	20.689	0.0	1325.9	250
360 min Summer	15.592	0.0	1283.4	370
480 min Summer	12.773	0.0	1234.3	488
600 min Summer	10.934	0.0	1197.6	608
720 min Summer	9.621	0.0	1171.0	728
960 min Summer	7.839	0.0	1136.9	966
1440 min Summer	5.822	0.0	1110.8	1444
2160 min Summer	4.255	0.0	2359.7	2160
2880 min Summer	3.398	0.0	2283.3	2736
4320 min Summer	2.477	0.0	2138.9	3416
5760 min Summer	1.998	0.0	4002.1	4200
7200 min Summer	1.724	0.0	4278.1	5040
8640 min Summer	1.545	0.0	4271.1	5880
10080 min Summer	1.422	0.0	4057.5	6760
15 min Winter	124.138	0.0	614.9	26
30 min Winter	85.623	0.0	683.2	41

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	9.202	0.702	8.1	1308.5	O K
120 min Winter	9.297	0.797	8.1	1552.5	O K
180 min Winter	9.359	0.859	8.1	1722.7	O K
240 min Winter	9.407	0.907	8.1	1858.0	O K
360 min Winter	9.478	0.978	8.1	2069.6	O K
480 min Winter	9.529	1.029	8.1	2228.1	O K
600 min Winter	9.568	1.068	8.1	2351.1	O K
720 min Winter	9.598	1.098	8.1	2449.2	O K
960 min Winter	9.641	1.141	8.1	2591.4	O K
1440 min Winter	9.685	1.185	8.1	2743.4	O K
2160 min Winter	9.698	1.198	8.1	2788.7	O K
2880 min Winter	9.689	1.189	8.1	2758.7	O K
4320 min Winter	9.650	1.150	8.1	2621.7	O K
5760 min Winter	9.621	1.121	8.1	2524.9	O K
7200 min Winter	9.609	1.109	8.1	2485.2	O K
8640 min Winter	9.605	1.105	8.1	2471.8	O K
10080 min Winter	9.608	1.108	8.1	2482.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.669	0.0	1245.6	70
120 min Winter	33.981	0.0	1339.2	128
180 min Winter	25.370	0.0	1324.3	188
240 min Winter	20.689	0.0	1292.6	246
360 min Winter	15.592	0.0	1228.0	364
480 min Winter	12.773	0.0	1187.5	482
600 min Winter	10.934	0.0	1162.4	598
720 min Winter	9.621	0.0	1147.7	716
960 min Winter	7.839	0.0	1139.8	950
1440 min Winter	5.822	0.0	1150.8	1414
2160 min Winter	4.255	0.0	2343.9	2096
2880 min Winter	3.398	0.0	2291.7	2748
4320 min Winter	2.477	0.0	2220.0	3892
5760 min Winter	1.998	0.0	4459.1	4448
7200 min Winter	1.724	0.0	4561.2	5408
8640 min Winter	1.545	0.0	4384.6	6392
10080 min Winter	1.422	0.0	4208.1	7272

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 250272 125099 SS 50272 25099
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 2.800

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	4	0.933	4	8	0.933	8	12	0.933

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 8.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1313.8	1.500	4245.5	1.501	4248.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0125-8100-1500-8100
Design Head (m)	1.500
Design Flow (l/s)	8.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	125
Invert Level (m)	8.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	8.1
Flush-Flo™	0.437	8.1
Kick-Flo®	0.922	6.4
Mean Flow over Head Range	-	7.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.5	1.200	7.3	3.000	11.2	7.000	16.8
0.200	7.3	1.400	7.8	3.500	12.1	7.500	17.4
0.300	7.9	1.600	8.3	4.000	12.9	8.000	17.9
0.400	8.1	1.800	8.8	4.500	13.6	8.500	18.5
0.500	8.1	2.000	9.3	5.000	14.3	9.000	19.0
0.600	7.9	2.200	9.7	5.500	15.0	9.500	19.5
0.800	7.3	2.400	10.1	6.000	15.6		
1.000	6.7	2.600	10.5	6.500	16.2		